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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE HIGH POINT QUADRANGLE, CARBON COUNTY, WYOMING

[Report includes 21 plates]

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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CONTENTS

ILLUSTRATIONS

Plates 1-21. Coal resource occurence and coal development potential maps:

Illustrations--Continued

TABLES

INTRODUCTION

Purpose

This text is to be used in conjunction with Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) Maps of the High Point quadrangle, Carbon 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 14-008-0001-17104. Published and unpublished public information was used as the data base for this study.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 High Point quadrangle is located in south-central Wyoming in the western portion of Carbon County, approximately 29 miles (46 km) southwest of Rawlins and 6 miles (10 km) southeast of Wamsutter, Wyoming. The area is unpopulated.

Accessibility

Wyoming Highway 789, which runs north-south along the eastern edge of the quadrangle, joins Interstate Highway 80 at Creston Junction approximately 8 miles (12 km) to the north and the town of Baggs near the Wyoming-Colorado border. The remainder of the quadrangle is served by a network of unimproved dirt roads and trails.

The main east-west line of the Union Pacific Railroad lies 5 miles (8 km) to the north of the quadrangle. This line passes through southern Wyoming, connecting Ogden, Utah to the west and Omaha, Nebraska to the east.

Physiography

The High Point quadrangle lies on the northeastern rim of the Washakie Basin. The landscape is characterized by rolling hills and questas. High Point, a 150-foot (46-m) high butte, is located in the

northeastern portion of the quadrangle. The southern branch of the Continental Divide, which encircles the Great Divide Basin, cuts across the southern half of the quadrangle. Altitudes vary from approximately 6,740 feet (2,055 m) on the southwestern edge of the quadrangle, to 7,321 feet (2,232 m) at the summit of High Point.

Horse Pasture Draw, Coal Bank Wash, and Standard Draw drain the northern portion of the quadrangle, flowing into an undrained depression west of the quadrangle boundary. Coal Gulch, draining the area south of the Continental Divide, is a tributary of Muddy Creek and the Little Snake River. All streams in the quadrangle flow intermittently in response to snowmelt in the spring.

Climate and Vegetation

The climate of south-central 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 annual precipitation in the area averages 10.4 inches (26.4 cm). Approximately two thirds of the precipitation falls in the spring and summer months during a seven-month period from April through October.

The average annual temperature in the area is 43°F (6°C). The temperature during January averages 21°F (-6°C) and ranges from 12°F (-11°C) to 31°F (-0.6°C). During July the average temperature is 68°F (20° C), and the temperature ranges from 51° F (11° C) to 84° F (29° C) (U.S. Bureau of Land Management, 1978, and Wyoming Natural Resources Board, 1966).

Winds are usually from the southwest and the west-southwest with an average velocity of 12 miles per hour (19 km per hr) (U.S. Bureau of Land Management, 1978).

Principal types of vegetation in the quadrangle include grasses, sagebrush, greasewood, saltbush, rabbitbrush, and other desert shrubs.

Land Status

The High Point quadrangle lies on the west-central edge of the Rawlins Known Recoverable Coal Resource Area. The eastern one half of the quadrangle lies within the KRCRA boundary. The Federal government owns the coal rights for approximately two fifths of this area. One active coal lease is present within the KRCRA boundary, as shown on plate 2.

GENERAL GEOLOGY

Previous Work

Ball (1909) described the coals of the Fort Union Formation present in the High Point quadrangle in his study of the western part of the Little Snake River coal field. Bradley (1964) described the stratigraphy and structure of the Washakie Basin and adjacent areas. Welder and McGreevy (1966) included the High Point quadrangle in a report published on the geology and ground-water resources of the Great Divide and Washakie Basins. Sanders (1974 and 1975) made detailed investigations of the geology and coal resources of the adjacent Creston Junction quadrangle and the Riner quadrangle to the northeast. Edson and Curtiss (1976) published lithologic descriptions and geophysical logs of coal test holes drilled by the U.S. Geological Survey in the High Point quadrangle in 1975. Recent unpublished data from the Rocky Mountain Energy Company (RMEC) and from the U.S. Geological Survey provided coal outcrop and coal thickness information.

Stratigraphy

The formations exposed in the High Point quadrangle range in age from Paleocene to Recent. Only the Paleocene-age Fort Union Formation contains coal in the quadrangle.

The Fort Union Formation, cropping out in the southeastern portion of the quadrangle, is approximately 3,400 feet (1,036) m) thick in the adjacent Creston Junction quadrangle. No information is available on the formation thickness in the High Point quadrangle. At the base of the Fort Union Formation are approximately 500 feet (152 m) of light-gray, thick-bedded to massive, medium- to coarse-grained sandstones. These

are overlain by approximately 1,500 feet (457 m) of alternating beds of light-brown to orange argillaceous siltstone, light-gray fine- to medium-grained sandstone, light- to dark-gray shale, and thin lenticular coal beds. Above these are approximately 700 feet (213 m) of arenaceous siltstone and carbonaceous shale. The upper 600 to 700 feet (183 to 213 m) of the Fort Union Formation consist of gray-brown argillaceous siltstone, brown micaceous sandstone, shale, thick coals, and lignite (Sanders, 1974 and 1975).

Unconformably overlying the Fort Union Formation and cropping out in the northwestern portion of the quadrangle, is the Eocene-age Wasatch Formation. The Wasatch Formation consists of intertonguing white to yellowish-white massive beds of arkose, or brown ferruginous lenses of coarse-grained to granulitic arkose, gray to green sandy claystone and siltstone, and thin beds of black carbonaceous shale which locally contains numerous plant fragments. The base of the formation is placed at the lowest occurrence of ferruginous lenses or massive arkose beds. These sediments, lithologically equivalent to the Battle Springs Formation to the north of the quadrangle, grade southwestward into the coal-bearing main body of the Wasatch Formation, which consists of cream-colored to gray siltstone, coal, organic shale, fossilferous fine-grained sandstone, and sandy limestone (Masursky, 1962, and Sanders, 1974 and 1975).

Recent deposits of alluvium cover the stream valleys of Standard Draw, Coal Bank Wash, and Coal Gulch.

Thick sections of detrital material, eroded from older deposits, were deposited as the coarse sandstones of the Fort Union Formation. The sandstones, shales and coals of the Fort Union Formation were deposited in stream, lake, and swamp environments.

The coarse-grained arkose of the Wasatch Formation is probably a fluvial facies of the main Wasatch Formation which formed in a piedmont environment adjacent to the sediment source. The beds of the Wasatch Formation grade southwestward into the fine-grained, thin-bedded,

coal-shale-sandstone facies deposited in alternating lake, swamp, and stream environments (Masursky, 1962).

Structure

The High Point quadrangle lies south of the Wamsutter Arch, a broad low structure separating the Great Divide and Washakie structural basins, on the northeastern rim of the Washakie Basin. Beds in the area strike northeasterly and dip gently to the northwest.

COAL GEOLOGY

The Fort Union Formation contains two coal zones, the Upper and Lower Fort Union Coal Zones, in the High Point quadrangle; the latter zone is encountered at depth in oil and gas wells drilled in the quadrangle. Approximately 1,500 feet (457 m) of coal, siltstone, sandstone and carbonaceous shale form the Lower Fort Union Coal Zone. Another 1,000 feet (305 m) of siltstone, carbonaceous shale, and sandstone separate the upper bed of the Lower Fort Union Coal Zone and the lowest identified bed of the Upper Fort Union Coal Zone. The Upper Fort Union Coal Zone is approximately 200 feet (61 m) thick in this quadrangle.

Chemical analyses of coal.--Representative chemical analyses of samples from the Upper Fort Union Coal Zones in the Creston Junction and Seaverson Reservoir quadrangles are included in table 1 (Sanders, 1975). An analysis of an undifferentiated coal bed in the Lower Fort Union Coal Zone from the Riner quadrangle is also included in table 1 (RMEC, no date).

In general the coals in this area rank as subbituminous B or C on a moist, mineral-matter-free basis according to ASTM Standard Specification D 388-77 (American Society for Testing and Materials, 1977).

Lower Fort Union Coal Zone

Beds of the Lower Fort Union Coal Zone do not crop out in the High Point quadrangle, but do occur in two oil or gas wells drilled in the quadrangle. They were found to be uncorrelatable with identified beds mapped to the east in the Seaverson Reservoir quadrangle because of the large distance to the outcrop. Bracketed numbers were used in this quadrangle to name the beds.

Nine Lower Fort Union coal beds were identified, and one, the FU[8] coal bed, was mapped as a local bed, while the rest were treated as isolated data points (see Isolated Data Points section of this report).

FU[8] Coal Bed

The FU[8] coal bed measures 10 feet (3.1 m) thick in sec. 9, T. 18 N., R. 92 W., and 11 feet (3.4 m) thick in sec. 32, T. 19 N., R. 92 W. The bed is nearly 3,000 feet (914 m) in depth and dips 9° to the west.

Upper Fort Union Coal Zone

Rocky Mountain Energy Company has drilled extensively in the Rawlins area and has named many of the Upper Fort Union coal beds using an alpha-numeric designation (e.g., D). Generic names (e.g., Cow Butte) have been used by Edson (1976) to designate the same coal beds. Both names are used in this report and on CRO maps where applicable.

The Upper Fort Union Coal Zone is represented in this quadrangle by three identified and three unnamed coal beds, plus numerous thin local coal beds. Bracketed numbers were assigned to the unnamed beds for identification purposes in this quadrangle only. Beds dip approximately 6° to the west (Edson, 1977).

Cow Butte (D) Coal Bed

The Cow Butte (D) coal bed is, stratigraphically, the lowest identified coal bed in the Upper Fort Union Coal Zone. The bed was named by Edson (1976) for Cow Butte, located in sec. 5, T. 19 N., R. 91 W. The

maximum thickness of the bed occurs in a measured section in sec. 3, T. 18 N., R. 92 W., and is reported to be 15.2 feet (4.6 m) thick excluding 9.5 feet (2.9 m) of carbonaceous shale. To the east in the Seaverson Reservoir quadrangle, the bed contains fewer shale partings and averages 10 feet (3.1 m) thick. In the Creston quadrangle to the north, the bed thickens to 23.5 feet (7.2 m) with a 12-foot (3.7-m) parting of carbonaceous shale. From plate 11, the dip of the bed is calculated as 2° to 5° to the west.

FU[11] Coal Bed

The FU[11] coal bed is located stratigraphically above the Cow Butte bed and is separated from it by approximately 25 feet (7.6 m) of shale and sandstone. The FU[11] bed measures 24.5 feet (7.5 m) thick in sec. 21, T. 19 N., R. 92 W. and 14.9 feet (4.5 m) thick in sec. 15, T. 19 N., R. 92 W. Based on these two measurements, it is believed that this bed extends into the Seaverson Reservoir quadrangle. An Areal Distribution and Identified Resource map was not prepared for the FU[11] bed since all coal 5 feet (1.5 m) or greater in thickness (Reserve Base thickness) lies within non-Federal or obligated Federal lands. The dip of the bed, as derived from plate 4, is approximately 2° to the west.

FU[12] Coal Bed

The FU[12] coal bed is about 110 feet (34 m) above the Cow Butte bed and is not found in any other quadrangle. The FU[12] coal bed was encountered in five drill holes; the maximum recorded thickness is 10 feet (3.1 m) and is located in sec. 33, T. 19 N., R. 92 W. The dip of this bed, calculated from plate 7, is approximately 2° to the west.

FU[13] Coal Bed

The FU[13] coal bed is a relatively insignificant local coal bed found 50 feet (15.2 m) above the FU[12] bed in one drill hole in the quadrangle. It measures 6 feet (1.8 m) thick in sec. 15, T. 19 N., R. 92 W., and to the east in the Seaverson Reservoir quadrangle the bed is reported to be 8 feet (2.4 m) thick. The bed is located on non-Federal

or obligated Federal land. Therefore, no Areal Distribution and Identified Resource map was prepared. The bed dips at approximately 2° to the west.

Cherokee Coal Bed

The Cherokee coal bed is the most significant coal bed occurring in the Upper Fort Union Coal Zone. The bed was named for the Cherokee loading station on the Union Pacific Railroad in sec. 10, T. 20 N., R. 91 W., and is stratigraphically located approximately 20 feet (6.1 m) above the FU[13] bed. This bed reaches a maximum thickness of 38.6 feet (11.8 m), excluding a 2.9-foot (0.9-m) parting of carbonaceous shale, in sec. 2, T. 19 N., R. 92 W. The total amount of partings increase to the south where the bed eventually pinches out before reaching the quadrangle boundary. In the Seaverson Reservoir quadrangle to the east, the bed averages 35 feet (10.7 m) thick when not split. In the northern portion of the Seaverson Reservoir quadrangle, the Cherokee coal bed is split by an average of 5 feet (1.5 m) of interburden that thickens gradually to the north. The dip of the bed is approximately 2.5° to the west as calculated from plate 15.

High Point (A) Coal Bed

The High Point (A) coal bed is, stratigraphically, the highest identified coal bed in the Upper Fort Union Coal Zone. The High Point coal bed was named for the High Point ridge in sec. 17, T. 19 N., R. 92 W (Edson, in press, a). The bed crops out along the eastern boundary of the quadrangle, attains a maximum thickness of 5.6 feet with a 1.0-foot (0.3-m) shale parting in sec. 21, T. 19 N., R. 92 W., and then thins rapidly to the west. To the east, in the Seaverson Reservoir quadrangle, the bed averages 6 feet (1.8 m) thick. In this quadrangle, no Areal Distribution and Identified Resources map was prepared because the bed exists only on non-Federal land. From plate 18, the dip of the High Point bed was calculated to be 1.5° to the west.

Isolated Data Points

In instances where isolated measurements of coal beds thicker than 5 feet (1.5 m) are encountered, the standard criteria for construction

of isopach, structure contour, mining ratio, and overburden isopach maps are not available. The lack of data concerning these coal beds limits the extent to which they can be reasonably projected in any direction and usually precludes correlations with other, better known beds. For this reason, isolated data points are included on a separate sheet (in U.S. Geological Survey files) for non-isopachable coal beds. The isolated data points used in this quadrangle are listed below. Coal beds identified by bracketed numbers are not formally named, but are numbered for identification purposes in this quadrangle only.

Source	Location	Coal Bed or Zone	Thickness
RMEC	sec. 27, T. 18 N., R. 92 W.	FU[1]	5.5 ft (1.7 m)
Michigan-Wisconsin Pipeline Co.	sec. 9, T. 18 N., R. 92 W.	FU[2]	5.0 ft (1.5 m)
Michigan-Wisconsin Pipeline Co.	sec. 9, T. 18 N., R. 92 W.	FU[3]	8.0 ft (2.4 m)
Michigan-Wisconsin Pipeline Co.	sec. 9, T. 18 N., R. 92 W.	FU[4]	6.0 ft (1.8 m)
Michigan-Wisconsin Pipeline Co.	sec. 9, T. 18 N., R. 92 W.	FU[5]	10.0 ft (3.1 m)
El Paso Natural Gas Co.	sec. 32, T. 19 N., R. 92 W.	FU[6]	10.0 ft (3.1 m)
Michigan-Wisconsin Pipeline Co.	sec. 9, T. 18 N., R. 92 W.	FU[7]	6.0 ft (1.9 m)
El Paso Natural Gas Co.	sec. 32, T. 19 N., R. 92 W.	FU[9]	5.0 ft (1.5 m)
El Paso Natural Gas Co.	sec. 32, T. 19 N., R. 92 W.	FU[10]	7.0 ft (2.1 m)

COAL RESOURCES

Information from oil and gas wells, coal test holes drilled by the U.S. Geological Survey (1965), and data from Edson (in press, a, in press, b, and 1977) were used to construct outcrop, isopach, and structure contour maps of the coal beds in this quadrangle. The source of each indexed data point used on plate 1 is listed in table 3. At the request of RMEC, coal-rock data for some of their drill holes have not been shown on plate 1 or on the derivative maps. However, data from

these drill holes have been used to construct the derivative maps. These data may be obtained by contacting RMEC.

Coal resources were calculated using data obtained from the coal isopach maps (plates 4, 7, 10, 14, and 18). The coal bed acreage (measured by planimeter) multiplied by the average isopached thickness of the coal bed and by a conversion factor of 1,770 short tons of coal per acre-foot (13,018 metric tons per hectare-meter) for subbituminous coal yields the coal resources in short tons of coal for each isopached coal bed. Reserve Base and Reserve tonnages for the isopached beds are shown on the Areal Distribution and Identified Resource maps, and are rounded to the nearest 10,000 short tons (9,072 metric tons). Coal beds thicker than 5 feet (1.5 m) that lie less than 3,000 feet (914 m) below the ground surface are included, although this criteria differs somewhat from that used in calculating Reserve Base and Reserve tonnages as stated in U.S. Geological Survey Bulletin 1450-B, which calls for a maximum depth of 1,000 feet (305 m) for subbituminous coal. Only Reserve Base tonnages (designated as inferred resources) are calculated for areas in this quadrangle that are influenced by isolated data points. Coal Reserve Base tonnages per Federal section are shown on plate 2 and total approximately 110.28 million short tons (100.05 million metric tons) for the entire quadrangle. Reserve Base tonnages in the various development potential categories for surface and subsurface mining methods are shown in tables 1 and 2.

Dames & Moore has not made any determination of economic recoverability for any of the coal beds described in this report.

COAL DEVELOPMENT POTENTIAL

Coal development potential areas are drawn to coincide with the boundaries of the smallest legal land subdivisions shown on plate 2. In sections or parts of sections where no land subdivisions have been surveyed by the BLM, approximate 40-acre (16-ha) parcels have been used to show the limits of the high, moderate, or low development potentials. A constraint imposed by the BLM specifies that the highest development potential affecting any portion of a 40-acre (16-ha) lot, tract, or

parcel be applied to that entire lot, tract, or parcel. For example, if 5 acres (2 ha) within a parcel meet criteria for a high development potential, 25 acres (10 ha) a moderate development potential, and 10 acres (4 ha) a low development potential, then the entire 40 acres (16 ha) are assigned a high development potential.

Development Potential for Surface Mining Methods

Areas where the coal beds are overlain by 200 feet (61 m) or less of overburden are considered to have potential for surface mining and were assigned a high, moderate, or low development potential based on the mining ratio (cubic yards of overburden per ton of recoverable coal).

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

Note: To convert mining ratio to cubic meters of overburden per metric ton of recoverable coal, multiply MR by 0.8428.

Areas of high, moderate, and low development potential for surface mining methods are defined as areas underlain by coal beds having respective mining ratio values of 0 to 10, 10 to 15, and greater than 15, as shown on plates 5, 8, 12, 16, and 19. These mining ratio values for each development potential category are based on economic and technological criteria and were provided by the U.S. Geological Survey.

Unknown development potentials have been assigned to those areas where coal data is absent or extremely limited, including areas influenced by isolated data points. Even though these areas contain coal thicker than 5 feet (1.5 m), limited knowledge of the areal distribution of the coal prevents accurate evaluation of development potential.

Tonnages included in the unknown potential category for isolated data points total 200,000 short tons (181,400 metric tons).

The coal development potential for surface mining methods (greater than 200 feet or 61 meters of overburden) is shown on plate 20.

Of the Federal land areas having a known development potential for surface mining methods, 71 percent are rated high, 14 percent are rated moderate, and 15 percent are rated low. The remainder of the Federal lands within the KRCRA are classified as having unknown development potential indicating that no known beds 5 feet (1.5 m) or more thick, not including isolated data points, occur within 200 feet (61 m) of the ground surface but that coal-bearing units are present.

Development Potential for Subsurface and In-Situ Mining Methods

The coal development potential for subsurface mining is shown on plate 21. Areas of high, moderate, and low development potential are defined as areas underlain by coal beds of Reserve Base thickness at depths ranging from 200 to 1,000 feet (61 to 305 m), 1,000 to 2,000 feet (305 to 610 m), and 2,000 to 3,000 feet (610 to 914 m), respectively.

Of the Federal land areas classified as having known development potential for conventional subsurface mining methods, 73 percent are rated high and 6 percent are rated moderate. The remaining Federal land is classified as having unknown development potential, implying that no known coal in beds 5 feet (1.5 m) or more thick, not including isolated data points, occur between 200 feet (61 m) and 3,000 feet (914 m) below the ground surface but that coal-bearing formations are present. Tonnages for the unknown (subsurface) development potential for isolated data points total 20.55 million short tons (18.64 million metric tons).

Because the coal beds in the quadrangle possess relatively gentle dips (less than 15°), development potential for in-situ mining methods is rated as unknown.

Table 1. Chemical analyses of coals in the High Point quadrangle, Carbon 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
Sec. 27, T. 19 N., R. 92 W. (Sanders, 1975)	High Point (A)	A	15.87	34.76	29.01	20.36	3.33	-	-	-	-	-	7,782
Cherokee coal district, Creston Junction quadrangle (Sanders, 1975)	Upper Cherokee	A	22.65	31.62	30.30	14.59	1.82	-	-	-	-	-	7,714
Cherokee coal district, Creston Junction quadrangle (Sanders, 1975)	Lower Cherokee	A	22.37	34.85	30.42	12.80	1.66	-	-	-	-	-	8,293
Cherokee coal district, Creston Junction quadrangle (Sanders, 1975)	Cow Butte (D)	A	17.64	35.01	25.80	21.28	3.26	-	-	-	-	-	7,417
NW¼, NW¼, NW¼, sec. 35, T. 20 N., R. 90 W. (RR-75, RMEC - Red Rim)	FU, Undifferentiated	A	25.42	29.15	37.16	8.27	0.46	-	-	-	-	-	8,109

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. Strippable coal Reserve Base data for Federal coal lands (in short tons) in the High Point quadrangle, Carbon County, Wyoming.

Coal Bed	High Development Potential	Moderate Development Potential	Low Development Potential	Total
Cherokee	18,730,000	6,360,000	800,000	25,890,000
Cow Butte (D)	730,000	1,880,000	4,290,000	6,900,000
FU {12}	--	830,000	--	830,000
FU {8}	--	--	--	--
Total	19,460,000	9,070,000	5,090,000	33,620,000

Note: To convert short tons to metric tons, multiply by 0.9072.

Table 3. Coal Reserve Base data for subsurface mining methods for Federal coal lands (in short tons) in the High Point quadrangle, Carbon County, Wyoming.

Coal Bed	High Development Potential	Moderate Development Potential	Low Development Potential	Total
Cherokee	27,700,000	--	--	27,700,000
Cow Butte (D)	10,230,000	--	--	10,230,000
FU {12}	2,470,000	--	--	2,470,000
FU {8}	2,690,000	250,000	10,130,000	13,070,000
Total	43,090,000	250,000	10,130,000	53,470,000

Note: To convert short tons to metric tons, multiply by 0.9072.

Table 4. -- Sources of data used on plate 1

Plate 1 Index Number	Source	Data Base
1	Ball, 1909, U.S. Geological Survey Bulletin 341-B, p. 252	Measured Section,
2	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 3AS
3	Edson and Curtiss, 1976, U.S. Geological Survey Open-File Report 76-272;	Drill hole No. HP-D2
4	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS
5	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. 3AS
6	↓	Drill hole No. 35
7	↓	Drill hole No. 36
8	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 2AS
9	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. 37
10	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS
11	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. 3AS
12	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 2AS
13	Edson and Curtiss, 1976, U.S. Geological Survey Open-File Report 76-272	Drill hole No. HP-D3

Table 4. -- Continued

Plate 1 Index Number	Source	Data Base
14	Edson, 1977, U.S. Geological Survey unpublished map	Drill hole No. 1AS
15	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 3AS
16	Michigan Wisconsin Pipeline Co.	Oil/gas well No. 1-9 Creston Amoco
17	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 2AS
18		Drill hole No. 3AS
19		Drill hole No. 1AS
20		Drill hole No. 3AS
21		Drill hole No. 2AS
22		Drill hole No. 1AS
23		Drill hole No. 2AS
24		Drill hole No. 1AS
25		Drill hole No. 3AS
26		Drill hole No. 2AS
27		Drill hole No. 3AS
28	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. BS 797-1 (Union Carbide)
29	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS

Table 4. -- Continued

Plate 1 Index Number	Source	Data Base
30	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 3AS
31	↓	Drill hole No. 2AS
32	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. 1AS
33	↓	Drill hole No. 1AS
34	↓	Drill hole No. 2AS
35	U.S. Geological Survey, 1965, Inactive Coal Lease No. Wyoming-0252675	Drill hole No. 4
36	El Paso Natural Gas Co.	Oil/gas well No. 1 Cortez-Govt.
37	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. 1AS
38	↓	Drill hole No. 2AS
39	Edson and Curtiss, 1976, U.S. Geological Survey Open File Report 76-272	Drill hole No. HP-D1

REFERENCES

American Society for Testing and Materials, 1977, Standard specification for classification of coals by rank, in Gaseous fuels; coal and coke; atmospheric analysis: ASTM Standard Specification D 388-77, pt. 26, 7 p.

Ball, M. W., 1909, The western part of the Little Snake River coal field, Wyoming, in Coal fields of Wyoming: U.S. Geological Survey Bulletin 341-B, p. 243-255.

Barclay, C. S. V., Jobin, D. A., and Storrs, J. P., 1978, Minutes for the revision of the Rawlins (Little Snake River) Known Recoverable Coal Resource Area, Carbon and Sweetwater Counties, Wyoming, January 31, 1978: U.S. Geological Survey Conservation Division, unpublished report, 15 p.

Bradley, W. H., 1964, Geology of Green River Formation and associated Eocene rocks in southwestern Wyoming and adjacent parts of Colorado and Utah: U.S. Geological Survey Professional Paper 496-A, p. A1-A10.

Edson, G. M., in press (a), Preliminary geologic map and coal sections of the Seaverson Reservoir quadrangle, Carbon County, Wyoming: U.S. Geological Survey Conservation Division, unpublished map, sheet 2, scale 1:24,000.

_____ in press (b), Preliminary geologic map of the northwestern part of the Rawlins (Little Snake River) Known Recoverable Coal Resources Area (KRCRA): U.S. Geological Survey Conservation Division, unpublished map, scale 1:63,360.

_____ 1977, Unpublished drill hole location map with coal data from Rocky Mountain Energy Resources Co. and Northern Energy Resources Co. (Pacific Power and Light Co.): U.S. Geological Survey Conservation Division, unpublished map, scale 1:12,000.

Edson, G. M., and Curtiss, G. S., 1976, Lithologic and geophysical logs of holes drilled in the High Point, Seaverson Reservoir, and Fillmore Ranch quadrangles, Carbon County, Wyoming: U.S. Geological Survey Open-File Report 76-272.

Masursky, Harold, 1962, Uranium-bearing coal in the eastern part of the Red Desert area, Wyoming, in Uranium-bearing coal in the Great Divide Basin, Sweetwater County, Wyoming: U.S. Geological Survey Bulletin 1099-B, 152 p.

Rocky Mountain Energy Company, (no date), Unpublished drill hole data from the Union Pacific coal inventory of 1971.

References--Continued

Sanders, R. B., 1974, Geologic map and coal resources of the Riner quadrangle, Carbon and Sweetwater Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C-68, scale 1:24,000.

_____ 1975, Geologic map and coal resources of the Creston Junction quadrangle, Carbon and Sweetwater Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C-73, scale 1:24,000.

Smith, J. B., Ayler, M. F., Knox, C. C., and Pollard, B. C., 1972, Strippable coal reserves of Wyoming, location, tonnages, and characteristics of coal and overburden: U.S. Bureau of Mines Information Circular 8538, 51 p.

U.S. Bureau of Land Management, 1978, Draft environmental statement, proposed domestic livestock grazing management program for the Seven Lakes area: U.S. Bureau of Land Management, Rawlins district, Wyoming, v. 1, pt. 2, p. 1-3.

U.S. Geological Survey, 1965, Inactive coal lease No. Wyoming 0252675, G. E. Sorenson.

_____ 1976, Coal resource classification system of the U.S. Bureau of Mines and U.S. Geological Survey: U.S. Geological Survey Bulletin 1450-B, 7 p.

Welder, G. E., and McGreevy, L. J., 1966, Ground-water reconnaissance of the Great Divide and Washakie Basins and some adjacent areas, southwestern Wyoming: U.S. Geological Survey Hydrologic Investigations Atlas HA-219.

Wyoming Natural Resources Board, 1966, Wyoming weather facts: Cheyenne, p. 14-15.