Text to accompany:

Open-File Report 78-056

1978

COAL RESOURCE OCCURRENCE MAPS OF THE DIFFICULTY QUADRANGLE, CARBON COUNTY, WYOMING

(Report includes 9 plates)

Prepared for:

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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[Plates are in pocket]

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INTRODUCTION

Purpose

This text is to be used along with the accompanying Coal Resource Occurrence (CRO) maps of the Difficulty quadrangle, Carbon County, Wyoming (9 plates; U.S. Geol. Survey Open-File Report 78-056) prepared by Texas Instruments Incorporated under contract to the U.S. Geological Survey. This report was prepared to support the land planning work of the U.S. Bureau of Land Management's Energy Minerals Activities Recommendation System (EMARS) program, and to contribute to a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States. The Coal Resource Occurrence maps for this quadrangle cover part of the northeastern portion of the KRCRA of the Hanna coal field. The lack of correlatable coal of Reserve Base thickness beneath unleased Federal land in this quadrangle, as indicated on the CRO maps, precluded the construction of Coal Development Potential (CDP) maps which normally accompany this type of report.

Acknowledgment

Texas Instruments Incorporated acknowledges the cooperation of the Rocky Mountain Energy Company, a wholly owned subsidiary of the Union Pacific Railroad Company, in supplying copies of survey sheets, drillers reports, electric logs, and coal analyses from the Union Pacific coal inventory program.

The Hanna and Carbon coal basins were studied as part of the Union Pacific coal inventory program and test drilling was conducted in 1970-1971. More than 650 Union Pacific coal drill holes have been evaluated as part of this contract study of 21 quadrangles in Carbon County, Wyoming, and the results and 230 coal analyses have been incorporated into these reports.

Location

The Difficulty 7½-minute quadrangle is in the northeastern part of Carbon County, Wyoming. The center of the quadrangle is approximately 15 miles (24 km) northeast of Hanna and 17 miles (27 km) northwest of Medicine Bow, Wyoming (Figure 1).

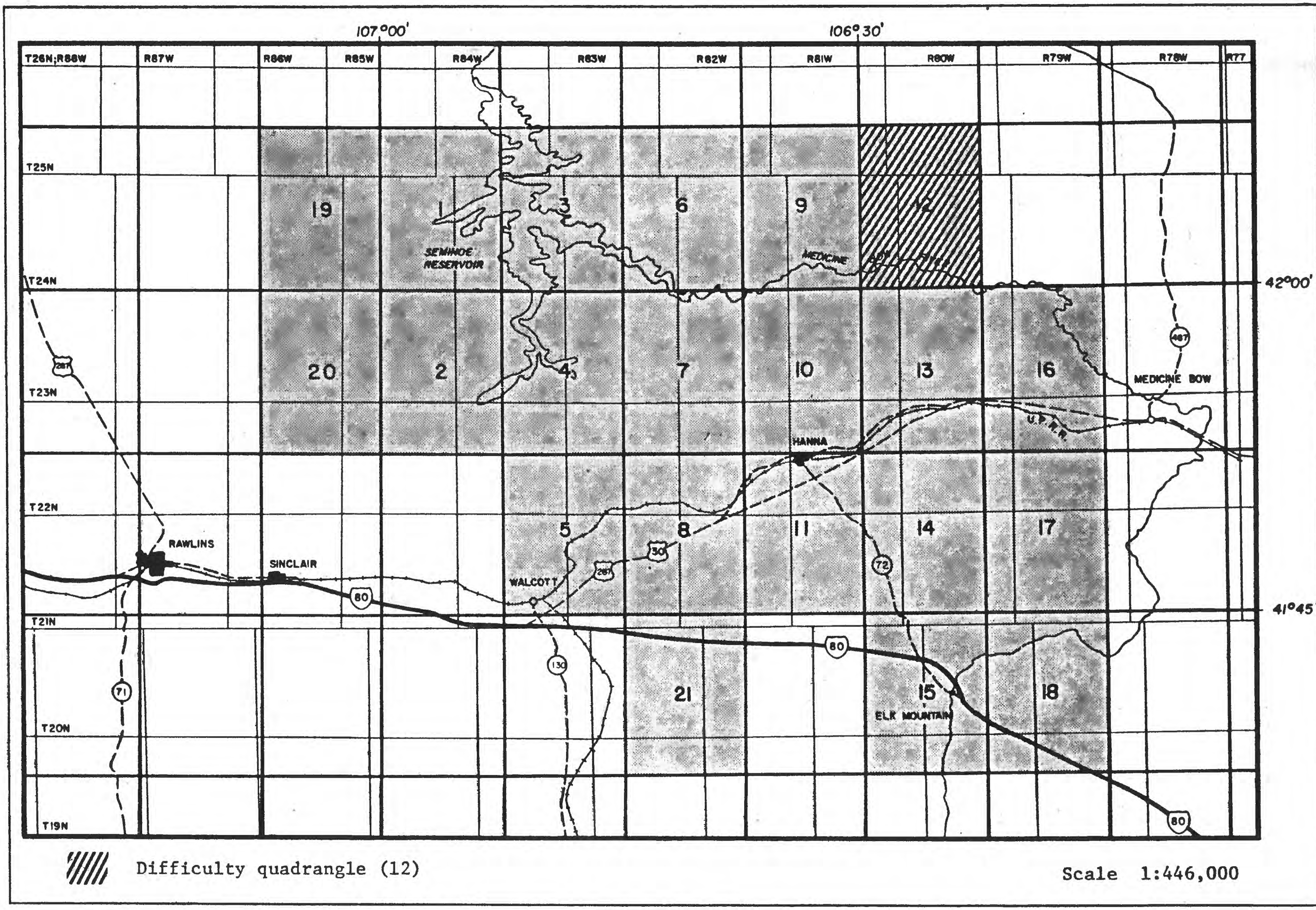

Figure 1. — Map of Hanna and Carbon Basins Study Area

Accessibility

Access within the quadrangle is provided by two light-duty roads, the Medicine Bow and Difficulty roads, and by numerous unimproved dirt roads. The Medicine Bow road crosses the southern part of the quadrangle from east to west, parallel to, and on the north side of, the Medicine Bow River. This road connects U.S. Highway 30/287 and the town of Medicine Bow, southeast of this quadrangle, with the site of Seminoe Dam to the west-northwest. The Difficulty road branches from the Medicine Bow road in sec. 28, T. 24 N., R. 80 W., and follows the valley of Difficulty Creek northward to the old settlement of Difficulty and the Ellis Ranch.

Numerous unimproved dirt roads are located in the central and eastern parts of the quadrangle, providing access from the main roads to ranches and sources of water. Fewer dirt roads are located in the more rugged terrain that occurs in the western half of the quadrangle.

The main east-west track of the Union Pacific Railroad passes 12 miles (19 km) south of the center of the quadrangle, connecting the town of Medicine Bow to the east with Sinclair and Rawlins to the west.

Physiography

The Difficulty quadrangle is located on the northeastern rim of the Hanna structural basin. The southern third of the quadrangle, within the drainage basin of the Medicine Bow River, is rolling topography that is typical of the dissected high plains grasslands of the Hanna Basin. The northern two-thirds of the quadrangle is more rugged and higher topography that is part of the flanking mountain ranges to the north of the Hanna Basin. In the northwest corner of the quadrangle is the southeastern end of the Shirley Mountains; in the east-central sector, east of Difficulty Creek, is the western end of the Freezeout Mountains; the intervening upland area, generally above 7,000 feet (2,134 m) elevation, is known locally as Little Basin.

Elevations in the quadrangle range from 8,360 feet (2,548 m) in the Shirley Mountains in the extreme northwest corner, to 6,420 feet (1,957 m) where the Medicine Bow River flows westerly at the southwest border. A prominent peak, Beer Mug Mountain, southwest of Difficulty, has a relief of 750 feet (229 m).

Drainage of the quadrangle is by creeks and their tributaries flowing south to the Medicine Bow River. The Medicine Bow River meanders westward near the quadrangle's southern boundary.

Climate

Climate data for the Difficulty quadrangle was obtained by evaluating and averaging the data recorded at two nearby weather stations. The Seminoe Dam station is located 24 miles (39 km) west-northwest of the center of the quadrangle at an elevation of 6,838 feet (2,084 m); precipitation and temperature records are available for 33 years to 1970. The Medicine Bow station is located 17 miles (27 km) southeast of the center of the quadrangle at an elevation of 6,570 feet (2,003 m); precipitation and temperature records are available for 23 years to 1970.

The climate is semiarid with a mean annual temperature of 42°F (6°C) and extremes ranging from 98° to -38°F (37° to -39°C). July is the warmest month with a mean monthly temperature of 67°F (19°C) and January is the coldest month with 21°F (-6°C). For seven months of the year, April to October, the mean monthly temperature exceeds 32°F (0°C). Average annual precipitation is 12 inches (30 cm) with 57 percent of this total falling in the five months of March to July. Part of the precipitation in March, April, and May is in the form of snow. Average annual snowfall is 102 inches (259 cm) with 63 percent falling in the four months of January to April. Snow rarely falls in July and August but an inch or more of snow may fall in any other month. March is the month of maximum snowfall (18 inches, or 46 cm). This snowfall data was obtained by averaging figures from Elk Mountain and Seminoe Dam weather stations. No data on snowfall was available from the Medicine Bow weather station.

High winds are common throughout most of the year. The prevailing wind direction, as recorded at four weather stations around the perimeter of the Hanna and Carbon Basins, is westerly for all twelve months of the year. The growing season is restricted to less than 100 days between late May and early September, which are the average times of the last killing spring frost and the first killing fall frost, respectively.

Land Status

The Difficulty quadrangle is located in the northeastern part of the KRCRA of the Hanna coal field. The Federal Government owns 40 percent of the coal rights in the quadrangle; the remaining 60 percent is non federally owned. Approximately 10 percent of the area of the quadrangle is included in the KRCRA, and within this region about 30 percent of the land is federally owned. Plate 2 of the CRO maps shows the boundary of the KRCRA and the ownership status of land in the quadrangle. There are no known active leases, permits, or licenses in the quadrangle; nor are there any producing or abandoned mines.

GENERAL GEOLOGY

Previous Work

Dobbin, Bowen, and Hoots (1929) mapped the southern third of the Difficulty quadrangle as part of their study of the geology and coal and oil resources of the Hanna and Carbon Basins. Berta (1951) reviewed the general stratigraphy and structure of the Hanna coal field. Weitz and Love (1952) compiled a geologic map of Carbon County, Wyoming, which incorporates available data, published and unpublished, to that date. Gill, Merewether, and Cobban (1970) defined and correlated the upper Cretaceous and lower Tertiary rocks of south-central Wyoming, including the stratigraphic units that are exposed in this quadrangle.

Stratigraphy

Rocks exposed in the quadrangle range in age from Late Paleozoic to Quaternary. Coal beds are found in the upper part of the Hanna Formation of Paleocene age.

Sediments older than Cretaceous age crop out in the northwest, northeast, and southeast parts of the quadrangle. The pre-Cretaceous age sediments include: the Pennsylvanian Tensleep and Amsden Formations, undivided Permian rocks, undivided Triassic rocks, undivided Jurassic rocks, and the Jurassic Morrison Formation. The approximate thickness of pre-Cretaceous sediments is 3,000 feet (914 m).

The marine sediments of pre-Cretaceous age are unconformably overlain by marine sediments of Cretaceous age totaling more than 6,500 feet (1,981 m) in thickness. Included are the Lower Cretaceous Cloverly, Thermopolis, and Mowry Formations and the Upper Cretaceous Frontier, Niobrara, and Steele Shale Formations.

The geologic map of Weitz and Love (1952) shows three small outcrops of Steele Shale near the Medicine Bow River, in the southeastern part of the Difficulty quadrangle. Dobbin, Bowen, and Hoots (1929) map more extensive outcrops in the southeastern, south-central, and west-central parts of the quadrangle, but both maps show the Steele Shale overlain unconformably by rocks of the Hanna Formation of Paleocene age. The missing part of the stratigraphic succession between the Steele Shale and the Hanna Formation includes the Mesaverde Group, the Lewis Shale, and the Fox Hills and Medicine Bow Formations, all of Late Cretaceous age, and the Ferris Formation of Late Cretaceous/Early Paleocene age. These rocks do not crop out in the quadrangle but they may be present in the subsurface. The five drill holes of the Union Pacific coal inventory program (Plates 1 and 3) that are located in the southwestern part of the quadrangle, were too shallow to intersect anything but rocks of the Hanna Formation; but an oil well located immediately west of the Difficulty quadrangle in sec. 27, T. 24 N., R. 81 W. is reported to have intersected 2,563 feet (781 m) of overburden and rocks of the Hanna Formation, 3,225 feet (983 m) of Ferris Formation rocks, and 3,799 feet (1,158 m) of Medicine Bow Formation rocks, before the well was completed at a depth of 9,587 feet (2,922 m).

The Hanna Formation crops out in the central areas of the Hanna and Carbon Basins and contains many of the thick coal beds of the Hanna coal field, particularly in the neighborhood of the town of Hanna. The Hanna Formation is normally not only unconformable on the underlying Ferris Formation but also transgresses across all underlying formations; this includes the Precambrian basement rocks, for example in the northern part of the Medicine Bow National Forest, 38 miles (61 km) south-southeast of the center of this quadrangle. Knight (1951) measured two stratigraphic sections in T. 24 N., R. 82 W., 12 miles (19 km) west of the center of this quadrangle. Here, the Hanna Formation sediments are the upper part of a thick (13,300 to 17,500 feet, 4,054 to 5,334 m) sequence of conformable continental sediments that terminate at an erosion surface, indicating that the upper part of the Hanna Formation has been eroded. Bowen (1918) named the formation when mapping outcrops north and west of the town of Hanna; he does not report a type section locality but states that the formation is about 7,000 feet (2,134 m) thick.

The Hanna Formation consists of conglomerate, conglomeratic sandstone, sandstone, shale, and many thick beds of coal. The conglomerate occurs throughout the formation but is most abundant in the lower half. Thick conglomeratic sandstone and, locally, massive conglomerate mark the base of the formation. The sandstones of the formation range from coarse-grained massive or thick-bedded varieties to fine-grained thin-bedded sandstones which, in weathered outcrops, are a brown color and readily break into thin slabs. The coarse-grained varieties of sandstone are buff to grayish-white, commonly conglomeratic, and highly feldspathic. The conglomerates of the Hanna Formation differ from those of the Ferris Formation both in color and in the size and composition of the clasts. Gill, Merewether, and Cobban (1970) therefore suggest that, apparently, the conglomerates of the Ferris were derived from a distant source and those of the Hanna from a nearby source.

The mapping of Dobbin, Bowen, and Hoots (1929) shows that, to the north of a major west-northwest trending fault in the southwestern part of the Difficulty quadrangle, the Hanna sediments dip northerly at 15^{o} to 25^{o}; on the south side of the fault the sediments dip southwesterly at 2^{o} to 6^{o}. The age of the Hanna Formation is in doubt; fossils from the Hanna indicate a late Paleocene age, but in the center of the Hanna Basin the formation may be as old as late-early Paleocene or middle Paleocene.

Sediments younger in age than those of the Hanna Formation crop out in the southwest corner of the Difficulty quadrangle. Knight (1951, p. 49) maps a sequence of coarse conglomerates, arkosic sandstones, siltstones, and shales, to which he assigns an Eocene age. Most probably, the shallow southwesterly dips recorded by Dobbin, Bowen, and Hoots (1929) in this area were measured at outcrops of Eocene rocks.

Alluvial deposits of Quaternary age occur in the valley bottoms of the Medicine Bow River and Difficulty Creek, in the southeastern part of Little Basin, and north of the Medicine Bow road at the west-central border of the quadrangle. Quaternary terrace deposits mantle the high ground west of Hay Slough, near the northwestern border of the quadrangle.

Structure

The Difficulty quadrangle is on the northern edge of the intermontane Hanna Basin. This basin is comparatively small in areal extent but it is one of the deeper structural basins in the Rocky Mountain region. The basin extends about 40 miles (64 km) east-west, 25 miles (40 km) north-south, and in its deepest portion in the southeastern part of T. 24 N., R. 82 W. contains approximately 30,000-35,000 feet (9,140-10,670 m) of sediments overlying crystalline basement. It is bounded on the north by the Sweetwater Arch which in this quadrangle is represented by the Freezeout and Shirley Mountains.

The principal deformation defining the present structural basin occurred during the Laramide Orogeny. The bordering highlands were raised and deformed, and the sediments accumulated rapidly in the basin; consequently, the present Hanna Basin has complexly folded and faulted borders, with mild deformation within the basin expressed by a few broad folds and normal faults. With the retreat of the sea in Late Cretaceous time, the depositional environment changed from marine to continental as exemplified by the sediments that crop out over the southwest part of this quadrangle.

One of the two major fault systems developed in the Hanna Basin crosses the south part of this quadrangle in a west-northwesterly direction. From its exposure south of the Oil Springs anticline in the northeast part of T. 23 N., R. 79 W., the fault trends west-northwest at the boundary of the basin to enter the Difficulty quadrangle in sec. 35, T. 24 N., R. 80 W. In this quadrangle the surface trace of the fault is concealed by the overlapping Hanna Formation and Quaternary alluvium but, further west, Paleozoic and Mesozoic sediments of the basin edge are faulted against Precambrian rocks of the Shirley Mountains. Dobbin, Bowen, and Hoots (1929) suggest the vertical displacement of this fault may be as much as 30,000 feet (9,140 m). The fault system continues west-northwest beyond this quadrangle across at least eight townships.

In the northern half of the quadrangle, Weitz and Love (1952) show a set of easterly trending faults which are parallel to the major fault system in the south part of the quadrangle. This set of faults is intersected by a north-northeast trending fault located west of Hay Slough, and a north-northwest trending fault which can be traced from east of Beer Mug Mountain to the north-central border of the quadrangle.

COAL GEOLOGY

Previous Work

The coal deposits of the Hanna and Carbon Basins have been studied by Veatch (1907), Dobbin, Bowen, and Hoots (1929), Berryhill and others (1950), and Glass (1972 and 1975).

Twenty-six coal analyses have been published since 1913 for coal beds of the Mesaverde Group and the Medicine Bow, Ferris, and Hanna Formations within the Hanna and Carbon Basins (Appendices 1 and 2). Samples collected and analyzed prior to 1913 have not been considered in this report (American Society for Testing and Materials, 1977, p. 218). An average analysis of coal beds in each of these four stratigraphic units has also been calculated for the 230 analyses from the Union Pacific Coal inventory program (Appendices 1 and 2). An apparent rank has been calculated from the average analysis for coal in each of the four stratigraphic units. A standard rank determination (ASTM, 1977, p. 216, sec. 6.2.2) cannot be made because: (a) some of the published analyses are from weathered coal samples; and (b) the procedure and quality of sampling for the Union Pacific coal evaluation program are not known.

Glass (1975) and U.S. Department of Interior (1975) published not only proximate coal analyses for 17 samples collected in the Hanna Basin, but also assays for 10 major and minor oxides, 12 major and minor elements, and up to 32 trace elements. Glass (1975, p. 1) stresses that his assay data are insufficient to characterize the chemical and physical properties of any individual coal bed, but that this will be possible at a later date as the study continues. Assay results of the 17 Hanna Basin samples show that these coals contain no significantly greater amounts of trace elements of environmental concern than are found in the 42 samples collected in six other Wyoming coal fields.

General Features

In the Difficulty quadrangle, three coal beds and three local coal lenses in the Hanna Formation have been mapped by Dobbin, Bowen, and Hoots (1929). Of these six coal occurrences, two coal beds, 88 and 89, were identified in the subsurface (Plate 3).

Analyses of two samples of Hanna coal, collected during the Union Pacific coal inventory program, are shown in Appendix 3.

Hanna Coal Beds

Dobbin, Bowen, and Hoots (1929) map three coal beds and three local coal lenses in the Hanna Formation; the outcrops occur in the southwest corner of the quadrangle, close to the major west-northwest trending fault system. Dip of the coal beds is 2^{o} to 6^{o} to the southwest on the south side of the fault system, and 9^{o} to 25^{o} to the north on the north side. However, Knight (1951) maps the area as one of Eocene outcrops with the variations in dip resulting from the presence of an east-trending anticline in the central parts of secs. 25 and 26, T. 24 N., R. 81 W. The major west-northwest trending fault system is traced by Knight (1951, p. 49) from sec. 32, into secs. 29, 30, and 19, T. 24 N., R. 80 W., and then continuing westwards in secs. 24 and 23, T. 24 N., R. 81 W. Knight (1951) notes the presence of coal in his Eocene sediments; therefore, it is likely that the coal beds 86, 87, 88, and 89 of Dobbin, Bowen, and Hoots (1929) are of Eocene age and therefore younger than Hanna coal beds. For this project study, however, the complete geologic map of Knight (1951) and a mapping of the Eocene coal beds are not available; therefore, the mapping of Dobbin, Bowen, and Hoots (1929) is used in the coal evaluation of the TE Ranch, Difficulty, Elmo, and Como West quadrangles.

Coal bed 88 crops out in sec. 31, T. 24 N., R. 80 W. and in secs. 25 and 36, T. 24 N., R. 81 W.; it is concealed beneath the alluvium of the Medicine Bow River channel in sec. 35 and part of sec. 36, T. 24 N., R. 81 W. In two measured sections of this coal bed the coal content is between 14 and 15 feet (4.3 and 4.6 m), with the better coal occurring in the bottom half of the section. The upper lenses in the measured sections are bony coal. Total amount of interburden varies from 7.0 to 15.2 feet (2.1 to 4.6 m) and carbonaceous shales are common. Dobbin, Bowen, and Hoots (1929, p. 76) state that the coal in this area "is associated with too many thick beds of carbonaceous shale to be of any economic value". Coal bed 88 was intersected in drill holes 1 and 2; coal content of the intersections range from 7 to 14 feet (2.1 to 4.3 m) and the interburden is 46 to 49 feet (14.0 to 14.9 m). The two analyses shown in Appendix 3 are of coal samples from the lower half of the coal bed 88 intersection in drill hole 1.

Coal bed 89 crops out in secs. 35 and 36, T. 24 N., R. 81 W. and was intersected in drill hole 1. The coal content of three measured sections of this coal bed varies from about 7.6 to 30 feet (2.3 to 9.1 m); interburden thicknesses range from 19 to 70 feet (5.8 to 21.3 m) with the major rock type of carbonaceous shale. This coal bed was also intersected in drill hole 1 but the thickness is only 1 foot (0.3 m).

COAL RESOURCES

Previous Work

Coal reserves of the Hanna and Carbon Basins have been estimated or calculated by Dobbin, Bowen, and Hoots (1929), Berryhill and others (1950), and Glass (1972).

Method of Calculating Resources

Data from Dobbin, Bowen, and Hoots (1929) and coal drill holes (written communication, Rocky Mountain Energy Company, 1977) were used to construct the Coal Data Map (Plate 1) and the Coal Data Sheet (Plate 3) for the Difficulty quadrangle. U.S. Geological Survey reviewed these two plates and on the basis of Reserve Base criteria, selected coal beds 88 and 89 for the calculation of coal resources in this quadrangle. In addition, calculation of coal resources was requested for isolated or noncorrelatable data points.

The coal data map and the coal data sheet were used to construct structure contour, coal isopach, and overburden isopach maps of the two selected coal beds (Plates 4-9). For single coal beds, the maps were drawn using, as control points, thicknesses measured at outcrop and subsurface data from drill hole information. Where coal beds are split, cumulative coal thicknesses were used, excluding non-coal partings.

Plates 4-9 provide the data for calculating the coal resources and reserves within the KRCRA boundary of the quadrangle, in accordance with the classification system given in U.S. Geological Survey Bulletin 1450-B. However, if Plates 4-9 are compared with the boundary and coal data map (Plate 2), it is seen that the area in the southwest part of the quadrangle that is underlain by the selected coal beds 88 and 89 is not unleased Federal land. Coal resources are calculated only for unleased Federal land within the KRCRA boundary. Information pertaining to leased or fee acreage and to private land is considered proprietary and not for publication. The additional Coal Resource Occurrence maps and the Coal Development Potential maps, which normally accompany this type of report, were not constructed.

The isolated or noncorrelatable data points within this quadrangle were also evaluated. Again, it was found that the areas underlain by coal resources developed from such data points were not unleased Federal land and therefore coal resources were not calcuated.

It is therefore concluded that no coal resources and coal reserves exist beneath unleased Federal land within the KRCRA boundary in the Difficulty quadrangle.

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Appendix 1. — Average analyses of coal samples from the Hanna and Carbon Basins

Source of Data	Number of samples (1)	Total footage		Average analyses — as received basis						Calorific Value, Btu/lb	Apparent rank of coal (3)
				Percent							
		Ft	in	Moisture	Ash	Volatile matter	Fixed carbon	Sulfur	Btu/lb	Moist, mineral-matter-free basis (2)	
Published analyses	26	318	6	12.5	7.1	36.2	44.2	0.6	10,553	11,438	sub A <u>or</u> hvCb
Union Pacific coal inventory program	230	1,605	10	12.48	8.74	35.12	43.68	0.82	10,398	11,494	sub A <u>or</u> hvCb

Notes:

(1) Published data from USBM (1931, p. 40-45, sample nos. 2623, 2624, 22800, 22972, 93486, 93488, 93541, A14123, A14124); Glass (1975, p. 16-19, sample nos. 74-23 to 74-34, inclusive); Dept. of Interior (1975, p. 38, sample nos. D169597-99, D169607-08). Union Pacific coal inventory program data from company files, Rocky Mountain Energy Company (1977).

(2) Moist, mineral-matter-free Btu/lb calculated from average analyses, as received basis, using Parr formula (ASTM, 1977, p. 216, sec. 8.2).

(3) Sub A — subbituminous A; hvCb — high volatile C bituminous (ASTM, 1977, p. 215, sec 4.2, and p. 217).

[To convert feet and inches to meters, multiply feet by 0.3048 and inches by 0.0254. To convert Btu/lb to kilojoule/kilogram, multiply by 2.326].

Appendix 2. — Average analyses of coal grouped by coal-bearing formations in the Hanna and Carbon Basins

Source of data	Formation or Group	Number of samples (1)	Total footage Ft	Total footage in	Average analyses — as received basis: Percent: Moisture	Ash	Volatile matter	Fixed carbon	Sulfur	Btu/lb	Calorific Value, Btu/lb: Moist, mineral-matter-free basis (2)	Apparent rank of coal (3)
Published analyses	Mesaverde	1	4	0	14.1	7.8	36.5	41.6	1.1	10,290	11,251	sub A or hvCb
	Medicine Bow	2	10	1	12.8	3.8	33.3	50.2	0.8	11,050	11,534	hvCb
	Ferris	10	93	1	.13.0	8.3	34.3	44.3	0.4	9,970	10,956	sub A or hvCb
	Hanna	13	211	4	12.0	6.6	38.1	43.3	0.7	11,946	11,797	hvCb
Union Pacific coal inventory program	Mesaverde	13	70	5	9.45	8.41	35.42	46.72	0.77	11,112	12,237	hvCb
	Medicine Bow	16	93	4	13.09	4.03	35.46	47.42	0.80	10,927	11,446	sub A or hvCb
	Ferris	114	863	1	12.69	7.96	34.39	44.97	0.44	10,331	11,309	sub A or hvCb
	Hanna	87	579	0	12.51	10.67	35.96	40.85	1.33	10,280	11,640	hvCb

Notes:

(1) Published data from USBM (1931, p. 40-45, sample nos. 2623, 2624, 22800, 22972, 93486, 93488, 93541, A14123, A14124); Glass (1975, p. 16-19, sample nos. 74-23 to 74-34, inclusive); Dept. of Interior (1975, p. 38, sample nos. D169597-99, D169607-08). Union Pacific coal inventory program data from company files, Rocky Mountain Energy Company (1977).

(2) Moist, mineral-matter-free Btu/lb calculated from average analyses, as received basis, using Parr formula (ASTM, 1977, p. 216, sec. 8.2).

(3) Sub A — subbituminous A; hvCb — high volatile C bituminous (ASTM, 1977, p. 215, sec. 4.2, and p. 217).

[To convert feet and inches to meters, multiply feet by 0.3048 and inches by 0.0254. To convert Btu/lb to kilojoule/kilogram, multiply by 2.326].

Appendix 3. — Coal analyses, Difficulty quadrangle

Drill hole	Location			Coal bed	Sample interval				Sample width		Analyses — as received basis					
					From		To				Percent					
	Sec.	Twp.	Rge.		Ft	in	Ft	in	Ft	in	Moisture	Ash	Volitile matter	Fixed carbon	Sulfur	Btu/pound
1	35	24N	81W	88	358	10	366	9	7	11	12.13	11.70	36.34	39.83	2.19	10,299
1	35	24N	81W	88	390	9	395	9	5	0	12.45	9.76	35.05	42.74	1.11	10,516

Data from Rocky Mountain Energy Company (1977).

[To convert feet and inches to meters (m), multiply feet by 0.3048 and inches by 0.0254.
To convert Btu/lb to kilojoules/kilogram (kJ/kg), multiply by 2.326].