ECONOMIC GEOLOGY

The Pats Bottom quadrangle was mapped by the U.S. Geological Survey as part of a project to classify and evaluate mineral lands in the public domain. The regional geology of the area was mapped and described by Dobbin, Bowen, and Hoots (1929). Subbituminous coal, sand and gravel, and ground water are resources of economic interest within the quadrangle. Oil and gas may occur at depth.

Coal beds of economic thickness are found throughout the upper 3,600 ft of the Ferris Formation. There are 21 numbered coal beds (F_1–F_{17A}) that are 4 ft or more thick, and numerous thin local beds. Burning of coal beds has occurred only in two small areas. Ten coal samples were analyzed by the Union Pacific Coal Company (now Rocky Mountain Energy Company) and the results are shown in table 1.

Two strip mines, Seminoe No. 1 and Medicine Bow, are (1978) being operated in the quadrangle: Medicine Bow mine, secs. 29, 32, and 33, T. 23 N., R. 83 W.; and Seminoe No. 1 mine, secs. 7, 8, 16, 17, and 18, T. 22 N., R. 83 W.; and secs. 1, 2, and 12, T. 22 N., R. 84 W. At the Seminoe No. 1, mining of beds F_1, F_2, F_4, and F_5 is almost completed and operation has begun on beds F_8, F_9, and F_{10}. At the Medicine Bow mine, beds F_{13}–F_{16} are being mined.

Several major problems inhibit coal mining in the area: (1) owing to the steep dips (15°-20°) along the southern border of the quadrangle, stripping of the overburden to the present limits of the dragline exposes little of the coal; (2) it is difficult for rubber-tired vehicles to negotiate steep grades; (3) faults, particularly small-displacement (5-10 ft) faults that may not be recognized in the drill hole, are difficult to compensate for while stripping; and (4) there must be aesthetic considerations because of the nearness to Seminoe Reservoir, and environmental considerations because of the closeness of the water table to the surface.

The U.S. Geological Survey drilled 5 exploratory drill holes in May and June 1976 and 10 holes in 1977. The U.S. Bureau of Land Management drilled 5 core holes for its Energy Mineral Rehabilitation Inventory and Analysis (EMRIA) Report No. 2 in September and October 1974. Coal has been found in 17 of these holes (measured sections, sheet 2). The locations of 27 additional drill holes, furnished by Rocky Mountain Energy Company, are shown on the map; data from these holes were used for coal-bed correlations. This proprietary information could not be directly shown on this map.

An unsuccessful oil-and-gas test was drilled by True Oil Company about 2 mi east of the quadrangle. It bottomed in the Medicine Bow Formation. The thick overburden (as much as 13,000 ft) that must be penetrated to reach the Upper Cretaceous marine sediments is a barrier in the development of possible reservoirs. To date, no successful well has been completed in the Medicine Bow, Ferris, or Hanna Formations.

Abundant terrace gravels are found along the North Platte River drainage. These gravels are an ideal source of material for road building and were used for this purpose in the construction of both strip mines in the quadrangle.

Sandstone within the Ferris and Hanna Formations (particularly along faults) and Quaternary deposits have yielded water for livestock use. Lowry, Rucker, and Wahl (1973) discussed water resources of the general area.

STRATIGRAPHY

The general stratigraphy of the area was first described by Veatch (1907). It was extensively revised by Bowen (1918), and further described by Dobbin, Bowen, and Hoots (1929). Gill, Merewether, and Cobban (1970) clarified stratigraphic relationships.

The contacts mapped by Dobbin, Bowen, and Hoots (1929) between the Medicine Bow-Ferris and the Ferris-Hanna Formations could not be retraced in the field.

The mapped contact between the Medicine Bow and Ferris Formations is between a sequence of grayish-white, massive sandstone and interbedded shale of the Medicine Bow Formation and the overlying conglomeratic sandstone of the Ferris Formation. This contact is approximately 1,000 ft stratigraphically higher than mapped by Dobbin, Bowen, and Hoots (1929). A recalculation of the thickness of the Ferris Formation indicates that it is approximately 4,800 ft rather than 6,500 ft, as previously estimated.

The contact between the Ferris and Hanna Formations is not everywhere unconformable, as stated by Dobbin, Bowen, and Hoots (1929). Gill, Merewether, and Cobban (1970, p. 46) and the authors of this report found no evidence for an unconformity in the quadrangle, as the upper part of the Ferris Formation grades into the lower part of the Hanna Formation in many places. In addition, no evidence of a persistent, thick, conglomeratic sandstone and local conglomerate was found at the base of the Hanna Formation. Therefore, the top of the Ferris Formation was mapped on top of a thin-bedded sandstone overlying the highest coal bed (F_{17} or F_{17A}) (bed 67 or 67A of Dobbin and others, 1929) and immediately below a thick sequence of massive, friable sandstone that is only locally conglomeratic. Dobbin, Bowen, and Hoots (1929) assigned beds F_{17} and F_{17A} (67 and 67A) to the Hanna Formation. To the north, these coal beds pinch out and are replaced by carbonaceous shale. Recognition of the contact was difficult and could be only approximately traced. The upper part of the Ferris Formation, in the northern part of the quadrangle, also contains conglomeratic sandstone similar in lithology to the lower part of the Hanna Formation. The upper part of the Ferris and Hanna Formations becomes increasingly more conglomeratic in a northerly direction.

The numbering sequence for persistent coal beds, as used by Dobbin, Bowen, and Hoots (1929), was revised to eliminate confusion in the correlation of the beds. Table 2 correlates the coal beds in this report with those of Dobbin, Bowen, and Hoots (1929).

Three samples of carbonaceous shale were analyzed for palynomorphs by the U.S. Geological Survey. One sample (USGS paleobotany locality D5612), collected near the base of the coal-bearing portion of the Ferris Formation in Seminoe No. 1 mine, was found to be of early to middle Paleocene age. Another sample from the Ferris Formation (USGS paleobotany locality D5613), collected directly beneath bed F_{16}, was of middle Paleocene or, possibly, late-middle Paleocene age. A third sample (USGS paleobotany locality D5616), collected just above the base of the Hanna Formation about 7 mi east of the eastern border of the quadrangle, also was of late-middle Paleocene age (F. B. May, written commun., 1976).

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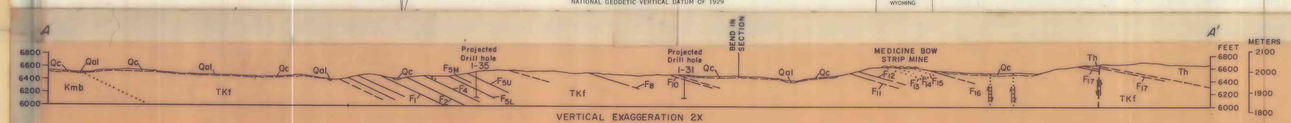
CONVERSION TABLE

To convert ENGLISH UNITS	Multiply by	To obtain METRIC UNITS
Feet	0.3048	Meters
Miles	1.609	Kilometers

This report has not been edited for conformity with U.S. Geological Survey editorial standards or stratigraphic nomenclature.



GEOLOGIC MAP AND COAL SECTIONS OF THE PATS BOTTOM QUADRANGLE, CARBON COUNTY, WYOMING

By

L. F. Blanchard and M. C. Comstock

1980

CORRELATION OF MAP UNITS

Qal, Qc, Qac, Qs, Qpl, Qtd	Holocene and Pleistocene	QUATERNARY
Unconformity		
Th	Eocene and Paleocene	TERTIARY
TKf	Paleocene and Upper Cretaceous	TERTIARY
Kmb	Upper Cretaceous	CRETACEOUS

LIST OF MAP UNITS

Qal	Alluvium
Qc	Colluvium and slope wash
Qac	Alluvium and colluvium
Qs	Stable sand dunes
Qpl	Playa lake deposits
Qtd	Terrace deposits undivided
Th	Hanna Formation
TKf	Ferris Formation
Kmb	Medicine Bow Formation

COAL BED—Approximately located; short dashed where inferred; dotted where concealed. Thickness of thin coal, measured at triangle in feet. Number in circle refers to location of measured coal section. Letter-and-number symbol indicates identification of coal bed

BAKED AND FUSED ROCK—Trace of burned coal bed approximately located; short dashed where inferred. Inverted v's represent approximate areal extent of burned coal

COAL OUTCROP—Thickness of coal, in feet

CONTACT—Approximately located; short dashed where inferred; dotted where concealed

FAULT—Approximately located; short dashed where inferred; dotted where concealed. Bar and ball on downthrown side

MINOR ANTICLINE—Showing direction of plunge

MINOR SYNCLINE—Showing direction of plunge

STRIKE AND DIP OF BEDS

ABANDONED COAL MINE

STRIP MINE—Pattern includes mined-out areas that have been subsequently reclaimed

MS-9007 U.S. BUREAU OF LAND MANAGEMENT DRILL HOLE, 1974

PB-2-6 U.S. GEOLOGICAL SURVEY DRILL HOLE, 1976

HB-1-PB U.S. GEOLOGICAL SURVEY DRILL HOLE, 1977

3-5 UNION PACIFIC COAL COMPANY DRILL HOLE

D5613 U.S. GEOLOGICAL SURVEY FOSSIL LOCALITY

SYSTEM	SERIES	FORMATION	LITHOLOGY
QUATERNARY	Holocene and Pleistocene	Surficial deposits	
		Unconformity	
TERTIARY	Eocene and Paleocene	Hanna Form. (part)	
	Paleocene	Ferris Formation	
CRETACEOUS	Upper Cretaceous	Medicine Bow Formation (part)	Covered

DESCRIPTION OF MAP UNITS

ALLUVIUM (Qal)—Clay, silt, sand; few pebbles and cobbles
COLLUVIUM AND SLOPE WASH (Qc)—Unconsolidated deposits of clay, silt, and sand; some well-rounded gravel adjacent to terrace deposits
ALLUVIUM AND COLLUVIUM UNDIVIDED (Qac)
STABLE SAND DUNES (Qs)—Local deposit of windblown sand, fixed by vegetation
PLAYA LAKE DEPOSITS (Qpl)—Clay and silt; some playa scrapers
TERRACE DEPOSITS (Qtd)—Unconsolidated deposits of silt, sand, and gravel; well-rounded pebbles and cobbles of sedimentary, igneous, and metamorphic rocks. There are at least three distinct terrace levels present along North Platte River as much as 200 ft above present river level

HANNA FORMATION (Th)—Interbedded sandstone, siltstone, shale, mudstone, carbonaceous shale, conglomerate, and coal. Only lower 150 ft of formation exposed in this quadrangle. Southern part of quadrangle: light-tan to orangish-brown, very fine to coarse-grained sandstone, conglomeratic part near base, fining upward in many of the sandstone bodies; massively bedded. Sandstone contains many large (5-10 ft) dark-brown ironstone concretions; conglomeratic part contains pebbles of chert, feldspar, and volcanic rocks. Moderately well exposed, lowest 100 ft forms resistant, hummocky masses. Base of formation mapped at base of massive resistant sandstone directly above highest coal in underlying Ferris Formation. Northern part of quadrangle: light-tan to dark-orangish-brown, very fine to coarse-grained and conglomeratic sandstone, thin- to thick-bedded and ferruginous, interbedded with gray mudstone and dark-brown carbonaceous shale. Generally poorly exposed. Base of formation mapped at top of thin-bedded sandstone overlying highest coal in underlying Ferris Formation. Several thin, irregular lenses of coal occur in lower part of formation. Total thickness exceeds 7,000 ft and may be as much as 13,500 ft

FERRIS FORMATION (TKf)—Upper part contains mudstone, shale, sandstone, carbonaceous shale, and coal. Sandstone, white to light-tan to dark-orangish-brown, very fine to coarse-grained and conglomeratic, arkosic, ferruginous, and concretionary. Numerous thick coal beds throughout upper part. Two plant microfossil collections yielded ages of early to middle Paleocene (D5612) collected near base of upper part, and late middle Paleocene (D5613) collected near top of upper part. Not mapped separately from the lower part. About 3,600 ft thick. Lower part contains conglomeratic sandstone, sandstone, shale, carbonaceous shale, and minor coal. Conglomeratic sandstone, dark-gray to dark-brown, ferruginous, containing pebbles of black, red, and yellow chert, red and gray quartzite, and sparse rhyolite and quartz latite porphyry (Bowen, 1918, p. 230). Bone fragments common, some have been identified as Triceratops (Bowen, 1918, p. 231). Plant microfossil assemblage (Gill, Merewether, and Cobban, 1970) yielded a Late Cretaceous date. About 1,100 ft thick. Generally, conglomeratic sandstone of lower part and sandstone of upper part are poorly exposed and form low, rounded ridges. Total thickness 4,700 ft

MEDICINE BOW FORMATION (Kmb)—Shale, mudstone, sandstone, carbonaceous shale, and coal. Only upper 100 ft exposed in this quadrangle; consists of a sequence of light-gray, fine-grained massive sandstones interbedded with shale that forms prominent, resistant outcrops that can be traced intermittently for several miles. Top of formation mapped at top of massive sandstone, directly beneath dark-colored conglomeratic sandstone of overlying Ferris Formation. Total thickness about 7,200 ft