DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with
THE U.S. BUREAU OF INDIAN AFFAIRS

COAL INVESTIGATIONS
MAP C–91

INTRODUCTION

The Maverick Spring quadrangle was mapped as part of a U.S. Geological Survey (USGS) and U.S. Bureau of Indian Affairs program to assess mineral resources on Indian reservations. Three coal exploration holes were drilled by the USGS as part of this program. The Maverick Spring quadrangle is about 38 mi northwest of Riverton, Wyo., in the northwest part of the Wind River basin. The Maverick Spring area can be reached by vehicle from the Maverick Spring road which connects with U.S. Route 26 about 14 mi south of the quadrangle and about 28 mi west of Riverton, Wyo. The quadrangle is totally within the boundaries of the Wind River Indian Reservation.

ECONOMIC GEOLOGY

Coal

Coal beds of potential economic thickness in the Maverick Spring quadrangle are in the Upper Cretaceous Mesaverde Formation, which is included in the Muddy Creek coal field. Coal beds occur throughout the Mesaverde Formation, but in the Maverick Spring quadrangle only the Maverick Spring coal zone and an unnamed coal bed at one locality are of potential economic importance. The Maverick Spring coal zone contains one to three coal beds in a sequence of sandstone, siltstone, shale, and coal that averages about 50 ft thick and is about 200–300 ft above the base of the Mesaverde Formation. The Signor coal bed at Alkali Butte about 45 mi southeast of Maverick Spring appears to be one of the most persistent coal beds in the area (Thompson and White, 1952, p. 12). The Maverick Spring coal zone in the Maverick Spring quadrangle occupies the same stratigraphic position as the Signor coal bed at Alkali Butte, but because of the large distance between the two areas, lack of outcrops, and lack of detailed mapping, no direct correlation could be made. The individual coal beds appear to be lenticular, and only three of the coal beds within the zone reach potential economic thickness within a limited areal extent. The thickest bed in the Maverick Spring coal zone is 8.7 ft (measured section No. 6) of clean coal in T. 6 N., R. 2 W., sec. 34, but it thins to less than 30 in. within a mile on either side of the measured section. The unnamed coal bed is about 580 ft above the base of the Mesaverde Formation and appears to be a lens of very limited areal extent. Because this coal bed is lenticular, it could not be correlated with any other beds. The unnamed coal bed is 3.0 ft thick at measured section No. 8 in T. 5 N., R. 1 W., sec. 7, but thins to less than 30 in. within ¼ mi on either side of the measured section. No known coal analyses exist from this area, but analyses from nearby areas of coal beds of similar age indicate that this coal is probably subbituminous rank (Glass, 1978, p. 77–78).

In the Maverick Spring quadrangle, the economic, coal-bearing part of the Mesaverde Formation is in the steeply dipping, locally overturned, southwest limb of the Maverick Spring Dome anticline where dips average about 70°. Drill hole DH-U penetrated 3.1 ft of coal in the Maverick Spring coal zone at a depth of 200 ft. Hole DH-T had no shows of coal and hole DH-W9 had no significant coal. Descriptions and logs of these three drill holes are given in a separate report (Warlow, 1981).

Coal resources were not calculated for the individual beds within the Maverick Spring coal zone because of the lenticular nature of the beds, but resources were calculated for the entire zone according to criteria set forth in the coal resource classification system of the U.S. Bureau of Mines and the U.S. Geological Survey (1976). Because the coal in the quadrangle is assumed to be subbituminous in rank, no resources were calculated for beds less than 30 in. thick. The total resources (table 1) in the quadrangle are about 33 million tons. No attempt has been made to determine resources of commercially minable coal because no active mines existed at the time of this report and no mining has taken place in this quadrangle in the past (Woodruff and Winchester, 1912, p. 543).

Oil and Gas

Two active oil fields in the quadrangle produce significant quantities of petroleum—the Maverick Spring field T. 6 N., R. 2 W., secs. 15, 22, 23, 26 and 36 and the Sheldon Dome field T. 5 N., R. 2 W., secs. 9, 10, 15 and 16. The Maverick Spring field was discovered in 1918 and has produced varying quantities of oil since that time (Briggs, 1950, p. 20–21). Average daily production for the field has been about 1000 barrels (Briggs, 1950, p. 42, 43).

In 1925, gas was discovered on the Sheldon anticline, but due to market conditions the well was shut in (Murphy and others, 1956). In 1945, oil was discovered at Sheldon Dome, and daily production has averaged about 150 barrels (Murphy and others, 1956). Petroleum production from these two fields will probably increase in the near future due to current market conditions.

Several wells have been drilled on Little Dome anticline (T. 5 N., R. 1 W., secs. 9 and 16), but all were dry holes.

Gypsum

Significant amounts of gypsum occur in the Gypsum Spring Formation of Jurassic age. A 50- to 100-ft thick bed occurs in the lower half of the formation and is exposed in the Maverick Spring quadrangle at Maverick Spring dome (T.6N.,R.2W.). Strippable reserves in secs. 22, 23, and 26 are about 14 million tons (Seeland and Brauch, 1975). These deposits are only potential at this time because of their great distance from markets.

Bentonite

Beds of bentonite are exposed along the flanks of Maverick Spring dome in the Mowry Shale, Thermopolis Shale, and Frontier Formation, all of Cretaceous age. The most abundant source is the Mowry Shale where beds up to several feet thick occur. Geologic structure, large amounts of overburden, and distance from markets preclude the development of these deposits at this time.

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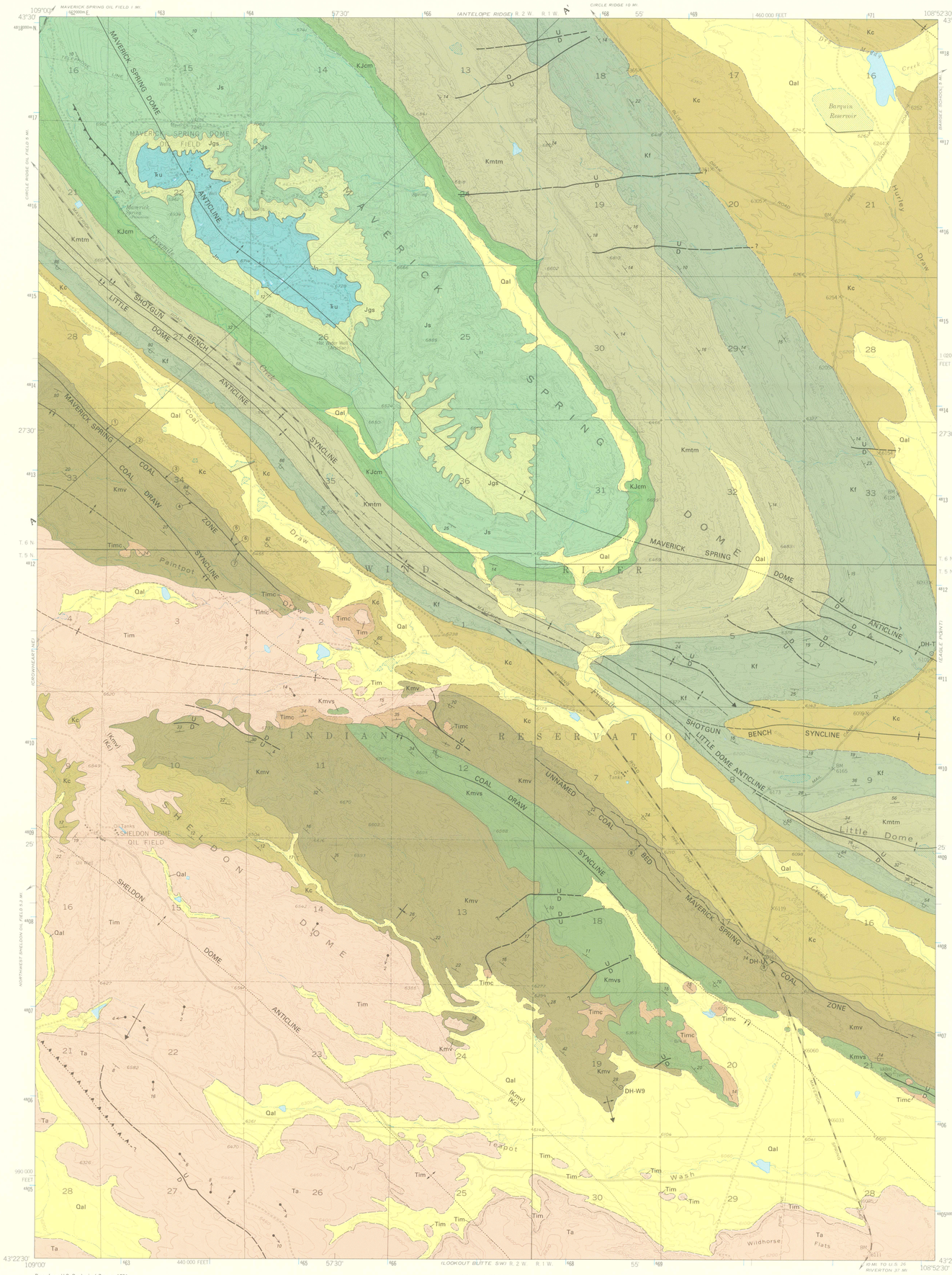


Base from U.S. Geological Survey, 1951
Photorevised 1978
10,000-foot grid based on Wyoming coordinate system, west central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

APPROXIMATE MEAN DECLINATION, 1985

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

Geology mapped in 1979

EXPLANATION OF MAP UNITS

- Qal — QUATERNARY
- Unconformity
- Ta — Unconformity — Tim, Timc — Unconformity — TERTIARY
- Kmvs, Kmv, Kc, Kf, Kmtm — CRETACEOUS
- KJcm, Js — CRETACEOUS AND JURASSIC
- Unconformity — Jgs, Jn — JURASSIC
- TRiu — TRIASSIC

DESCRIPTION OF MAP UNITS

Qal — **Alluvium (Quaternary)**—Gravel, sand, and silt in stratified and unstratified deposits along major drainages

Ta — **Aycross Formation (Middle Eocene)**—Sandstone, greenish gray, fine- to very-coarse-grained, massive bedded, arkosic in part; siltstone, and shale, variegated; thickness 0–900 ft

Tim, Timc — **Indian Meadows Formation (Lower Eocene)**—Upper member Tim; shale, variegated, tuffaceous in part; lower member Timc; conglomeratic sandstone, gray to grayish-red; siltstone, and shale, variegated; thickness 0–2500 ft

Kmvs — **Unnamed white sandstone member, Mesaverde Formation (Upper Cretaceous)**—Sandstone, white to light-gray, fine- to coarse-grained, thin-bedded to massive, calcareous in part; a few beds of gray to brown carbonaceous shale and siltstone; thickness about 280 ft

Kmv — **Mesaverde Formation (Upper Cretaceous)**—Sandstone, very light- to medium-gray, very fine- to medium-grained, limonitic in part, thin-bedded to massive, some ironstone concretions, calcareous in part; siltstone, light- to medium-gray; shale, light-gray to black, carbonaceous in part, calcareous in part, variegated in part; contains lenticular bed of subbituminous coal; thickness 1640 ft

Kc — **Cody Shale (Upper Cretaceous)**—Sandstone, light-gray to buff, very fine- to fine-grained, mostly thin-bedded, calcareous in part, glauconitic in part; shale, light- to medium-gray, arenaceous in part, bentonitic in part; thickness about 3000+ ft

Kf — **Frontier Formation (Upper and Lower Cretaceous**—Sandstone, white to gray, very fine- to coarse-grained, thin-bedded to massive, locally crossbedded, bentonitic in part, tuffaceous in part, calcareous in part, numerous dark mineral grains; tuff, white to gray; shale, gray to black, arenaceous in part, carbonaceous in part, bentonitic in part, contains a few very thin beds of coal; thickness 620+ ft

Kmtm — **Mowry Shale (Lower Cretaceous) (includes Thermopolis Shale and Muddy Sandstone**—Shale, dark-gray to black, siliceous in part, bentonitic in part, some ironstone concretions; sandstone, medium- to coarse-grained, medium-gray, some chert pebbles, silty in part; siltstone medium-gray; thickness about 1000 ft

KJcm — **Cloverly and Morrison Formations undivided (Lower Cretaceous and Upper Jurassic)**—Sandstone, gray to brown, very fine- to medium-grained, thin- to thick-bedded, some ironstone concretions; shale, variegated; thickness 400+ ft

Js — **Sundance Formation (Upper and Middle Jurassic)**—Sandstone, very fine- to fine-grained, light-gray to grayish-green to red, thin- to thick-bedded, argillaceous in part, glauconitic in part, calcareous in part; shale, gray to grayish-red; siltstone, green, calcareous in part, glauconitic in part; limestone, arenaceous in part; thickness about 325 ft

Jgs, Jn — **Gypsum Spring Formation (Middle Jurassic)**—Limestone, grayish-red to red; shale, gray to grayish-red gypsiferous in part; dolomite, gray to grayish-red; gypsum, massive; thickness 200+ ft. Jn, Nugget Sandstone (Lower Jurassic)—Sandstone, gray to yellowish-white, fine-grained, thin-bedded to massive, crossbedded in part; thickness 0–30+ ft

TRiu — **Triassic rock, undivided**— Sandstone, very fine- to fine-grained, grayish-green to red; siltstone, red and ochre; shale, grayish-green; only about the upper 100 ft exposed; thickness 1400+ ft

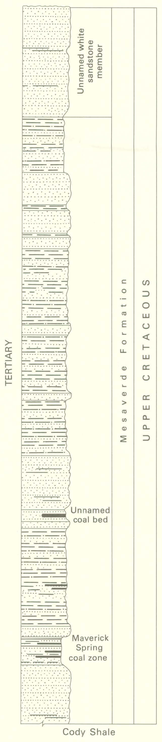
Glacial deposits not shown

EXPLANATION OF MAP SYMBOLS

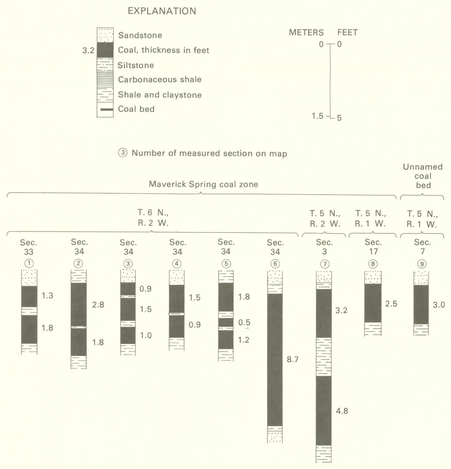
- **Contact**—Dashed where approximately located; dotted where concealed
- **Coal Bed**—Dashed where approximately located. Circled number refers to measured coal section
- **Normal Fault**—Dashed where approximately located. U, upthrown side; D, downthrown side; queried where uncertain
- **Thrust Fault**—Dashed where approximately located; sawteeth on upper plate; queried where uncertain
- **Anticline**—Showing crestline and direction of plunge. Dashed where approximately located; dotted where concealed
- **Syncline**—Showing troughline and direction of plunge. Dashed where approximately located; dotted where concealed
- **Overturned Anticline**—Showing direction of dip of limbs
- **Overturned Syncline**—Showing direction of dip of limbs
- **Strike and dip of beds**
  - Overturned
  - Inclined
  - Vertical
- **Component of dip of beds**—Dot marks point of observation
- DH-U — **U.S.G.S. drill hole**

Table 1.—Identified resources of the subbituminous coal in the Mesaverde Formation in the Maverick Spring quadrangle
[In thousands of short tons; 1 short ton = 0.917 metric tons, 1 foot = 0.348 meters; totals rounded to 3 significant figures]

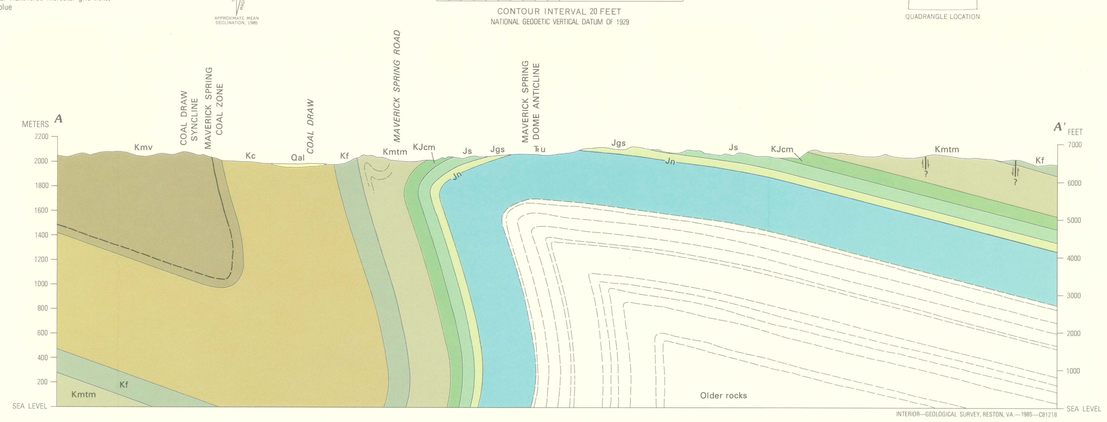
LOCATION T. N.	R. W.	RESOURCES 2.5–5.0 FT THICK Measured	Indicated	Inferred	TOTAL
Maverick Spring coal zone					
0–1000 ft overburden					
6	2	1638	1699	974	4311
5	1	547	59	0	606
5	2	31	155	2660	2846
1000–2000 ft overburden					
6	2	0	2294	3579	5873
5	1	58	673	0	731
5	2	0	63	3262	
2000–3000 ft overburden					
6	2	0	1972	40	2012
5	1	0	786	0	786
5	2	0	0	1541	1541
Unnamed coal bed					
0–1000 ft overburden					
5	1	819	506	0	1325
1000–2000 ft overburden					
5	1	0	909	0	909
2000–3000 ft overburden					
5	1	0	870	0	870
		RESOURCES 5.0–10.0 FT THICK Measured	Indicated	Inferred	
Maverick Spring coal zone					
0–1000 ft overburden					
6	2	476	184	0	660
5	2	0	81	1475	1556
1000–2000 ft overburden					
6	2	0	0	126	126
5	2	0	0	2474	2474
2000–3000 ft overburden					
6	2	214	0	0	214
Unnamed coal bed					
0–1000 ft overburdened					
5	1	636	425	0	1061
1000–2000 ft overburden					
5	1	0	814	0	814
2000–30000 ft overburden					
5	1	0	826	0	826
Quadrangle total		4419	12,316	16,131	32,866



GENERALIZED COLUMNAR SECTION (PARTIAL)



MEASURED COAL SECTIONS IN THE MAVERICK SPRING QUADRANGLE



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GEOLOGIC MAP AND COAL RESOURCES OF THE MAVERICK SPRING QUADRANGLE, FREMONT COUNTY, WYOMING

By
Ralph C. Warlow

1985

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