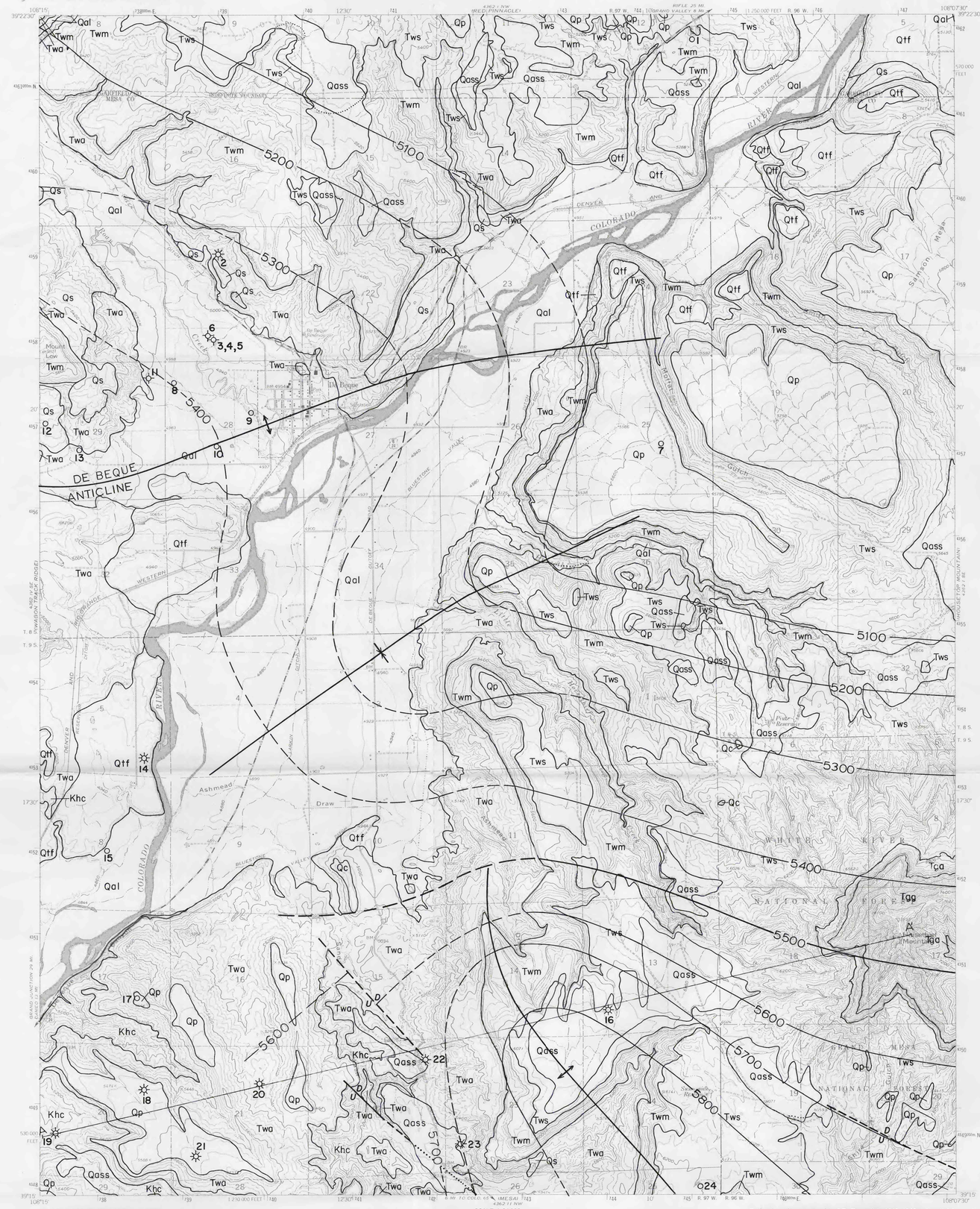
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF–2201



Base from U.S. Geological Survey, 1962

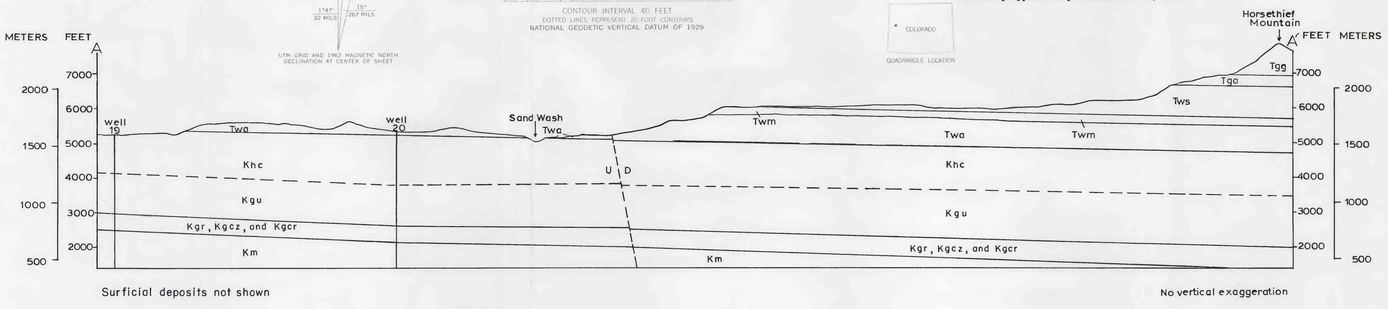
Bedrock geology mapped by J.R. Donnell in 1963–1965 and surficial geology mapped by W.E. Yeend in 1963–1966. Geology modified by L.J. Schmitt in 1987–1991, assisted by Joe Nahama in 1987.
Manuscript approved for publication March 27, 1992.

SCALE 1:24000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20 FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

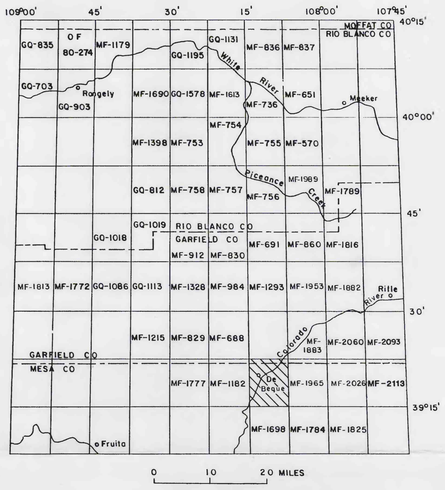
UTM GRID AND 1962 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

COLORADO
QUADRANGLE LOCATION



CORRELATION OF MAP UNITS

Qal	Qass	Qs		Holocene	QUATERNARY
	Qtf	Qp	Qc	Pleistocene	
Unconformity					
	Tgg			Eocene	TERTIARY
	Tga				
	Tws				
	Twm				
	Twa			Paleocene	
Unconformity					
	Khc			Upper Cretaceous	CRETACEOUS
	Kgu				
	Kgr				
	Kgcz				
	Kgcr				
	Km				



INDEX MAP SHOWING LOCATION OF THIS QUADRANGLE (PATTERNED) AND OTHER PUBLISHED U.S. GEOLOGICAL SURVEY (USGS) 7 1/2-MINUTE GEOLOGIC MAPS IN THE PICEANCE CREEK BASIN AREA, NORTHWESTERN COLORADO. Published USGS maps include Geologic Quadrangle Maps (GQ), Miscellaneous Field Studies Maps (MF), and Open-File Reports (OF).

DESCRIPTION OF MAP UNITS

[Note: The Mount Garfield Formation and the Mancos Shale were interpreted to be present in well logs by R.C. Johnson and are shown only in cross section. The unit descriptions were taken from Johnson (1989), Cashion (1973), and interpretations of gamma-ray laterologs]

Qal **Alluvium (Holocene and Pleistocene?)**—Stream-bed, low alluvial-terrace, and floodplain deposits. Unconsolidated clay, silt, sand, gravel, cobbles, and boulders deposited along Colorado River and its tributaries. Well-rounded and well-sorted clasts of crystalline rock are common in alluvium along Colorado River

Qass **Alluvial and eolian sand and silt (Holocene)**—Yellowish-brown silt and sand; reddish-brown silt; generally well sorted. Derived mostly from nearby sedimentary rocks; commonly fills depressions and valleys. Mapped only where areally extensive. Maximum thickness about 30 ft (9 m)

Qs **Slump, earthflow, and landslide deposits (Holocene)**—Relatively small, recent deposits developed mainly in mudstone beds of Wasatch Formation. Most slides still active

Qtf **Terrace and fan deposits (Pleistocene)**—Pebbles, cobbles, and boulders in a sandy matrix; poorly sorted to well sorted. Clasts angular to well rounded; clasts are commonly basalt but also include sedimentary rock fragments. Cobbles of igneous and metamorphic rocks are abundant near Colorado River. Maximum thickness about 150 ft (46 m)

Qp **Pediment deposits (Pleistocene)**—Subangular to subrounded pebbles, cobbles, and boulders in a sandy matrix covering gently sloping erosional surfaces on Wasatch Formation. Cobbles, pebbles, and matrix are composed mostly of sandstone, siltstone, claystone, and marlstone of Green River and Wasatch Formations; some basalt boulders are present. Generally less than 50 ft (15 m) thick

Qc **Colluvium (Pleistocene)**—Angular to subangular, poorly sorted pebbles, cobbles, and boulders in a matrix of greenish-gray sandy silt. Basalt boulders as much as 5 ft (1.5 m) in diameter, and sandstone, marlstone, and claystone slabs as much as 1 ft (0.3 m) in length are common. Caps isolated hills. Thickness about 50–80 ft (15–24 m)

Green River Formation (Eocene)—Sediments deposited in a variety of mostly lacustrine environments

Tgg **Garden Gulch Member**—Light- to medium-gray marlstone, siltstone, and silty claystone; some thin limestone and fine- to medium-grained thin sandstone beds; minor amounts of papery to flaky shale. Algal stromatolites, oolites, oncolites, and ostracodes present locally. Exposed only in southeastern part of quadrangle on Horsethief Mountain. Thickness about 850–1,000 ft (259–305 m)

Tga **Anvil Points Member**—Brown and yellowish-brown, ledge-forming, fine- to coarse-grained, massive sandstone interbedded with lesser amounts of light-gray siltstone and marlstone. Exposed only in southeastern part of quadrangle on Horsethief Mountain. Thickness about 160–280 ft (49–85 m)

Wasatch Formation (Eocene and Paleocene)—Rocks mostly of fluvial origin

Tws **Shire Member (Eocene)**—Mostly variegated red, brown, lavender, purple, and gray mudstone or claystone including a few lenticular, gray or yellowish-gray, calcareous, fine- to coarse-grained sandstone beds; locally forms badland topography. Sandstone beds are generally less than 20 ft (6 m) thick. Measured reference section is located in southeastern part of quadrangle in SE1/4 sec. 13, T. 9 S., R. 97 W. and S1/2 sec. 18, T. 9 S., R. 96 W. (Donnell, 1969, p. M17–M18). Thickness of reference section about 950 ft (290 m)

Twm **Molina Member (Eocene and Paleocene)**—Gray and brown, fine- to coarse-grained, massive sandstone interbedded with lenticular gray, greenish-gray, or lavender mudstone or siltstone. Ledge-forming sandstone beds are conspicuous, and basal sandstone of the Molina is generally persistent. Sandstone contains small subangular to subrounded chert and quartzite pebbles. A measured reference section of Molina Member is located in southern part of quadrangle in N1/2 sec. 24, T. 9 S., R. 97 W. (Donnell, 1969, p. M14–M15). Thickness of reference section is 390 ft (119 m)

Twa **Atwell Gulch Member (Paleocene)**—Upper part is composed predominantly of yellowish-gray, yellowish-brown, and black mudstone or claystone and commonly contains carbonaceous shale or mudstone and some coal locally. Middle part is composed of mostly banded purple, lavender, red-brown, maroon, and gray mudstone or claystone, including some interbedded lenticular yellow-brown sandstone; weathers to badlands locally and is similar in appearance to Shire Member. Lower part is composed predominantly of brown sandstone, locally conglomeratic at base. Basal brown conglomerate as much as 10 ft (3 m) thick and composed of chert and quartz pebbles unconformably overlies gray to white Upper Cretaceous Hunter Canyon Formation. This conglomerate is particularly well exposed in southern part of quadrangle along Sand Wash in sec. 22, T. 9 S., R. 97 W. Measured reference section of Atwell Gulch Member is in southern part of quadrangle in N1/2 sec. 26 and S1/2 sec. 23, T. 9 S., R. 97 W. (Donnell, 1969, p. M13-M14). The brown sandstone and conglomerate that were assigned to Ohio Creek Formation by Donnell (1969) are here considered to be basal part of Atwell Gulch Member of Wasatch Formation. Thickness of Atwell Gulch reference section as modified here is about 565 ft (172 m)

Khc **Hunter Canyon Formation (Upper Cretaceous)**—Massive to thick-bedded, pale-yellowish-gray to white sandstone in upper part, and pale-yellow to brownish-yellow sandstone in lower part, interbedded with lesser amounts of gray mudstone and gray carbonaceous claystone. Nonmarine origin. Sandstone is fine to coarse grained, forms prominent cliffs, and is locally cross bedded, wavy bedded, or horizontally laminated. Sandstone in upper part of unit locally contains a few lenses of chert-pebble conglomerate. White sandstone in upper 160–490 ft (49–149 m) of unit is conspicuous, and color is caused by kaolinite derived from alteration of feldspar (Johnson and May, 1980). The white, sparsely conglomeratic strata have been included in the Ohio Creek Conglomerate by other workers and considered to be Tertiary, but the Ohio Creek Conglomerate was reassigned as the upper member of the Hunter Canyon Formation by Johnson and May (1980). Thickness of partial section exposed in southwestern part of quadrangle is about 350 ft (107 m). Base of unit is not exposed in quadrangle

Mount Garfield Formation (Upper Cretaceous)—Brownish-yellow and gray, fine- to medium-grained sandstone interbedded with gray shale; lower part contains coal beds of economic significance. Thickness about 1,660–1,920 ft (506 m–585 m). Shown only in cross section

Kgu **Mount Garfield Formation, upper part**—That part of the Mount Garfield Formation which is above the Rollins Sandstone Member

Kgr **Rollins Sandstone Member**—Prominent regressive marine sandstone overlain by Cameo-Fairfield coal zone and underlain by unnamed tongue of Mancos Shale. Thickness about 70–90 ft (21–27 m)

Kgcz **Cozzette Sandstone Member**—Interbedded marginal marine sandstone, gray shale, carbonaceous shale, and coal; overlain and underlain by unnamed tongues of Mancos Shale. Thickness about 130 ft (40 m)

Kgcr **Corcoran Sandstone Member**—Interbedded marginal marine sandstone, gray shale, carbonaceous shale, and coal; overlain by unnamed tongue of Mancos Shale and underlain by main body of Mancos Shale. Thickness about 80–100 ft (24–30 m)

Km **Mancos Shale (Upper Cretaceous)**—Dark-gray to black marine shale containing some thin sandstone beds. Thickness about 3,000 ft (914 m). Shown only in cross section

Contact—Approximately located; dotted where concealed

U / D **Fault**—*U*, upthrown side; *D*, downthrown side. Dashed where approximately located; dotted where concealed

5300 **Structure contour**—Drawn to show base of Molina Member of Wasatch Formation. Dashed where datum was removed by erosion. Contour interval 100 ft (30.5 m). Contours not drawn below 5,100 ft because of insufficient information

2 **Gas well**—Number keyed to table 1

3 **Dry hole**—Oil and gas test hole. Number keyed to table 1

4 **Test well**—Oil and gas test hole of unknown production status. Number keyed to table 1

Anticline

Syncline

ECONOMIC GEOLOGY

At least 24 oil and gas test wells have been drilled within the quadrangle, and several have produced gas. Petroleum was first discovered near the town of De Beque in 1902 at a depth of 614 ft (187 m), and ten wells were drilled within two years (Woodruff, 1913). Most of the wells in the De Beque field showed some gas and oil either from the base of the Wasatch Formation or the upper part of the Mesaverde Group. The De Beque field is located along the crest of the De Beque anticline. No production figures are available for the De Beque field.

Gas wells in the southern part of the quadrangle are part of the Shire Gulch field. These wells produce gas from the Mesaverde Group, Dakota Sandstone, and Morrison Formation, and the known cumulative gas production through 1988 for wells in the quadrangle is 737,462 Mcf (thousand cubic feet) (Colorado Oil and Gas Conservation Commission, 1989). The Shire Gulch field extends south into the Mesa quadrangle.

Oil shale is present in the Green River Formation in the southeastern part of the quadrangle, but it is generally thin and low in grade. Elsewhere to the north, in the Piceance Creek basin, the Green River Formation contains major oil-shale deposits (Donnell, 1961).

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Donnell, J.R., 1961, Tertiary geology and oil-shale resources of the Piceance Creek basin between the Colorado and White Rivers, northwestern Colorado: U.S. Geological Survey Bulletin 1082–L, p. 835–891.

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Johnson, R.C., 1989, Geologic history and hydrocarbon potential of Late Cretaceous-age, low-permeability reservoirs, Piceance basin, western Colorado: U.S. Geological Survey Bulletin 1787, 51 p.

Johnson, R.C., and May, Fred, 1980, A study of the Cretaceous-Tertiary unconformity in the Piceance Creek basin, Colorado—The underlying Ohio Creek Formation (Upper Cretaceous) redefined as a member of the Hunter Canyon or Mesaverde Formation: U.S. Geological Survey Bulletin 1482–B, 27 p.

Woodruff, E.G., 1913, Geology and petroleum resources of the De Beque oil field, Colorado: U.S. Geological Survey Bulletin 531, p. 54–68.

Table 1. *Oil and gas test wells; approximately located*

Well No.	Section	Company and well name	Total Depth Feet	Total Depth Meters
		T. 8 S., R. 97 W.		
1	12	Oroco Oil & Gas Co. Federal #1	4,686	1,428
2	21	Teton Energy Co. West De Beque 21–2	2,600	792
3	21	William J. Bond Baker #1	250?	76?
4	21	De Beque Oil Co. De Beque #1	820?	250?
5	21	William J. Bond Baker #1–A	1,735	529
6	21	G & G Services #1 Rose-Veal et al	553	169
7	25	Teton Energy Co. FEE #1	8,980	2,737
8	28	Terry Oil Co. El Pomar #2	1,535	468
9	28	Teton Energy Co. Getty #2	1,720	524
10	28	Teton Energy Co. Getty #3	1,765	538
11	29	Gulf Oil Corp. Mulrooney #1	8,531	2,600
12	29	Teton Energy Co. Federal 29–2	3,683	1,123
13	29	Teton Energy Co. Callahan No. 29	1,840	561
		T. 9 S., R. 97 W.		
14	5	Coors Energy Co. Prather #1–5	3,490	1,064
15	8	Coors Energy Co. De Beque 1–8	7,864	2,397
16	13	J N Oil & Gas J N Kulp Lyon #1	8,965	2,733
17	17	Koch Exploration Co. Horseshoe Canyon #1–17	7,826	2,385
18	20	Koch Exploration Co. Horseshoe Canyon 3-20	7,803	2,378
19	20	Koch Exploration Co. Horseshoe Canyon 1-20	7,300	2,225
20	21	Koch Exploration Co. Horseshoe Canyon 4–21	7,770	2,368
21	21	Koch Exploration Co. Horseshoe Canyon 1–21	7,850	2,393
22	22	Alta Energy Corp. Alta Federal No. 22–1	7,625	2,324
23	23	Alta Energy Corp. Alta No. 23–1	7,950	2,423
24	25	Kenai Oil & Gas, Inc. Kenai-Latham 25–41	4,300	1,311

NOTE

STRUCTURE

The De Beque quadrangle is in northwestern Colorado on the southwestern flank of the Piceance Creek basin, a north- and northwest-trending asymmetric Laramide basin that was actively subsiding during Late Cretaceous through Eocene time. The southwestern part of the basin consists of strata that dip gently to the northeast. Dips generally range from about 1° to 3°. In the De Beque quadrangle the northeasterly dip is locally reversed by a very low amplitude, west-trending fold system consisting of the De Beque anticline and a complementary unnamed syncline. The De Beque anticline extends from approximately the east margin of the De Beque quadrangle westward to a point about 15 mi (24 km) west of the quadrangle (Cashion, 1973). In the southern part of the quadrangle there is an anticline oriented antithetically to the De Beque anticline.

Three faults were mapped in the southern part of the quadrangle. These are high-angle, northwest-trending normal faults, and their displacements are estimated to be about 100 ft (30 m) or less.

GEOLOGIC MAP OF THE DE BEQUE QUADRANGLE, GARFIELD AND MESA COUNTIES, COLORADO

By

John R. Donnell, Warren E. Yeend, Leonard J. Schmitt, and Marjorie C. Smith

1992

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1992

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