Composite columnar section of outcropping sedimentary rocks

SYSTEM	SERIES	FORMATION AND BED	LITHOLOGY	THICKNESS OF COAL BED, IN FEET	THICKNESS, IN FEET
QUATERNARY	Holocene	Alluvium and terrace deposits			0-50
TERTIARY	Paleocene	Poison Canyon Formation			850-1100
CRETACEOUS and TERTIARY	Upper Cretaceous and Paleocene	Raton Formation		0-2 1/4	
				0-3 1/2	
		Local coal bed*		0-2	200-450
		Ciruela coal zone*		0-5	
				0-3	
		Local coal bed*		0-1 1/2	
		Boncarbo coal zone		0-5	170-190
				0-1 1/2	
				0-2	
				0-2	
				0-1	140-230
		Primero coal zone		2-7	
				0-4 1/2	
		Local coal bed*		0-1	200+
				0-2	

DESCRIPTION OF COAL BEDS

All the mapped coal beds in the upper part of the Raton Formation are irregularly banded with alternations of vitrain and durain, have closely spaced cubic or prismatic cleavage, deteriorate slightly from weathering, and commonly contain partings of carbonaceous shale or bony coal. Some beds contain one or more partings of tonstein -- a grayish-brown claystone that weathers to light-gray claystone with a sandstone-like appearance. Most beds are noncontinuous, resting directly on shale or sandstone, rarely on an underclay; commonly beds are overlain by carbonaceous or coaly shale, locally by thin shale at base of thick sandstone. Although individual coal beds are lenticular, most are in coal zones that are persistent; commonly, in the stratigraphic interval where coal is expected but is missing, the coal zone is represented by coaly shale or carbonaceous shale that contains many thin beds of coal each a few inches thick. Locally some coal beds are cut by sandstone-filled channels.

East of Wet Canyon, coal is underlain by 3 feet of coal shale; in Molino Canyon, there is 7 feet of coaly shale that contains several thin coal beds; coal exposures in Sarcillo Canyon are overlain by 10 feet of coaly shale.

Upper bed of Ciruela coal zone, thickest in southwestern part, lies 1,600 feet stratigraphically above top of Trinidad Sandstone. Lower coal bed contains tonstein parting near top of bed.

Principal coal bed of Boncarbo coal zone was mined at Quinto coal mine prospect one-half mile south of Weston; lies 1,460 feet stratigraphically above top of Trinidad Sandstone; is probably equivalent to the lower coal bed of Boncarbo coal zone in Madrid quadrangle (Danilchik, 1979). South of Furgatoire River the coal is overlain by thick shale; north of river, along Wet Canyon the bed is overlain by thin shale, and locally by sandstone-filled channel. Middle bed of zone contains tonstein at base of bed.

Upper bed of Primero coal zone, 35 to 55 feet above lower bed, is equivalent to Apache coal bed of Wood and others (1951); generally a clean coal bed with few partings. Lower bed of coal zone named for Primero coal mine east of quadrangle; lies approximately 1,150 feet stratigraphically above top of Trinidad Sandstone.

*Mapped coal bed
*Structure contours drawn for the top of this bed

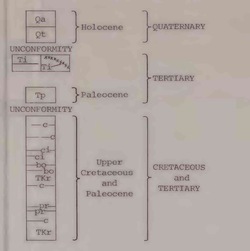
Base from U.S. Geological Survey, 1971

Geology mapped by Walter Danilchik in 1978, based in part on reports by Wood, G. H., Jr., and others (1951, 1956, 1957)

GEOLOGIC AND COAL OUTCROP MAP OF THE WESTON QUADRANGLE, LAS ANIMAS COUNTY, COLORADO

By
Walter Danilchik
1979

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (HOLOCENE)--Unconsolidated gravel, sand, and silt in floodplain deposits of present drainage

Qt TERRACE DEPOSITS (HOLOCENE)--Silt, sand, and poorly to very well cemented pebble to cobble gravel

Ti DIKES (LATE TERTIARY)--Igneous, dominantly basic, range in width from a few feet to as much as 40 feet; underlie linear ridges

Ti SILLS (LATE TERTIARY)--Basic, aphanitic, commonly 5 feet thick, locally 40 feet thick; commonly intrude along and replace coal bed

Tp POISON CANYON FORMATION (PALEOCENE)--Sandstone, sandy claystone, and shale. Sandstone, grayish-orange-pink, medium- to coarse-grained, arkosic, pebbly, very thick bedded, commonly crossbedded, well-cemented. Shale, yellowish-gray to brownish-gray, locally contains plant impressions. Sandy claystone, brownish-gray, weathers to yellowish-gray soil. Thickness of exposed rocks: 850 to 1,100 feet

TKr RATON FORMATION (UPPER CRETACEOUS AND PALEOCENE)--Sandstone, silty shale, carbonaceous shale, and coal. Sandstone, pale yellowish-gray to medium-gray, very fine to fine-grained, clayey; some thick beds are areally extensive, others are abruptly lenticular channel-filled sandstone deposits. Silty shale, medium- to dark-gray, compact, generally thick, locally in thin beds regularly interbedded with thin beds of clayey sandstone and having steep primary dips. Carbonaceous shale, dark-gray to very dark gray, containing thin beds and laminae of coal. Coal, generally bright, very thinly banded; most beds contain partings of carbonaceous shale, and some contain tonstein partings of kaolin formed from volcanic tuff. Thickness of exposed rocks: 800 to 1,000 feet. Mapped coal beds: c, unnamed coal bed; cl, coal bed in Ciruela coal zone; bo, coal bed in Boncarbo coal zone; pr, coal bed in Primero coal zone

CONTACT--Dotted where concealed

bo 29/36 COAL BED--Dotted where concealed. Bar indicates where coal is cut out in paleochannel. Letters indicate identified coal bed or coal bed of identified coal zone. Numerals indicate coal and bed thicknesses in inches; smaller number denotes net coal thickness, larger number denotes bed thickness including partings

13 COAL OUTCROP--Showing bed thickness of local coal bed, in inches

6960 STRUCTURE CONTOURS--Drawn on top of the principal bed of the Boncarbo coal zone. Dashed where contour horizon is above land surface; contour interval 40 feet; datum is mean sea level

FAULT--Ball and bar on downthrown side

L LINEAMENT--Linear feature visible on air photos; probably are surface expression of faults, but direction and amount of displacement not discerned

ABANDONED ADIT

B DRILL HOLE--See drill hole explanation

ECONOMIC GEOLOGY

Several small coal mines and prospects are present in the area but have not been worked for many years. Production, apparently for local use, has been from the lower bed of the Primero coal zone, the principal bed of the Boncarbo coal zone, and the lower bed of the Ciruela coal zone. These beds appear to be the most promising for future underground mining.

In this area the minimum thickness of coal that is generally considered to be minable by underground methods is about 30 inches. However, some beds as thin as 14 inches could be mined by other means including strip and auger mining. Therefore, the outcrop of all beds more than 14 inches thick that could be traced and correlated over a distance of more than one mile were mapped. Subsurface information on coal is from one driller's log and from interpretation of two geophysical logs.

According to recent unpublished analyses of coal from core drill samples the coal of this area is ranked as medium volatile bituminous coal. The coal is classed as low-sulfur coking coal with heating values that exceed 14,000 Btu/lb (calculated on a moist, mineral-mater-free basis).

Geologic impediments to underground mining in the Raton Formation in this area include minor faults, lentiularity of coal beds, coal grading laterally into shales, scour of coal beds by fluvial sandstone-filled channels, abrupt lateral variability of roof rocks, and intrusion by igneous rocks. In addition, coal in this area is gassy. Mappable faults are not common; in addition to those that can be traced, small-displacement growth or compaction faults locally offset the coal beds in the subsurface. These compaction faults rarely reach the surface and cannot be mapped.

An oil/gas test well (drill hole A) has been drilleded into the Upper Cretaceous Trinidad Sandstone at a depth of 2,160 feet apparently without success and abandoned. However, an appreciable amount of gas was found in coal core from a recently drilled coal exploratory hole (drill hole C). Gas description of a core sample from a coal bed at a depth of 500 feet showed that the coal in place could yield as much as 160 cubic feet of methane per ton of coal (Danilchik, Schultz and Tremain, 1979).

Studies by the U.S. Bureau of Mines (Deul, 1975) have shown that commercial production of flammable gas can be obtained by draining the gas contained in coal beds through bore holes. The most prospective coal beds for this purpose in this quadrangle are in the basal part of the Upper Cretaceous Vermejo Formation. These beds are approximately 1,450 feet stratigraphically below the principal bed of the Boncarbo coal zone. Drilling depth to these beds is estimated to range from 1,150 feet along the Picketwire Valley to more than 2,750 feet in the highlands in the north part of the quadrangle.

Some sandstone lenses consist of even-textured, uniformly colored pale yellowish-gray, well-cemented quartzose sandstone. Locally these rocks have been quarried for construction stone used for bridge abutments and small buildings.

Ground water is reported by local inhabitants to be adequate for domestic purposes in all parts of the quadrangle. Tube wells drilled into water-yielding sandstone beds at various elevations range from 20 to as much as 200 feet deep.

REFERENCES

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_____1957, Geology and coal resources of the Starkville-Weston area, Las Animas County, Colorado: U.S. Geological Survey Bulletin 1051, 68 p.

A	B	C
Alamo Oil Co.	International Energy Corp.	U.S. Geological Survey
Valdez No. 1	IEC - 1A	D. H. 78 - 2
C, S½N½ sec. 12,	NW¼SW¼ sec. 16,	SW¼SE¼ sec. 27,
T. 33 S., R. 67 W.	T. 33 S., R. 66 W.	T. 33 S., R. 66 W.
GL 7,410 (estimated)	GL 6,900 (estimated)	GL 6,865 (estimated)
R 490	R 50	R 138
C 3.0	C 1.6	C 2.0 pr
R 57	R 9	R 1
C 4.0	C 1.0	C 1.0 pr
R 60	R 29	R 31
C 2.5 cl	C 1.0	C 2.0 pr
R 243	R 3	R 123
C 4.0	C 2.0 bo	C 1.0
R 20	R 12	R 5
C 3.0	C 1.0	C 2.5
R 96	R 58	R 174
C 3.5 pr	C 5.0	C 3.0
R 10	R 66	R 14
C 1.5	C 2.0	C 2.5
R 48	R 35	R 34
C 2.5	C 2.0	C 2.0
R 4	R 22	R 337
C 2.5	C 5.0 pr	C 1.5
R 37	R 102	R 11
C 2.0	C 2.0	C 1.0
R 95	R 26	R 75
C 2.5	C 2.0	C 1.0
R 20	R 218	R 65
C 3.0	C 1.5	C 2.0
R 6	R 46	R 5
C 1.0	C 2.0	C 2.5
R 20	R 48	R 4
C 2.5		C 1.5
R 17		R 3
C 2.5		C 2.0
R 20		R 7
C 4.0		C 1.0
R 17		R 35
C 3.0		C 2.0
R 190		R 6
C 2.0		C 1.0
R 43		C 2.5
C 3.5		R 6+
R 5		
C 1.5		
R 6		
C 2.0		
R 14		
C 4.0		
R 99		
C 5.0		
R 8		
C 2.0		
R 188		
C 3.0		
R 44		
C 3.0		
R 34		
C 4.0		
R 18		
C 3.0		
R 21		
C 4.0	R 50	
R 42	C 1.6	
C 4.0	R 9	
R 50	C 1.0	
C 2.0	R 29	
R 24	C 1.0	
C 3.5	R 3	
R 60+	C 2.0 bo	

EXPLANATION

B ---------- Map designation of hole
International Energy Corp. -- Operator
IEC - 1A ---------- Hole designation
NW¼SW¼ sec. 16,
T. 33 S., R. 66 W. -------- Location
GL 6,900 (estimated) ------- Drill collar elevation
R 50 ---------- Rock, in feet
C 1.6 ---------- Coal in feet
bo ---------- Letters identify coal bed