COAL BEDS IN THE VERMEJO FORMATION, CIMARRON DISTRICT

COAL BEDS IN THE VERMEJO FORMATION, DAWSON DISTRICT

The Vermejo Formation of Montana and Laramie ages was coal field and form conspicuous sandstone cliffs that cap

thickness from 70 to 150 feet in the Trinidad-Aguilar area,

named by Lee (1913, p. 531) from exposures at Vermejo Park,

N. Mex. The formation crops out in irregular cliffs above

the Trinidad Sandstone along the southern margin of the coal

field, and consists of thin- to medium-bedded, fine- to medium-

and gray to gray green. Sand grains are chiefly quartz with

Most of the shale beds are thick, silty, buff or dark gray to

some weathered feldspar and ferromagnesian minerals

black, and they contain abundant carbonaceous and bitumi-

nous material. Coal beds occur throughout the shale, and

range in thickness from a few inches to as much as 12 feet.

The thickest coal beds are near Koehler and Dawson. Many

in claystone beds below the coal, and ironstone concretions

At Dawson a thick-bedded to massive, coarse-grained,

light-gray sandstone bed is present near the middle of the

Vermejo Formation. It was named the Rail Canyon Sand-

stone Member of the Vermejo Formation by Lee (1924, p. 121)

for exposures in Rail Canyon. The sandstone contains many

roof in the mines. The Rail Canyon Sandstone is lenticular

Mountain. The member has not been mapped, but it is

differentiated in the stratigraphic sections at localities Q to

V. The Rail Canyon Sandstone Member ranges in thickness

The thickness of the Vermejo in the map area ranges from

0 at Ute Park to 221 feet west of Dawson. However, at the

type locality near Vermejo Park, it attains a thickness of

about 375 feet (Lee, 1917, p. 51), and reaches its maximum

thickness of 550 feet along Bear Canyon (Wood, Johnson, and

Dixon, 1956) southwest of the Spanish Peaks in southern

Colorado. The Vermejo also thins eastward to 0 under the

Raton mesas north and east of Raton (Lee, 1917, p. 52). The

erosion. Johnson, Dixon, and Wanek (1956, p. 128) show that

region, and they believe that this eastward thinning of the

Vermejo is most likely due to nondeposition rather than to

on the outcrop from the vicinity of Dawson, N. Mex., south- Dixon, and Wanek (1956, p. 128), Wood, Johnson, and Dixon mation, and can be traced in the canyon walls along Ponil

ward to the junction of Chase Canyon and Ponil Creek. Lee (1957, p. 22), Johnson (1958, p. 564), and Harbour and Dixon Creek and Cerrososo Creek and its tributaries from localities

(1917, p. 48-50; pl. 4) recognized the presence of a tongue of (1959, p. 457-458) state that the Vermejo Formation is con-

the Vermejo in the Trinidad Sandstone, and in this area sub-formably overlain by the Raton Formation in southern eastward into lithology similar to that of the Raton Forma-

divided the Trinidad into an upper and lower sandstone. This Colorado and northernmost New Mexico. However, in the tion. In Cimarron Canyon at localities E to G, this Poison

relationship is shown on the geologic map and in the stratig- southern part of the Raton Mesa region thick coal beds near Canyon tongue thickens and interfingers with the lower part

raphic sections at localities I to R. Coal beds in this Vermejo Koehler are truncated by the basal conglomerate of the Raton Formation. The interval of Raton strata between

tongue have been mined locally at the junction of Chase Formation, and in a distance of several miles the Vermejo this tongue and the base of the overlying Poison Canyon For-

Canyon and Ponil Creek. Smaller scale intertonguing is also Formation thins to a few feet. The coal beds are best devel- mation interfingers with and grades into the arkosic beds of

Ute Park, N. Mex., to about 129 feet near Dawson, N. Mex. this was an area of erosion rather than nondeposition of the Turkey Creek Canyon to about 1,400 feet in Van Bremmer lakebeds.

and crops out along the Vermejo River and on Saltpeter

clay balls and disconformably lies on coal and other beds in the

carbonized plant fragments and impressions are well preserved

grained sandstone beds intercalated with carbonaceous shale

Colorado (Harbour and Dixon, 1959, p. 456).

cemented by calcium carbonate and clay.

are common throughout the shaly units.

from 0 to about 35 feet.

bearing formations are the Vermejo Formation of Late Cre- and coal. The thicker beds of sandstone are lenticular,

taceous age and the Raton Formation of Late Cretaceous and irregularly bedded, and cross-laminated; they vary from buff

the overlying Trinidad with which it intertongues on a large lower part of the Vermejo Formation; locally it forms a good

material and ferromagnesian minerals. The lower beds of the eastward thinning of the Vermejo Formation was considered

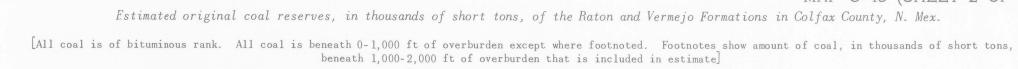
Trinidad Sandstone contain abundant molds and casts of by Lee (1917, p. 53) to be due to widespread post-Cretaceous

Intertonguing occurs between the Trinidad Sandstone and the formation thins southeastward across the Raton Mesa

thin interval of coal beds and coaly shale that can be traced pre-Raton erosion. Johnson and Wood (1956, p. 712), Johnson,

Mesa region (Johnson and Stephens, 1954a), and ranges in Formations are shown in the line of sections.

64 just east of the junction of Bear and Cimarron Canyons. similar condition is apparent at Van Houten a short distance locality H.



	Measur	ed and ind	icated rese		burden that	Inferred	reserves,			of measured		
Formation and coalbeds	14 to 28 inches thick	in bed 28 to 42 inches thick	More than 42 inches thick	Total	14 to 28 inches thick		More than 42 inches thick	Total	14 to 28 inches	28 to 42 1 inches thick		Total
				AREA 1:			4°45′-104°50) *				
Raton Formation (lower part)all beds Vermejo FormationDawson bed	0	0 5,336	0 96,387	0 101,723	32,541	0	0 1 _{52,411}	32,541 1 _{52,411}	32,541	0 5,336	0 1 _{148,798}	32,54 1 ₁₅₄ ,13
Lower Raton bed Upper Raton bed	2,686 14,061	1,646	139	4, 471 14, 061	794 15, 138	0	0 0	794 15, 138	3,480 29,199	1,646	139	5,26 29,19
Other beds	0	0	0	0	6,385	0	5,615	12,000	6,385	0	5,615	12,000
Total	16,747	6,982	96,526	120, 255 AREA 2:	54,858 36°40′-36°	0 45' and 10	¹ 58,026 04°50′-104°55	¹ 112,884	71,605	6,982	¹ 154,552	¹ 233, 139
Raton Formation (lower part)all beds	0	0	0	0	² 34, 409	0	0	² 34,409	234,409	0	0	234,409
Vermejo FormationDawson bed Upper Raton bed	0	0	0	0	³ 19,878 2,117	0	12,278	³ 32, 156 2, 117	³ 19,878 2,117	0	12,278	³ 32,156 2,11
Total	0	0	0	0	⁴ 56,404	0	12,278	⁴ 68,682	⁴ 56, 404	0	12,278	⁴ 68,682
				AREA 3:			04°55′-105°00		504 405			50
Raton Formation (lower part)all beds Vermejo FormationCimarron bed	0	0	0	0	⁵ 34, 427 6 8, 647	0	0	⁵ 34, 427 6 8, 647	⁵ 34, 427 6 8, 647	0	0	⁵ 34, 427 6 8, 647
Total	0	0	0	0	743,074	0	0	743,074	743,074	0	0	743,074
				AREA 4:			4°55′-105°00		804 500			804 500
Raton Formation (lower part)all beds Vermejo FormationCimarron bed Other beds	4,771 0	0	0 0	4,771 0	834,528 944,621 1,935	0 0	0 0	834,528 944,621 1,935	834,528 949,392 1,935	0 0	0 0	834,528 949,392 1,935
Total	4,771	0		4,771	1081,084	0	0	1081,084	1085,855	0	- 0	1085,855
				AREA 5:		40' and 10	04°50′-104°5					
Raton Formation (lower part)all beds Vermejo FormationCimarron bed	0 2,363	0	0	0 2,363	30,833 7,397	0	0	30,833 7,397	30,833 9,760	0	0	30,833
Dawson bed Lower Raton bed	0 0	0 4,410	0	0 4,410	5,668 1,658	0	0	5,668 1,658	5,668 1,658	0 4,410	0	5,668 6,068
Other beds	0	2,941	0	2,941	20,611	0	0	20,611	20,611	2,941	0	23,552
Total	2,363	7,351	0	9,714 AREA 6:	66, 167	0	0 04°45′-104°50	66, 167	68,530	7,351	0	75,88
Raton Formation (lower part)all beds	0	0	0	0 O	11,756	40 and 10	0	11,756	11,756	0	0	11,75
Vermejo FormationDawson bed Lower Raton bed	3, 131 2, 072	1,796 16,405	25,471 0	30,398 18,477	5,677 3,207	0	480 0	6, 157 3, 207	8,808 5,279	1,796 16,405	25,951 0	36,555 21,684
Upper Raton bed Other beds	8,029 332	0	0	8,029 332	0 4,084	0	0	4,084	8,029 4,416	0	0	8,029 4,41
Total	13,564	18,201	25,471	57,236	24,724	0	480	25,204	38,288	18,201	25,951	82,440
	1			AREA 7:	36°30′-36°	35' and 10	04°45′-104°50	0'				
Raton Formation (lower part)all beds Vermejo FormationLower Raton bed	0	0	0	0	956 0	0 2, 122	0	956 2, 122	956 0	0 2, 122	0	950 2,123
Total	0	0	0	0	956	2, 122	0	3,078	956	2, 122	0	3,078
				AREA 8:	36°30′-36°	35' and 10	04°50°-104°5	5 '				
Raton Formation (lower part)all beds Vermejo FormationCimarron bed	0 7,326	0	0	0 7,326	9,572	0	0	9,572	9,572 7,326	0	0	9,573 7,326
Other beds	0				8,232	0		8, 232	8, 232	0	0	8, 23
Total	7,326	0	0	7,326 AREA 9:	17,804 36°30′-36°	0 35' and 10	0 04°55′- 105°	17,804	25, 130	0	0	25,130
Raton Formation (lower part)all beds	0	0	0	0	13, 156	0	0	13,156	13, 156	0	0	13, 15
Vermejo FormationCimarron bed Other beds		0	0		2,842 13,251	0	0	2,842 13,251	33,885 16,946	0	0	33,88 16,94
Total	34,738	0	0	34,738	29, 249	0	0	29,249	63,987	0	0	63,98
				AREA 10:		45' and 10	05°00′-105°0					
Raton Formation (lower part)all beds Vermejo FormationCimarron bed	0				192, 113 37, 924	0	0	192, 113 37,924	192,113 37,924	0	0	192,11 37,92
Total	0	0	0	0	230,037	0	0	230,037	230,037	0	0	230,03
						6°45' and	105°05′-105°	10′				
Vermejo FormationCimarron bed	0	0	0		32,647	0		32,647	32,647	0	0	32, 64
Vermejo FormationCimarron bed	0	0	0	AREA 14:	36°35°-36	0 40 and 0	105°05′-105°	10° 11 _{9,710}	¹¹ 9,710	0	0	11 _{9,71}
				AREA 15:	36°35′-36	0°40' and	105°00′-105°	05′	1			
Raton Formation (lower part)all beds	0			0	12 5,614	0	0	12 5,614 13 - 15	12 5,614 1341,879		0	12 5, 61 13 _{41,87}
Vermejo FormationCimarron bed Total	0	0			13 _{41,879} 14 _{47,493}	0		13 _{41,879}	1447, 493	0	0	4 /.
10021		0	0				105°00′-105°		41,490	0	-	71, 12
Vermejo FormationCimarron bed	6,228	0	0		7,142	0		7,142	13,370	0	0	13,37
	1				T.	28 N., R.	. 21 E.		1			
Raton Formation (lower part)all beds	0			0	9,616	0	0	9,616	9,616		0	9,61
Vermejo FormationDawson bed Lower Raton bed Upper Raton bed		47,733 2,655 43	16,766	22, 448	2,333 0	49,453 2,779 0	0 0	49,453 5,112 0	657 5,360 6,760	97, 186 5, 434 43	14,956 16,766	112,79 27,56 6,80
Total	10,444		31,722		11,949	52,232	0	64, 181	22, 393	102,663	31,722	156,778
					T.	29 N., R.	21 E.					
Raton Formation(lower part)all beds- Vermejo FormationDawson bed		0		0 36,057	26,478 2,103	0 13, 438	0	26, 478 64, 433	26, 478 3, 280	0	0	26, 47
Lower Raton bed Upper Raton bed	2,548	3,148	103,420	106,568	9,585 8,008	13, 438 31, 378 0	48,892 0 0	40,963 8,008	9,585 10,556	13,438 34,526 1,979	83,772 103,420 0	100,49 147,53 12,53
Total	3,725			147, 152	46,174	44,816		139,882	49,899		187, 192	287,03
					1	29 N., R.						
Raton Formation (lower part)all beds Vermejo FormationUpper Raton bed	0				3,249	0			3, 249	0	0	3,24
Lower Raton bed	0				0	0	0	0	0	1,574 521	25,989	1,57 26,510
Total	0	2,095	25,989	28,084	3,249	0	0	3,249	3,249	2,095	25,989	31,33
Grand total all areas	99,906	90, 187	318,008	508,101	¹⁵ 762,721	99,170	¹ 119,676	16 _{981,567}	15 _{862,627}	189,357	¹ 437,684	16 _{1,489,668}
1 5,044 3 12 2 3 520 4 15	2, 409	5 2 6	9, 181 8, 647	7 3 8	7,828	9 22 10 24	, 424	11 9,710 12 3 402		13 38,418 14 41 820	3	15 130, 16 135

Representative analyes of samples of the Raton coal bed from mines of the Koehler and Dawson districts, Colfax County, New Mex. [Analyses (made on an "as received basis") are selected from Ellis (1936, p. 44-47)]

		Analyses, in percent										
Mine	Sample No.		Pr				Heating value					
No.	Sample No.	Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British Thermal Units
					Daws	son distr	ict					
2	256-D	2.2	37.9	45.1	14.8	0.7	60 50 50 50 50 50 50 50 50	00 100 00 00 00 00			6,994	12,590
	12235	3.3	35.7	48.7	12.3	.7	5.3	70.4	1.2	10.1	7,089	12,760
	18 17 1	2.3	38.2	48.6	10.8	. 6					7,278	13, 10
	A40606	2.1	33.8	48.5	15.6	. 7	5.0	68.3	1.3	9.1	6,756	12, 16
	A40603(3)-		44.1	55.9		. 8	6.2	83.7	1.7	7.6	8,444	15,200
	33022	1.9	37.1	46.3	14.7	.6	5.2	69.4	1.3	8.8	6, 939	12,49
	A40599(3)-		41.4	58.6		1.1	6.0	82.9	1.5	8.5	8,272	14,89
	A40602(2)-		34.5	46.5	19.0	.7	4.9	66.8	1.2	7.4	6,683	12,030
					Koeh	ler distr	ict					
L	12338	3.6	37.5	50.0	12.5	0.7	5.0	72.4	1.4	8.0	7,278	13, 100
	14796	2.3	35.9	49.9	11.9	. 6	5.2	71.3	1.3	9.7	7,178	12,920
	33018	2.5	36.7	49.3	11.5	. 7	5.2	71.6	1.4	9.6	7,122	12,820
3	17781(3)		42.1	57.9		. 9	5.9	83.3	1.6	8.3	8,283	14,91

Wells drilled for oil and gas in Colfax County, N. Mex.

Location				W 11				Stratigraphic unit				
Section		T. N.	R. E.	Operator	Lease	Well No.	Comple- tion date	Eleva- tion (ft)	Total depth (ft)	Surface rocks	Bottom rocks	Date abandone
SE ¹ 4NW ¹ 4NW ¹ 4	1	26	20	American Manufacturing Co. of Texas.	W. S. Ranch	1	1946	6,400	3,825	K	р€	1949
\W\4\\\4\\\4\\\4\\\4\\\4\\\4\\\4\\\4\\\	11	28	22	Continental Oil Co.	Maxwell Land Grant.	1	1954	6, 181	2,939	K	р€	1954
	16	29	22	do	St. Louis,	5	1955	Unknown	2,882	K	Jm	1955
NE¼NE¼SW¼	17	29	22	do	Rocky Mountain, and Pacific Co.	4	1954	6,531	4,709	K	PIPm and	1954
	24	30	22	do	do	1	1054	7 022	r 10r	W	intrusive	7054
	-			do	do	1	1954	7, 233	5, 185	K	p€	1954
SW4NE4NW4		30	22	do		3	1954	7,765	5,500	T	Pg	1954
SE ¹ / ₄ SE ¹ / ₄		31	22		do	6	1955	6,762	3,675	K	Je	1955
NW4SW4SW4	26	31	21	do	do	2	1954	7,751	7,268	T	PIPm	1954

Coal mined, in short tons, in the southern part of the Raton coal field, New Mexico, from 1899 to 1954

Area 1899-1904 1905-1913 1914-1925 1926-1935 1936-1945 1946-1954 Total Koehler district--- 3,085,133 4,952,289 ------ 1,057,619 3,564,659 12,659,700 Dawson district--- 705,103 8,781,828 10,961,513 5,373,666 ----- 25,822,110 Total----- 705, 103 11,866,961 15,913,802 5,373,666 1,057,619 3,564,659 38,481,810

INTERIOR-GEOLOGICAL SURVEY, WASHINGTON, D. C.-G62416

coal production averaged about 2,000 tons per month. In 1953 drill holes, or were available in published sources (Lee, 1917, The marine strata of the Magdalena Group thin to several _1959, Geology of the Huerfano Park area, Huerfano thousand feet in the same direction and intertongue with and and Custer Counties, Colorado: U.S. Geol. Survey Bull. grade into the more coarsely clastic rocks of the Sangre de 1071-D, p. 87-119 [1960]. Cristo Formation. Johnson, R. B., Dixon, G. H., and Wanek, A. A., 1956, Late The presence of potential source beds in clastic rocks of the Cretaceous and Tertiary stratigraphy of the Raton basin of Magdalena Group and possible reservoir beds in the Sangre New Mexico and Colorado, in New Mexico Geol. Soc. Guidebook 7th Field Conf., Southeastern Sangre de Cristo de Cristo Formation may have led to the accumulation of oil and gas in stratigraphic traps. Oil and gas may occur in the Mountains, New Mexico: p. 122-133. Trinidad Sandstone, which is similar in lithology and strati-Johnson, R. B., and Stephens, J. G., 1954a, Geology of the La Veta area, Huerfano County, Colorado: U.S. Geol. Survey Oil and Gas Inv. Map OM-146. __1954b, Coal resources of the La Veta area, Huerfano County, Colorado: U.S. Geol. Survey Coal Inv. Map C-20. Johnson, R. B., and Wood, G. H., Jr., 1956, Stratigraphy of Upper Cretaceous and Tertiary rocks of Raton basin, Colorado and New Mexico: Am. Assoc. Petroleum Geologists Bull., v. 40, no. 4, p. 707–721. Knopf, Adolph, 1936, Igneous geology of the Spanish Peaks region, Colorado: Geol. Soc. America Bull., v. 47, no. 11, p. 1727-1784.

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abundance and reliability of data available for making the graphic relations to the gas-producing Pictured Cliffs Sandstone (Dane, 1948; Wood, Kelley, and MacAlpin, 1948; and Zapp, 1949) of the San Juan Basin in southwestern Colorado and northwestern New Mexico (Johnson and Wood, 1956, p. 712). Both formations intertongue with underlying marine shale bodies and are overlain by coal-bearing rocks. Changes of porosity and permeability in the strata or folding may control the migration of fluids and contain them in stratigraphic or structural traps. The Trinidad Sandstone is very oituminous at the locality east of the junction of Bear and Cimarron Canyons. The sandstone beds lie in a minor downfold in the basin and it is possible that the fluids migrated into the sandstone from source beds in the underlying shales of Late Cretaceous age. East of Ute Park the upturned beds of the Trinidad Sandstone and Pierre Shale are beveled by the coarse clastics of the Poison Canyon Formation. It is possible that the unconformity may trap fluids along the trace of this erosion surface from Cimarron Canyon to about 8 miles to the north in much the same manner that oil seeps were trapped at the unconformable contact of the Pierre Shale and Poison Canyon Formation at Butte Valley and Alamo in the northern part of the Trinidad coal field in

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Proc., v. 3, pt. 2, p. 148–164.

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information. Inferred reserves are based on geologic data on the correlation and continuity of coal beds in the subsurface southern Colorado (Johnson and Stephens, 1954a). that, in general, lie more than 1 mile from points of controlled SELECTED REFERENCES The amount of coal recovered and lost in the area from 1899 American Society for Testing Material, 1938, Standard speciimportant in the report area. The coal is banded, has a to 1954 is about 38,481,870 short tons, and the remaining fications for classification of coals by rank, in A.S.T.M. generally vitreous luster, and contains considerable resin that reserves in beds more than 14 inches thick with less than Standards, Pt. 3 (1939): A.S.T.M. Designation D 388-38, 3.000 feet of overburden total about 1.452 million short tons. Brown, R. W., 1943, Cretaceous-Tertiary boundary in the Denver Basin, Colorado: Geol. Soc. America Bull., v. 54, no. Dane, C. H., 1948, Geologic map of part of eastern San Juan Basin, Rio Arriba County, New Mexico: U.S. Geol. Survey Oil and Gas Inv. Prelim. Map OM-78. Eldridge, G. H., 1888, On some stratigraphical and structural

The Raton basin is a sedimentary and structural basin of

Much of the area lies within the unsurveyed tract of the

Maxwell Land Grant, and therefore reserves are estimated

for individual 5-minute rectangles; however, in the eastern-

of 36 square miles. In the table showing estimated original

most part the reserves are estimated for individual townships

reserves, the reserves are presented according to area, town-

ship, thickness of beds, amount of overburden, and relative

The reserves are given in 3 categories according to thickness,

in inches, of beds: 14-28, 28-42, and more than 42. Isopach

maps of the coal beds were drawn in each thickness category.

information the tonnage of coal reserves was calculated.

The areal extent and the average thickness of each coal bed

within the isopach interval was determined, and from this

The reserves are also presented in 3 categories according

to thickness, in feet, of overburden: 0-1,000, 1,000-2,000, and

2,000-3,000. Beds more than 3,000 feet below the surface are

not included in the estimates. A large part of the coal in the

Vermejo and Raton Formations in the southern part of the

Estimates of measured and indicated reserves are based on

specific measurements of coal in outcrops, drill holes, and mine

workings. Most of the coal thus classified is near the outcrop

or a control point. Where the coal is believed to be continuous

on the basis of geologic evidence, reserves were estimated to

a maximum of 1 mile from the nearest point of controlled

Raton coal field is less than 1,000 feet below the surface.

conomically important beds. The coal in the Raton field is classified as high-volatile C ituminous by the American Society for Testing Materials (1938, p. 60). It is nonagglomerating, nonweathering, and nas coking qualities. Coal reserves.—The original reserves of coal in the southern part of the coal field in beds more than 14 inches thick and with

COAL BEDS IN THE VERMEJO FORMATION, DAWSON DISTRICT

COAL BEDS IN THE VERMEJO FORMATION, KOEHLER DISTRICT

from the St. Louis, Rocky Mountain, and Pacific Coal Co.

The Kaiser Coal Corp. has conducted an extensive drilling

program on the west side of the Raton basin; however, the

The mine workings in the Koehler district are between

Saltpeter and Crow Creeks. The principal coal bed is the

Raton, which lies in the lower part of the Vermejo Formation

just above the Trinidad Sandstone. The Raton bed ranges in

hickness from 2 feet to 12 feet 5 inches; its greatest thickness

The Dawson coal district extends as far east as Saltpeter

Creek, but the mine workings are chiefly along the canyon of

he Vermejo River between Spring and Lacy Canyons.

Dawson was the commercial center for the coal district until

1946, when the mines were abandoned. The producing coal

bed, the Dawson bed, is in the lower part of the Vermejo

Sandstone, correlations made in numerous stratigraphic

section indicate that it lies below the Raton bed of the

Koehler district. The Dawson bed attains a maximum thick-

the Dawson district to Ute Park. The district included a few

wagon mines which are now abandoned. The coal bed that

was mined is here named the Cimarron bed; it lies strati-

graphically below the Dawson coal bed. The coal beds in the

No coal beds in the Raton Formation have been mined in

the southern part of the Raton coal field. The beds are thin,

lenticular, of limited lateral extent, and very impure. They

are not as well developed in this part of the coal field as they

are farther northeast near Raton, and are not economically

GEOLOGY AND FUEL RESOURCES OF THE SOUTHWESTERN PART OF THE RATON COAL FIELD, COLFAX COUNTY, NEW MEXICO

Alexander A. Wanek

1963

The Cimarron coal district extends south and west from

ness of about 8 feet 10 inches in locality 34.

district are thin and have limited lateral extent.

Formation. Although this coal bed lies above the Trinidad

nain operation is at the mines in the Koehler district.

occurs in the Koehler district.

the Kaiser Steel Corp. purchased coal lands in the Raton field 1922, and 1924).

EXPLANATION

Siltstone

Upper Cretaceous and Paleocene rocks.—Strata of the where in the map area the basal conglomerate appears to rest

Raton Formation (Lee, 1913, p. 531) crop out over most of the

intertongue with the rocks of the overlying Poison Canyon

Formation of Paleocene age (Hills, 1888) in a southwesterly

direction. This relation occurs along the central and western

margin of the Raton Mesa region (Johnson and Wood, 1956,

p. 714-717, fig. 6), and it can be traced along Cimarron Canyon

from Turkey Creek Canyon west to Ute Park. The Raton

Formation is of Late Cretaceous and Paleocene age (Brown,

1943, p. 82-84). Brown, on the basis of paleontological evi-

dence gathered along the Cuchara River west of Walsenburg,

Tertiary in the lower part of the Raton Formation.

Colo., placed the boundary between the Cretaceous and

The lowermost part of the Raton consists chiefly of buff,

gray, and purple-gray granule and pebble conglomerate, and

coarse-grained sandstone that is cliff forming and cross-

laminated, and contains subangular to subround pebbles and

granules of granite, gneiss, and quartzite in a matrix of

form a high percentage of the constituents, and ferromag-

coarse sand grains. Quartz, and fresh and weathered feldspar.

nesian minerals are abundant. The cementing materials are

silica, calcium carbonate, and clay. Locally, fragments of

beds of the Vermejo Formation. The conglomeratic sand-

stone at the base occurs as a single bed, or in some localities

as several beds, and it also varies in lithology. Along the

Vermejo River near Dawson, the basal part of the Raton

Formation is a thin siliceous sandstone bed overlying coaly

shale, whereas in other places it is a massive conglomerate.

In general, the rocks in the lower part of the Raton Formation

are coarser and thicker bedded in the western part of the area.

Succeeding the basal unit there is a sequence 250 to 350 feet

thick of interbedded buff to gray, fine- to medium-grained,

cross-laminated sandstone, gray to dark-gray siltstone, and

black carbonaceous shale. Thin, lenticular impure coal beds

overlain by 500 to 700 feet of massive, cliff-forming, buff or

gray, cross-laminated, fine- to medium-grained sandstone

that forms the cap rock in this part of the Raton Mesa region.

Gray silty shale beds and minor lenses of coal are intercalated

with some fresh and weathered feldspar and ferromagnesian

minerals that are well cemented with calcium carbonate or

A large tongue of arkosic conglomerate and yellow silty

with the sandstone beds. The sand grains are chiefly quartz

clay. The amount of fresh feldspar is greater in the upper-

most beds of the Raton Formation that intertongue with beds

shale in the Poison Canyon Formation splits the Raton For-

in the overlying Poison Canyon Formation.

are present in this sequence. This interval is conformably

coal are present, presumably derived from erosion of the coal

mesas near the south and east margins. They grade into and

disconformably upon Vermejo strata.

of Late Cretaceous age.

In the central and western part of the Raton Mesa region

in Colorado the coal-bearing strata of the Raton Formation

are conformably overlain by and intertongue with beds of

coarse-grained arkose (Johnson and Wood, 1956, p. 714-717),

which here are considered as the age equivalents of the lower

part of the Poison Canyon Formation (Hills, 1888) of Paleocene

age in Huerfano Park, Colo. In the vicinity of Ute Park,

strata previously described by Lee (1917, p. 56-61, 62-68) as

Raton are believed by Johnson and Wood (1956, p. 715) to be

a facies of the Poison Canyon, and in this report they have

been mapped as the Poison Canyon Formation along the

The thickness of the Poison Canyon Formation ranges from

0 near Dawson to 1,200 feet near Ute Park, and to about 1,500

feet west of Vermejo Park. In the central and western part

of the Raton basin, the Poison Canyon Formation contains

the coarse-grained arkose beds and conformably overlies the

Raton Formation, whereas in the eastern part it includes the

arkose sequence that intertongues with the Raton coal-

bearing strata. This relation is shown on the geologic map

and in the stratigraphic sections. At Ute Park, the Poison

Canyon Formation rests with angular unconformity upon

steeply dipping and successive strata of the Vermejo Forma-

massive cliff-forming beds of medium- to coarse-grained

arkosic sandstone, grit, and pebble conglomerate, and thick

lenticular, cross-laminated, buff to gray, and friable. Quartz

grains and fresh subangular feldspar form the chief constit-

and calcium carbonate. The sand grains weather at the out-

crop and form a gritty soil mantle. Thick intervals of

yellowish-gray silty shale that are intercalated with the

sandstone show some suggestion of bedding. The main

sequence of Poison Canyon rocks is barren of coal, but some

carbonaceous shale and thin lenses of impure coal are present

in the zone of intertonguing with strata of the Raton Forma-

consists of colluvium, pediment gravels, and alluvium. Col-

of the great plains just east of the Cimarron Mountains. They

rest on a surface of eroded shale of Late Cretaceous age, and

range in thickness from a thin mantle to about 20 feet. The

gravel deposits are composed of cobbles, pebbles, and granules

derived from igneous and metamorphic rocks of Precambrian

Thin deposits of gravel that are not mapped rest on high

age, from intrusive and extrusive rocks of Tertiary and

surfaces of the coal field, and correlate, on the basis of litho-

logies and position, with the gravel deposits underlying the

composed of talus, landslide debris, gravel, and soil.

Quaternary age, and from sedimentary rocks.

luvium covers large areas along steep mesa slopes, and is

Pediment gravels are at several levels, and cover large areas

Quaternary deposits.—Surficial deposits within the area

uents in the beds, and they are variably cemented with clay

tion, Trinidad Sandstone, Pierre Shale, and older formations

western margin of the Raton coal field from Vermejo Park

to Ute Park in the southern part of the coal field.

Section not plotted

Member boundary of correlation line

Localities shown on map

northeast of Cimarron, N. Mex. The rock is gray green and

fine grained. It has been classified megascopically as a

diorite. The plug has been intruded by several thin sill-like

bodies of basaltic rock. Several feet of baked shale occur in

a thin aureole around the intrusion; no mineralization is evi-

A large sill exposed along Wilson Mesa west of the Ponil

Base Camp on South Ponil Creek is intruded into the Poison

Canyon Formation. The sill surfaces the mesas as far west as

the junction with the slope of Baldy Mountain, where it is

overlain by strata of the Poison Canyon. It is thickest toward

The sill forms a vertical cliff about 20 feet high, and exhibits

columnar jointing. The rock is light gray, fine grained to

porphyry. The sill appears related to the dike swarm nearby.

appears to radiate from a focal point in the general area of

Baldy Mountain. Since the area is near complex faulting to

the west, the dikes were probably intruded along fractures

associated with these faults. The dikes are vertical, and most

of them strike north and northeast, although three belong to

an intersecting set that trends southeastward. They are

emplaced in the Pierre Shale and the overlying strata of the

Poison Canyon Formation, and when eroded form sharp

Basaltic dikes and sills mapped in the eastern part of the

ridges. The rocks are gray porphyry with aphanitic ground-

period. They occur chiefly near Koehler and in the area east

of Koehler. These rocks are porphyritic and contain olivine,

groundmass. Most of the dike rocks show some alteration of

the mafic minerals. Many of the coal beds in the Koehler

area have been intruded by basaltic dikes, and there has been

some crushing and baking of the coal for short distances

The Raton coal field lies in the structural trough of the

Raton basin, a broad asymmetrical syncline that extends along

the east front of the southern Rocky Mountains in northern

New Mexico and southern Colorado. The axis of the Raton

basin trends northward in a slightly sinuous fashion from

Cimarron, N. Mex., into Huerfano Park, Colo. The west limb

The southern part of the Raton coal field is characterized

by gently undulating folds and a general paucity of faults.

On the western limb of the basin in the northwestern part of

flexures in the area, extends eastward into the basin. It

probably merges north of the map area with the main axis

West of Ponil Base Camp, a normal fault has displaced an

gneous sill to the east against sedimentary rocks. The trace

of this fault can be followed to the vicinity of the Dan Beard

Trail Camp. At Copper Park, on the east side of Baldy

Mountain, several large normal faults downthrown on the

the map area, a syncline, more sharply folded than the other

is steep, whereas the east limb slopes gently at dips ranging

from 1° to 5° into the broad central part of the syncline.

mass, and are megascopically classed as dacite porphyry.

The Poison Canyon Formation is composed of thick to area appear generally to have been emplaced during a later

from the intrusions.

of the basin.

beds of yellow silty shale. Most of the sandstone beds are pyroxene, and plagicalase phenocrysts in a fine-grained

porphyritic, and is classified megascopically as a dacite

The dike swarm in the northwestern part of the map area

the east and appears to thin westward toward Baldy Mountain.

in. 61 62 Ft in. 66 Ft in. 67 6 68 Ft in. 68 Ft in. 69 Ft in. 68 Ft in. 69 Ft in. 68 F

occurs in streaks. The coal beds appear well cleated. Generally, the thinner beds are impure and contain much bone. OIL AND GAS POSSIBILITIES The thickest coal bed is about 4 feet 6 inches thick in a core hole drilled at locality 21. The coal beds occur in the lower part of the Raton Formation and are overlain conformably by a thick sequence of coal-barren strata. Coal beds in the Vermejo Formation, which range in thickness from a few inches to many feet, are much thicker and more persistent than those in the Raton Formation. Most of them have less than 1,000 feet of overburden, and at the center of the basin they appear to have less than 2,000 feet of overburden. The coal beds contain many shale partings and interbeds of impure coal. Much of the coal is compact, hard, and banded, and has generally dull luster and irregular fracture. The impurities in the coal are usually quartz grains, nelanterite, and pyrite. Bony coal, carbonaceous shale, and iltstone form partings in the coal. The Raton, the Dawson, and the Cimarron beds, together with others occupying similar stratigraphic positions, extend over large areas and are the

information.

Late Cretaceous and early Tertiary age that may be considered favorable for accumulations of oil and gas. A thin sequence of Jurassic and Triassic rocks, is underlain by a thick sequence of late Paleozoic rocks deposited in a major geosynclinal belt, the Rowe-Mora basin (Read and Andrews, 1944). Marine rocks deposited during the Pennsylvanian and Permian Periods are assigned to the Magdalena Group. These strata and rocks of Late Cretaceous age are considered favorable for oil and gas potentials in structural and strati-

Data obtained from wells drilled in and adjacent to the report area indicate that upper Paleozoic rocks thin eastward. Approximately 4,000 feet of strata in the upper part of the Magdalena Group exposed in the southern part of Moreno Valley west of the report area contain several thick dark shale units with much organic matter that are possible source beds. In the western part of the basin these rocks intertongue with the lower part of the Sangre de Cristo Formation of Pennsylvanian and Permian ages. The strata in the lower part of the Sangre de Cristo Formation consist of permeable and highly porous sandstone and conglomerate beds that are potential reservoir beds. The Sangre de Cristo Formation is about 5,000 feet thick at the north end of

basalt flows on Fowler and Urraca Mesas in the Philmont east have dropped Poison Canyon strata about 1,500 feet in common and can be seen at the outcrop north of U.S. Highway oped here at the locality where thinning is most rapid. A the Poison Canyon Formation west of Dean Canyon at area south of the coal field. an en echelon pattern. Alluvium consists of gravel, sand, and silt, and fills the The Trinidad Sandstone ranges in thickness from 0 near north of the area. The evidence suggests to the writer that bottom of the large valleys and their tributaries and some less than 2,000 feet of overburden are estimated to be 1,489 Coal was mined in the Raton field during the period 1889 million short tons. This estimate is based on beds for which Morena Valley and thickens northward to nearly 10,000 feet It is about 300 feet thick in the northern part of the Raton Vermejo. The relations between the Raton and Vermejo Canyon. The basal Raton conglomerate rests disconformably Igneous rocks.—A plug or small stock is intruded into the upon the Trinidad Sandstone just northeast of Koehler. Else- Pierre Shale near the mouth of Encinosa Canyon about 3 miles all coal districts except the Koehler district, where in 1957 thicknesses were measured at outcrops, in logs of diamond on the Vermejo River near the Colorado-New Mexico line.

COAL INVESTIGATIONS MAP C-45 (SHEET 2 OF 2)

INTRODUCTION

the Raton coal field, which is that part of the Raton Mesa coal

region that lies in New Mexico. The Raton coal field has been

an important source of high-volatile C bituminous coal of

coking quality, and coal mining was active in the field until

1946. Present mining operations are limited, but much coal

SEDIMENTARY ROCKS

nary in age, and include the Pierre Shale, Trinidad Sandstone,

the coal-bearing Vermejo and Raton Formations, Poison

Upper Cretaceous rocks.—The Pierre Shale (Meek and

Hayden, 1862, p. 419, 424) of Montana age (Eldridge, 1888,

p. 93) is the oldest formation exposed in the map area. It is

of unknown thickness in the region, but it probably approaches

1,600 feet (Johnson and Wood, 1956, p. 710), and consists of

gray to dark-gray silty shale interbedded with thin lenses of

sandstone. The upper part of the Pierre is continuously

exposed along the margin of the coal field where it forms

steep slopes below the resistant Trinidad Sandstone; the lower

part is concealed beneath soil and gravel deposits. The upper

part of the formation is very sandy, and it is transitional with

The Trinidad Sandstone of Montana age (Eldridge, 1888,

p. 93) was named by Hills (1899, p. 2) for exposures at Trinidad,

Colo., and is exposed in continuous outcrop along the margin

of the coal field. The formation consists of a cliff-forming

sequence of thick to massive beds of cross-laminated, fine- to

beds of gray shale and siltstone. The sand grains are chiefly

quartz with some weathered feldspar, mica, or ferromagnesian

material, and they are cemented with calcium carbonate and

clay. The shale beds are thin and dark gray and locally

contain abundant carbonaceous material. In Cimarron Canyon

near the confluence with Bear Canyon, the Trinidad Sandstone

is very dark gray and contains a high percentage of bituminous

beds in the overlying Vermejo Formation. The Trinidad

Sandstone is split into an upper and a lower sandstone by a

Ophiomorpha major (Les quereux).

medium-grained, light-gray sandstone intercalated with thin

Canvon Formation, and unconsolidated alluvial deposits.

Sedimentary rocks range from Late Cretaceous to Quater-

Paleocene age.

remains in the ground for future exploitation. The coal-

The area of this report includes the southwestern part of