UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Text to accompany:

Open-File Report 79-195

COAL RESOURCE OCCURRENCE MAPS OF THE SMIZER GULCH QUADRANGLE RIO BLANCO AND MOFFAT COUNTIES, COLORADO

By

AAA Engineering and Drafting, Inc.
Salt Lake City, Utah

Prepared for the U.S. Geological Survey
under contract No. 14-08-0001-17457

1980

CONTENTS

ILLUSTRATIONS

TABLES

INTRODUCTION

Purpose

These maps were compiled to support the land-use planning work of the Bureau of Land Management and to provide a systematic coal resource inventory of Federal coal lands in the Lower White River Known Recoverable Coal Resource Area (KRCRA) in response to the land-use planning requirements of the Federal Coal Leasing Amendments Act of 1976.

Published and unpublished non-proprietary data sources were used for this study. No new drilling or field mapping was done to supplement this study. No confidential or proprietary data were used.

Location

The Smizer Gulch quadrangle is located in the north central part of Rio Blanco County and the south central part of Moffat County in northwestern Colorado. The city of Meeker, the county seat of Rio Blanco County, is about 19 miles (31 km) southeast of the quadrangle. The city of Craig, the county seat of Moffat County, is approximately 39 miles (63 km) east of the quadrangle. The Colorado-Wyoming state line is approximately 52 miles (84 km) north of the quadrangle and the Colorado-Utah state line is 36 miles (58 km) west. The town of Rangely is 23 miles (37 km) west of the quadrangle.

Accessibility

Colorado State Highway 64 crosses the southwest quarter of the quadrangle in a northwest-southeast direction. The highway continues westward 27 miles (43 km) to Rangely and southeastward 25 miles (40 km) to Meeker. Numerous unimproved dirt roads and jeep trails provide accessibility to many of the canyons and ridges in the quadrangle. The area southwest of Colorado State Highway 64 in the quadrangle is mostly inaccessible because of the steep escarpment up to 1,000 ft (305 m) high around Blair Mountain.

The White River flows in a meandering channel on the northeast side of Highway 64 and forms a natural barrier to vehicular traffic. However, two roads cross the river in the quadrangle area.

The nearest railhead is at Craig which is on the western end of a branch line of the Denver and Rio Grande Western Railroad which connects to Denver, Colorado. An airfield is maintained at Rangely.

Physiography

The general topography of the Smizer Gulch quadrangle is hilly but not extremely mountainous. The most rugged feature is the northeastward-facing escarpment in the southwest corner of the quadrangle. This long steep mountain face ranges from 400 to 1,000 ft (122 to 305 m) in height above the more gently sloping foothill area along its base. The escarpment forms the southwest side of the valley cut by the White River. The rest of the quadrangle consists of shallow narrow valleys, gulches, and washes bounded by low hills from 100 to 400 ft (30 to 122 m) above the drainage elevation.

The maximum relief in the quadrangle is approximately 1,600 ft (488 m) with with the high point on a ridge of the escarpment on the south edge of the quadrangle at 7,150 ft (2,179 m) above sea level. The low point is where the White River intersects the west side of the quadrangle at an elevation of 5,550 ft (1,692 m).

Crooked Wash has the largest drainage area of the tributaries of the White River in the quadrangle. White River flows northwestward through the southwest quarter of the quadrangle where its flood plain ranges from ¼ to ½ mile (0.4 to 0.8 km) in width. The river continues to flow westward toward its confluence with the Green River in Utah.

Climate

The Smizer Gulch quadrangle has a mid-latitude steppe climate and semi-arid conditions prevail in the area. The normal annual precipitation for the quadrangle ranges from 11 inches (28 cm) in the central and southern parts of the quadrangle to 13 inches (33 cm) in the northeast quarter of the quadrangle (U.S. Department of Commerce, (1964)).

The nearest weather data recording station is at Rangely where a record high temperature of 104° F (40° C) and a record low temperature of -37° F (-38° C) were recorded (National Weather Service Forecast Office, personal communication). The mean annual temperature at Rangely is 45.6° F (7.6° C). The temperatures in the Smizer Gulch quadrangle are probably a few degrees cooler than temperatures at Rangley (elevation, 5,240 ft (1,597 m)) because of the higher altitudes in the quadrangle area. A flood hazard exists along the flood plain of the White River.

Land Status

The Smizer Gulch quadrangle lies at the eastern end of the Lower White River Known Recoverable Coal Resource Area (KRCRA). The KRCRA covers approximately 23,360 acres (9,454 ha) of the quadrangle. The areas of non-Federal land and the KRCRA boundary are shown on plate 2. There were no existing coal leases or preference right lease applications in this quadrangle at the date of the land check for this report as shown on plate 2. The total non-Federal land in the quadrangle comprises approximately 3,360 acres (1,360 ha) or 9 percent of the quadrangle area. The unleased Federal coal rights land covers about 32,970 acres (13,343 ha) or 91 percent of the quadrangle area. The Federal land may or may not be underlain by coal.

Previous Work

Gale (1910) described the coal fields of northwestern Colorado and northeastern Utah including the Lower White River field. Hail (1973) mapped the geology and surface exposures of the coal beds in the Smizer Gulch quadrangle. He also mapped the adjoining Rough Gulch quadrangle (Hail 1974a), Barcus Creek quadrangle (Hail, 1974b), and Barcus Creek SE quadrangle (Hail, 1972). Dyni (1968) mapped the geology and coal exposures in the adjoining Elk Springs quadrangle.

GENERAL GEOLOGY

Stratigraphy

Sedimentary rocks in the Smizer Gulch quadrangle are Late Cretaceous and Tertiary in age. The oldest exposed formation is the Williams Fork Formation which crops out in the northwest quarter of the quadrangle. This formation has a maximum thickness of about 2,650 ft (808 m) in the quadrangle of which about 2,200 ft (671 m) are exposed (Hail, 1973). The formation is composed of interbedded light-gray to brown, mostly fine-grained nonpersistent sandstone, and gray, greenish-gray, and light-brown shale and claystone. It also contains considerable brown carbonaceous shale and several lenticular coal beds in zones of carbonaceous shale in the upper part of the formation (Hail, 1973). The base of the formation is not exposed in the quadrangle.

The Williams Fork Formation is overlain by the Ohio Creek Formation of Paleocene age. The maximum known thickness of the Ohio Creek Formation in the quadrangle is about 50 ft (15 m) (Hail, 1973). It consists of light-brown to white sandstone which is locally quartzitic and which locally contains very sparse concentrations of small chert pebbles.

The Ohio Creek Formation is overlain by the Fort Union Formation of Paleocene age which is divided into a lower and an upper member. The lower member is about 1,150 ft (351 m) thick and consists of olive-green to gray claystone, light-brown to light-gray lenticular crossbedded to massive sandstone, sparse clay-pebble conglomerate, minor siltstone and mudstone, and very sparse limestone and carbonaceous shale. The upper member is about 525 ft (160 m) thick and is composed of brown to gray shale, carbonaceous shale, minor coaly shale, thin relatively persistent sandstone beds, and lesser amounts of claystone and siltstone (Hail, 1973).

The Wasatch Formation of Eocene and Paleocene age overlies the Fort Union Formation and is about 1,550 ft (472 m) thick. The main body of the Wasatch Formation is composed of tan, yellowish-gray, and red claystone, shale, and mudstone; brown to gray, massive to crossbedded lenticular sandstone; and minor carbonaceous shale. The Wasatch Formation contains a unit with beds of probably lacustrine origin including several thin, persistent ostracodal sandstone beds and some brown, possibly carbonaceous shale, Nonlacustrine beds predominate in the unit and are similar in lithology to the main body of the Wasatch Formation. The lacustrine unit has a thickness of about 340 ft (104 m) and the top of the unit lies about 200 ft (61 m) below the top of the formation.

The Green River Formation of Eocene age overlies the Wasatch Formation and consists of the following members in ascending order: basal sandstone member, Garden Gulch Member, Parachute Creek Member, tongue of the Evacuation Creek Member, and tongue of the Parachute Creek Member. The basal sandstone member has a maximum thickness of 120 ft (37 m) on outcrop and thins to about 40 ft (12 m) at the west edge of the quadrangle. It consists mostly of brown-weathering sandstone and lesser amounts of siltstone, sandy claystone, and shale. The Garden Gulch Member has a maximum thickness

on outcrop in the quadrangle of about 670 ft (204 m) and consists mostly of dark-gray to brown fissle clay shale. It also contains a ledge of marly shale, including some oil shale, in the upper part. The lower part of the member contains a few thin ostracodal limestone and sandstone beds. The main body of the Parachute Creek Member has a maximum thickness on outcrop of about 1,050 ft (320 m) in the quadrangle and consists mostly of light-gray weathering, massive to platy marlstone including several oil shale zones. The tongue of the Evacuation Creek Member overlies the main body of the Parachute Creek Member and consists of brown-weathering massive to cross-bedded locally conglomeratic sandstone, tuffaceous siltstone, and minor marlstone. The tongue of the Evacuation Creek Member has a maximum thickness of 220 ft (67 m) in the quadrangle. The tongue of the Parachute Creek Member overlies the tongue of the Evacuation Creek Member and consists of about 40 ft (12 m) of light-gray marlstone (Hail, 1973).

Structure

The most prominent structural feature in the Smizer Gulch quadrangle is the eastward-plunging midland anticline whose axial trace passes through the north half of the quadrangle in an east-west direction (pl. 1). On the north flank of the anticline the beds dip from 6^{o} to 9^{o}. On the south flank of the anticline the beds dip southeastward from 3^{o} to 20^{o}. The axial trace of the Crooked Wash syncline crosses the extreme northwest corner of the quadrangle in a northeast-southwest direction.

Two faults over 1 mile (1.6 km) in length and two short, probably insignificant faults, cut the coal-bearing rocks of the upper part of the Williams Fork Formation in the central part of the quadrangle. Three faults on the south side of the quadrangle occur where the coal-bearing beds are more than 3,000 ft (914 m) below the surface (pl. 1).

COAL GEOLOGY

Hail (1973) reports that "coal beds in the upper part of the Williams Fork Formation are present in the northwestern part of the quadrangle. . . The coal beds occur in discontinuous carbonaceous shale zones, and most beds are thin and lenticular. These coals lie at the extreme southeastern edge of the lower White River coal field, described by Gale (1910, p. 179-197). They continue northward into the Elk Springs 15-minute quadrangle where they constitute the upper coal zone as mapped by Dyni (1968)."

The coal beds in the Smizer Gulch quadrangle are lenticular and generally less than 5 ft (1.5 m) thick. Therefore, no coal isopach, structure contour, and overburden isopach maps were made. Hail (1973), however, correlated several groups of thin coal beds over short distances and the datum line shown on plate 3 of this report is the top of the coal-bearing carbonaceous zones F and N of Hail.

Isolated Data Points

The standard criteria for construction of isopach, structure contour, and overburden isopach maps cannot be applied to those coal beds that are 5 ft (1.5 m) or more thick at only a few and isolated points of measurement. The lack of data for these beds limits the extent to which they can be reasonably projected in any direction and usually precludes correlations with other beds. For these reasons, maps of isolated data points are not included in this report but are in U.S. Geological Survey files. Resource tonnages were calculated for these non-isopached coal beds and are shown in table 1 and listed by Federal section on plate 2.

Table 1.--Isolated data points in the Smizer Gulch quadrangle, Rio Blanco and Moffat Counties, Colorado.

Index Number (pl. 1 and 3)	Location	Coal Bed Name	Outcrop or Drill Hole	Coal Thickness (ft)[1]	Measured Area (ac)[2]	Resource Tonnage (s.t.)[3]
7	NE¼NW¼ sec. 24, T. 3 N., R. 98 W.	Local	Outcrop	5.5	44	400,000
17	SW¼NE¼ sec. 24 T. 3 N., R. 98 W.	Local	Outcrop	5.5	45	400,000
27	NW¼NE¼ sec. 14, T. 3 N., R. 98 W.	Local	Outcrop	5.3+	62	600,000
29	SW¼NW¼ sec. 24, T. 3 N., R. 98 W.	Local	Outcrop	8.8	56	900,000
38	NE¼SE¼ sec. 25 T. 3 N., R. 98 W.	Local	Outcrop	6.5	74	900,000
51	NE¼SE¼ sec. 25 T. 3 N., R. 98 W.	Local	Outcrop	6.8	60	700,000
77	SE¼SE¼ sec. 27 T. 3 N., R. 97 W.	Local	Drill Hole	6.0	106	1,100,000
				Total Resource Tonnage		5,000,000

[1] To convert feet to meters, multiply feet by 0.3048
[2] To convert acres to hectares, multiply acres by 0.4047
[3] To convert short tons to metric tons, multiply short tons by 0.9072

Proximate Analyses of the Coal

No analyses of coal from the Smizer Gulch quadrangle are available. However, several analyses of coal from the Staley or "D" coal bed in the coal unit of the Mesaverde Group in the Cactus Reservoir quadrangle about 14 miles (23 km) west are listed in table 1. The coal analysed is equivalent in stratigraphic position to the coal in the Williams Fork Formation the the Smizer Gulch quadrangle.

Table 1.--Proximate analyses of samples (as-received) from the Staley or "D" coal bed in the Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado.

	Moisture (percent)	Volatile matter (percent)	Fixed carbon (percent)	Ash (percent)	Heating value (Btu/lb[1])	Sulphur (percent)
1.	11.09	36.97	46.65	5.29	11,361	0.34
2.	11.7	33.5	49.2	5.6	11,210	0.4
3.	10.8	34.5	50.5	4.2	11,450	0.5
4.	13.2	36.6	45.3	4.9	11,070	0.4

[1]To convert Btu/lb to Kj/kg multiply by 2.326

On the basis of the analyses in table 1, the Staley or "D" coal is ranked as high-volatile C bituminous coal (American Society for Testing and Materials, 1977). The coal in the Smizer Gulch quadrangle may be of similar quality.

MINING OPERATIONS

No coal is known to have been produced in the Smizer Gulch quadrangle, although some may have been mined for local use by ranches.

COAL RESOURCES

The principal source of data used in the construction of the coal data maps (pl. 1) and coal data sheet (pl. 3) was Hail (1973). A number of oil and gas test wells have been drilled in the quadrangle and the available logs

of these wells were inspected, but the logs were generally non-definitive for coal, or the wells were drilled in non-coal areas.

The following criteria for coal resource determinations are given in U.S. Geological Survey Bulletin 1450-B: "Measured.--Resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that the tonnage is judged to be accurate within 20 percent of true tonnage. Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coal beds, the points of observation are no greater than ½ mile (0.8 km) apart. Measured coal is projected to extend as a ¼ mile (0.4 km) wide belt from the outcrop or points of observation or measurement.

"Indicated.--Resources are computed partly from specified measurements and partly from projection of visible data for a reasonable distance on the basis of geologic evidence. The points of observation are ½ (0.8 km) to 1½ miles (2.4 km) apart. Indicated coal is projected to extend as a ½ mile (0.8 km) wide belt that lies more than ¼ mile (0.4 km) from the outcrop or points of observation or measurement.

"Inferred --Quantitative estimates are based largely on broad knowledge of the geologic character of the bed or region and where few measurements of bed thickness are avialable. The estimates are based primarily on an assumed continuation from Demonstrated coal (a collective term for the sum of coal in both Measured and Indicated Resources and Reserves) for which there is geologic evidence. The points of observation are 1½ (2.4 km) to 6 miles (9.6 km) apart. Inferred coal is projected to extend as a 2¼-mile (3.6 km) wide belt that lies more than 3/4 mile (1.2 km) from the

the outcrop or points of observation or measurement." (U.S. Bureau of Mines and U.S. Geological Survey, 1976, p. B6 and B7).

In this quadrangle coal resources could not be determined for measured, indicated, and inferred categories for isopached coal beds because no coal beds were 5 ft (1.5 m) or more thick except at the isolated data points. Resource tonnages calculated for isolated data points (non-isopached coal beds) are classified as inferred coal and placed in the unknown development potential category. The coal resources for the isolated data points are shown in table 1 and total 5.0 million short tons (4.5 million metric tons). In this quadrangle, coal resources of unknown coal development potential are projected to extend as a ¼ mile (0.4 km) wide belt from the outcrop or points of measurement at the isolated data points.

AAA Engineering and Drafting, Inc. has not made any determination of economic recovery for any of the coal beds described in this report.

COAL DEVELOPMENT POTENTIAL

No coal development potential maps were made for this quadrangle because there are no known areas where a coal bed is 5 ft (1.5 m) or more thick except at the isolated data points discussed above. Therefore, the land with Federal coal rights in this quadrangle has an "unknown"-development-potential rating in those areas that are underlain by coal-bearing formations which are less than 3,000 ft (914 m) below the surface.

Table 3.--Sources of data used on plate 1.

Plate 1 Index No.	Source	Measured Section or Drill Hole No. in Reference Source
1	Hail, 1973	1
2	Do.	2
3	Do.	3
4	Do.	4
5	Do.	5
6	Do.	6
7	Do.	7
8	Do.	8
9	Do.	9
10	Do.	10
11	Do.	11
12	Do.	12
13	Do.	13
14	Do.	14
15	Do.	15
16	Do.	16
17	Do.	17
18	Do.	18
19	Do.	19
20	Do.	20
21	Do.	21
22	Do.	22
23	Do.	23
24	Do.	24
25	Do.	25
26	Do.	26
27	Do.	27
28	Do.	28
29	Do.	29
30	Do.	30
31	Do.	21
32	Do.	32
33	Do.	33
34	Do.	34
35	Do.	35
36	Do.	36
37	Do.	37
38	Do.	72
39	Do.	73
40	Do.	74
41	Do.	38
42	Do.	71
43	Do.	39
44	Do.	40
45	Do.	41

Table 3.--Sources of data used on plate 1 cont.

Plate 1 Index No.	Source	Measured Section or Drill Hole No. in Reference Source
46	Do.	42
47	Do.	43
48	Do.	44
49	Do.	45
50	Do.	46
51	Do.	75
52	Do.	47
53	Do.	48
54	Do.	49
55	Do.	50
56	Do.	51
57	Do.	52
58	Do.	53
59	Do.	57
60	Do.	58
61	Do.	59
62	Do.	60
63	Do.	61
64	Do.	62
65	Do.	63
66	Do.	64
67	Do.	65
68	Do.	66
69	Do.	67
70	Do.	68
71	Do.	69
72	Do.	70
73	Do.	54
74	Do	55
75	Do.	56
76	The California Co.	Federal 1
77	E. W. Levison	Coyote 1-A

REFERENCES

American Society for Testing and Materials, 1977, Standard Specifications for classification of coals by rank, in Gaseous fuels, coal and coke; atmospheric analyses: ASTM Publication D 388-77.

Dyni, J. R. 1968, Geologic map of the Elk Springs quadrangle, Moffat County, Colorado: U.S. Geol. Survey Geologic Quadrangle Map GQ-702.

Gale, H. S., 1910, Coal fields of northwestern Colorado and northeastern Utah: U.S. Geol. Survey Bulletin 415.

Hail, W. J., Jr., 1972, Preliminary geologic map of the Barcus Creek SE quadrangle, Rio Blanco County, Colorado: U.S. Geol. Survey Misc. Field Studies Map MF-347.

_____ , 1973, Geologic map of the Smizer Gulch quadrangle, Rio Blanco and Moffat Counties, Colorado: U.S. Geol. Survey Geologic Quadrangle Map GQ-1131.

_____ , 1974a, Geologic map of the Rough Gulch quadrangle, Rio Blanco and Moffat Counties, Colorado: U.S. Geol. Survey Geologic Quadrangle Map GQ-1195.

_____ , 1974b, Preliminary geologic map and section of the Barcus Creek quadrangle, Rio Blanco County, Colorado: U.S. Geol. Survey Misc. Field Studies Map MF-619.

U.S. Bureau of Mines and U.S. Geological Survey, 1976, Coal resource classification system of the U.S. Bureau of Mines and U.S. Geological Survey: U.S. Geol. Survey Bull. 1450-B.

U.S. Department of Commerce, (1964), Normal annual precipitation, 1931-1960, Colorado: Environmental Science Services Admin., Weather Bureau.