UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Northeast Rangely coal area, Rio Blanco and Moffat Counties, Colorado

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U. S. Geological Survey
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Introduction

The Northeast Rangely coal area is located along the northeast flank of the Rangely or Raven Park anticline in Rio Blanco and Moffat Counties, Colorado. The report area, plate 1, covers about 73 square miles in parts of T. 2 N., Rs. 101 and 102 W., and T. 3 N., Rs. 101 and 102 W.

This investigation was initiated at the request of the Branch of Mining Operations, U. S. Geological Survey, to determine the outcrop and extent of the principal coal zone as an aid to the supervision of coal mining on Federal lands.

Field work for this investigation was done between August 23 and September 21, 1959, and July 12 through 16, 1960. Geologic boundaries were mapped on air photographs of the Soil Conservation Service, approximate scale 1:30,000. The base map, plate 1, was constructed by plane table triangulation and radial line intersection of air photographs.

The map area is included on a geologic and topographic reconnaissance map (Gale, 1908 and 1909), and the Vernal topographic sheet (Army Map Service, scale 1:250,000). A part of the southern and southwestern portion of the area is also shown on Oil and Gas Investigations Preliminary Maps (Thomas, 1944 and 1945, and Bass, 1946).

Pertinent information is contained within published reports by Gale (1908, 1910) and Landis (1959).

Geology

Sedimentary rocks

The rocks exposed in the area are confined to the Mancos shale and Mesaverde group of Late Cretaceous age. Remnants of the basal part of the Wasatch formation of Eocene age may be present locally along the axis of the Red Wash syncline in the area of sec. 25, T. 3 N., R. 101 W.

The sedimentary beds are generally well exposed as southwest-facing escarpments along the flank of the Rangely anticline, and as hogbacks along the northern perimeter of the Red Wash syncline (figs. 1, 2, and 3). Within the area of plate 1, these rocks have a stratigraphic interval of about 2,700 feet.

Cretaceous system

Upper Cretaceous series

Mancos shale

The upper part of the Mancos shale is exposed below the basal "Rim Rock sandstone (Hale, 1959)" along the southern and northern borders of the area. The lithology of this shale is the subject of

numerous publications (see Gale, 1908, Bass, 1946, and Hale, 1959). A zone of cephalopods, Baculites n. sp. in limestone concretions was found about 280 feet below the base of the Rim Rock sandstone near the quarter corner of secs. 19 and 24, T. 2 N., Rs. 101 and 102 W. According to Cobban (written communication, 1960) this undescribed species is characterized by widely spaced flank nodes and marks a zone younger than the level of the Morapos sandstone member of Mancos shale of the Axial Basin area.

Mesaverde group

The Mesaverde group in the Northeast Rangely coal area is largely composed of yellowish to very light gray, massive, thin-bedded and flaggy, angular to sub-angular, very fine to fine-grained quartz sandstone interbedded with sandy gray shale, siltstone and mudstone, carbonaceous shale, coal, and occasional thin, often concretionary, lenses of limey sandstone and sandy limestone (see measured sections, p. 7-15 and composite section, pl. 1).

The Mesaverde group is shown as a single unit on plate 1, although it appears to be divisable into at least two units. The lower unit, about 500 feet thick, is largely marine in origin (see Gale, p. 24, 1908) and includes the Buck (Rangely) tongue of the Mesaverde (Hale, 1959). The upper, or "carbonaceous", unit is approximately 2,200 feet thick. The lower 1,100 feet and possibly the remainder of the upper unit appears to be predominantly of a continental or fresh and brackish water origin (Gale, 1908, p. 24).

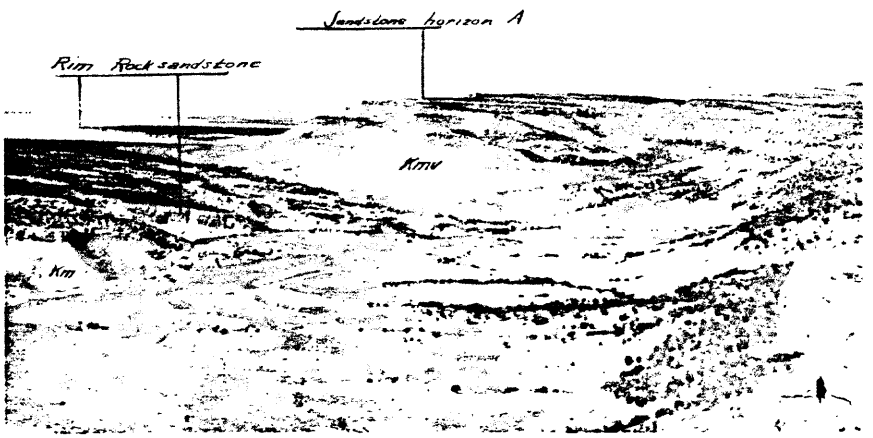

Figure 1. View northwest from triangulation station 6194, SW¼ sec. 18, T. 2 N., R. 101 W., showing southwest facing escarpments of lower Mesaverde rocks, the "Rim Rock sandstone (Hale, 1959)" and sandstone horizon A.

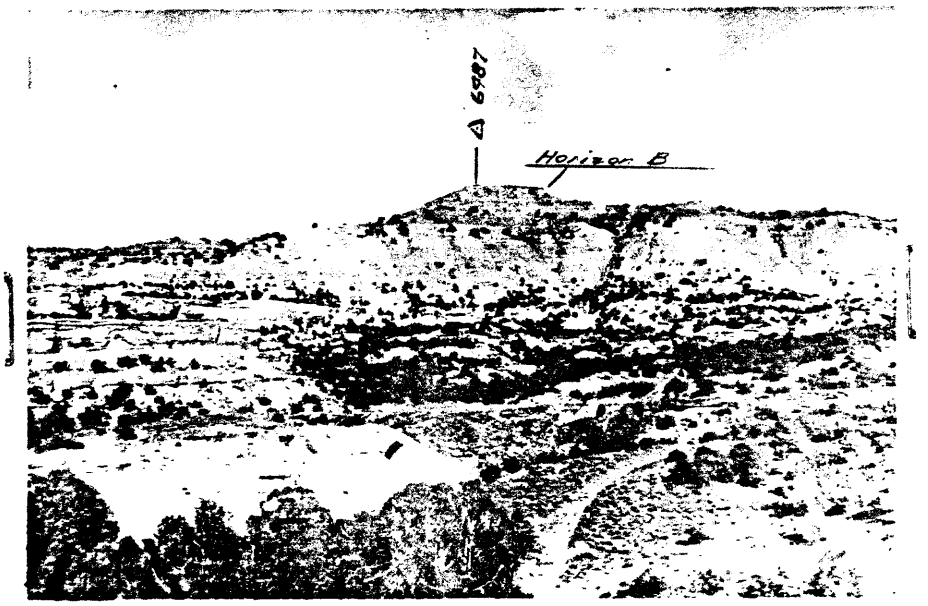

Figure 2. View northeast from locality of triangulation station 6160, NE¼ sec. 13, T. 2 N., R. 102 W., showing Mesaverde rocks included in upper "carboniferous" unit.

The top of the lower unit and base of the upper unit is marked by a persistent, massive, white sandstone (Horizon A, pl. 1). No coal was found in the lower unit although some carbonaceous shale is present in measured section number 5 (pl. 1) about 320 feet above the top of the Rim Rock sandstone. Some coal may be present locally in this basal unit (Gale, 1908, p. 20).

Above sandstone horizon A, in contrast, as many as 66 carbonaceous shale horizons, aggregating 195 feet in thickness, and some 28 coal beds and seams aggregating 45 feet in thickness, were found in measured sections 10 and 22. The carbonaceous shale horizons range from a fraction of a foot up to 25 feet in thickness, the coal beds range from a tenth of a foot to 9.5 feet in thickness. Nearly 25 percent of the lower 1,100 feet of this upper unit of the Mesaverde is recorded in the measured sections 4, 5, and 9 as carbonaceous shale, coal, bony coal, or coaly material. (See pages 7-15, and composite section, pl. 1). Reference to cross section B-B' indicates that about 1,100 feet of unmeasured section overlie the composite measured section illustrated on plate 1. This 1,100-foot unmeasured interval appears to be largely sandstone and shale, but according to Gale (1908, p. 22, and 1910, p. 189) contains scattered coal beds or carbonaceous streaks.

Gale (pl. 11, 1908, and pl. 19, 1910) divides the Mesaverde of the Rangely area into two members, a lower containing "minor coals", and an upper containing "principal coals". The top of his lower member is apparently placed at the top of sandstone horizon A of this report (Gale, 1908, p. 21).

Section of the "lower" or basal unit of Mesaverde group as exposed along measured section 14, plate 1, secs. 11, 12, and 13, T. 2 N., R. 102 W.

	Feet
Sandstone, (Horizon A), very light-gray to white, massive calcareous, friable, fine-grained, angular quartz sand; contains some yellowish-gray, noncalcareous, very fine-grained sand (top)	35.0
Sandstone, grayish, yellowish-orange, thick-bedded to massive, friable, fine-grained, angular, quartz sand; middle part thin to thick, and cross bedded with shaly siltstone partings, upper 5 feet slabby sandstone	39.0
Sandstone, yellowish-gray, thin-bedded, slabby, very fine-grained; interbedded with light-gray siltstone and silty shale	23.0
Shale, gray, with a few thin beds of yellowish-grayish-orange, slightly calcareous, very fine-grained sand	4.5
Sandstone, yellowish-gray, very fine-grained	2.5
Sandstone and shale, yellowish-gray, thin-bedded, friable, sub-angular, very fine-grained sandstone, and light-gray to olive-gray siltstone and silty shale	5.0
Sandstone, yellowish-gray and yellowish-brown, massive, very fine to fine-grained angular quartz sand; lower part friable, upper part calcareous, and well cemented	8.0
Shale and sandstone, medium- to light-gray shale, shaly siltstone, and sandstone	2.0
Sandstone-yellowish-gray, massive, very fine to fine-grained, contains some fish bones	3.0
Sandstone and shale, yellowish-gray, thin-bedded, very fine-grained, silty sand, and interbedded silty, slightly calcareous, olive-gray shale	15.0
Siltstone, light-olive to yellowish-gray sandy siltstone and silty shale	4.0
Sandstone, light-olive to yellowish-gray and yellowish-brown, thin-bedded, flaggy, well-cemented, very fine to fine-grained, angular to sub-angular quartz sand, contains mudcracks	3.0
Sandstone, very light- to yellowish-gray, massive, friable, fine-grained, angular quartz sand	9.0
Shale and siltstone, medium-dark, gypsiferous, slightly carboniferous shale, yellowish and very light-gray siltstone	6.0
Sandstone, yellowish-gray, friable, fine-grained, sub-angular to sub-rounded quartz sand	1.5
Shale, sandy shale, and shaly sandstone	3.5

	Feet
Sandstone, yellowish-gray, friable, very fine-grained sub-angular quartz sand	2.0
Shale, gray, contains brackish water oyster shells (Ostrea sp., Cobban, 1960)	4.0
Sandstone, yellowish-gray, friable, very fine-grained	2.0
Shale, medium to dark-gray	1.0
Shale and sandstone, gray shale and yellowish-gray, very fine-grained silty sandstone	4.0
Siltstone, yellowish gray	2.0
Shale, olive-gray to brown, laminated, somewhat carbonaceous, sandy	1.2
Shale and sandstone, gray, sandy shale and very fine-grained shaly sandstone	2.5
Sandstone, pale yellow-orange, friable, silty, very fine-grained, covered by shale slopewash	6.0
Sandstone, yellowish-gray, medium- to massive-bedded, calcareous, well-cemented, fine-grained, yellowish-brown weathering	17.0
Shale, dark to light olive-gray, sandy	56.0
Shale, medium-gray, gypsiferous, weathers a light brown; contains a few gray, fossiliferous (Inoceramus sp. and Baculites n. sp. (P?), Cobban, 1960) limestone concretions-	51.0
Shale, gray; contains large medium-gray limestone concretions, much selenite gypsum, fossiliferous in lower part (Baculites n. sp. (P?), Cobban, 1960)	40.0
Shale, gray	25.0
Shale, gray, fossiliferous (Baculites)	11.0
Shale, gray	90.0
Sandstone, ("Kim rock") yellowish-gray to light-gray, massive, friable, sub-angular to sub-rounded, fine-grained, yellowish-orange weathering; contains small, irregular, iron-cemented areas weathering out as rust-colored nodules, and thin lenses of brown sandstone (base)	30-57.0
	512.0 ±

Measured section of part of upper or "carboniferous" unit of Mesaverde group as exposed along measured section 10, plate 1, in Sec. 2, T. 2 N., R. 102 W., and sec. 35, T. 3N., R. 102 W.

	Feet
(Top) section starts at triangulation station 6465 in SE sec. 35, T. 3 N., R. 102 W.	
Sandstone, light gray, brown to yellow-orange weathering, limey, well-cemented, very fine-grained	1.0
Sandstone, very light-gray, very fine-grained	12.0
Limestone, medium light-gray, dark yellowish-orange weathering, sandy, ledge-forming	1.7
Shale, gray	4.0
Coal	4.6
Shale, gray	5.7
Coal and bony coal	1.7
Shale, carbonaceous	.9
Shale and sandstone	6.0
Sandstone, gray, weathers brown, flaggy, limey	.5
Shale, gray	5.0
Coal	1.0
Sandstone (unconformity at top (very light-gray to white	8.0
(thin- to massive-bedded (calcareous, very fine-	
((grained, silty sand 2.0-4.0	
(thin to laminated 1.5	
(flaggy, medium-bedded 3.0	
(flaggy, thin-bedded, light-gray, buff weathering 1.0	
Sandstone, gray, thin-bedded, flaggy, (Horizon B)	2.5
Shale, carbonaceous	.2
Coal	.5
Shale, carbonaceous	.4
Sandstone, gray, shaly	13.0
Sandstone, gray, light-brown, weathering, thin-bedded, flaggy, very fine-grained	12.0
Shale, gray	1.0
Shale, carbonaceous	.2
Sandstone, shaly	4.0
Sandstone, gray, yellowish-gray and brown weathering, top calcareous	8.0
Shale and claystone	1.9
Shale, gray, includes .2 foot carbonaceous shale in middle	6.6
Shale, carbonaceous	.6
Coal	.9
Shale, gray	1.0

	Feet
Sandstone, thin-bedded	.3
Sandstone, gray, very fine-grained	1.4
Sandstone, shaly	1.7
Shale, gray	2.6
Coal	1.0
Shale, carbonaceous	.1
Shale, gray	3.0
Shale, carbonaceous	1.0
Shale, gray	1.0
Sandstone, light-gray, weathers dark-brown, very calcareous, ledge-forming	1.5
Sandstone, thin-bedded, slightly calcareous, very fine-grained-	5.5
Limestone, concretionary	.4
Shale, gray	5.5
Coal	1.0
Shale and sandstone	7.0
Coal	1.2
Shale, carbonaceous	.3
Sandstone and shale	2.9
Sandstone, very light-gray to white, friable, fine-grained, angular quartz sand	19.0
Shale, carbonaceous	1.0
Shale, gray	2.5
Sandstone, gray, dark-brown weathering, limey	.5
Shale, gray	5.5
Sandstone, yellowish-gray, thin-bedded, calcareous, fine-grained	3.5
Shale, gray	.5
Shale, carbonaceous, some bony coal	1.4
Shale, gray	2.7
Shale, carbonaceous	.6
Shale, gray	2.1
Sandstone, flaggy, calcareous, very fine-grained	3.0
Shale and sandstone, gray	6.0
Shale and sandstone, carbonaceous	2.0
Coal	.1
Shale, carbonaceous	2.5
Sandstone	1.6
Coal, bony	.6
Shale, gray, some carbonaceous	6.0
Sandstone, shaly	1.0
Shale, carbonaceous	.7
Sandstone, shaly	1.5
Coal, bony, some carbonaceous shale	1.5
Sandstone and shale, thin- to thick-bedded, thick-bedded sandstone at top	11.0
Coal, bony, some carbonaceous shale	1.2
Shale, gray, contains calcareous concretions	11.0

	Feet
Sandstone, gray, shaly, slightly carbonaceous	4.5
Shale, gray, slightly carbonaceous	3.5
Sandstone, thin-bedded	2.0
Mudstone	4.0
Sandstone and shale, forms massive sandstone lenses to east	23.0
Mudstone	11.0
Sandstone, contains clay pellets	5.0
Sandstone, yellowish-gray, massive, friable, angular to subangular, fine-grained quartz sand; contains pods of silty clay locally and fragments of dinosaur and turtle bones near base	20.0
Shale, gray, forms sandstone lenses to east	5.5
Shale, carbonaceous	1.6
Shale, gray	3.6
Shale, carbonaceous	3.3
Shale and sandstone, gray	13.0
Shale, carbonaceous	1.0
Shale, gray	1.8
Sandstone, yellowish-gray, calcareous, fine-grained	7.5
Shale, gray	5.6
Shale, carbonaceous	1.5
Shale and sandstone	4.0
Shale, carbonaceous	1.5
Shale, gray, contains few thin sandstone beds	17.0
Sandstone, yellowish-gray, fine-grained	10.0
Shale, gray	6.0
Sandstone, yellowish-gray, massive, medium-grained, ledge-forming	13.6
Shale and mudstone, gray	3.2
Shale, carbonaceous	3.0
Sandstone, yellowish-gray, very fine-grained	5.5
Mudstone, nodular	4.0
Shale, gray	7.0
Sandstone, calcareous to very calcareous, fine-grained	6.0
Shale and mudstone, gray	4.6
Sandstone, thin-bedded	3.5
Sandstone, yellowish-gray, very fine-grained	7.0
Shale, gray	3.0
Sandstone, yellowish-gray, thin-bedded, fine- to medium-grained	17.0
Limestone and sandstone, light-olive to greenish-gray, yellowish-brown weathering limestone; yellowish-gray, calcareous, friable, angular, fine-grained quartz sandstone, forms prominent dip slope	8.0
Shale, gray, contains two limey sandstone beds in middle	17.0
Sandstone, yellowish-gray, massive, very calcareous, angular, very fine-grained quartz sands	16.0

	Feet
Shale, gray, contains several one-foot sandstone beds, and four, one-foot, carbonaceous shale beds near top	47.0
Sandstone, gray, weathers brown, massive, limey	6.0
Sandstone, thin-bedded, calcareous, fine-grained	1.8
Shale, gray, contains limestone concretions 1 to 6 feet thick	9.0
Shale, carbonaceous	2.0
Shale, gray	3.6
Sandstone, very light-gray to white, massive, friable, calcareous at top, angular to sub-rounded fine-grained quartz sand; and yellowish-gray noncalcareous, friable, angular, very fine to fine-grained quartz sand at base	18.0
Sandstone, tan, thin-bedded, calcareous, very fine-grained	6.0
Shale, carbonaceous	7.5
Coal, bony	.4
Shale, gray, slightly carbonaceous	4.0
Sandstone, thin-bedded	5.6
Shale, gray	5.6
Shale, carbonaceous	1.2
Sandstone, gray, thin-bedded, very fine-grained	10.0
Shale, gray	1.5
Shale, carbonaceous	1.2
Coal	.7
Shale, carbonaceous	1.4
Coal	1.3
Shale, carbonaceous	2.0
Sandstone, brown, carbonaceous; contains some iron-stone nodules and lenses	4.0
Coal, bony	.8
Sandstone, light-gray, thin-bedded, very fine-grained	5.6
Shale, carbonaceous	1.0
Shale and sandstone, contains two, one-foot carbonaceous shale beds	22.0
Shale, carbonaceous, coaly	4.0
Shale, gray, contains some iron-stone concretions	5.0
Shale, carbonaceous	5.0
Siltstone, light-gray; contains some brown claystone, a few thin yellowish-gray, friable, angular, very fine- to fine-grained sandstone beds, and some limestone lenses	6.0
Limestone and sandstone, light- to olive-gray, brown- to greyish-orange weathering, sandy limestone and limey, very well cemented sand; contains fern (?) and scale tree impressions	4.0
Sandstone, medium- to light-gray, massive, calcareous, iron-stone pods at base	10.0
Sandstone and shale, flaggy	6.0
Sandstone, light-tan, thin-bedded, calcareous	3.0
Sandstone, very fine-grained	2.5

	Feet
Shale, carbonaceous	8.6
Sandstone, light-gray, medium and cross bedded, very fine-grained	3.0
Shale, carbonaceous	14.2
Sandstone, light-gray, very fine-grained; contains iron-stone concretions and vertical seams of gypsum	4.5
Shale, gray, sandy	7.4
Sandstone, laminated and thin-bedded, slightly calcareous, very fine-grained; contains some interbedded shale and sandy shale	
Shale, carbonaceous	1.4
Shale, gray, laminated and thin-bedded, fissile, sandy	2.9
Shale, carbonaceous	3.2
Sandstone, gray, thin-bedded, very fine- to fine-grained	2.0
Shale, gray, laminated, fissile (base)	6.0
Sandstone horizon A	
Total section	781.0 ±

Measured section 22 adjacent to White River Fuel mine in NW¼ sec. 11, T. 2 N., R. 101 W.

	Feet
Sandstone (top of ridge)	40.0 ±
Shale, carbonaceous	15.0
Sandstone	6.0
Shale, carbonaceous	4.0
Sandstone	4.3
Shale, carbonaceous	25.0
Sandstone, thin-bedded	1.7
Shale, carbonaceous	6.0
Coal, bony	1.8
Shale, carbonaceous	3.8
Sandstone, lenticular (wedges out 400 feet to west); contains calcareous concretions	20.0
Shale, carbonaceous	1.4
Sandstone and sandy shale	3.3
Shale, carbonaceous	2.5
Sandstone	1.0
Shale, carbonaceous and gray	19.0
Sandstone	5.0
Limestone, concretionary	1.0
Shale, gray	5.6
Sandstone	5.0
Shale, carbonaceous and gray	15.0
Sandstone, limey	1.0
Shale, carbonaceous and gray	10.0
Sandstone, calcareous, lenticular	4.0
Sandstone	2.0
Shale, gray and carbonaceous	2.0
Coal	.2
Shale, carbonaceous and gray	6.0
Coal	.9
Shale, carbonaceous	.5
Coal	.8
Shale, carbonaceous	.7
Coal	1.7
Shale, carbonaceous	1.6
Sandstone and sandy shale	2.8
Limestone, concretionary	.5
Shale, carbonaceous	1.0
Mudstone	3.6
Shale, carbonaceous	2.2
Coal	.4
Shale, carbonaceous	.3

	Feet
Coal	.2
Shale, carbonaceous	7.0
Coal	3.4
Shale, carbonaceous	1.0
Coal	.6
Concealed	5.6
Sandstone	17.0
Sandstone and shale, calcareous	4.0
Shale, carbonaceous	3.3
Coal, (Staley bed)	6.0
Shale and sandstone	11.0
Coal (base)	9.0
	300.0 ±

Tertiary system

Eocene series

Wasatch formation

Gale (1908, 1910, pl. 2 and 19) shows a small area mapped as Wasatch in secs. 23, 24, and 25, T. 3 N., R. 101 W., based on both lithologic and fossil evidence (Gale, 1908, p. 23, 24). The writers did not critically investigate this contact; however, a thin residual mantle of cherty, conglomeratic, pebble-gravel debris is locally conspicuous along the drainage divide east of triangulation station 5566.

Unconsolidated deposits

Unconsolidated alluvial materials are approximately delineated on plate 1 from aerial photographs of the area. These contacts, in general, are arbitrary but show the general aerial extent of thick alluvial fill. Most of the alluvial material shown on plate 1 has been deeply incised by intermittent streams to depths of 10 to 20 feet or more. Landforms of particular interest would include the two or more high-level erosional terraces along the south side of the White River valley in secs. 11, 12, and 14, T. 2 N., R. 101 W. These terraces apparently have a generally thin mantle of overburden overlying bedrock.

Structure

The main structural feature of the Northeast Rangely coal area is the Red Wash syncline (Gale, 1916, p. 36) an apparently simple asymmetrical flexure on the northeast flank of the Rangely anticline. The axis of the syncline crosses the northern part of the area (pl. 1) and rises at about 250 feet to the mile towards the west with a consequent narrowing in that direction. Beds exposed on the eroded flank of the Rangely anticline along the southwestern limb of the Red Wash syncline dip gently 4° to 12° or more northeast towards the synclinal axis. Exposures on the north flank of the synclinal axis (within the map area) have steep southerly dips ranging from 20 to 70 degrees. Marker beds shown on plate 1 crop out on both sides of the syncline.

The only faults observed in the area are the normal, near vertical displacements shown on plate 1, in secs. 34 and 35, T. 2 N., R. 101 W. These fractures have an apparent offset of approximately 10 to 40 feet and are downthrown on the southeast side.

Discrepancies in core hole data with relation to spot elevations obtained on nearby surface exposures indicate considerable offset of the principal coal zone southeast of the White River Fuel mine near the junction of Scullion gulch and the White River valley. It appears that a fault zone trends northeast across this general locality. The elevation of key coal beds (from core holes in this locality, pl. 1, p. 42-48) do not correlate well with one another.

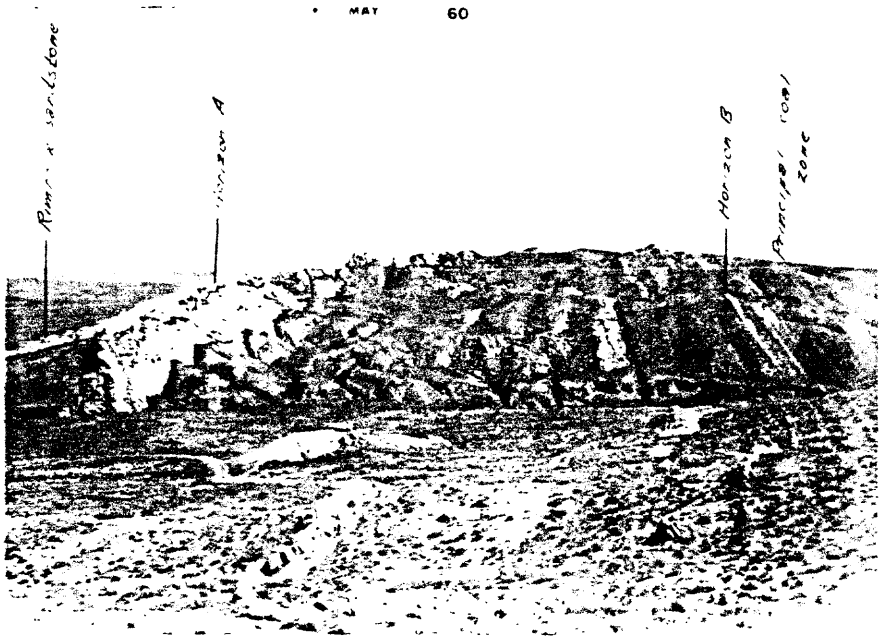

Figure 3. View east from quarter corner 5660, sec. 14, T. 3 N., R. 101 W., showing steeply inclined strata of Mesaverde group along northern flank of the Red Wash syncline.

Coal beds in core hole 1, do not correspond in relative elevation to the same beds in hole 8; key beds in hole 8 appear to be offset from corresponding beds in holes 3 and 19; and key beds in holes 3 and 19 appear offset from beds in hole 8. Similarly, core hole 11 found no coal adjacent to outcrops of the "principal coal zone" on the west wall of the White River valley. The "principal coal zone" also appears to be offset in relation to core holes 15 and 17.

There is also reason to suspect offset of coal beds in the Spring Creek valley, although data is inconclusive and the area was not critically examined.

Coal

General

The Northeast Rangely coal area is a part of the Lower White River coal field as defined by Gale (1909, p. 298). According to Landis (1959, p. 150), the coal in the Lower White River field is of high volatile C bituminous rank and is noncoking.

The outcrop and inferred outcrop of the principal coal zone is shown on plate 1. This "principal coal zone" as indicated in measured sections, plate 2, varies in the total thickness of workable coal and in the number and grouping of the coal beds. The beds are lenticular and generally thin, although several have a maximum thickness of 6 to 9 feet or more locally. The coal is exposed in many places; often as areas of baked rock or clinker where the coal has been burned along its outcrop, baking the enclosing strata to shades of red and yellow and indurating the rocks to a flinty texture.

As indicated in the generalized sections on plate 2, the stratigraphic interval of the "principal coal zone", including the interbedded sandstone and shales, varies from about 30 feet to as much as 60 feet or more.

In general the coal beds are concealed at the surface, "so that they usually can not be traced and often can not be discovered at the outcrops. The presence of valuable coal in much of the region * * * can not be positively determined from surface indications and can only be inferred from a study of the stratigraphic sections that are most favorably exposed. * * * individual beds can not be traced from place to place except in less common instances" (Gale, 1910, p.15).

Reference to plate 2 indicates the difficulty of correlating individual coal beds in this area. Field evidence suggests that many, if not the majority, of the coal beds in the area do not occur as single, persistent, traceable beds, but rather as a series or zone of interfingering lenticular seams.

Gale (1910, p. 188, 191-192) summarizes the coal deposits of the 4 townships included in the Northeast Rangely coal area.

Mines and prospects

White River Dual Mine.-- This mine in sec. 11, T. 2 N., R. 101 W., is the only mine presently operating in the area. The underground workings are delineated on plate 1. The major coal production has been from the "Staley bed" which ranges from about 6 to 8.5 feet in thickness and dips about 12° northeast.

The following coal section was measured underground by J. P. Storrs, Branch of Mining Operations, U. S. Geological Survey.

NE¼NE¼ sec. 10.

		Feet	Inches
upper seam	Coal (Staley bed, top)	6	3
	Rock		3
	Coal	1	
	Rock	11	
lower seam	Coal	6	6
	Rock		3½
	Coal	2	9

Red Wash mine.--This mine is in SW¼NE¼ sec. 11, T. 2 N., R. 101 W. According to Gale (1910, p. 192), the main entry extended down dip "at least 75 feet and had been worked out in a room of considerable size. The coal bed measured 3 feet 8 inches." An analysis of coal from this mine shows "a good coal of bituminous grade, containing a considerable percentage of ash * * * the coal contains much bone, in irregular distributed layers."

Prospects.--Many prospects are shown on plates 2 and 14 (Gale, 1908, 1910) and on the Bureau of Land Management township plats of the area (see discussion of prospects and outcrops by Gale, 1910, p. 188, 191-192).

Measured sections
(located on plate 1)

Section 1, Sec., sec. 11, T. 3 N., R. 102 W.

	Feet
Shale, carbonaceous (top)	3.5
Coal	.7
Shale, carbonaceous	1.0
Shale, gray	2.1
Sandstone	1.0
Shale, carbonaceous	.5
Shale, gray	.5
Shale, carbonaceous	.9
Coal	7.5
Shale	2.3
Coal	1.4
Shale, gray (base)	1.7
Sandstone, horizon B	

Section 2, [illegible] sec. 23, T. 3 N., R. 102 W.

	Feet
Sandstone (top)	5.0
Coal	.4
Shale, carbonaceous	2.0
Coal	1.3
Shale, carbonaceous	18.0
Sandstone and shale	5.6
Coal	.6
Shale	5.0
Sandstone	5.0
Sandstone and shale	34.0
Shale, carbonaceous	5.0
Sandstone and shale	33.0
Sandstone	3.0
Shale, carbonaceous	11.0
Coal	6.8
Shale, carbonaceous	2.5
Coal	2.7
Shale, carbonaceous	6.8
Sandstone	.8
Shale, gray and carbonaceous	16.0
Shale, carbonaceous	2.0
Sandstone	.8
Coal	4.1
Shale, carbonaceous	1.5
Sandstone	1.6
Shale, gray	5.6
Sandstone (Horizon B ?)	6.0
Shale, carbonaceous	1.6
Sandstone	8.0
Shale, carbonaceous	2.9
Shale, gray	2.0
Sandstone	4.6
Shale	4.0
Coal	1.1
Shale and sandstone	4.0
Shale, carbonaceous	1.2
Sandstone	11.0
Coal	.6
Shale, carbonaceous	1.2
Sandstone	6.5
Shale, gray	3.2
Coal	.7
Shale, carbonaceous	1.5

	Feet
Coal	1.4
Shale, gray	1.8
Sandstone and shale	30.0
Coal	.1
Shale, carbonaceous	1.0
Sandstone	9.0
Shale, carbonaceous	7.1
Coal	1.1
Shale, carbonaceous	5.6
Sandstone	8.6
Shale, carbonaceous	.8
Coal, bony (base)	1.1

Section 3, SE¼ sec. 26, T. 3 N., R. 102 W.

	Feet
Sandstone, thin- to thick-bedded (top)	25.0
Shale, carbonaceous and coaly	11.0
Coal	.3
Shale, carbonaceous and coaly	5.0
Shale, gray, partly covered	11.0
Coal, lignitic with some coaly shale	1.4
Coal	2.7
Shale, carbonaceous	3.0
Shale, gray	3.0
Shale and sandstone, partly covered	20.0
Shale, coaly	.3
Coal	1.2
Shale and sandstone, partly covered	30.0
Coal	.9
Shale, carbonaceous	2.0
Coal, upper part lignitic and impure coal	1.8
Shale, coaly	2.0
Shale, gray and carbonaceous, partly covered	16.0
Shale, carbonaceous	2.0
Coal	.8
Shale, gray and carbonaceous	5.5
Coal	2.2
Shale, gray and carbonaceous	7.0
Coal, impure	1.0
Shale, carbonaceous	5.2
Coal	4.3
Shale, carbonaceous and gray	1.2
Sandstone and shale	11.0
Coal	7.4
Shale, coaly	.3
Coal	3.5
Shale, gray and carbonaceous, some sandstone	6.0
Coal, impure	.3
Shale, carbonaceous and gray	12.0
Sandstone, massive to shaly, ledge-forming, (Horizon B)	6.0
Coal	2.5
Shale, gray	2.0
Sandstone, flaggy, thin-bedded	12.0

	Feet
Shale, gray	3.0
Sandstone	2.0
Shale, partly covered, some sandstone	23.0
Coal	.9
Sandstone and shale	12.0
Coal	1.0
Shale and sandstone	4.0
Coal	1.7
Sandstone and shale, partly covered	55.0
Coal	.3
Sandstone and shale, partly covered	33.0
Coal, bony	.8
Sandstone and shale	4.5
Shale, carbonaceous	.5
Coal	.3
Shale, carbonaceous	.4
Sandstone and shale, partly covered	65.0
Sandstone, buff-yellowish weathering, massive, cliff-forming, (base)	25.0 ±
Shale, gray	

Section 4, SW¼ sec. 25, T. 3 N., R. 102 W.

	Feet
Sandstone and sandy limestone, thin- to thick-bedded (top)	28.0 ±
Shale, gray and carbonaceous	10.0
Coal	1.9
Shale, carbonaceous	15.9
Coal	1.0
Shale, largely carbonaceous	8.0
Limestone, sandy, brown-weathering	2.0
Shale, carbonaceous	5.5
Coal	.9
Shale, carbonaceous and gray	3.6
Shale, gray	3.4
Coal, impure	1.0
Shale, carbonaceous and gray	18.0
Coal	1.0
Shale, carbonaceous	2.6
Shale, gray	3.0
Limestone, sandy, brown-weathering	2.0
Coal (base)	5.0

Section 5, SW¼ sec. 25, T. 3 N., R. 102 W.

	Feet
Limestone, sandy, brown-weathering (top)	
Coal	.9
Shale, carbonaceous and gray	6.0
Coal	.5
Shale, carbonaceous and impure coal	4.6
Coal (base in creek bed)	6.0

Section 6, NE¼ sec. 35, T. 3 N., R. 102 W.

		Feet
Limestone, sandy, brown-weathering		2.0
Coal		6.0
Shale, carbonaceous		.3
Coal		4.2
Shale, carbonaceous and coaly		3.0
Shale, gray		7.0
Shale, carbonaceous, unit contains some coal streaks and gray shale		10.0
Sandstone, light-gray, thin- to thick-bedded	horizon B	5.0
Sandstone, laminated to thin-bedded	horizon B	12.0
Coal		1.7
Shale, carbonaceous (base)		2.0

Section 7, NW¼ sec. 36, T. 3 N., R. 102 W.

	Feet
Sandstone (top)	11.0
Shale, carbonaceous	3.2
Coal	3.0
Shale, carbonaceous	.4
Coal	8.3
Sandstone and shale	14.0
Coal	3.7
Shale, carbonaceous	1.0
Coal	1.5
Shale, carbonaceous	1.1
Coal	1.8
Shale, carbonaceous	1.0
Sandstone and shale (base)	22.5

Section 8, N½ sec 36, T. 3 N., R. 102 W.

	Feet
Shale, carbonaceous (top covered)	2.0
Coal	3.0
Shale, carbonaceous and coaly	.8
Coal (base)	5.1

Section 9, NW¼ sec. 36, T. 3 N., R. 102 W.

	Feet
Shale, gray (top covered)	2.0
Shale, carbonaceous	3.0
Coal	4.0
Shale, carbonaceous	1.0
Shale, gray	4.6
Covered	6.0
Coal	.8
Shale, carbonaceous	1.0
Shale, gray (base)	4.6

Section 11, NW¼ sec. 5, T. 2 N., R. 101 W.

	Feet
Sandstone (top)	20.0
Shale, carbonaceous	5.0
Sandstone and shale	26.0
Sandstone	8.0
Shale, carbonaceous	.2
Coal	1.6
Shale, carbonaceous	4.5
Coal	.2
Shale, carbonaceous	.4
Shale, gray	1.5
Shale, carbonaceous	.6
Coal	.4
Shale, gray	6.4
Shale, carbonaceous	2.0
Limestone, concretionary	1.0
Coal	.4
Shale, carbonaceous	2.3
Coal	1.0
Shale	2.6
Sandstone	22.0
Shale, carbonaceous	10.2
Coal	1.3
Shale, carbonaceous	5.0
Coal	1.1
Shale, carbonaceous	14.3
Coal	2.4
Shale, carbonaceous	13.1
Coal	1.7
Shale, carbonaceous	3.5
Shale, gray	3.2
Limestone, concretionary	2.0
Shale	1.0
Coal	1.1
Shale, carbonaceous	1.7
Shale, gray	5.0
Sandstone and shale	9.6
Coal	1.2
Shale, carbonaceous	.8
Coal	3.3
Shale, carbonaceous	7.5
Coal	2.8
Shale, carbonaceous	.5
Shale, gray	4.0
Sandstone, white (Horizon B) (base)	8.0

Section 12, SW¼ sec. 5, T. 2 N., R. 101 W.

	Feet
Sandstone	
Shale (top)	6.0
Shale, carbonaceous	2.0
Coal	1.5
Shale, carbonaceous	.3
Coal	3.0
Shale, gray	3.1
Shale, carbonaceous	.6
Coal	2.0
Shale, gray	5.0
Sandstone	4.0
Shale, carbonaceous	3.0
Coal	3.0
Shale, carbonaceous	2.0
Shale, gray	5.0
Sandstone and shale	5.6
Coal	2.0
Shale, carbonaceous	.5
Sandstone, white (Horizon B)	12.0
Shale, carbonaceous	3.0
Sandstone and shale	34.0
Sandstone, brown, slabby	10.0
Shale, gray	1.4
Coal	1.1
Shale, carbonaceous	1.2
Shale, gray	3.0
Coal	.9
Shale, carbonaceous	1.3
Coal	.6
Shale, carbonaceous	.4
Mudstone and shale	5.0
Sandstone, white	8.0
Shale, gray	5.0
Coal	.9
Shale, carbonaceous	4.0
Coal	.7
Shale, carbonaceous	.8
Sandstone, white (base)	4.0

Section 15, SW¼ sec. 17, T. 2 N., R. 101 W.

	Feet
Sandstone, massive and thin-bedded	
Shale slope, mostly covered (top)	42.0
Sandstone, light-gray, thin- to massive-bedded, (Horizon A ?)	6.5
Sandstone, thin- to thick-bedded	4.0
Sandstone, massive	5.0
Shale and thin beds of sandstone	4.0
Sandstone, massive, cliff-forming	17.0
Shale, gray	3.0
Sandstone, friable, thin- to thick-bedded	3.0
Sandstone, massive, cliff-forming	16.5
Sandstone, thin- to massive-bedded (probably some shale covered)	83.0
Sandstone, friable, thin-bedded, partly covered	33.5
Sandstone, massive, ledge-forming	23.0
Sandstone, limey, brown-weathering	8.0
Sandstone, massive, cliff-forming	33.6
Shale, sandy (base)	200.0
Rimrock sandstone	

Section 17, E½ sec. 15, T. 2 N., R. 101 W.

	Feet
Top covered	
Shale, carbonaceous and coaly	1.5
Shale, gray	3.0
Shale, coaly, contains some impure coal	1.4
Coal	.6
Sandstone, thin-bedded	.8
Shale, gray	5.0
Coal	.9
Sandstone and shale	11.0
Coal (base)	2.1

Note: (base of 2.1 coal bed inferred to be approximately 200 feet above top of horizon A)

Section 19, SW¼ sec. 23, T. 2 N., R. 101 W.

	Feet
Sandstone (top)	5.0
Shale, gray	11.0
Coal	1.6
Shale	3.1
Coal	.5
Shale	3.3
Coal	1.5
Shale, carbonaceous	1.3
Coal	.7
Shale, carbonaceous	4.3
Sandstone	4.0
Shale and sandstone	8.0
Coal	.5
Shale	9.4
Coal	1.4
Shale	13.0
Coal	.3
Shale, carbonaceous	.4
Coal	.6
Shale, carbonaceous	4.6
Coal	4.8
Shale, carbonaceous	1.0
Shale, gray	5.6
Sandstone	11.0
Coal	1.0
Shale, carbonaceous	.7
Sandstone, white	4.5
Shale, gray	.7
Coal	1.2
Shale, carbonaceous	2.4
Coal	2.4
Shale, carbonaceous (base)	11.2
Sandstone (Horizon B)	

Note: Lower part of section shows position of coal bed exposures graphically on plate 2.

Section 21 on left bank of White River
in SW¼ sec. 11, T. 2 N., R. 101 W.

	Feet
Overburden (top)	10.0
Shale, carbonaceous, contains limestone concretions	10.0 ±
Coal (Staley bed?)	7.4
Shale, carbonaceous and gray	2.0
Coal, bony	1.1
Shale, carbonaceous	6.6
Coal	2.9
Shale	1.0
Sandstone	3.0
Coal	4.1
Shale, carbonaceous	2.5
Coal	.6
Shale, carbonaceous	.4
Coal (base)	1.1
Shale, carbonaceous (at river level)	

Section 23, SE¼ sec. 4, T. 2 N., R. 101 W.

	Feet
Sandstone, massive (top)	20-30.0
Coal and carbonaceous shale	.8
Shale, gray	4.2
Shale, carbonaceous	3.0
Coal	9.5
Shale, carbonaceous	1.6
Coal	1.2
Shale, carbonaceous	1.0
Shale, gray (base)	3.5

Section 26, SW¼ sec. 7, T. 3 N., R. 101 W.

	Feet
Top covered	
Shale, carbonaceous	1.0
Coal	1.5
Sandstone and shale	9.0
Shale, carbonaceous	3.6
Sandstone and shale	15.0
Shale, carbonaceous	2.0
Sandstone and shale	30.0
Sandstone	5.0
Shale and sandstone	45.0
Shale, carbonaceous	2.0
Shale and sandstone	35.0
Coal, bony	1.0
Shale, carbonaceous	2.0
Sandstone, light-gray to white (Horizon A)	57.0
Coal	1.5
Shale, carbonaceous (base)	1.5

Section 27, N½ sec. 8, T. 3 N., R. 101 W.

	Feet
Top covered	
Shale, gray	1.0
Coal	1.7
Shale, carbonaceous	1.5
Coal	3.2
Shale, carbonaceous	3.8
Coal	5.2
Covered	1.7
Sandstone	1.0
Coal	2.8
Shale, carbonaceous	2.0
Covered	1.2
Sandstone	2.3
Shale, carbonaceous	1.6
Coal	1.8
Shale, carbonaceous	.4
Sandstone, light-gray	3.0
Shale, carbonaceous	3.3
Sandstone, light-gray to white (Horizon B)	2.8
Shale, gray	3.3
Covered	4.5
Sandstone, brown (base)	1.0

Logs of core holes drilled by Edna Coal Co.,
Denver, Colorado, April - May 1959

(plotted on plate 1)

Core hole 1; SW¼SW¼ sec. 11, T. 2 N., R. 101 W.

Ground elevation 5,402 ft.
4.0 ft. coal at elevation of 5,340 ft.
6.0 ft. coal at elevation of 5,317 ft.

Core hole 2; SW¼SW¼ sec. 11, T. 2 N., R. 101 W.

Ground elevation 5,391 ft.
3.0 ft. coal at elevation of 5,395 ft.
(total depth of hole 135 ft.)

Core hole 3; SE¼SW¼ sec. 11, T. 2 N., R. 101 W., ground elevation 5,425 ft.

Description	Thickness (feet)
Earth and clay	11.0
Hard blue rock	30.0
Blue shale	3.0
Coal	4.0
Brown shale	2.0
Hard blue shale with streaks of sandstone	20.0
Soft shale	6.0
Hard shale	4.5
Coal	6.0
Brown shale	21.0
Total depth	107.5

Core hole 4; SW¼NE¼ sec. 4, T. 2 N., R. 101 W., ground elevation 5,714 ft.

Description	Thickness (feet)
Earth and clay	20.0
Sandstone	2.0
Dark shale	2.0
Gray shale	3.0
Carbonaceous shale	1.0
Sandstone	1.0
Shale	9.9
Coal	4.0
Brown shale	.3
Sandstone	4.9
Shale	7.5
Coal	.5
Hard shale	9.0
Hard sandstone	5.0
Dark shale	20.5
Sandstone	.5
Total depth	91.1

Core hole 6; SE¼NW¼ sec. 11, T. 2 N., R. 101 W., ground elevation 5,410 ft.

Description	Thickness (feet)
Earth and clay	15.0
Shale	11.0
Sandy shale and sandstone	8.0
Coal	.2
Shale	13.0
Coal (Staley bed)	8.5
Shale with streaks of sandstone	5.2
Total depth	60.9

Core hole 7; SW¼NW¼ sec 11, T. 2 N., R. 101 W., ground elevation 5,430 ft.
(11.0' below base of Staley coal bed at this location)

Description	Thickness (feet)
Shale	10.9
Coal	6.9
Brown shale	.1
Coal	1.9
Shale	9.2
Sandstone	2.0
Total depth	31.0

Core hole 8; NE¼SE¼ sec. 11, T. 2 N., R. 101 W., ground elevation 5,362 ft.

Description	Thickness (feet)
Earth and clay	10.0
Shale	2.0
Coal smut	1.0
Shale	5.0
Coal	.1
Shale	4.9
Coal (Staley bed)	9.0
Shale	2.0
Coal	.1
Shale	5.9
Coal	3.0
Sandstone	2.0
Shale	1.5
Coal	3.5
Brown shale	.5
Coal	.5
Brown shale	15.0
Gray shale	10.0
Total depth	76.0

Core hole 9; S½ sec. 3, T. 2 N., R. 101 W., ground elevation 5,527 ft.

Description	Thickness (feet)
Earth and clay	15.0
Sandstone	3.0
Brown shale	3.0
Sandstone, soft	4.0
Gray shale	7.0
Sandstone, hard	6.0
Alternating beds sandstone and shale	26.0
Coal	8.5
Sandstone	3.5
Shale	11.0
Coal	5.0
Brown shale, bony	1.5
Coal	5.5
Shale, hard	3.0
Total depth	102.0

Core hole 10; N½ Sec. 10, T. 2 N., R. 101 W., ground elevation 5,504 ft.

Description	Thickness (feet)
Gravel	4.0
Sandstone with shale streaks	30.0
Coal	8.5
Shale	6.5
Sandstone	4.0
Coal	4.0
Bony coal	.2
Coal	1.5
Bony coal	2.0
Coal	1.0
Bony coal	1.2
Coal	1.0
Total depth	63.9

Core hole 11; W½SW¼ sec. 10, T. 2 N., R. 101 W., ground elevation 5,714 ft.

Description	Thickness (feet)
Clinker and burnt rock	Total depth 106.0

Core hole 13; N½ sec. 15, T. 2 N., R. 101 W., ground elevation 5,928 ft.

Description	Thickness (feet)
Brown sandstone	12.0
Blue shale	1.0
Brown shale	5.0
Coal	2.0
Brown shale with coal streaks	5.0
Shale	7.0
Hard sandstone	17.0
Shale with coal streaks at top	4.0
Shale	2.5
Coal	8.7
Shale and sandstone	35.6
Total depth	99.8

Core hole 14; SW¼NW¼ sec. 15, T. 2 N., R. 101 W., ground elevation 6,184 ft.

Description	Thickness (feet)
Sandstone	10.0
Shale	3.0
Sandy shale	10.0
Brown shale	2.4
Coal	8.8
Shale (coal streaks at 43')	16.8
Bony coal	.2
Coal	6.1
Bony coal	.4
Coal	2.4
Shale	.5
Shale and sandstone	18.0
Total depth	78.6

Core hole 15; NE¼SE¼ sec. 10, T. 2 N., R. 101 W., ground elevation 5,751 ft.

Description	Thickness (feet)
Sandstone	9.0
Shale	6.0
Sandstone	5.0
Shale	13.0
Sandy shale with coal streaks at 37'	4.0
Shale	4.0
Coal	4.0
Sandy shale	26.0
Coal	.1
Shale	6.0
Coal	1.0
Shale	33.0
Coal	.1
Shale	6.0
Coal	.1
Shale	8.0
Coal	2.0
Shale	7.0
Sandstone	3.5
Coal	10.5
Shale, sandy	34.5
Sandstone and shale	9.0
Coal	.1
Sandstone and shale	7.0
Total depth	197.9

Core hole 16; S½SE¼ sec. 10, T. 2 N., R. 101 W., ground elevation 5,763 ft.

Description	Thickness (feet)
Sandstone	12.0
Shale	8.0
Brown shale with streaks of coal	4.0
Shale	6.0
Sandstone	25.0
Total depth	55.0

Core hole 17; NW¼ sec. 15, T. 2 N., R. 101 W., ground elevation 6,075 ft.

Description	Thickness (feet)
Soft sandstone	11.0
Dark-gray shale	18.5
Coal	6.5
Dark shale	24.0
Coal	.1
Coal	9.7
Shale	6.9
Shale and sandstone	19.0
Coal	1.0
Shale	1.0
White sandstone (Horizon B ?)	4.5
Total depth	102.2

Core hole 18; SW¼ sec. 4, T. 2 N., R. 101 W., ground elevation approx. 5,850 ft.

Description	Thickness (feet)
Soft sandstone	2.0
Hard sandstone	4.0
Soft sandstone	6.0
Gray shale	8.0
Sandy shale	3.0
Dark shale	6.0
Coal	.1
Dark shale	8.0
Sandstone	2.0
Coal	.1
Brown shale	2.8
Gray shale	4.0
Sandstone	2.0
Dark shale with a few alternating layers of gray shale	28.0
Total depth	76.0

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Appendix

to

Northeast Rangely Coal Area

Rio Blanco and Moffat County, Colo.

Appendix Index

7 copies

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab., U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Upper Cretaceous — Kinds of fossils: Mollusks

General locality: Colorado — Quadrangle or area: North Rangely Coal Area

Referred by: G. H. Horn, 12/28/59 — Shipment No.: CD-59-5D
Conservation Division

Report prepared by: W. A. Cobban, 1/20/60 — Date material received: Fall 1959

Status of work: Complete

Report not to be quoted or paraphrased in publication without a final recheck by the Paleontology and Stratigraphy Branch.

For the zonation of these lower Montana rocks, see the first part of this report (Thornburg area).

Station 1 (USGS Mesozoic loc. D2372). 500 feet north of ¼ cor. secs. 19 and 24, T. 2 N., Rs. 101 and 102 W. Mancos shale, 280 feet below base of "Rimrock" sandstone. G. H. Horn and D. L. Gaskill, Aug. & Sept. 1959.

Cephalopod (ammonite):
Baculites n. sp (C)

Remarks:
This undescribed species is characterized by widely spaced flank nodes. It marks a zone younger than the level of the Morapos sandstone and older than that of the Rimrock sandstone.

Unit 3 (USGS Mesozoic loc. D2373). SE¼ sec. 11, SW¼ sec. 12, NW¼ sec 13, and NE¼ sec 14, T. 2 N., R. 102 W. Mesaverde formation, from shale 90-101 feet above the "Rimrock" sandstone. G. H. Horn and D. L. Gaskill, Aug. and Sept. 1959.

Pelecypod:
Inoceramus sp.

Cephalopod:
Baculites n. sp. (E)

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Unit 5 (USGS Mesozoic loc. D2374). Same locality. Mesaverde formation, from shale about 130-140 feet above the "Rimrock" sandstone. J. H. Horn and D. L. Gaskill, Aug. and Sept. 1959.

Cephalopod:
Baculites n. sp. (E?)

Remarks:
These specimens are too few and too poorly preserved for positive specific determination. They are either species E of F, but most likely E.

Unit 7 (USGS Mesozoic loc. D2375). Same locality. Mesaverde formation, from shale 220-276 feet above "Rimrock" sandstone. J. H. Horn and D. L. Gaskill, Aug. and Sept. 1959.

Pelecypod:
Inoceramus sp. (discarded)

Cephalopod:
Baculites n. sp. (F?)

Unit 15. Same locality. From interbedded shale and sandstone 336-344 feet above "Rimrock" sandstone.

Pelecypod:
Ostrea sp.

Remarks:
These fragments of a brackish-water oyster have been discarded.

Unit 23. Same locality. From a 3-foot sandstone 394-397 feet above "Rimrock" sandstone.

Fish bones (discarded)

W. A. Cobban
W. A. Cobban

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DEPARTMENT OF THE INTERIOR DEC 3 1948
BUREAU OF MINES

U. S. Geological Survey
Mining
Denver, Colorado

D-3835

Can No. 4741

F—SAMPLING REPORT

Lab No. D-3835

(1) State Colorado (2) County Rio Blanco (3) Town Rangely (Post office) (4) Mine White River

(5) Sample of Bituminous Coal (6) Analysis desired Proximate and Specific Gravity

(7) Method of sampling Standard Face. (Describe if other than standard)

(8) Location in mine Face Second North Entry 30' inby Main Slope. (Distance and direction from opening. Locate with respect to rib, room, pillar, aircourse, entry, etc.)

(9) Date 10/15 (Of sampling), 1948

(10) Coal, dry or moist Dry (11) Gross wt., lbs. 50 (Sample cut) (12) Net wt., lbs. 3-1/2 (sample mailed)

(13) Sample from fresh or weathered coal Fresh

(14) Roof Shale-good (Kind and quality)

(15) Draw slate or roof coal -None (Description and thickness)

(16) Floor Shale-hard (Kind, soft or hard, smooth or rough)

(17) Vertical depth from surface to point of sampling, feet 500

No.	Section of Bed	Ft.	Ins.	No.	Section of Bed	Ft.	Ins.
1	Coal	8	6	10			
2				11			
3				12			
4				13			
5				14			
6				15			
7				16			
8					Total thickness of bed	8	6
9					Thickness in sample	8	6

(18) Excluded from sample, marked X, section Nos.

(19) Send analysis to H. I. Smith (20) Collector Chas. M. McConnell Office U.S.G.S.
Mining Engineer Denver, Colo.

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(4)

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES DEC 3 1948

D-3525

G—COAL-ANALYSIS REPORT

Regional Sampling No. D-3525
Mining
Denver, Colorado

Sample of Bituminous Coal - N.A.b. Can No. 4741

Operator M. E. Staley Mine White River

State Colorado County Rio Blanco Bed Unnamed

Town Rangely

Location in mine Face Second North Entry 30' inby Main Slope.

Method of sampling Standard Face. Gross weight, lbs. 50 Net weight, grams 500.5

Date of sampling 10/15/48 Date of Lab. sampling 11/1/48 Date of analysis

B. of M. or U. S. G. S. section Colorado Collector Chas. M. McConnell, Mining Engineer

Air-dry Loss 2.9	Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Coal (Moisture and ash free)
Proximate Analysis				
Moisture	8.2	10.8		
Volatile matter	35.6	34.5	38.7	40.7
Fixed carbon	51.9	50.5	56.6	59.3
Ash	4.3	4.2	4.7	
	100.0	100.0	100.0	100.0
Ultimate Analysis				
Hydrogen				
Carbon				
Nitrogen				
Oxygen				
Sulphur	.5	.5	.5	.6
Ash				
British thermal units	11300	11450	12850	13490

NOTED
NOV 30 1948
E. L. SMITH

Fusibility of ash	°F.
Initial deformation temperature	2310
Softening temperature	2380
Fluid temperature	2570

Apparent Specific Gravity 1.33

Date November 16, 1948 (Signed) [illegible] Chemist.
jd.

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(5)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

E.S.09

Can No. 4515

B—SAMPLING REPORT

Lab. No. [illegible]

(1) State Colorado (2) County Rio Blanco (3) Town Rangley (Post office) (4) Mine [illegible]

(5) Sample of Coal (6) Analysis desired Prox., S., B.t.u., & F.S.[illegible]

(7) Method of sampling Face (Describe if other than standard)

(8) Location in mine Face most inby room, 200' from entry. (Distance and direction from opening. Locate with respect to rib, room, pillar, aircourse, entry, etc.)

(9) Date 2/20/53, 19 (Of sampling)

(10) Coal, dry or moist Moist (11) Gross wt., lbs. 25 (Sample cut) (12) Net wt., lbs. 4 (Sample mailed)

(13) Sample from fresh or weathered coal Fresh

(14) Roof Shale, good (Kind and quality)

(15) Draw slate or roof coal None (Description and thickness)

(16) Floor Shale, hard (Kind, soft or hard, smooth or rough)

(17) Vertical depth from surface to point of sampling, feet 750'

No.	Section of Bed	Ft.	Ins.	No.	Section of Bed	Ft.	Ins.
1	Coal	7	8 1/2	10			
2				11			
3				12			
4				13			
5				14			
6				15			
7				16			
8					Total thickness of bed		
9					Thickness in sample		

(18) Excluded from sample, marked X, section Nos.

(19) Send analysis to U.S.G.S., Wash., D.C. (20) Collector Chas. M. McConnell (21) Office Denver, Colo.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

3-5105

G--COAL-ANALYSIS REPORT

Test No. ________ Lab. No. Z-[illegible]

Sample of Coal (If non-weathering High Volatile C Bituminous; if weathering subbituminous A)-ASA (Se. - [illegible]) Can No. [illegible]

Operator M.E. Staley Mine White River (Slope)

State: Colorado County Rio Blanco Bed Unnamed

Town Rangley

Location in mine Face most inby room 200' from entry

Method of sampling Face Gross weight, lbs. ________ Net weight, grams 800.0

Date of sampling 2/20/53 Date of Lab. sampling 3/10/53 Date of analysis ________

B. M. or U. S. G. S. section U.S.G.S. Collector Chas. M. McConnell

Air-dry Loss	Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Coal (Moisture and ash free)
Proximate Analysis				
Moisture		13.2		
Volatile matter		36.6	42.2	44.7
Fixed carbon		45.3	52.2	55.3
Ash		4.9	5.6	
		100.0	100.0	100.0
Ultimate Analysis				
Hydrogen				
Carbon				
Nitrogen				
Oxygen				
Sulphur		.4	.5	.5
Ash				
British thermal units		11070	12740	13500

Fusibility of Ash:
Initial deformation temperature ________
Softening temperature ________
Fluid temperature ________

Free Swelling Index No.: non-caking

(7)

Date March 31, 1953 (Signed) Roy F. Abernethy, Chemist.

amd.

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Form 6–188

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Can No. 562

F—SAMPLING REPORT

Lab. No. G-87650

(1) State Colorado (2) County Rio Blanco (3) Town Rangely (Post office) (4) Mine

(5) Sample of Coal (6) Analysis desired Prox.

(7) Method of sampling Channel sample of weathered outcrop in dry stream bed (Describe if other than standard)

(8) Location in mine (Distance and direction from opening. Locate with respect to rib, room, pillar, aircourse, entry, etc.)

(9) Date 7/13 (Of sampling), 1960

(10) Coal, dry or moist Dry (11) Gross wt., lbs. (Sample cut) (12) Net wt., lbs. 2 lbs. 14 oz. (Sample mailed)

(13) Sample from fresh or weathered coal Weathered

(14) Roof (Kind and quality)

(15) Draw slate or roof coal (Description and thickness)

(16) Floor (Kind, soft or hard, smooth or rough)

(17) Vertical depth from surface to point of sampling, feet

No.	Section of Bed	Ft.	Ins.	No.	Section of Bed	Ft.	Ins.
X1	Shale, carbonaceous			10			
2	Coal	3	0	11			
3	Coal, lignite	1	6	12			
X4	Sandstone	3	0	13			
X5	Coal	1	0	14			
X6	Shale	1	8	15			
X7	Shale, gray	4	2	16			
X8	Coal, lignitic and shaly	1	0		Total thickness of bed		
9					Thickness in sample	4	6

(18) Excluded from sample, marked X, section Nos. 1, 4, 5, 6, 7, and 8

(19) Send analysis to U.S.G.S. (20) Collector D. L. Gaskill (21) Office Denver, Colo.

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(9)

GPO 916709

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G-139
(September 1943)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

G—COAL-ANALYSIS REPORT

Test No. _____ Lab. No. G-87650

Sample of Coal Can No. 562

Operator _____ Mine _____

State Colorado County Rio Blanco Bed _____

Town Rangely, NE 1/4 Sec. 17, T. 2 N., R. 101 W., 6th PM

Location Channel sample of weathered outcrop in dry stream bed

Method of sampling _____ Gross weight, lbs. _____ Net weight, grams 878.

Date of sampling 7/13/60 Date of Lab. sampling 8/16/60 Date of analysis _____

Sampled by U. S. G. S. section U. S. G. S. Collector D. L. Gaskill

Air-dry Loss .34		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Coal (Moisture and ash free)
Proximate Analysis	Moisture	8.7	9.0		
	Volatile matter	30.4	30.3	33.3	51.2
	Fixed carbon	29.0	28.9	31.8	48.8
	Ash	31.9	31.8	34.9	
		100.0	100.0	100.0	100.0
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	1.0	1.0	1.1	1.6
	Ash				
British thermal units		6270	6240	6860	10540

Fusibility of Ash, °F.	
	Initial deformation temperature
	Softening temperature
	Fluid temperature

Date September 12, 1960 (Signed) Roy F. Abernethy
Chemist.

Jo

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(8)

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Form 6–138

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Can No. 1711

F—SAMPLING REPORT

Lab. No. G-87651

(1) State Colorado (2) County Rio Blanco (3) Town Rangely (Post office) (4) Mine

(5) Sample of Coal (6) Analysis desired Prox.

(7) Method of sampling Channel sample from exposure in dry gully of a steep escarpment face (Describe if other than standard)

(8) Location in mine (Distance and direction from opening. Locate with respect to rib, room, pillar, aircourse, entry, etc.)

(9) Date July 15 (Of sampling), 1960

(10) Coal, dry or moist Dry (11) Gross wt., lbs. (Sample cut) (12) Net wt., lbs. 2 lbs. 7 oz (Sample mailed) (incl can)

(13) Sample from fresh or weathered coal Weathered

(14) Roof (Kind and quality)

(15) Draw slate or roof coal (Description and thickness)

(16) Floor (Kind, soft or hard, smooth or rough)

(17) Vertical depth from surface to point of sampling, feet

No.	Section of Bed	Ft.	Ins.	No.	Section of Bed	Ft.	Ins.
X1	Gray Shale			10			
2	Coal	1	1	11			
X 3	Shale, coaly		5	12			
4	Coal		5	13			
X5	Shale, carbonaceous	3	0	14			
X6	Coal		10	15			
7				16			
8					Total thickness of bed		
9					Thickness in sample	1	6

(18) Excluded from sample, marked X, section Nos. 1, 3, 5, and 6

(19) Send analysis to U.S.G.S. (20) Collector D. L. Gaskill (21) Office Denver, Colo

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G-139
(September 1943)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

G—COAL-ANALYSIS REPORT

Test No. _____ Lab. No. G-87651

Sample of Coal Can No. 1711

Operator _____ Mine _____

State Colorado County Rio Blanco Bed _____

Town Near Rangely, SW 1/4 Sec. 23, T. 2 N., R. 101 W., 6th P. M.

Location Channel sample from exposure in dry gully of a steep escarpment face

Method of sampling _____ Gross weight, lbs. _____ Net weight, grams 792.

Date of sampling 7/15/60 Date of Lab. sampling 8/16/60 Date of analysis _____

By Mr. or U. S. G. S. section U. S. G. S. Collector D. L. Gaskill

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Coal (Moisture and ash free)
	Air-dry Loss 1.89				
Proximate Analysis	Moisture	11.6	13.3		
	Volatile matter	33.8	33.2	38.2	47.1
	Fixed carbon	38.0	37.2	43.0	52.9
	Ash	16.6	16.3	18.8	
		100.0	100.0	100.0	100.0
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	1.0	1.0	1.1	1.4
	Ash				
British thermal units		7890	7740	8930	10990

Fusibility of Ash, °F.
- Initial deformation temperature _____
- Softening temperature _____
- Fluid temperature _____

Date September 12, 1960 (Signed) Roy F. Abernethy
Chemist.

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G-439
(September 1943)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

G—COAL-ANALYSIS REPORT

Test No. _____ Lab. No. G-87652

Sample of Coal Can No. 9202

Operator _____ Mine _____

State Colorado County Rio Blanco Bed _____

Town Near W 1/4 cor., sec. 7, T. 2 N., R. 101 W., 6th P. M.

Location Channel sample from shallow road cut

Method of sampling _____ Gross weight, lbs. _____ Net weight, grams 862.

Date of sampling 7/15/60 Date of Lab. sampling 8/16/60 Date of analysis _____

Bed or Mine U. S. G. S. section U. S. G. S. Collector D. L. Gaskill

	Air-dry Loss .46	Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Coal (Moisture and ash free)
Proximate Analysis	Moisture	9.3	9.8		
	Volatile matter	28.1	28.0	31.0	50.0
	Fixed carbon	28.1	27.9	31.0	50.0
	Ash	34.5	34.3	38.0	
		100.0	100.0	100.0	100.0
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	.7	.7	.7	1.2
	Ash				
British thermal units		5720	5690	6310	10180

Fusibility of Ash, °F.
Initial deformation temperature _____
Softening temperature _____
Fluid temperature _____

Date September 12, 1960 (Signed) Roy F. Abernethy
Chemist.

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Form 6-138

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

F—SAMPLING REPORT

Can No. 9202 Lab. No. C-87652

(1) State Colorado (2) County Rio Blanco (3) Town (Post office) Near W 1/4 cor., Sec. 7, T.2N., R.101W., 6th P.M. (4) Mine

(5) Sample of Coal (6) Analysis desired Prox.

(7) Method of sampling Channel sample from shallow road cut
(Describe if other than standard)

(8) Location in mine
(Distance and direction from opening. Locate with respect to rib, room, pillar, aircourse, entry, etc.)

(9) Date (Of sampling) 7/15, 19 60

(10) Coal, dry or moist Dry (11) Gross wt., lbs. (Sample cut) (12) Net wt., lbs. (Sample mailed) 2 3/4 (incl. can)

(13) Sample from fresh or weathered coal Weathered

(14) Roof
(Kind and quality)

(15) Draw slate or roof coal
(Description and thickness)

(16) Floor
(Kind, soft or hard, smooth or rough)

(17) Vertical depth from surface to point of sampling, feet

No.	Section of Bed	Ft.	Ins.	No.	Section of Bed	Ft.	Ins.
1	Coal	2	2	10			
2				11			
3				12			
4				13			
5				14			
6				15			
7				16			
8					Total thickness of bed		
9					Thickness in sample	2	2

(18) Excluded from sample, marked X, section Nos.

(19) Send analysis to U.S.G.S. (20) Collector D. L. Gaskill (21) Office Denver, Colo.

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Form 6-738

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Can No. 8066

F—SAMPLING REPORT

Lab. No. C-87653

(1) State Colorado (2) County Rio Blanco (3) Town T. 2 N., R. 101 W., 6th P.M. E 1/2 sec. 15. (4) Mine

(5) Sample of Coal (6) Analysis desired Prox.

(7) Method of sampling Channel sample of weathered exposure
(Describe if other than standard)

(8) Location in mine
(Distance and direction from opening. Locate with respect to rib, room, pillar, aircourse, entry, etc.)

(9) Date 7/13 (Of sampling), 1960

(10) Coal, dry or moist Dry (11) Gross wt., lbs. (Sample cut) (12) Net wt., lbs. 3 (Sample mailed)

(13) Sample from fresh or weathered coal Weathered

(14) Roof
(Kind and quality)

(15) Draw slate or roof coal
(Description and thickness)

(16) Floor
(Kind, soft or hard, smooth or rough)

(17) Vertical depth from surface to point of sampling, feet

No.	Section of Bed	Ft.	Ins.	No.	Section of Bed	Ft.	Ins.
X 1	Carbonaceous and coaly shale	1	6	10			
X 2	Shale	3	0	11			
X 3	Coaly shale and impure coal	1	5	12			
X 4	Coal		7	13			
X 5	Sandstone		10	14			
X 6	Shale	5	0	15			
X 7	Coal		10	16			
X 8	Massive sandstone and shale	11	0		Total thickness of bed		
9	Coal	2	3		Thickness in sample	2	3

(18) Excluded from sample, marked X, section Nos. 1 thru 8

(19) Send analysis to U. S. G. S. (20) Collector D. L. Caskill (21) Office Denver, Colo.

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GPO 916709

G-
(September 1943)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

G—COAL-ANALYSIS REPORT

Test No. _____ Lab. No. G-87653

Sample of Coal Can No. 8066

Operator _____ Mine _____

State Colorado County Rio Blanco Bed _____

Town E 1/2 sec. 15, T. 2 N., R 101 W., 6th P. M.

Location in mine Channel sample of weathered exposure

Method of sampling _____ Gross weight, lbs. _____ Net weight, grams 936.

Date of sampling 7/13/60 Date of Lab. sampling 8/16/60 Date of analysis _____

Bureau of Mines U. S. G. S. section U. S. G. S. Collector D. L. Gaskill

Air-dry Loss .21		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Coal (Moisture and ash free)
Proxin Analysis	Moisture	7.2	7.4		
	Volatile matter	32.8	32.7	35.4	48.3
	Fixed carbon	35.1	35.1	37.8	51.7
	Ash	24.9	24.8	26.8	
		100.0	100.0	100.0	100.0
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	1.3	1.3	1.4	1.9
	Ash				
British thermal units		7300	7280	7870	10750

Fusibility of Ash, °F.
Initial deformation temperature _____
Softening temperature _____
Fluid temperature _____

Date September 12, 1960 (Signed) Roy F. Abernethy
Chemist.

Jo

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