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COAL RESOURCE OCCURRENCE MAPS AND COAL DEVELOPMENT POTENTIAL MAP OF THE PINE RIVER QUADRANGLE, RIO ARRIBA AND SAN JUAN COUNTIES, NEW MEXICO

[Report includes 31 plates]

by

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This report has not been edited for conformity with U.S. Geological Survey editorial standards or stratigraphic nomenclature.

CONTENTS

CONTENTS

PLATES

CONTENTS

PLATES

CONTENTS

PLATES

TABLES

PINE RIVER 7 1/2-MINUTE QUADRANGLE

INTRODUCTION

Purpose

This text is to be used in conjunction with the Coal Resource Occurrence (CRO) Maps and Coal Development Potential (CDP) Map of the Pine River quadrangle, Rio Arriba and San Juan Counties, New Mexico. These maps were compiled to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) of the western United States. The work was performed under contract with the Conservation Division of the U.S. Geological Survey (Contract No. 14-08-0001-17172).

The resource information gathered in this program is in response to the Federal Coal Leasing Amendments Act of 1976 and is a part of the U.S. Geological Survey's coal program. The information provides basic data on coal resources for land-use planning purposes by the Bureau of Land Management, state and local governments, and the public.

Location

The Pine River 7 1/2-minute quadrangle is in northwest Rio Arriba County and northeast San Juan County, New Mexico. The area is approximately 36 miles (58 km) east-northeast of Farmington, New Mexico.

Accessibility

The Pine River quadrangle is accessible from New Mexico State Routes 17 and 511 which extend across the area. Light-duty roads provide access to remote parts of the quadrangle. The Atchison, Topeka, and Santa Fe Railway operates a route approximately 110 miles (177 km) to the southwest of the area at Gallup, New Mexico.

Physiography

This quadrangle is in the north-central portion of the Central Basin area (Kelley, 1950) of the structural depression known as the San Juan Basin. Elevations range from 5,737 ft (1,749 m) in the western San Juan River Valley to 6,942 ft (2,116 m) in the southeast. The Navajo Reservoir is near the west-central border of the area, into which drain the Los Pinos River from the northwest, Frances Creek from the east, and the San Juan River from the northeast; all have steep-walled terraces on either side. The San Juan River is joined by several large, steep-walled tributary canyons. Other parts of the quadrangle are dissected by small streams which have carved a topography of canyons and mesas.

Climate

The climate of the San Juan Basin is arid to semi-arid. Annual precipitation is usually less than about 10 inches (25 cm) but varies across the basin due to elevational differences. Rainfall is rare in the early summer and winter; most precipitation is received in July and August as intense afternoon thundershowers. Annual temperatures range from below 0°F (-18°C) to over 100°F (38°C) in the basin. Snowfall may occur from November to April.

Land Status

Approximately 19 percent of the quadrangle is in the northeastern portion of the San Juan Basin Known Recoverable Coal Resource Area. The Federal Government owns the coal rights for approximately 84 percent of the KRCRA land within the quadrangle as shown on Plate 2 of the Coal Resource Occurrence Maps. No Federal coal leases occur in the quadrangle.

GENERAL GEOLOGY

Previous Work

A publication by Fassett and Hinds (1971) includes subsurface interpretations of Fruitland Formation coal deposits throughout the San Juan Basin.

Geologic History

The San Juan Basin, an area of classic transgressive and regressive sedimentation, provided the ideal environment for formation of coals during Late Cretaceous time. At that time a shallow epeiric sea, which trended northwest-southeast, was northeast of the basin. The sea transgressed southwesterly into the basin area and regressed northeasterly numerous times; consequently, sediments from varying environments were deposited across the basin. Noncarbonaceous terrestrial deposition predominated during Paleocene and Eocene time.

Depositional evidence of the final retreat of the Late Cretaceous sea are the nearshore regressive Pictured Cliffs Sandstone and the overlying paludal Fruitland Formation which were deposited in successively higher stratigraphic positions to the northeast. Southwest (shoreward) of the beach deposits, swamps, which were dissected by streams, accumulated organic matter which later became coals of the Fruitland Formation. Deposition of organic material was influenced by the strandline as shown by both the continuity of the coal beds parallel to the north-south strandline in this part of the basin and their discontinuity perpendicular to it to the east.

The brackish-water swamp environment of the Fruitland moved farther to the northeast as the regression continued in that direction. Terrestrial freshwater sediments then covered this quadrangle as indicated by the lacustrine, channel, and floodplain deposits of the Kirtland Shale. This sequence of events is evidenced by both an upward decrease in occurrence and thickness of Fruitland coals and a gradational change to noncarbonaceous deposits of the Kirtland. Continuous deposition during Late Cretaceous time ended with the Kirtland. The sea then retreated beyond the limits of the quadrangle area, and modern basin structure began to develop. An erosional unconformity developed in a relatively short time as part of the Cretaceous Kirtland Shale was removed.

Terrestrial deposition resumed in the Paleocene as represented by the Ojo Alamo Sandstone and the overlying Nacimiento Formation. Alluvial plain and floodplain deposits of the Ojo Alamo were followed by the thick, lithologically varied deposits of the Nacimiento during continuous nonmarine deposition. The Nacimiento was later exposed to erosion.

The Eocene San Jose Formation was subsequently deposited over the Nacimiento erosional surface, reflecting various nonmarine environments which developed across the basin. Deposition and structural deformation of the basin then ceased, and the warped strata of the San Juan Basin have been exposed to the present time.

Stratigraphy

The formations studied in this quadrangle range from Late Cretaceous to Eocene in age. They are, in order from oldest to youngest: the Pictured Cliffs Sandstone, Fruitland Formation, Kirtland Shale, Ojo Alamo Sandstone, Nacimiento Formation, and San Jose Formation. A composite columnar section on CRO Plate 3 illustrates the stratigraphic relationships of these formations and is accompanied by lithologic descriptions of the individual formations.

The Pictured Cliffs Sandstone averages 130 ft (40 m) thick in this area. Because the unit is present throughout most of the San Juan Basin and easily recognized on geophysical logs, the top was used as the datum (CRO Plate 3) for Fruitland coal correlations. The formation consists of a cream to light gray, kaolinitic, slightly micaceous, friable sandstone interbedded with gray shale near the base of the unit. Intertonguing with the overlying

Fruitland Formation occurs throughout the entire basin, and, consequently, minor Fruitland coal beds commonly are present in the upper portion of the Pictured Cliffs.

The major coal-bearing unit in the quadrangle is the Fruitland Formation. Wide variations in reported thickness are common due to an indistinct upper contact with the Kirtland Shale, but the average is about 375 ft (114 m) in this quadrangle. Many authors have utilized various criteria for establishing the upper contact, but, in general, for this study the uppermost coal was chosen (after Fassett and Hinds, 1971). The formation primarily consists of gray, carbonaceous shale with plant fossils, interbedded gray siltstone, and lenticular coal beds.

The Upper Cretaceous Kirtland Shale comformably overlies the Fruitland Formation and averages 660 ft (201 m) in thickness in this area. It consists predominantly of freshwater, gray-green to brown shale and interbedded gray-green siltstone with plant fossils. The formation has previously been divided into several members by various authors; however, for the purposes of this report it was not necessary to distinguish between the individual members.

The Paleocene Ojo Alamo Sandstone unconformably overlies the Kirtland Shale. It is a white to gray, locally conglomeratic sandstone with interbedded gray shale and averages 140 ft (43 m) in thickness.

Approximately 1,200 ft (366 m) of the Paleocene Nacimiento Formation overlie the Ojo Alamo Sandstone. These rocks consist of gray-green to brown shale, interbedded tan to gray-green, micaceous siltstone, and interbedded silty sandstone.

The San Jose Formation of Eocene age unconformably overlies the Nacimiento Formation and crops out over the entire quadrangle area. It predominantly consists of white to cream, locally conglomeratic, kaolinitic, friable sandstone, interbedded gray-green to brown shale, and interbedded gray-green siltstone.

Structure

The axis of the San Juan Basin is about 1 mile (1.6 km) northeast of the Pine River quadrangle area and trends in an arcuate pattern across the northern portion of the Central Basin (Baltz, 1967). Regional dip within the quadrangle is to the east at approximately 1°.

COAL GEOLOGY

Individual coal beds are not continuous across the San Juan Basin because the coal-related strata are progressively younger from southwest to northeast; the strata rise in steps due to minor transgressions which occurred during the overall retreat of the sea. However, for the exclusive purpose of reserve and reserve base calculations, the Fruitland coal beds have been correlated and mapped as if they were single beds, continuous throughout the basin.

A lithologic datum was used for correlation of the coals (CRO Plate 3). The primarily marine sandstone unit (Pictured Cliffs) which underlies the coal-bearing formation (Fruitland) was used as a datum since it represents a more laterally continuous boundary than any of the overlying paludal, fluvial, and lacustrine deposits of the coal-bearing formation. Also, the sandstone unit is generally more easily recognized on geophysical logs. As shown on CRO Plate 3, the top of the Pictured Cliffs Sandstone has been used as a datum for each drill hole and the coals have been plotted in the column and correlated based upon their position relative to the datum.

Seven coal beds (Fruitland 1, Fruitland 2, Fruitland 3, Fruitland 4, Fruitland 5, Fruitland 6, Fruitland 7) and a coal zone (Fruitland) were identified in the subsurface of this quadrangle (CRO Plate 1). The Fruitland 1 (Fr 1) coal bed is defined by the authors as the lowermost coal of the Fruitland Formation; it is generally directly above the Pictured Cliffs Sandstone. The Fruitland 2 (Fr 2) coal bed is above the Fruitland 1 separated by a rock interval of 12 to 49 ft (3.7-14.9 m); the Fruitland 3 (Fr 3) coal bed is above the Fruitland 2 separated by a rock interval of 15 to 52 ft (4.6-15.8 m); the Fruitland 4 (Fr 4) coal bed is above the Fruitland 3 separated by a rock interval of 11 to 66 ft (3.4-20.1 m); the Fruitland 5 (Fr 5) coal bed is above the Fruitland 4 separated by a rock interval of 13 to 35 ft (4.0-10.7 m); the Fruitland 6 (Fr 6) coal bed is above the Fruitland 5 separated by a rock interval of 7 to 53 ft (2.1-16.2 m); the Fruitland 7 (Fr 7) coal bed is above the Fruitland 6 separated by a rock interval of 32 to 56 ft (9.8-17.1 m). Between these Fruitland beds there may be a local (L) coal bed which is noncorrelative and discontinuous.

The remaining coals are in the upper portion of the Fruitland Formation are designated as the Fruitland zone (Fr zone). These coals are generally noncorrelative, discontinuous, and less than reserve base thickness (5 ft [1.5 m]); an exception is a 6-ft (1.8-m) coal in drill hole 3. Due to these characteristics, derivative maps were not constructed.

Fruitland Formation coals in the central part of the San Juan Basin are considered high volatile A bituminous in rank. The rank has been determined on a moist, mineral-matter-free basis with calorific values averaging 15,371 Btu's per pound (35,753 kj/kg) (Amer. Soc. for Testing and Materials, 1977). The coal is hard, brittle, and black with a bright luster. The coal readily slakes with exposure to weather; however, it stocks fairly well when protected. The "as received" analyses indicate moisture content of 1.2 to 1.7 percent, ash content ranging from 10.7 to 28.5 percent, sulfur content varying from 0.6 to 2.2 percent, and heating values on the order of 12,073 Btu's per pound (28,082 kj/kg). Analyses of several Fruitland Formation coals are given in Table 1 (Bauer and Reeside, 1921; Dane, 1936; Fassett and Hinds, 1971).

Fruitland 1 Coal Bed

The coal bed has been mapped only in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map (CRO Plate 5) the coal bed dips less than 1° in a northerly direction. As a result of topography and dip, overburden (CRO Plate 6) varies from less than 2,800 ft (853 m) in the San Juan River, Los Pinos River, and Frances Creek Valleys, and Gobernador Canyon to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 4) shows the coal bed is greater than 5 ft (1.5 m) thick in a portion of the northwest and southwest parts of the mapped area. The thickness decreases from these areas, and the coal is absent in the northeast and west-central areas.

TABLE 1

Analyses of coal samples from the Fruitland Formation

(Form of analysis: A, as received; B, moisture free; C, moisture and ash free)

U.S. Bureau Mines Lab No.	Well or Other Source	Location Section	T.N.	R.W.	Approx. Depth Interval of Sample (ft.)	Form of Analysis	Proximate, percent Moisture	Volatile matter	Fixed Carbon	Ash	Sulfur	Heating Value (Btu)	Remarks
H-7560	El Paso Nat. Gas S.J.U. 29-6 No. 66	SW¼ 9	29	6	3,575-3,580	A	1.2	27.7	42.6	28.5	0.6	10,780	
						B	---	28.0	43.1	28.9	0.6	10,910	
						C	---	39.4	60.6	---	0.8	15,330	
H-16310	Aztec Oil & Gas Cain No. 16-D	SW¼ 30	29	9	1,985-2,005	A	1.6	41.1	46.6	10.7	0.7	13,310	
						B	---	41.7	47.5	10.8	0.7	13,520	
						C	---	46.8	53.2	---	0.7	15,160	
H-15142	El Paso Nat. Gas S.J.U. 30-6 No. 37	NE¼ 10	30	6	3,100-3,105	A	1.5	24.1	49.4	25.0	0.7	11,310	
						B	---	24.5	50.1	25.4	0.7	11,480	
						C	---	32.8	67.2	---	0.9	15,380	
H-50079	Delhi-Taylor Moore No. 6	NE¼ 5	30	8	2,800-3,028	A	1.7	32.6	41.4	24.3	1.8	11,250	
						B	---	33.2	42.1	24.7	1.8	11,440	
						C	---	44.0	56.0	---	2.4	15,190	
H-35925	El Paso Nat. Gas Turner No. 3	SE¼ 28	30	9	2,385-2,390	A	1.5	39.9	45.5	13.1	2.2	12,960	
						B	---	40.5	46.2	13.3	2.2	13,150	
						C	---	46.7	53.3	---	2.5	15,170	
H-50012	Delhi-Taylor Barrett No. 1	SW¼ 20	31	9	3,230-3,255	A	1.3	33.7	49.2	15.8	0.7	12,830	
						B	---	34.1	49.9	16.0	0.7	13,000	
						C	---	40.6	59.4	---	0.9	15,470	

To convert Btu's/lb to kj/kg, multiply Btu's/lb by 2.326.
To convert feet to meters, multiply feet by 0.3048.

Chemical Analyses of the Frutland 1 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

Fruitland 2 Coal Bed

The coal bed has been mapped only in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map (CRO Plate 9) the coal bed dips less than 1° to the northeast. As a result of topography and dip, overburden (CRO Plate 10) varies from less than 2,600 ft (792 m) in portions of the San Juan River Valley to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 8) indicates the coal bed thickness is greater than 10 ft (3.0 m) in the southwest and decreases from this area. The coal is absent in the northwest part of the mapped area.

Chemical Analyses of the Fruitland 2 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

Fruitland 3 Coal Bed

The coal bed has been mapped only in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map (CRO Plate 12) the coal bed dips less than 1° to the northeast.

As a result of topography and dip, overburden (CRO Plate 13) varies from less than 2,600 ft (792 m) in the Los Pinos River, San Juan River, and Frances Creek Valleys to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 11) shows the coal bed has a thickness of greater than 5 ft (1.5 m) in the south and west-central parts of the quadrangle. The thickness decreases from these areas, and the coal is absent in the north and a small area in the southwest.

Chemical Analyses of the Fruitland 3 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

Fruitland 4 Coal Bed

The coal bed has been mapped only in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map (CRO Plate 16) the coal bed dips less than 1° to the northeast. As a result of topography and dip, overburden (CRO Plate 17) varies from less than 2,600 ft (792 m) in the Los Pinos River, San Juan River, and Frances Creek Valleys to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 15) illustrates that the coal bed is greater than 15 ft (4.6 m) thick in the west-central part of the quadrangle and thins in all directions from this area. The coal is absent in the north and in part of the center of the quadrangle.

Chemical Analyses of the Fruitland 4 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

Fruitland 5 Coal Bed

The coal bed has been mapped only in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map (CRO Plate 20) the coal bed dips less than 1° to the northeast. As a result of topography and dip, overburden (CRO Plate 21) varies from less than 2,600 ft (792 m) in the Los Pinos River, San Juan River, and Frances Creek Valleys to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 19) shows the coal bed has a thickness of greater than 30 ft (9.1 m) in the southwest which decreases in all directions. The coal is absent along the west edge and in a narrow east-west-oriented area in the central part of the quadrangle.

Chemical Analyses of the Fruitland 5 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

Fruitland 6 Coal Bed

The coal bed has been mapped in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map

(CRO Plate 24) the coal bed dips less than 1° to the northeast. As a result of topography and dip, overburden (CRO Plate 25) varies from less than 2,600 ft (792 m) in the Los Pinos River, San Juan River, and Frances Creek Valleys to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 23) illustrates that the coal bed has a thickness of greater than 10 ft (3.0 m) in portions of the north-central and west. The thickness decreases from these areas, and the coal is absent in an area slightly south of the center of the quadrangle and in part of the west.

Chemical Analyses of the Fruitland 6 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

Fruitland 7 Coal Bed

The coal bed has been mapped only in areas of less than 3,000 ft (914 m) of overburden (the study limit). As indicated by the structure contour map (CRO Plate 28) the coal bed dips less than 1° to the northeast. As a result of topography and dip, overburden (CRO Plate 29) varies from less than 2,600 ft (792 m) in the Los Pinos River, San Juan River, and Frances Creek Valleys and Gobernador Canyon to greater than 3,000 ft (914 m) on the mesas. The isopach map (CRO Plate 27) shows the coal bed is greater than 15 ft (4.6 m) thick in the central part of the quadrangle. In general, it thins in all directions from this area and is absent in portions of the northeast and west.

Chemical Analyses of the Fruitland 7 Coal Bed - Analyses of several coals of the Fruitland Formation from the area surrounding this quadrangle are given in Table 1 (Fassett and Hinds, 1971). These coals are assumed to be similar to the coals of this quadrangle.

COAL RESOURCES

Coal resource data from oil and gas wells (El Paso Natural Gas Co., 1978, unpublished data in well log library in Farmington, New Mexico) was used in the construction of isopach and structure contour maps of coals in this quadrangle. All of the coals studied in the Pine River quadrangle are more than 200 ft (61 m) below the ground surface and, thus, have no outcrop or surface development potential.

The U.S. Geological Survey designated the Fruitland 1, Fruitland 2, Fruitland 3, Fruitland 4, Fruitland 5, Fruitland 6, and Fruitland 7 coal beds for the determination of coal resources in this quadrangle. Coals of the Fruitland zone were not evaluated because they are discontinuous, noncorrelative, and generally less than the reserve base thickness (5 ft [1.5 m]).

For Reserve Base and Reserve calculations, each coal bed was areally divided into measured, indicated, and inferred resource categories (CRO Plates 7, 14, 18, 22, 26, and 30) according to criteria established in U.S. Geological Survey Bulletin 1450-B. Data for calculation of Reserve Base and Reserves for each category were obtained from the respective coal isopach (CRO Plates 4, 8, 11, 15, 19, 23, and 27) and areal distribution maps (CRO Plates 7, 14, 18, 22, 26, and 30) for each coal bed. The surface area of each isopached bed was measured by planimeter, in acres, for each category, then multiplied by both the average isopached thickness of the coal bed and 1,800 short tons of coal per acre-foot (13,239 tons/hectare-meter), the conversion factor for bituminous coal. This yields the Reserve Base coal, in short tons, for each coal bed.

In order to calculate Reserves, a recovery factor of 50 percent was applied to the Reserve Base tonnages for underground coal. However, in areas of underground coal exceeding 12 ft (3.7 m) in thickness, the Reserves (mineable coal) were calculated on the basis of a maximum coal bed thickness of 12 ft (3.7 m), which represents the maximum economically mineable thickness for a single coal bed in this area by current underground mining technology.

Reserve Base and Reserve values for measured, indicated, and inferred categories of coal for the Fruitland 1 and Fruitland 2, Fruitland 3, Fruitland 4, Fruitland 5, Fruitland 6, and Fruitland 7 beds are shown on CRO Plates 7, 14, 18, 22, 26, and 30, respectively, and are rounded to the nearest hundredth of a million short tons. The total coal Reserve Base, by section, is shown on CRO Plate 2 and totals approximately 154.6 million short tons (140.3 million metric tons).

The coal development potential for each bed was calculated in a manner similar to the Reserve Base, from planimetered measurements, in acres, for areas of high, moderate, and low potential for subsurface mining methods. The Pine River quadrangle has development potential for subsurface mining methods only (CDP Plate 31).

COAL DEVELOPMENT POTENTIAL

Coal beds of 5 ft (1.5 m) or more in thickness which are overlain by 200 to 3,000 ft (61-914 m) of overburden are considered to have potential for underground mining and are designated as having high, moderate, or low development potential according to the overburden thickness: 200 to 1,000 ft (61-305 m), high; 1,000 to 2,000 ft (305-610 m), moderate; and 2,000 to 3,000 ft (610-914 m), low. Table 2 summarizes the coal development potential, in short tons, for underground coal of the Fruitland 1, Fruitland 2, Fruitland 3, Fruitland 4, Fruitland 5, Fruitland 6, and Fruitland 7 coal beds.

Development Potential for Surface Mining Methods

All coals studied in the Pine River quadrangle occur more than 200 ft (61 m) below the ground surface and, thus, they have no coal development potential for surface mining methods.

Development Potential for Subsurface Mining Methods

Underground coal of the Fruitland 1, Fruitland 2, Fruitland 3, Fruitland 4, Fruitland 5, Fruitland 6, and Fruitland 7 beds has low development potential in the west-central part of the quadrangle encompassed by the KRCRA (CDP Plate 31). The specific coal resource areas shown on the respective areal distribution maps (CRO Plates 7, 14, 18, 22, 26, and 30) for each coal bed are areas of low development potential. Coal bed thicknesses in these areas include: 5 ft (1.5 m), Fruitland 1, Fruitland 2, and Fruitland 3 (CRO Plates 4, 8, and 11); 5 to 15 ft (1.5-4.6 m), Fruitland 4 (CRO Plate 15); 5 to 30 ft (1.5-9.1 m), Fruitland 5 (CRO Plate 19); and 5 to 10 ft (1.5-3.0 m), Fruitland 6 and Fruitland 7 (CRO Plates 23 and 27). The over-

TABLE 2

COAL RESOURCE DATA FOR UNDERGROUND MINING METHODS FOR FEDERAL COAL LANDS
(in short tons) IN THE PINE RIVER QUADRANGLE,
RIO ARRIBA AND SAN JUAN COUNTY, NEW MEXICO

(To convert short tons to metric tons, multiply by 0.9072)

Coal Bed	High Development Potential	Moderate Development Potential	Low Development Potential	Total
Fruitland 7	--	--	17,160,000	17,160,000
Fruitland 6	--	--	24,650,000	24,650,000
Fruitland 5	--	--	57,980,000	57,980,000
Fruitland 4	--	--	34,830,000	34,830,000
Fruitland 3	--	--	11,740,000	11,740,000
Fruitland 2	--	--	800,000	800,000
Fruitland 1	--	--	7,410,000	7,410,000
TOTAL	--	--	154,570,000	154,570,000

burden for each coal bed in the respective areas of low potential is 2,800 to 3,000 ft (853-914 m) thick for the Fruitland 1 and Fruitland 2 (CRO Plates 6 and 10) and 2,600 to 3,000 ft (792-914 m) thick for the Fruitland 3, Fruitland 4, Fruitland 5, Fruitland 6, and Fruitland 7 (CRO Plates 13, 17, 21, 25, and 29).

Approximately one-third of the Federal land within the KRCRA has unknown development potential and includes areas where the individual coal bed thicknesses are less than 5 ft (1.5 m) and areas outside the 3,000-foot (914-m) overburden study limits of each coal bed. Unpatterned areas shown on CDP Plate 31 are outside the KRCRA and are not included in the resource evaluation.

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