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COAL RESOURCE OCCURRENCE MAPS OF THE REGINA QUADRANGLE, RIO ARRIBA AND SANDOVAL COUNTIES, NEW MEXICO

[Report includes 2 plates]

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PLATES

REGINA 7 1/2-MINUTE QUADRANGLE

INTRODUCTION

Purpose

This text is to be used in conjunction with the Coal Resource Occurrence (CRO) Maps of the Regina quadrangle, Rio Arriba and Sandoval 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 Regina 7 1/2-minute quadrangle is located in northeast Sandoval County and southwest Rio Arriba County, New Mexico. The area is approximately 80 miles (129 km) southeast of Farmington and 78 miles (126 km) northwest of Albuquerque, New Mexico. The Jicarilla Apache Indian Reservation is located in the extreme western part of the area.

Accessibility

The Regina quadrangle is accessible by New Mexico State Routes 96, 95, and 112. Many light-duty and unimproved dirt roads originate from these State Routes and provide access to other parts of the area. The Atchison, Topeka, and Santa Fe Railway operates an east-west route 78 miles (126 km) southeast of the area which passes through Albuquerque, New Mexico.

Physiography

The quadrangle is in the southeastern portion of the Central Basin area (Kelley, 1950) of the structural depression known as the San Juan Basin. Elevations range from 7,179 ft (2,188 m) in the southwestern part of the quadrangle to 10,190 ft (3,106 m) in the southern portion of the San Pedro Mountains. Three physiographic divisions of Baltz (1967) occur within the quadrangle boundaries. The Northern Hogback Belt physiographic division in the northeastern part reflects the topographic features resulting from the Nacimiento Monocline; it is characterized by resistant hogbacks paralleled by intervening alluvial valleys. The San Pedro Foothills division encompasses the southeastern part of the area; it is characterized by westward-sloping terraces dissected by numerous arroyos and washes. The northwestern and western portions of the area are part of the Tapicitos Plateau division, which is characterized by a highly dissected plateau. The Continental Divide extends across the northwestern part of the quadrangle along an area known as the Badland Hills.

Climate

The climate of the San Juan Basin is arid to semi-arid. Annual precipitation is usually less than 10 inches (25 cm) but varies across the basin due to elevational differences. Rainfall is rare in the early summer; 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 with an average of 18 inches (46 cm) in the southern part of the basin.

Land Status

Approximately 20 percent of the quadrangle is in the southern part of the isolated portion of the San Juan Basin Known Recoverable Coal Resource Area located east of the main KRCRA area. The Federal Government owns the coal rights for all the KRCRA lands within the quadrangle, except 160 acres in the northwest as shown on Plate 2 of the Coal Resource Occurrence Maps. No Federal coal leases occur within the quadrangle.

GENERAL GEOLOGY

Previous Work

Wood and Northrop (1946) mapped the geology of the area on a scale of 1:63,360. Baltz (1967) also mapped the geology of the quadrangle on a scale of 1:63,360. The most recent work in the area is a publication by Fassett and Hinds (1971) which includes subsurface interpretations of Fruitland Formation coal deposits in 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 is the nearshore regressive Pictured Cliffs Sandstone. 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 northwest-southeast strandline and their discontinuity perpendicular to it to the northeast. The less continuous Fruitland coals appear to be noncorrelative, but are stratigraphically equivalent in terms of their relative position within the Fruitland Formation.

The brackish-water swamp environment of the Fruitland moved farther to the northeast as the regression continued in that direction. Terrestrial freshwater sediments covered the 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 in the basin then ceased. Structural deformation related to the Nacimiento Uplift subsequently warped the strata in a long, narrow belt along the Nacimiento Fault. Tectonic activity then subsided, and the warped strata of the San Juan Basin have been exposed to erosional processes to the present.

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, undivided Fruitland Formation and Kirtland Shale, Ojo Alamo Sandstone, Nacimiento Formation, and San Jose Formation.

The Pictured Cliffs Sandstone is a regressive sandstone of near-shore marine origin. Because this unit is present throughout most of the San

Juan Basin and displays a distinctive character on geophysical logs, the top was used as the datum for Fruitland Formation coal correlations.

The Fruitland Formation, which is a major coal-bearing unit across the San Juan Basin, conformably overlies the Pictured Cliffs Sandstone. The drill hole data available for this quadrangle indicate that there is coal in the Fruitland Formation, but it is deeper than the 3,000-foot (914-m) overburden study limit. Available publications show no outcrop of Fruitland coal in this area. Due to an indistinct contact between the Fruitland Formation and the overlying Kirtland Shale these two formations were not divided. The average combined thickness is 150 to 200 ft (46-61 m).

The San Jose Formation of Eocene age unconformably overlies the Nacimiento Formation. It consists of shale and sandstone and many gradations between the two. Baltz (1967) has mapped individual members of the San Jose Formation, but for the purposes of this report it is not necessary to distinguish between them.

Structure

The Regina quadrangle is located in the Central Basin area (Kelley, 1950) of the San Juan Basin. The axis of the basin is northwest of the quadrangle and trends northwest and west in an arcuate pattern across the northern portion of the Central Basin area (Baltz, 1967).

The structure in this area is dominated by the Nacimiento Monocline. Dips along the monocline range from 56° to 70° to the west along the flank of the monocline. In the southern part of the area the beds along the monocline are overturned at angles of 73° to 86°. West of the Nacimiento

Monocline the dip angle decreases to 3° to the west. Many small synclinal and anticlinal flexures related to the Nacimiento uplift trend northwest-southeast across the area (Baltz, 1967).

COAL GEOLOGY

In this quadrangle the available drill hole data (refer to CRO Plate 1) indicate that no coals of the Fruitland Formation have less than 3,000 ft (914 m) of overburden (the study limit). Therefore, derivative maps were not constructed.

COAL RESOURCES

The Regina quadrangle contains no coal resources.

COAL DEVELOPMENT POTENTIAL

Since there are no coal resources, the quadrangle has no coal development potential.

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