Text to Accompany:

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# COAL RESOURCE OCCURRENCE MAPS AND COAL DEVELOPMENT POTENTIAL OF THE POINT OF ROCKS SE QUADRANGLE, SWEETWATER COUNTY, WYOMING

[Report includes 8 plates]

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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

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# INTRODUCTION

## Purpose

This text is to be used in conjunction with Coal Resource Occurrence (CRO) Maps of the Point of Rocks SE quadrangle, Sweetwater County, Wyoming. This report was compiled to support the land planning work of the Bureau of Land Management (BLM) to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States. This investigation was undertaken by Dames & Moore, Denver, Colorado, at the request of the U.S. Geological Survey under contract number 14-08-0001-17104. The resource information gathered for this report is in response to the Federal Coal Leasing Amendments Act of 1976 (P.L. 94-377). Published and unpublished public information available through May, 1978, was used as the data base for this study. No new drilling or field mapping was performed, nor was any confidential data used.

## Location

The Point of Rocks SE quadrangle is located in central Sweetwater County, approximately 5 miles (8 km) south of the town of Point of Rocks and 11 miles (18 km) west of the town of Bitter Creek, Wyoming. The area is unpopulated except for the Brooks Ranch located in sec. 12, T. 18 N., R. 102 W.

## Accessibility

An improved light-duty road runs north-south along the southwestern edge of the quadrangle. The remainder of the quadrangle is served by numerous unimproved dirt roads and jeep trails. Interstate Highway 80 runs east-west approximately 5 miles (8 km) north of the quadrangle through the town of Point of Rocks.

The main east-west line of the Union Pacific Railroad passes through the northeastern part of the quadrangle. This line provides railway service across southern Wyoming connecting Ogden, Utah, to the west with Omaha, Nebraska, to the east.

## Physiography

The Point of Rocks SE quadrangle lies on the eastern flank of the Rock Springs uplift. The landscape within the quadrangle is characterized by steep escarpments with long dip slopes, buttes and valleys. Altitudes range from approximately 6,540 feet (1,993 m) along Bitter Creek in the northeastern part of the quadrangle to 8,097 feet (2,468 m) on Black Buttes near the center of the quadrangle.

Bitter Creek flows northwesterly across the northeastern corner of the quadrangle and then westerly to the Green River about 40 miles (64 km) west of the quadrangle. Black Butte Creek, a tributary of Bitter Creek, flows northerly along the western edge of the quadrangle. All the streams in the area are intermittent, flowing mainly in response to snowmelt in the spring.

## Climate and Vegetation

The climate of southwestern Wyoming is semiarid and is characterized by low precipitation, rapid evaporation, and large daily temperature changes. Summers are usually dry and mild, and winters are cold. The annual precipitation averages approximately 9 inches (23 cm), with approximately two thirds falling during the spring and early summer months.

The average annual temperature is 42°F (6°C). The temperature during January averages 18°F (-8°C), with temperatures typically ranging from 8°F (-13°C) to 28°F (-2°C). During July temperatures typically range from 54°F (12°C) to 84°F (29°C), with an average of 69°F (21°C) (Wyoming Natural Resources Board, 1966; U.S. Bureau of Land Management, 1978).

Winds are usually from the west-southwest and southwest with an average annual velocity of 11 miles per hour (18 km per hr) (U.S. Bureau of Land Management, 1978).

Principal types of vegetation in the area include sagebrush, rabbitbrush, greasewood, mountain mahogany, juniper, and grasses (U.S. Bureau of Land Management, 1978).

### Land Status

The Point of Rocks SE quadrangle lies in the east-central part of the Rock Springs Known Recoverable Coal Resource Area (KRCRA). Only ten percent of the quadrangle lies within the KRCRA boundary, with the Federal government owning the coal rights to less than half of this area. One active coal lease is present within the KRCRA boundary, as shown on plate 2.

## GENERAL GEOLOGY

### Previous Work

Schultz described the geology and coal resources of the northern (1909) and southern (1910) parts of the Rock Springs coal field. Hale described the stratigraphy and depositional history of the formations cropping out on the flanks of the Rock Springs uplift in 1950 and 1955. Yourston (1955) described the strucure and stratigraphy of the coal-bearing formations in the Rock Springs coal field and reported chemical analyses for coals in the Rock Springs area. Weimer (1960), Smith (1961), Keith (1965), and Gosar and Hopkins (1969) described the stratigraphy and discussed the depositional environment of Upper Cretaceous formations in the Rock Springs area. Douglass and Blazzard (1961) and Weimer (1961) also described the depositional history of these formations. Roehler and others (1977) described the geology and coal resources of the Rock Springs uplift. Roehler (1977a and 1977b) prepared a geologic map of the Point of Rocks SE quadrangle and a generalized geologic map of the Rock Springs uplift and adjacent areas.

### Stratigraphy

The formations exposed in the Point of Rocks SE quadrangle are Late Cretaceous in age and crop out in northeast-trending bands across the quadrangle. The Rock Springs and Almond Formations are the major coal-bearing formations.

The Mesaverde Group of Late Cretaceous age is subdivided into four formations which are, in ascending order, the Blair Formation, the Rock Springs Formation, the Ericson Sandstone, and the Almond Formation.

The upper part of the Blair Formation crops out along Black Butte Creek and along the northwestern edge of the quadrangle (Roehler, 1977b). Geophysical logs from oil and gas wells drilled in the quadrangle indicate that the Blair Formation consists of approximately 780 to 970 (238 to 296 m) of shales and sandstones. These alternating sandy marine shales and ripple-marked sandstones are in transitional contact with cliff-forming marine sandstones at the base and the top of the formation. The lithology of the Blair Formation varies considerably both laterally and vertically. The lower part of the formation is composed of a basal layer of massive to thick-bedded, light-brown to brown, very fine to fine-grained sandstone which grades downward into the underlying Baxter Shale. Above this is a thick series of light-brown, thin-bedded, very fine grained sandstone; light-brownish-gray arenaceous siltstone; and brownish-gray silty to sandy shale. The upper part of the formation consists of light-brown sandy shale and gray fine- to medium-grained sandstone which grade into the overlying Rock Springs Formation (Hale, 1950 and 1955; Keith, 1965; Smith, 1961).

The coal-bearing Rock Springs Formation, which conformably overlies the Blair Formation, crops out in a northeast-trending band across the northwestern half of the Point of Rocks SE quadrangle (Roehler, 1977b). It is approximately 1,730 feet (527 m) thick where penetrated by the Mountain Fuel Supply Co. Golden Wall Unit No. 1 well drilled in sec. 28, T. 18 N., R. 101 W. The lithology of the Rock Springs Formation varies considerably. In the northwestern part of the Rock Springs uplift it consists of a paludal sequence of thick coals, carbonaceous shales, siltstones, claystones, and sandstones. These sediments intertongue to the southeast with massive white to light-gray, fine- to medium-grained littoral sandstone. These, in turn, change to gray marine shale and associated thin, very fine grained sandstone in the southeastern part of the Rock Springs uplift (Hale, 1950 and 1955; Smith, 1961; Keith, 1965). In this quadrangle, the littoral and barrier sandstones of the Rock

Springs Formation have become thicker and more common, while the coal-bearing interval has become thinner and less frequent. In the northwest corner of this quadrangle, these sandstones grade northwestward into, and become interstratified with, the carbonaceous coal-bearing zones of the continental Rock Springs Formation. In the southern and southeastern portions of the quadrangle, the sandstones grade abruptly into the offshore deposits of the Black Butte Tongue, the marine equivalent of the continental Rock Springs sediments. The major tongues making up the Rock Springs Formation in this area are described below.

The Chimney Rock Tongue of the Rock Springs Formation crops out along the western edge of the quadrangle and is composed of five to seven prominent reddish-brown, cliff-forming sandstone tongues interbedded with thin sandy shales. This transition zone between the shales of the underlying Blair Formation and overlying Black Buttes Tongue is approximately 950 feet (289 m) thick (Roehler, 1978).

The Black Butte Tongue crops out just east of the Chimney Rock Tongue along Black Buttes Creek. It consists of approximately 480 feet (146 m) of dark-gray carbonaceous shale and interbedded thin sandstone in the adjacent Black Buttes quadrangle to the east (Roehler, 1978).

Four thin marine tongues overlie the Black Buttes Tongue. These are the Brooks Sandstone, the Coulson Tongue, the McCourt Sandstone, and the Gottsche Tongue. The Brooks Sandstone is fine- to medium-grained, massive, buff-colored to brown and resistant. It is approximately 110 feet (34 m) thick in this quadrangle. The Coulson Tongue consists of shale, carbonaceous shale, siltstone and thin sandstone. It is approximately 100 feet (30 m) thick. The McCourt Sandstone overlies the Coulson Tongue and consists of a lower buff-colored to brown, massive sandstone and an upper white cross-bedded sandstone. The carbonaceous shales, shales and thin sandstones of the Gottsche Tongue overlie the McCourt Sandstone. The Gottsche Tongue is approximately 100 feet (30 m) thick where measured by Roehler (1978) in this quadrangle (Smith, 1961).

The Ericson Sandstone, approximately 825 to 880 feet (251 to 268 m) thick in adjacent quadrangles, crops out in a wide northeasterly-trending band in the eastern half of the quadrangle where it conformably overlies the Rock Springs Formation (Roehler, 1977b). The upper and lower sections of the Ericson Sandstone consist of light-gray, massive, cliff-forming, well-bedded, fine- to medium-grained sandstones with an occasional coarse-grained to conglomeratic lens. These are separated by a middle section of gray shale, occasional thin coal beds, and rusty-weathering sandstone. This middle section, often referred to as the "rusty zone," is approximately 400 feet (122 m) thick near Black Buttes in T. 18 N., R. 101 W. (Hale, 1950 and 1955; Smith, 1961).

The Almond Formation conformably overlies the Ericson Sandstone and crops out along the eastern edge of the quadrangle (Roehler, 1977b) where it is approximately 500 feet (152 m) thick. The lower part of the formation consists of carbonaceous shale, siltstone, mudstone, and sandstone alternating with coal beds of variable thickness and quality. The thicker coal beds are found in the lower part of the formation. The upper part of the formation is predominately buff-colored to light-gray, thick-bedded to massive, fossiliferous sandstone (Hale, 1950 and 1955; Yourston, 1955).

The Lewis Shale conformably overlies the Almond Formation. The lower part of the formation crops out in the southeastern corner of the quadrangle and in a fault block on the east-central edge of the quadrangle (Roehler, 1977b). The Lewis Shale consists of approximately 600 feet (183 m) of bluish- to light-gray gypsiferous marine shale with calcareous concretions and thin beds of sandy limestone. Thin ripple-marked sandstones are common near the base and top of the formation (Hale, 1950 and 1955).

Holocene deposits of alluvium cover the stream valleys of Bitter Creek and Black Butte Creek.

The Upper Cretaceous formations in the Point of Rocks SE quadrangle indicate the transgressions and regressions of a broad, shallow, north-south trending seaway that extended across central North America. They accumulated near the western edge of the Cretaceous sea and reflect the location of the shoreline (Weimer, 1960 and 1961).

The transitional sequence of nearshore marine sandstones and offshore marine shales of the Blair Formation were deposited in a shallow-water marine environment as the Cretaceous sea regressed eastward (Douglass and Blazzard, 1961; Gosar and Hopkins, 1969).

The Rock Springs Formation contains intertonguing marine and continental deposits. These coal-bearing deposits were formed in fresh- to brackish-water environments, including deltaic, lagoonal, bay, estuarine, lacustrine, tidal flat and paludal environments that existed on the landward side of a marine strand line. They are intertongued with littoral marine sandstones and marine shales. The Black Butte Tongue is characteristic of deposition in a shallow-water nearshore environment (Douglass and Blazzard, 1961; Hale, 1950).

The Ericson Sandstone was deposited as alluvial fans on a series of broad inland floodplains by rivers flowing from a source area to the northwest (Douglass and Blazzard, 1961; Hale, 1955).

The Almond Formation reflects deposition in fresh-water coastal swamps, brackish-water lagoons, and shallow-water marine environments (Hale, 1950).

Deposition of the marine Lewis Shale occurred in the relatively quiet, uniform conditions present in intermediate offshore and offshore marine environments as the Cretaceous sea moved landward (Hale, 1950 and 1955).

## Structure

The Point of Rocks SE quadrangle lies on the eastern flank of the Rock Springs uplift which separates the Great Divide and Green River structural basins. The Rock Springs uplift is a doubly plunging asymmetric anticline with steeper dips on the west limb. Beds in the Point of Rocks SE quadrangle strike northeasterly and dip 4° to 5° to the southeast (Roehler, 1977a).

The quadrangle is highly faulted with major normal faults trending northeasterly across the quadrangle. Displacement along these faults may range from a few feet to several miles (Yourston, 1955).

## COAL GEOLOGY

The Rock Springs and Almond Formations contain coal in this quadrangle. Areas where coal beds in the Rock Springs Formation occur in this quadrangle are limited in areal extent by major faulting and tend to be thin because of their depositional origin. The thicker coal beds of the formation are restricted to areas of coastal swamp deposition in the northwestern part of the Rock Springs uplift (Roehler and others, 1977), which is in contrast with the Point of Rocks area where the depositional environment was predominantly deltiac. Several Rock Springs Formation coal beds crop out in the quadrangle, but none are of Reserve Base thickness (5 feet or 1.5 meters).

Six correlatable coal beds were identified within the Almond Formation, three of which exceed Reserve Base thickness. The major coal beds occur within an interval approximately 300 feet (91 m) thick near the middle of the formation.

Chemical analyses of coal.--No analyses were available for this quadrangle, but analyses from the adjacent Point of Rocks quadrangle and the southwest quarter of the Superior 15-minute quadrangle are included in table 1. In general, the Almond Formation coal beds rank as subbituminous B and the Rock Springs coal beds rank as high-volatile C bituminous on a moist, mineral-matter-free basis according to ASTM Standard Specification D 388-77 (American Society for Testing and Materials, 1977).

### Coal Beds of the Almond Formation

Coal beds in the Almond Formation crop out in the eastern half of the quadrangle. Several major faults cut the coal beds, offsetting the locations of the outcrops by more than 3 miles (4.8 km). The coal beds are generally thin although some coal beds occasionally measure 10 feet (3.0 m) or more in thickness. Dips in the quadrangle average 5° to the east as measured by Roehler (1977a), and overburden thicknesses increase in the same direction. Names of the three coal beds isopached in this quadrangle are those used by Roehler (1977b), and Roehler and others (1977).

### Lebar Coal Bed

The Lebar coal bed is, stratigraphically, the lowest isopached coal bed in this quadrangle. The maximum recorded thickness of the coal bed is 12.9 feet (3.9 m), located in a measured section in sec. 14, T. 18 N., R. 101 W. (plate 4). To the southwest, the Lebar coal bed thins to less than 5 feet (1.5 m) and then thickens to 8 feet (2.4 m) near the southern boundary of the quadrangle. The outcrop continues to the northeast into the Black Buttes quadrangle averaging approximately 7 feet (2.1 m) in thickness. Three large east-west trending faults in the northern half of the quadrangle have offset Lebar outcrops into this quadrangle from the Black Buttes quadrangle to the east. In a drill hole located between the southernmost and middle faults, the coal bed was reported to be 12 feet (3.7 m) thick. Between the middle and northern faults, measurements of the coal bed along the crop line did not exceed Reserve Base thickness.

### Lebar Rider Coal Bed

The Lebar Rider coal bed is located approximately 15 feet (4.6 m) stratigraphically above the Lebar coal bed. As shown on plate 7, the maximum thickness of 9.0 feet (2.7 m) was reported in sec. 14, T. 18 N., R. 101 W. for this coal bed. However, it averages less than 5.0 feet (1.5 m) in most of the quadrangle. The Lebar Rider is offset into this quadrangle from the east by the same faults that offset the thick Lebar coal bed. A maximum thickness of 6.8 feet (2.1 m) was reported along the outcrop between the southern and middle faults. Other measurements to the north of the middle fault were less than Reserve Base thickness. An areal distribution and identified resources map of the Lebar Rider coal bed was not constructed because its occurrence in this quadrangle is limited to non-Federal or Federal lands already leased for coal mining.

Magpie Coal Bed

The Magpie coal bed, exposed in the southeastern corner of the quadrangle, is located approximately 75 feet (22.9 m) stratigraphically above the Lebar Rider coal bed. This coal bed is usually thin, averaging 2.0 feet (0.6 m) thick in this quadrangle. However, it occasionally exceeds 5 feet (1.5 m) in thickness as shown on plate 8 by a measurement of 5.7 feet (1.7 m) recorded in sec. 27, T. 18 N., R. 101 W. The Magpie coal bed pinches out to the east in the Black Buttes quadrangle. An areal distribution and identified resources map of the Magpie coal bed was not constructed because its occurrence is limited to non-Federal or Federal lands already leased for coal mining.

## COAL RESOURCES

Information from oil and gas wells and from coal test holes drilled by Rocky Mountain Energy Company (RMEC), as well as surface mapping by Roehler (1977a) was used to construct outcrop, isopach, and structure contour maps of the coal beds in this quadrangle. The source of each indexed data point shown on plate 1 is listed in table 2.

Coal resources were calculated using data obtained from the isopach map of the Lebar coal bed. The coal bed acreage (measured by planimeter) multiplied by the average thickness of the coal bed and by a conversion factor of 1,770 short tons of coal per acre-foot (13,018 metric tons per hectare-meter) for subbituminous coal yields the coal resources in short tons of coal. Coal beds thicker than 5 feet (1.5 m) that lie less than 3,000 feet (914 m) below the ground surface are included. These criteria differ from those used in calculating Reserve Base and Reserve tonnages as stated in U.S. Geological Survey Bulletin 1450-B which calls for a maximum depth of 1,000 feet (305 m) for subbituminous coal.

Reserve Base and Reserve tonnages for the entire quadrangle are derived from the Lebar coal bed and are shown on plate 6. The total Reserve Base tonnage is approximately 0.05 million short tons (0.05 million metric tons), rounded to the nearest 10,000 short tons (9,072 metric tons), as shown on plate 2. In the area where tonnages have been calculated, the Lebar coal bed is less than 200 feet (61 m) below the ground surface and is amenable to surface mining methods only. Reserve Base tonnage in the high development potential category is listed in table 2.

Dames & Moore has not made any determination of economic recoverability of any of the coal beds described in this report.

## COAL DEVELOPMENT POTENTIAL

Coal development potential areas are drawn so as to coincide with the boundaries of the smallest legal land subdivisions shown on plate 2. In sections or parts of sections where no land subdivisions have been surveyed by the BLM, approximate 40-acre (16-ha) parcels have been used to show the limits of the high, moderate, or low development potentials. A constraint imposed by the BLM specifies that the highest development potential affecting any part of a 40-acre (16-ha) lot, tract, or parcel be applied to that entire lot, tract, or parcel. For example, if 5 acres (2 ha) within a parcel meet criteria for a high development potential, 25 acres (10 ha) a moderate development potential, and 10 acres (4 ha) a low development potential, then the entire 40 acres (16 ha) are assigned a high development potential.

### Development Potential for Surface Mining Methods

Areas where the coal beds of Reserve Base thickness (5 feet or 1.5 meters) are overlain by 200 feet (61 m) or less of overburden are considered to have potential for surface mining and are assigned a high, moderate, or low development potential based on the mining ratio (cubic yards of overburden per ton of recoverable coal). The formula used to calculate mining ratios for surface mining of coal is shown on the next page.

$$MR = \frac{t_o\,(cf)}{t_c\,(rf)}$$

where MR = mining ratio

$t_o$ = thickness of overburden in feet

$t_c$ = thickness of coal in feet

rf = recovery factor (85 percent for this quadrangle)

cf = conversion factor to yield MR value in terms of cubic yards of overburden per short tons of recoverable coal:

0.911 for subbituminous coal

0.896 for bituminous coal

Note: To convert mining ratio to cubic meters of overburden per metric ton of recoverable coal, multiply MR by 0.8428.

Areas of high, moderate, and low development potential are defined as areas underlain by coal beds having respective mining ratio values of 0 to 10, 10 to 15, and greater than 15. These mining ratio values for each development potential category are based on economic and technological criteria and were provided by the U.S. Geological Survey.

Unknown development potentials are assigned to those areas where coal data is absent or extremely limited. Even though these areas may contain coal beds thicker than 5 feet (1.5 m), limited knowledge pertaining to the areal distribution, thickness, depth, and attitude of the coal beds prevents accurate evaluation of the development potential in the high, moderate, or low categories.

In this quadrangle, only that part of the NW 1/4, NE 1/4, sec. 34, T. 18 N., R. 101 W., that lies within the quadrangle boundary is known to have known development potential for surface mining methods, and all of this area has been rated high. No coal development potential map was prepared because only this small land area was rated as having a development potential for surface mining methods. The remaining Federal land areas within the KRCRA boundary in this quadrangle are classified as having unknown development potential for surface mining methods.

## Development Potential for Subsurface and In-Situ Mining Methods

Areas considered to have development potential for conventional subsurface mining methods include those areas where coal beds of Reserve Base thickness lie between 200 and 3,000 feet (61 and 914 m) below the ground surface and dip less than 15°. Coal beds lying between 200 and 3,000 feet (61 and 914 m) below the ground surface, dipping greater than 15°, are considered to have development potential for in-situ mining methods.

Because no coal beds of Reserve Base thickness are known to occur in this quadrangle at depths greater than 200 feet (61 m) on Federal lands available for leasing, and because the strata have dips less than 15°, the Federal land areas within the KRCRA boundary have been classified as having unknown development potential for conventional subsurface and in-situ mining methods.

Table 1. -- Chemical analyses of coals in the Point of Rocks SE quadrangle, Sweetwater County, Wyoming

| Location | COAL BED NAME | Form of Analysis | Proximate | | | | Ultimate | | | | | Heating Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Moisture | Volatile Matter | Fixed Carbon | Ash | Sulfur | Hydrogen | Carbon | Nitrogen | Oxygen | Calories | Btu/Lb |
| SW¼ SW¼ sec. 26, T. 20 N., R. 101 W. (Point of Rocks Mine) (U.S. Bureau of Mines, 1931) | Almond, upper | A | 16.0 | 33.2 | 46.4 | 4.4 | 0.8 | -- | -- | -- | -- | -- | 9,550 |
| | | C | 0.0 | 39.5 | 55.3 | 5.2 | 0.9 | -- | -- | -- | -- | -- | 11,730 |
| SW¼ SW¼ sec. 26, T. 20 N., R. 101 W. (Point of Rocks Mine) (Yourston, 1955) | Almond, lower | A | 16.6 | 30.2 | 44.0 | 9.2 | 0.7 | -- | -- | -- | -- | -- | 9,410 |
| | | C | 0.0 | 36.3 | 52.7 | 11.0 | 0.8 | -- | -- | -- | -- | -- | 11,290 |
| SE¼ NW¼ sec. 20, T. 21 N., R. 102 W. (Superior D Mine) (U.S. Bureau of Mines, 1931) | Rock Springs No. 1 | A | 13.8 | 31.5 | 50.5 | 4.2 | 1.3 | -- | -- | -- | -- | -- | 11,430 |
| | | C | 0.0 | 36.6 | 58.5 | 4.9 | 1.5 | -- | -- | -- | -- | -- | 13,250 |

**Form of Analysis:** A, as received
B, air dried
C, moisture free

**Note:** To convert Btu/pound to kilojoules/kilogram, multiply by 2.326

Table 2. -- Coal Reserve Base data for surface mining methods for Federal coal lands (in short tons) in the Point of Rocks SE quadrangle, Sweetwater County, Wyoming

| Coal Bed | High Development Potential | Moderate Development Potential | Low Development Potential | Total |
|---|---|---|---|---|
| Lebar | 52,000 | - | - | 52,000 |
| Totals | 52,000 | - | - | 52,000 |

NOTE: To convert short tons to metric tons, multiply by 0.9072.

Table 2. -- Sources of data used on plate 1

| Plate 1 Index Number | Source | Data Base |
|---|---|---|
| 1 | True Oil Co. | Oil/gas well True-Bluewater-Johnson Federal No. 11-2 |
| 2 | Rocky Mountain Energy Co., (no date), unpublished data | Drill hole No. 2, line A |
| 3 | Roehler, 1977, U.S. Geological Survey, unpublished map | Measured section No. 4776 |
| 4 | ↓ | Measured section |
| 5 | ↓ | Measured section No. 1477 |
| 6 | ↓ | Measured section No. 1277 |
| 7 | ↓ | Measured section No. 2477 |
| 8 | ↓ | Measured section No. 1077 |
| 9 | ↓ | Measured section No. 877 |
| 10 | ↓ | Measured section No. 177 |
| 11 | ↓ | Measured section |
| 12 | ↓ | Measured section |
| 13 | ↓ | Measured section |

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Table 2. -- Continued

| Plate 1 Index Number | Source | Data Base |
|---|---|---|
| 14 | Roehler, 1977, U.S. Geological Survey, unpublished map | Measured section No. 2077 |
| 15 | Rocky Mountain Energy Co., (no date) unpublished data | Drill hole No. 1, line A |
| 16 | Roehler, 1977, U.S. Geological Survey, unpublished map | Measured section No. 5076 |
| 17 | Texaco, Inc. | Oil/gas well No. 1-Gov't-M.L. Stevenson |
| 18 | ↓ | Oil/gas well No. 1-D-UPRR |
| 19 | True Oil Co. | Oil/gas well No. 21-20 Lacoy-Federal |
| 20 | Mountain Fuel Supply Co. | Oil/gas well Golden Wall Unit No. 1 |

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