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1985

FEDERAL COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE HOSPAH 7 1/2-MINUTE QUADRANGLE, McKINLEY COUNTY, NEW MEXICO

[Report includes 16 plates]

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HOSPAH QUADRANGLE
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INTRODUCTION

Purpose

This text complements the Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) maps of the Hospah 7½ minute quadrangle, McKinley County, New Mexico. These maps and report are part of an evaluation of fifty-six 7½ minute quadrangles in northwestern New Mexico, which were completed under U. S. Geological Survey Contract No. 14-08-0001-17459 (see figs. 1 and 2).

The purpose of this Coal Resource Occurrence-Coal Development Potential program, which was conceived by Congress as part of its Federal Coal Leasing Amendments Act of 1976, is to obtain coal resource information and to determine the geographical extent of Federal coal deposits. In addition, the program is intended to provide information on the amount of coal recoverable by various mining methods and to serve as a guide for land-use planning.

The U. S. Geological Survey initiated the program by identifying areas underlain by coal resources. These areas were designated Known Recoverable Coal Resource Areas based on the presence of minable coal thicknesses, adequate areal extent of these coal deposits, and the potential for developing commercial quantities of coal at minable depths.

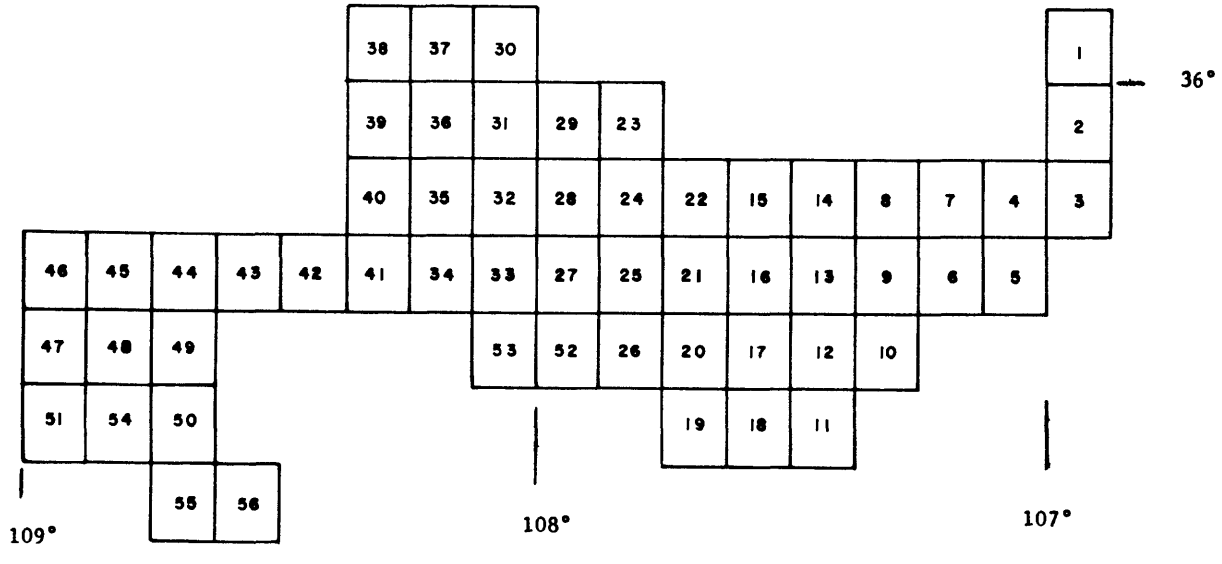
This report is limited to coal resources which are 3,000 ft (914 m) or less below ground surface. Published and unpublished public information was used as the data base for this study. No new drilling or field mapping was performed as part of this study, nor were any confidential data used.


PROJECT AREA
AREA OF THIS REPORT
COLORADO
ARIZONA
FARMINGTON
ALBUQUERQUE
Grants
Bloomfield
Bernalillo
LOCATION OF PROJECT AREA

FIGURE 1

FIGURE 2.--Index to USGS 7 1/2-minute quadrangles and coal resource occurrence/ coal development potential maps for the southern San Juan Basin area, New Mexico

Map No.	Quadrangle	Open-file report
1	Cuba	79- 623
2	San Pablo	79- 624
3	La Ventana	79-1038
4	Headcut Reservoir	79-1043
5	San Luis	79-1044
6	Arroyo Empedrado	79-1045
7	Wolf Stand	79-1046
8	Tinian	79- 625
9	Canada Calladita	79- 626
10	Cerro Parido	79- 627
11	El Dado Mesa	79- 628
12	Mesa Cortada	79- 629
13	Mesita del Gavilan	79- 630
14	Rincon Marquez	79- 631
15	Whitehorse Rincon	79- 632
16	Mesita Americana	79- 633
17	El Dado	79- 634
18	Cerro Alesna	79- 635
19	San Lucas Dam	79- 636
20	Piedra de la Aguila	79-1039
21	Hospah	79- 637
22	Whitehorse	79-1040
23	Seven Lakes NE	79- 638
24	Kin Nahzin Ruins	79- 639
25	Orphan Annie Rock	79-1041
26	Mesa de los Toros	79-1122
27	Laguna Castillo	79- 640
28	Seven Lakes	79-1042
29	Seven Lakes NW	79-1123
30	Kin Klizhin Ruins	79-1047
31	Nose Rock	79- 641
32	Becenti Lake	79-1124
33	Heart Rock	79- 642
34	Crownpoint	79-1125
35	Antelope Lookout Mesa	79-1376
36	Milk Lake	79-1377
37	La Vida Mission	79-1378
38	The Pillar 3 SE	79-1379
39	Red Lake Well	79-1380
40	Standing Rock	79-1381
41	Dalton Pass	80- 026
42	Oak Spring	80- 027
43	Hard Ground Flats	80- 028
44	Big Rock Hill	80- 029
45	Twin Lakes	80- 030
46	Tse Bonita School	80- 031
47	Samson Lake	80- 032
48	Gallup West	80- 033
49	Gallup East	80- 034
50	Bread Springs	80- 035
51	Manuelito	80- 036
52	Borrego Pass	80- 037
53	Casamero Lake	80- 038
54	Twin Buttes	80- 039
55	Pinehaven	80- 040
56	Upper Nutria	80- 041



Location

The Hospah 7½ minute quadrangle includes acreage in Tps. 16, 17 and 18 N., Rs. 7, 8 and 9 W. of the New Mexico Principal Meridian, McKinley County, northwestern New Mexico (see figs. 1 and 2).

Accessibility

No paved roads pass through the Hospah quadrangle. A light-duty maintained road passes through the town of Hospah, and provides access to U. S. Highway 66, 38.5 mi (61.9 km) SSW of the town limits. Extensive oil-and-gas drilling activities have increased the quality and quantity of roads in the quadrangle. The Atchison, Topeka, and Santa Fe Railroad line passes about 37 mi (60 km) due south of the quadrangle (see fig. 1).

Physiography

The Hospah quadrangle is in the Navajo section of the southernmost part of the Colorado Plateau physiographic province (U. S. Geological Survey, 1965). The topography of the quadrangle is mesa-and-canyon.

No perennial streams are present in the quadrangle. Local drainage is provided by several intermittent arroyos including: Alfredo Padilla Arroyo, Lucero Arroyo, Sand Springs Arroyo, and Sandoval Arroyo. Elevations within the quadrangle range from less than 6,680 ft (2,036 m) along the Sand Springs Arroyo in the northeast to 7,190 ft (2,192 m) in the central western portion of the quadrangle.

Climate

The climate of this area is semiarid to arid. The following temperature and precipitation data were reported by the National Oceanic and Atmospheric Administration for the San Mateo Station. The Hospah quadrangle is about 19 mi (31 km) NNW of the San Mateo Station. Average total annual precipitation for ten of the previous fifteen years is 9.37 in (21.26 cm). Intense thunderstorms in July, August, and September account for the majority of precipitation. The area is susceptible to flash flooding associated with these thunderstorms. Mean annual temperature for four of the previous fifteen years is 48.8° F (9.3° C). The average daily temperatures in January and July are 28.3° F (-2.1° C) and 69.0° F (20.6° C), respectively.

Land status

The Federal Government holds the coal mineral rights to approximately 25 percent of the Hospah quadrangle. For the specific coal ownership boundaries, see plate 2. It is not within the scope of this report to provide detailed land-surface ownership. About 165 acres (67 ha) in the southwestern corner of the quadrangle are within the Crownpoint Known Recoverable Coal Resource Area. The remainder of the quadrangle is within the Hospah Known Recoverable Coal Resource Area. As of October 26, 1978, there were no Federal coal leases, coal preference right lease applications or coal exploration licenses within the Hospah quadrangle.

GENERAL GEOLOGY

Previous work

Early reports on the area include reconnaissance mapping by Gardner (1910) who mapped areas within the Hospah quadrangle but did not identify any coals. Hunt (1936) mapped three inferred Menefee Cleary coal outcrops in the southern part of the quadrangle, although no coal outcrop thicknesses were included in his report. Shomaker, Beaumont, and Kottlowski (1971) reported coals in the vicinity of the Hospah Oil Field. They reported a speculative estimate of strippable reserves with 250 ft (76 m) or less of overburden as 75 million short tons (68 million t) for T. 16 N., R. 9 W., T. 16 N., R. 10 W., T. 17 N.; R. 8 W.; T. 17 N., R. 9 W.; and T. 17 N., R. 10 W. Portions of these areas are within the Hospah quadrangle. They suggested that detailed field work would probably locate additional coal outcrops in the area.

Stratigraphy

Within the San Juan Basin, the shoreline positions of the Cretaceous seaways changed innumerable times. The overall regional alignment of the shorelines trended N. 60° W.-S. 60° E. (Sears, Hunt, and Hendricks, 1941). The transgressive and regressive shoreline migrations are evidenced by the intertonguing relationships of continental and marine facies. Rates of trough (geosynclinal) subsidence and the availability of sediment supplies are the major factors that controlled the transgressive-regressive shoreline sequences.

Exposed rock units in the Hospah quadrangle include some of the sedimentary units of Upper Cretaceous age. There is Quaternary alluvium along

drainages in the area.

The Dalton Sandstone Member of the Crevasse Canyon Formation was deposited in a nearshore environment during a relatively minor withdrawal of the Cretaceous seaways in the San Juan Basin. The unit is composed of yellowish-gray, very fine-grained, quartzose sandstone, and ranges from 0 to 160 ft (0 to 49 m) thick locally. The continental sediments deposited inland from the beach area during deposition of the Dalton Sandstone Member compose the overlying Gibson Coal Member of the Crevasse Canyon Formation. The Gibson Coal Member contains, stratigraphically, the lowest identified coal beds in the Hospah quadrangle. Medium gray, carbonaceous siltstone with interbedded gray to tan sandstones, and coal beds comprise the lithologies of the Gibson Coal Member, which ranges from 0 to 85 ft (0 to 26 m) thick locally.

In this quadrangle, the Dalton Sandstone Member and Gibson Coal Member are not present in the northern portion of the area. Both members merge into the overlying, expanded thickness of the Hosta Tongue of the Point Lookout Sandstone. Therefore, the approximate northeastward development of the Dalton Sandstone Member and Gibson Coal Member was in the central part of the Hospah quadrangle.

The Hosta Tongue was deposited during a southwestward advance of the Cretaceous seaways. The unit is composed of light gray to reddish-brown, fine-to medium-grained sandstone with interbedded shales, and ranges from 100 to 220 ft (30 to 67 m) thick locally. As the transgression proceeded and the Cretaceous seaways deepened, the Satan Tongue of the Mancos Shale was deposited over the Hosta Tongue. The Satan Tongue is composed of dark gray to black, silty shale with interbedded tan to buff sandstone, and averages 280 ft (85 m) thick in this area.

The Point Lookout Sandstone overlies the Satan Tongue, and represents nearshore or littoral deposits which formed during the succeeding regression. This regression was the most extensive northeastward retreat prior to the final withdrawal of the Cretaceous seaways in the San Juan Basin (Sears, Hunt, and Hendricks, 1941). Lithology of the Point Lookout Sandstone is similar to the Hosta Tongue. The Point Lookout Sandstone ranges from 165 to 185 ft (50 to 56 m) thick in the area. The continental sediments deposited inland from the beach area during deposition of the Point Lookout Sandstone compose the overlying Menefee Formation.

The Menefee Formation consists of dark gray to brown, carbonaceous to noncarbonaceous shales, light gray sandstone, and coal beds, and is divisible into the basal Cleary Coal Member and upper Allison Member. A massive channel sandstone sequence, which crops out in the northern portion of the quadrangle, defines the boundary between the two members. The Cleary Coal Member ranges from 375 to 450 ft (114 to 137 m) thick locally, and contains the thickest coal beds in this quadrangle. Maximum thickness of the Allison Member is about 150 ft (46 m) in this area, although no Allison Member coals have been identified.

Depositional environments

The Cretaceous System sedimentary units in the quadrangle represent transgressive and regressive depositional conditions. There were innumerable minor cycles of widely varying duration and extent within the major sedimentary sequences. The paucity of data in this quadrangle and the intended scope of this report permit only general interpretations of the depositional environments.

The Cretaceous coal deposits of the San Juan Basin are products of former coastal swamps and marshes. These swamps and marshes were supported by heavy precipitation and a climate conducive to rapid vegetal growth in moderately fresh water. Due to the relatively low sulfur contents of the San Juan Basin coals, Shomaker and Whute (1977) suggest the coals formed in fresh water environments.

Most of the coal-bearing units were deposited in coastal plain environments. The majority of the peat deposits formed in a transition zone between lower and upper deltaic sediments during periods of relative shoreline stability. Coals also formed in lake margin swamps inland from the coastal area. Shoreline oscillations and the subsequent influx of continental or marine debris upon the peat accumulations produced the vertical buildup or "stacking" of peat deposits. This sediment debris is represented by variable ash contents, rock partings, and splits within the coal seams.

The peat accumulated in lenses or pods which were generally parallel to the ancient shorelines. The coals in the lower portions of the coal-bearing units represent regressive depositional conditions (Sears, Hunt, and Hendricks, 1941). The coals in the upper portions of these units are relatively sporadic in occurrence.

Structure

The Hospah quadrangle is in the Chaco Slope structural division in the southern portion of the structural depression known as the San Juan Basin (Kelley, 1950). The Hospah Dome is the major structural feature in the northeastern part of the quadrangle. Dips of the rock units range from 1^{o}

to 3° N to NE, with local variations. Minor northeast-trending faults mapped by Hunt (1936) are present in the southwestern part of the quadrangle.

COAL GEOLOGY

In this quadrangle, the authors identified four coal beds and one coal zone in oil and gas well logs and Hunt's (1936) surface mapping. These coal beds and coal zone are here informally called the Crevasse Canyon Gibson No. 1 coal bed, Menefee Cleary No. 1, No. 2, and No. 3 coal beds, and the Menefee Cleary coal zone.

The Crevasse Canyon Gibson No. 1 coal bed is, stratigraphically, the lowest coal bed identified in the Hospah quadrangle. The bed is present only in the southwestern corner of the quadrangle and was identified in two oil and gas well logs from 10 to 20 ft (3 to 6 m) above the Dalton Sandstone Member.

The Menefee Cleary No. 1 coal bed occurs up to 19 ft (6 m) above the Point Lookout Sandstone, and is mapped throughout the quadrangle. About 25 to 33 ft (8 to 10 m) above the Point Lookout Sandstone, the Menefee Cleary No. 2 coal bed was identified in three drill holes with a thickness of 2.5 ft (0.8 m). The Menefee Cleary No. 3 coal bed occurs in drill holes #3 - #7 (see plate 3) and occurs from 42 to 84 ft (13 to 26 m) above the Point Lookout Sandstone. These coal beds are inferred to be continuous although they may be several different beds that are stratigraphically equivalent.

Stratigraphically, the Menefee Cleary coal zone contains the highest coals in this quadrangle. The zone coals occur from 31 to 421 ft (9 to 128 m) above the Point Lookout Sandstone. These zone beds may be correlated for limited distances in portions of the area but they lack sufficient continuity

with poorly defined stratigraphic position and cannot be designated as persistent coal beds.

There are no published coal quality analyses for coal beds from the Hospah quadrangle. An analysis of a core sample of Cleary Coal Member beds taken anout 5.5 mi (8.8 km) west of the quadrangle has been reported by Shomaker, Beaumont, and Kottlowski (1971) and is shown in table 1. The Cleary Coal Member beds analyzed are probably similar in quality to the Cleary Coal Member beds in this quadrangle. Rank of the Cleary Coal Member seams is probably subbituminous A to high volatile C bituminous in this area.

Menefee Cleary coal zone

The Menfee Cleary coal zone was identified by Hunt's (1936) surface measurements and in oil and gas well logs. The zone coals are generally less than 3.0 ft (0.9 m) thick, lenticular, and correlative over very limited distances. The coal zone isopach map (plate 4) is based on the total zone coal thickness at each data point.

Interburden for each data point is the total rock thickness, excluding coal thicknesses, from the uppermost zone coal to the lowest Menfee Cleary zone coal identified. Partial interburden data occurs in the oil and gas well logs when a no record interval (surface casing or not logged interval) is present (see plate 6).

Menefee Cleary No. 3 coal bed

The Menefee Cleary No. 3 bed was identified in five drill hole logs with a maximum thickness of 11.5 ft (3.5 m) with a 6.5 ft (2.0 m) rock

parting. The procedure prescribed by the U. S. Geological Survey regarding rock partings in coal beds with 200 ft (61 m) or more of overburden is the rock parting must be thicker than one coal bench to discount the thinner bench from the total coal thickness. In this quadrangle, coal benches were deleted from drill holes #5, #6, and #7 (see plate 3). The Menefee Cleary No. 3 coal bed is not present south of the Tps. 17 and 18 N. boundary, and east of the Rs. 8 and 9 W. boundary, and is shown to pinch out. In sec. 36, T. 18 N., R. 9 W., the coal bed also pinches out (see plate 7).

Menefee Cleary No. 1 coal bed

The Menefee Cleary No. 1 bed was identified in all drill hole logs in this quadrangle, and attains a maximum thickness of 5.5 ft (1.7 m). Following U. S. Geological Survey guidelines, several coal benches were negated from drill holes #3, #4, #5, #6, #12, #13, #18, #19 and #24 (see plates 3 and 10). The Menefee Cleary No. 1 bed is not present in the southwestern corner of the quadrangle.

COAL RESOURCES

The U. S. Geological Survey requested resource evaluations of the Menefee Cleary No. 1 and No. 3 coal beds, where the beds are 3.0 ft (0.9 m) or more thick. The evaluation is restricted to Federal coal lands.

The following procedures were prescribed by the U. S. Geological Survey for the calculation of reserve base. Criteria established in U. S. Geological Survey Bulletin 1450-B were used to areally divide the bed into measured, indicated, and inferred reserve base categories. Reserve base was calculated

Table 1. - Analysis of a coal sample from the Cleary Coal Member of the Menefee Formation.

(Core sample from sec. 36, T. 17 N., R. 10 W.)

[Form of analysis: A, as received; B, moisture free; C, moisture and ash free]

from Shomaker, Beaumont, and Kottlowski, 1971

Form of analysis	Proximate analysis (percent)				Sulfur	Heating value (Btu/lb)
	Moisture	Volatile Matter	Fixed Carbon	Ash		
A	16.5	33.4	40.4	9.7	0.6	10,070
B	----	40.0	48.3	11.7	0.7	12,060
C	----	45.3	54.7	----	0.8	12,650

Remarks:

A moist, mineral-matter-free (MMMF) calculation using the Parr formula (American Society for Testing and Materials, 1973) yields a heating value of 11,256 Btu/lb (26,181 kJ/kg). The free-swelling index of the analysis shows the sample to be nonagglomerating.

for each category, by section, using data from the isopach and overburden maps (plates 10, 12, 13, and 15). The acreage in each category (measured by planimeter) multiplied by the average coal bed thickness and a bituminous coal conversion factor (1,800 tons of coal per acre-ft) yields the reserve base for that category. Due to the variability in quality over short distances of the San Juan Basin coals, most of the Menfee Formation coals range from subbituminous A to high volatile C bituminous in rank. The bituminous coal conversion factor was used for reserve base calculations because the authors believe, based on published coal quality analyses, that a bituminous coal conversion factor is appropriate for the majority of coals in the area.

Coal beds with 3.0 ft (0.9 m) minimum thickness are included in reserve base and reserve data rather than the 28 in. (71 cm) minimum thickness prescribed in U. S. Geological Survey Bulletin 1450-B. Reserve figures are derived from reserve base totals by applying recovery factors of 85 percent and 50 percent for coal beds 0 to 200 ft (0 to 61 m) and 200 to 3,000 ft (61 to 914 m) deep, respectively. All reserve base and reserve values are rounded to the nearest 10,000 short tons (9,072 t).

Total reserve base data for the Menefee Cleary No. 1 and No. 3 coal beds, which include all reserve base categories, are shown by section on plate 2. Reserve base and reserve data in the various categories are shown on plates 13 and 14.

The U. S. Geological Survey also requested a resource evaluation of the Menefee Cleary coal zone, where the total coal thickness is 5.0 ft (1.5 m) or greater. Total identified resources for the Menefee Cleary Coal zone in the Hospah quadrangle are 72.59 million short tons (65.85 million t).

COAL DEVELOPMENT POTENTIAL

The factors used to determine the development potential are the presence of a potentially coal-bearing formation, and the thickness and overburden of correlative coal beds. The U. S. Geological Survey supplied the criteria to evaluate the coal development potential for Federal lands in this quadrangle. These criteria are based on current industry practice, U. S. Geological Survey Bulletin 1450-B, and anticipated technological advances. All available data were utilized for the surface and subsurface coal development potential evaluations.

Any area underlain by a potentially coal-bearing formation with 200 ft (61 m) or less of overburden has potential for surface mining. The U. S. Geological Survey designated the 200 ft (61 m) maximum depth as the stripping limit. Areas where a potentially coal-bearing formation is overlain by more than 200 ft of overburden have no potential for surface mining. Areas with no correlative coal beds or a correlative coal bed less than 3.0 ft (0.9 m) in thickness and overlain by 200 ft (61 m) or less of overburden have unknown surface mining potential. Areas which have a correlative coal bed 3.0 ft (0.9 m) or more thick with surface mining potential are assigned a high, moderate or low development potential based on the mining ratio (cubic yards of overburden per short ton of recoverable coal). The formula used to calculate mining ratios is:

$$MR = \frac{t_o\ (C)}{t_c\ (Rf)}$$

Where MR = Mining ratio

t_o = Thickness of overburden in feet

t_c = Thickness of coal in feet

Rf = Recovery factor

C = Volume-weight conversion factor

(.896 yd^3/short ton for bituminous coal)

(.911 yd^3/short ton for subbituminous coal)

High, moderate, and low development potential areas have respective surface mining ratio values of 0 to 10, 10 to 15, and greater than 15.

Any area underlain by a potentially coal-bearing formation with 200 to 3,000 ft (61 to 914 m) of overburden has potential for subsurface mining. Areas where a potentially coal-bearing formation is overlain by more than 3,000 ft (914 m) of overburden have no subsurface mining potential. Development potential for subsurface mining is unknown where a potentially coal-bearing formation within 200 to 3,000 ft (61 to 914 m) of the surface contains no identified correlative coal bed or a correlative coal bed less than 3.0 ft (0.9 m) thick. High, moderate, and low development potential areas have respective overburden values of 200 to 1,000 ft (61 to 305 m), 1,000 to 2,000 ft (305 to 610 m), and 2,000 to 3,000 ft (610 to 914 m).

The no and unknown development potential boundaries for surface mining methods (plate 15) are defined at the contact of the coal-bearing Menefee Formation with the underlying noncoal-bearing Point Lookout Sandstone. These contacts are approximated due to the inaccuracies of adjusting old geologic maps to modern topographic bases.

Boundaries of coal development potential areas coincide with the boundaries of the smallest legal land subdivision (40 acres or lot). When a land subdivision contains areas with different development potentials, the potential shown on the map is that of the areally largest component area. When an area is underlain by more than one bed, the potential shown on the map is that of the bed with the highest potential.

Reserve base (in short tons) in the various development potential categories for surface and subsurface mining methods are shown in tables 2 and 3, respectively.

The coal development potential maps are subject to revision. Map boundary lines and reserve base values are based on coal resource occurrence map isopachs, overburden isopachs, and coal bed correlations that are interpretive and subject to change as additional coal information becomes available.

Development potential for surface mining methods

The coal development potential for surface mining methods in the Hospah quadrangle is shown on plate 15. Based on coal development criteria, all Federal coal lands have low, unknown or no surface mining potentials. Refer to table 4 for reserves and planimetered acreage, by section, for Federal coal lands with surface mining potential.

Development potential for subsurface mining methods and in situ gasification

The coal development potential for subsurface mining methods in the Hospah quadrangle is shown on plate 16. Based on coal development criteria,

all Federal coal lands have subsurface mining potentials of high or unknown. Refer to table 5 for reserves and planimetered acreage, by section, for Federal coal lands with subsurface mining potential.

In situ gasification of coal has not been done on a commercial scale in the United States and criteria for rating the development potential of this method are unknown.

Table 2. - Reserve base data (in short tons) for surface mining methods for Federal coal lands in the Hospah quadrangle, McKinley County, New Mexico.

[Development potentials are based on mining ratios (cubic yards of overburden/ton of underlying coal). To convert short tons to metric tonnes, multiply by 0.9072; to convert mining ratios in yds^3/ton coal to m^3/t, multiply by 0.842].

Coal Bed	High Development Potential (0-10 Mining Ratio)	Moderate Development Potential (10-15 Mining Ratio)	Low Development Potential (greater than 15 Mining Ratio)	Total
Menefee Cleary No. 3	----	----	410,000	410,000
Total	----	----	410,000	410,000

Table 3. - Reserve base data (in short tons) for subsurface mining methods for Federal coal lands in the Hospah quadrangle, McKinley County, New Mexico.

[Development potentials are based on thickness of overburden. To convert short tons to metric tonnes, multiply by 0.9072].

Coal Bed	High Development Potential (200'-1,000' overburden)	Moderate Development Potential (1,000'-2,000' overburden)	Low Development Potential (2,000'- 3,000' overburden)	Total
Menefee Cleary No. 3	5,180,000	----	----	5,180,000
Menefee Cleary No. 1	8,300,000	----	----	8,300,000
Total	13,480,000	----	----	13,480,000

Table 4. - Reserves and planimetered acreage, by section, for Federal coal lands in the Hospah quadrangle with surface mining potential.

[To convert acres to hectares, divide acres by 2.471; to convert short tons to metric tonnes, multiply short tons by 0.9072].

Potential category	Coal bed	Sec.	T.	N.	R.	W.	Acres (planimetered)	Reserves (in short tons)
Low	Menefee Cleary No. 3	6	16		8		55.2	350,000

Table 5. - Reserves and planimetered acreage, by section, for Federal coal lands in the Hospah quadrangle with subsurface mining potential.

[To convert acres to hectares, divide acres by 2.471; to convert short tons to metric tonnes, multiply short tons by 0.9072].

Potential category	Coal bed	Sec.	T. N.	R. W.	Acres (planimetered)	Reserves (in short tons)
High	Menefee Cleary No. 1	2	16	8	92.7	280,000
		4			21.3	60,000
		10			18.7	60,000
		4	17	8	34.9	90,000
		6			317.7	940,000
		18			130.7	370,000
		19			244.8	720,000
		30			36.9	100,000
		12	17	9	473.3	1,560,000
	Menefee Cleary No. 3	6	16	8	13.0	50,000
		4	17	8	1.5	less than 10,000
		6			5.0	10,000
		19			5.0	10,000
		30			250.8	1,010,000

SELECTED REFERENCES
(HOSPAH QUADRANGLE)

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coal bed--A stratified sequence of coal, composed of relatively homogeneous material, exhibiting some degree of lithologic unity and separated from the rocks above and below by physically rather well defined boundary planes.

coal bed separation line--A line on a map plate separating areas where different coal beds or zones are mapped.

coal bench--One of two or more divisions of a coal bed separated by rock.

coal conversion factor--A factor used to convert acre-feet of coal into short tons of coal; bituminous coal is 1800 tons/acre-ft; subbituminous coal is 1770 tons/acre-ft.

coal development potential--A subjective determination of the comparative potential of Federal coal lands for development of a commercially viable coal mining operation.

coal exploration license--An area of Federal coal lands in which the licensee is granted the right, after outlining the area and the probable methods of exploration, to investigate the coal resources. An exploration license has a term not to exceed 2 years and does not confer rights to a lease.

coal lease--An area of Federal coal lands in which the Federal Government has entered into a contractual agreement for development of the coal deposits.

coal split--A coal bed resulting from the occurrence of a noncoal parting within the parent coal bed which divides the single coal bed into two or more coal beds.

coal zone--A distinctive stratigraphic interval containing a sequence of alternating coal and noncoal layers in which the coal beds may so lack lateral persistence that correlating individual beds in the zone is not feasible.

Federal coal land--Land for which the Federal Government holds title to the coal mineral rights, without regard to surface ownership.

hypothetical resources--Undiscovered coal resources in beds that may reasonably be expected to exist in known mining districts under known geologic conditions. In general, hypothetical resources are in broad areas of coal fields where points of observation are absent and evidence is from distant outcrops, drill holes or wells. Exploration that confirms their presence and reveals quantity and quality will permit their reclassification as a Reserve or Identified Subeconomic Resource.

identified resources--Specific bodies of coal whose location, rank, quality, and quantity are known from geologic evidence supported by engineering measurements.

indicated--Coal for which estimates for the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections.

inferred--Coal in unexplored extensions of demonstrated resources for which estimates of the quality and quantity are based on geologic evidence and projections.

isopach--A line joining points of equal bed thickness.

Known Recoverable Coal Resource Area (KRCRA)--Formerly called Known Coal Leasing Area (KCLA). Area in which the Federal coal land is classified (1) as subject to the coal leasing provisions of the Mineral Leasing Act of 1920, as amended, and (2) by virtue of the available data being sufficient to permit evaluation as to extent, location, and potential for developing commercial quantities of coal.

measured--Coal for which estimates for rank, quality, and quantity can be computed, within a margin of error of less than 20 percent, from sample analyses and measurements from closely spaced and geologically well known sample sites.

mining ratio--A numerical ratio equating the in-place volumes, in cubic yards, of rocks that must be removed in order to recover 1 short ton of coal by surface mining.

overburden--A stratigraphic interval (composed of noncoal beds and coal beds) lying between the ground surface and the top of a coal bed. For coal zones, overburden is the stratigraphic interval lying between the ground surface and the structural datum used to map the zone.

parting--A noncoal layer occurring along a bedding plane within a coal bed.

Preference Right Lease Application (PRLA)--An area of Federal coal lands for which an application for a noncompetitive coal lease has been made as a result of exploration done under a coal prospecting permit. PRLA's are no longer obtainable.

quality or grade--Refers to measurements such as heat value; fixed carbon; moisture; ash; sulfur; phosphorus; major, minor, and trace elements; coking properties; petrologic properties; and particular organic constituents.

rank--The classification of coal relative to other coals, according to degree of metamorphism, or progressive alteration, in the natural series from lignite to anthracite (Classification of coals by rank, 1973, American Society for Testing and Materials, ASTM Designation D-388-66).

recovery factor--The percentage of total tons of coal estimated to be recoverable from a given area in relation to the total tonnage estimated to be in the Reserve Base in the ground.

reserve--That part of identified coal resource that can be economically mined at the time of determination. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the reserve base.

reserve base--That part of identified coal resource from which Reserves are calculated.

stripping limit--A vertical depth, in feet, measured from the surface, reflecting the probable maximum, practical depth to which surface mining may be technologically feasible in the forseeable future. The rock interval, expressed in feet, above the stripping limit is the "strippable interval."

structure contour--A line joining points of equal elevation on a stratum or bed.