

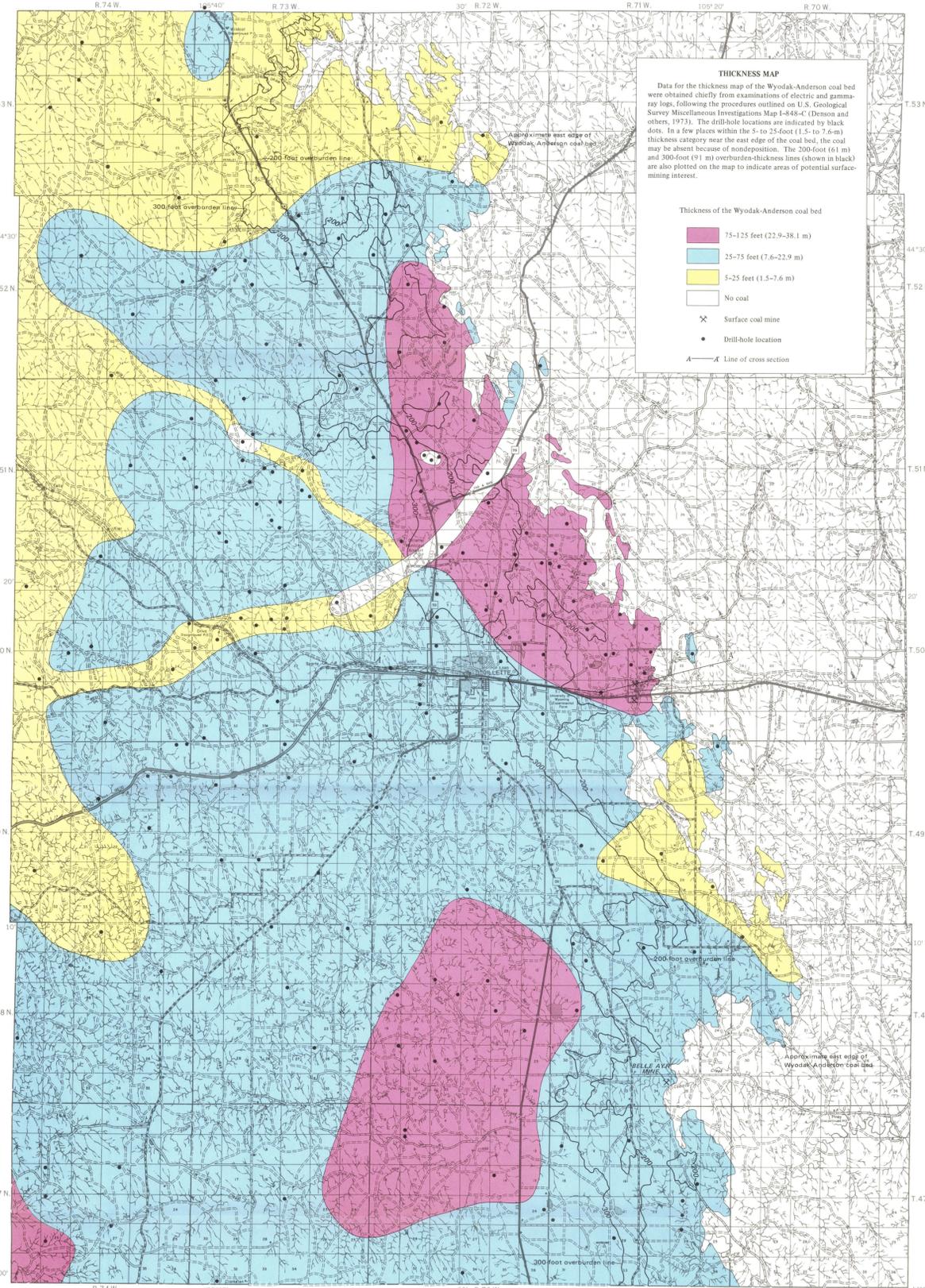
STRUCTURE CONTOUR MAP  
DRAWN ON BASE OF COAL BED

Base from Wyoming State Highway Commission, 1956,  
with main highway system updated to 1969

**STRUCTURE CONTOUR MAP**

A structure contour map illustrates the position and configuration of a given rock layer beneath the ground surface. The contour lines connect points of equal elevation on a given surface, and contour-elevation values are generally given in feet above (or below) sea level—in essence, the lines show the "topography" of the top or the base of the selected rock layer. On this map, the structure contours are drawn through points of equal elevation on the base of the Wyodak-Anderson coal bed. These lines readily show the general westward inclination (decrease in elevation) of the coal bed throughout much of the Gillette area. Hatched structure contours enclose depressions or low areas of the contoured surface. The data used to prepare the structure contours were derived chiefly from holes drilled for oil and gas; the locations of which are shown by black dots on the map. The positioning of the structure contours is further illustrated on the cross section, where the points of intersection of the base of the Wyodak-Anderson coal bed with the 4,000-, 4,200-, and 4,400-foot elevations (above sea level) are plotted. The line of the cross section is labeled A-A' on the map.

A principal use of the information shown on the structure contour map is in determining the depths involved in mining the Wyodak-Anderson coal at any given place within the mapped area. For this purpose, topographic contour maps showing ground surface elevations are also required. The difference between the surface elevations (as shown on a topographic map) and the elevation of the base of the coal at a given locality (as shown on this map) is, of course, a direct measure of the total depth of mining at that place. Subtracting from this figure the thickness of the coal at the same locality (as shown on the thickness map) gives a direct measure of the amount of overburden that would have to be removed in surface-mining operations. The small index map provides the name of, and the area covered by, various 7½-minute topographic quadrangle maps within the Gillette area at a scale of 1:24,000 (1 inch equals 2,000 feet or 1 cm equals 240 m).



THICKNESS MAP OF COAL BED

**THICKNESS MAP**

Data for the thickness map of the Wyodak-Anderson coal bed were obtained chiefly from examinations of electric and gamma-ray logs, following the procedures outlined on U.S. Geological Survey Miscellaneous Investigations Map I-848-C (Denson and Keefer, 1973). The drill-hole locations are indicated by black dots. In a few places within the 5- to 25-foot (1.5- to 7.6-m) thickness category near the east edge of the coal bed, the coal may be absent because of nondeposition. The 200-foot (61 m) and 300-foot (91 m) overburden-thickness lines (shown in black) are also plotted on the map to indicate areas of potential surface-mining interest.

**Thickness of the Wyodak-Anderson coal bed**

- 75-125 feet (22.9-38.1 m)
- 25-75 feet (7.6-22.9 m)
- 5-25 feet (1.5-7.6 m)
- No coal

X Surface coal mine  
 • Drill-hole location  
 A—A' Line of cross section

**THE WYODAK-ANDERSON COAL BED, GILLETTE AREA**

The Wyodak-Anderson coal bed<sup>1</sup> in the Powder River Basin is one of the world's largest known coal deposits. It occurs as a single bed, or in a group of closely spaced beds separated by thin partings of noncoaly rocks. Thicknesses range from 5 feet (1.5 m), or perhaps less in very limited areas, to nearly 125 feet (38 m) (see thickness map). The coal underlies about 800 square miles (2,070 sq km) of the area shown on the map, as well as large areas to the north, south, and west.

The Gillette area lies along the east margin of the Powder River Basin, where the rock layers are inclined westward toward the basin interior. The westward inclination is slight, however, averaging only about 45 feet per mile (8.5 m per km), with the result that the Wyodak-Anderson coal bed remains close to the ground surface over extensive areas (see structure contour map and cross section). The coal, for example, lies at depths of 200 feet (61 m) or less over approximately 15,000 acres of the Gillette area (east of the 200-foot overburden line shown on the thickness map), and at depths ranging from 200 to 300 feet (61 to 91 m) over an additional 39,000 acres. Because some of the thickest parts of the deposit also occur at these shallower depths, the Wyodak-Anderson coal bed is a prime target for large-scale development in the coming years. At present, coal from the Wyodak-Anderson bed is being surface-mined at two localities in the Gillette area: (1) The Wyodak mine, 4.5 miles (7.2 km) east of Gillette, where the bed is about 90 feet (27.4 m) thick beneath approximately 50 feet (15.2 m) of overburden, and (2) the Belle Ayr mine, 1.5 miles (2.4 km) southeast of Gillette, where the bed is about 70 feet (21.3 m) thick beneath only a few feet of overburden in the initial mining cut.

The east edge of the Wyodak-Anderson coal deposit, as shown on the maps, is marked either by coal outcrops or by clinker deposits; very locally, however, both coal and clinker may be entirely absent. Here and there coal is present in nearby hills and buttes that lie east of the main coal area. Extensive burning of coal beds, triggered by natural causes chiefly during prehistoric times, has been a common occurrence in the Gillette area. Clinker, which is easily recognized by its conspicuous red and purple colors, represents the hard-baked materials from rocks directly above the burned coal, as well as the residue of noncombustible materials within the coal itself. The clinker deposits associated with the Wyodak-Anderson bed are especially prominent because of the substantial thickness of coal that was involved, and in many places they mantle hills and slopes that stretch several miles east of the present limit of the coal. The relation between coal and clinker is shown on the cross section.

Available data indicate that the Wyodak-Anderson coal bed was either partially or entirely removed by erosion along an ancient stream channel extending from T. 50 N., R. 74 W., eastward and northeastward to the northeast corner of T. 51 N., R. 72 W., a distance of about 19 miles (30.6 km). A similar, though smaller feature appears to cut northwestward across T. 51 N., R. 73 W. During the period of earth history extending from about 55 to 50 million years ago, in which the coal bed and the directly overlying rocks were deposited, the region was laced by many streams, some of which must have been of substantial size. Somewhat later, the channels of these streams became filled with sand, gravel, and silt. Interpretations of the rocks encountered in three drill holes in secs. 16 and 17, T. 51 N., R. 72 W., suggest that the Wyodak-Anderson coal is also absent in that limited area. Other places, in which little or no Wyodak-Anderson coal is now present, may be found as more drill data become available.

Within the area shown on the accompanying maps, the Wyodak-Anderson coal deposit is estimated, on the basis of geologic and drill-hole information, to contain 41 billion tons of coal.<sup>2</sup> The part that lies within 200 feet (61 m) of the ground surface (approximately 75,000 acres, see thickness map) contains an estimated 7 billion tons<sup>3</sup> of the above figure. The coal is subbituminous in rank, and available analyses indicate that its sulfur content averages less than 1 percent, ash content averages 6.3 percent, and heat value averages 8,900 British Thermal Units per pound (Glass, 1972; V. E. Swanson, oral commun., 1973).

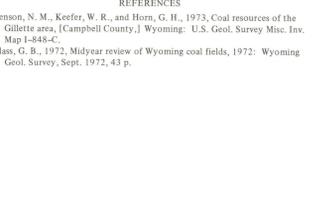
<sup>1</sup> For purposes of this report, the Wyodak and Anderson coal beds are considered to form a single, continuous coal unit, although, as described in a 1973 report, the Wyodak bed may split westward into both the Anderson and Canyon beds (Denson and Keefer, 1973). Previously, the name Wyodak (or, the D bed) has been used in areas generally east and south of Gillette, and the name Anderson has been used generally in areas north of Gillette.

<sup>2</sup> Such estimates of tonnage are a combination of measured and indicated resources. These are resources for which tonnage is computed from closely spaced measurements in surface exposures and from detailed coal bed correlations based on records from more widely spaced drill holes.

**REFERENCES**

Denson, N. M., Keefer, W. R., and Horn, G. H., 1973, Coal resources of the Gillette area, [Campbell County,] Wyoming: U.S. Geol. Survey Misc. Inv. Map I-848-C.

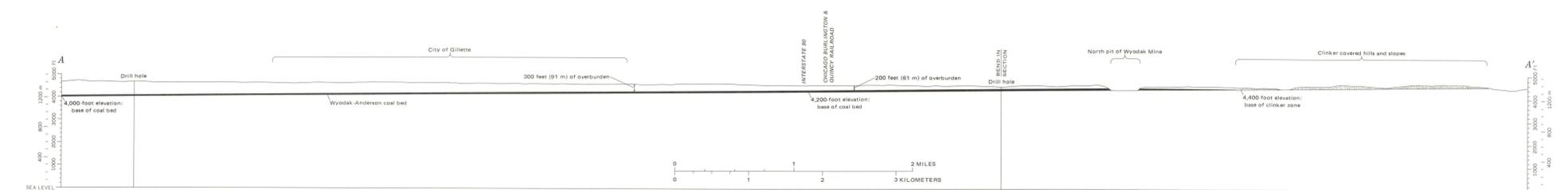
Glass, G. B., 1972, Midyear review of Wyoming coal fields, 1972: Wyoming Geol. Survey, Sept. 1972, 43 p.



**INDEX TO 7½-MINUTE TOPOGRAPHIC QUADRANGLE MAPS IN THE GILLETTE AREA, WYOMING**

Quadrangle names which appear in parentheses are preliminary administrative names and apply only to the presently available advance-print edition of the maps. These maps will be superseded by regular-edition maps using the first-shown name.

A—Tomlin Draw (Croton 3 SE)	P—Gillette East
B—Wildcat	Q—Fortin Draw
C—Calf Creek	R—Rozett
D—Wetson SW (Bertha 3 SW)	S—Scott Dam
E—Lone Tree Creek (Bertha 3 SE)	T—J Ranch
F—Adon (Bertha 4 SW)	U—Appel Butte
G—Twenty-mile Butte (Echeta 2 NE)	V—The Gap
H—Townsend Spring	W—Coyote Draw
I—Rawhide School	X—Coon Track Creek
J—Moyer Springs	Y—Double Tanks
K—Green Hill	Z—Pisanandale
L—Rosen NW	AA—Scopus Reservoir
M—Jeffers Draw (Echeta 2 SE)	BB—The Gap SW
N—Orin	CC—Kicken Creek
O—Gillette West	DD—Whitetail Creek



CROSS SECTION SHOWING POSITION OF WYODAK-ANDERSON COAL BED IN RELATION TO SEA LEVEL AND TO THE GROUND SURFACE

**MAP OF THE WYODAK-ANDERSON COAL BED IN THE GILLETTE AREA, CAMPBELL COUNTY, WYOMING**

By  
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