



### DESCRIPTION OF MAP UNITS

**Qal** Alluvium (Holocene and Pleistocene)—Unconsolidated stratified deposits of silt, sand, and gravel along major drainages; includes coarse unsorted flood deposits in Dry Wash, Paradise Canyon, and Escalante Canyon. Thickness 5-50 feet.

**Qls** Landslide deposits (Holocene and Pleistocene)—Unstratified deposits of gravel, sand, and mud; includes large sandstone blocks of Straight Cliffs and Wahweap Formations and rubble that has moved down steep slopes as landslide material and talus. Thickness 5-75 feet.

**Qst** Tufa deposits (Holocene and Pleistocene)—Calcareous tufa, very porous, contains plant impressions in the northern part of Paradise Bench. Thickness 10-20 feet.

**Kk** Kaiparowits Formation (Upper Cretaceous)—Sandstone, greenish gray to brownish gray, very fine grained, friable, some thin mudstone. Only lower 200 feet exposed in quadrangle.

**Kkw** Wahweap Formation (Upper Cretaceous)

**Kwl** Upper part—Massive, light-gray, cliff-forming sandstone, fine to coarse grained, crossbedded. Contains pebble conglomerate lenses; some gray mudstone interbeds in upper 100 feet, grades into Kaiparowits Formation (Kk). Thickness 100-300 feet.

**Kadt** Lower part—Light-brown, fine to medium-grained sandstone and interbedded olive-gray mudstone; sandstone very lenticular and crossbedded. Base is conformable with Drip Tank Member of the Straight Cliffs Formation (Upper Cretaceous).

**Kksh** Drip Tank Member—Grayish-orange to light-gray, medium- to coarse-grained, crossbedded sandstone. Generally of fluvial origin, but base may be reworked marine or beach sand. Thickness 150-250 feet.

**Kksc** John Henry Member—Pale-yellowish-orange, fine-grained, marine or beach sandstone interbedded with fluvial sandstone, mudstone, carbonaceous shale, and coal. Marine sandstone occurs only in eastern part of quadrangle. Coal resources are in Alvey, Rees, and Christensen coal zones and make up 12 percent of the member. Thickness 600-700 feet.

**Kt** Smoky Hollow Member—Shown on cross section only. Mottled white to grayish-orange, coarse-grained to conglomeratic, massive sandstone; crossbedded at top (Calico bed). Lower part, interbedded gray mudstone, carbonaceous shale, and thin lenticular coal beds. Some bentonite beds replace carbonaceous shale near base and middle part of member. Thickness 120-150 feet.

**Kd** Tibet Canyon Member—Shown on cross section only. Grayish-yellow, fine-grained sandstone; marginal marine, intertongues with Tropic Shale (Kt). Thickness 80-100 feet.

**Kd** Tropic Shale (Upper Cretaceous)—Shown on cross section only. Olive-gray marine shale, a few thin grayish-orange, fine-grained sandstone beds in upper part. Thickness 600-700 feet.

**Kd** Dakota Formation (Upper Cretaceous)—Shown on cross section only. Sandstone, grayish orange, interbedded with light-olive gray shale in upper half. Coal beds may be present near middle of formation. Brownish-black carbonaceous mudstone and some beds of grayish-orange sandstone in lower half. Thickness 100-200 feet.

**Coal bed**—Dashed where approximately located. Thickness of coal, in feet, measured at triangle (multiple numbers indicate thicknesses of individual beds). Number in circle keyed to measured coal section.

**Burned coal bed**—Approximately located.

**Contract**—Approximately located.

**Structure contours**—Drawn on top of Alvey coal zone of John Henry Member of Straight Cliffs Formation from subsurface and projected surface control. Approximately located; dashed where projected over land surface. Contour interval 100 feet.

### ECONOMIC GEOLOGY

The Petes Cove quadrangle, Utah, was mapped as part of the U.S. Geological Survey program of classifying and evaluating mineral lands in the public domain. Coal is the main resource of economic interest. Approximately 77 percent of the quadrangle is covered by Federal coal leases, 9.5 percent covered by State of Utah coal leases, and 13.5 is not leased. The entire quadrangle is in the Kaiparowits Plateau Known Recoverable Coal Resource Area (KRCRA). The quadrangle was mapped by Doelling and Graham (1972, p. 213-217) and their report contains pertinent detailed geographic and stratigraphic descriptions. New coal and structural information that was not available to them has been incorporated in this report.

The north edge of the Petes Cove quadrangle is about 24 miles south of Escalante, Utah, in the central part of the Kaiparowits Plateau and can be reached by vehicle from the Alvey Wash-Big Sage road south of Escalante. The south border of the quadrangle is 35 miles northeast of Glen Canyon City on U.S. Highway 89. The quadrangle is highly dissected and eroded by deep canyons. The only relatively flat areas are along the north and east margins at Big Sage, Window Sash Bench, and Dry Bench. The central area, which contains the thickest coaly intervals, is extremely rugged and relief between canyon floors and ridge tops is 1,000 feet or more. The Escalante Canyon, Paradise Canyon, and Dry Wash trend southward into Last Chance and Lake Powell. In the northeastern part of the quadrangle, Upper Tropic Canyon and Horse Canyon drain eastward into Left Hand Collet Canyon and ultimately into the Escalante River and Lake Powell.

The quadrangle contains a large amount of coal which was extensively drilled and sampled; some data in this report is from the El Paso Coal Company and the Peabody Coal Company. No detailed resource calculations were attempted because of the lenticular nature of the coal beds, a lack of information on coal quality, and the proprietary nature of the drilling data. However, my estimate of the coal resources in beds greater than 4 feet thick is 3.5 billion tons.

The Alvey, Rees, and Christensen coal zones are all present in drill hole no. 20; this drill hole is typical of much of the coal in the quadrangle. In much of the quadrangle total coal thickness, for as many as 8 to 12 beds, is more than 100 feet.

Individual coal beds are generally lenticular and grade laterally into carbonaceous shale and mudstone. During peat deposition, the marine shoreline trended about N. 20° W. in the general region and field observations indicate that all coal zones are more persistent parallel to this direction. At right angles to this line, coal zones tend to split and interfinger with carbonaceous shale, mudstone, and sandstone. Coal beds 1 foot or more thick are indicated on the geologic map and are shown in the coal sections. Only the thicker beds can be correlated for any significant distance from a measured section. In general, the coal bed symbol on the map represents a single bed, but on steep cliff faces it may include as many as 3 coal beds (see measured sections 5, 11, and 18).

No official information on coal quality is available in the quadrangle, however, an analysis of coal from the Christensen coal zone about 15 miles to the north at the abandoned Don Shurtz mine produced the following results on an air-dried basis (Gregory and Moore, 1931, p. 153): 12.20 percent moisture, 29.35 percent volatile matter, 40.20 percent fixed carbon, 4.25 percent ash, 0.82 percent sulfur, and a heating value of 11,108 Btu/lb. Coal from the Alvey, Rees, and Christensen coal zones taken from a core hole drilled by the U.S. Geological Survey about 8 miles northwest of the quadrangle on Mossy Dell ridge had an average (as-received) analysis of 20 percent moisture, 34 percent volatile matter, 38 percent fixed carbon, 7 percent ash, 0.80 percent sulfur, and a heating value of 9,660 Btu/lb. (Zeller, 1979). The average heating value for moist, mineral-free Btu was calculated according to the American Society for Testing and Materials (Part Formula) (Wood and others, 1983, p. 29) and is 10,400 Btu/lb. All coal sampled in the Kaiparowits Plateau coal field is nonagglomerating.

### REFERENCES

Doelling, H. H., and Graham, R. L., 1972, Southwestern Utah coal fields—Alton, Kaiparowits, and Kolob-Harmony. Utah Geologic and Mineralogical Survey Monograph Series 1, 333 p.

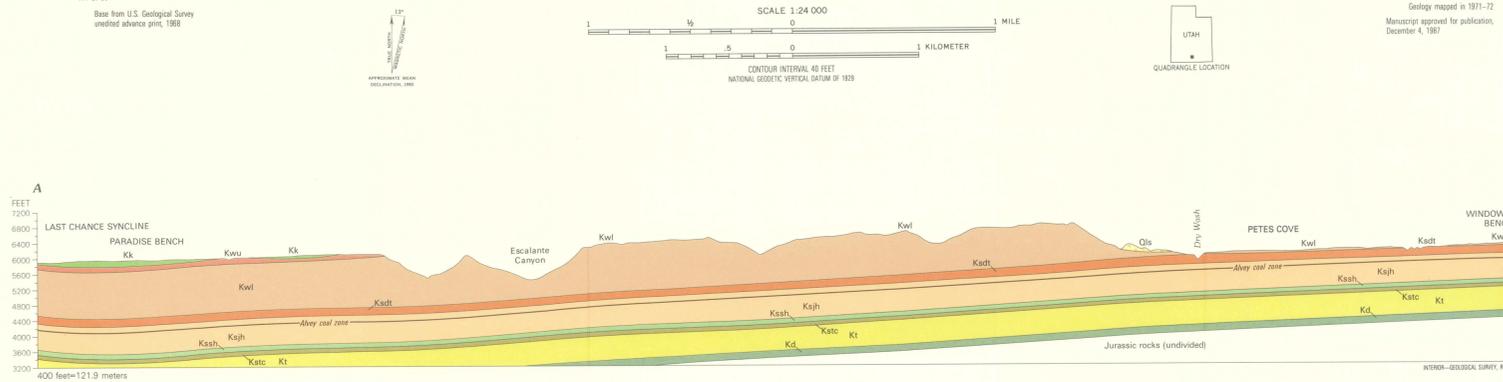
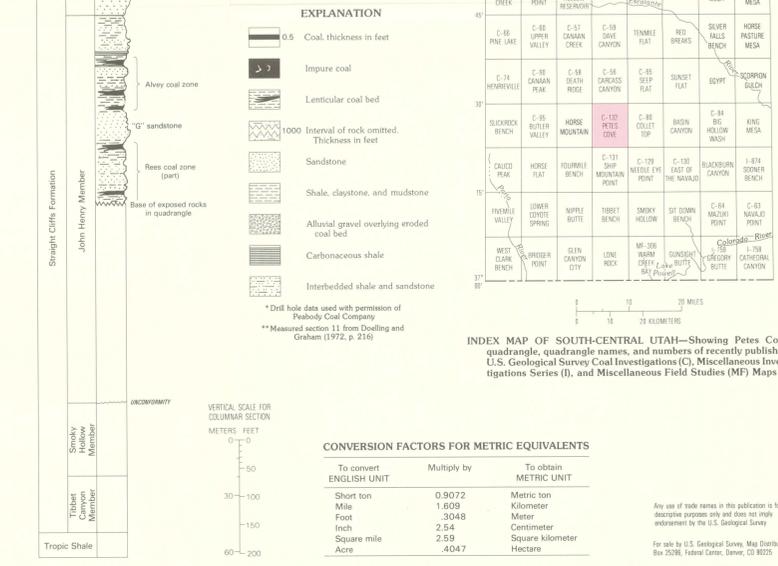
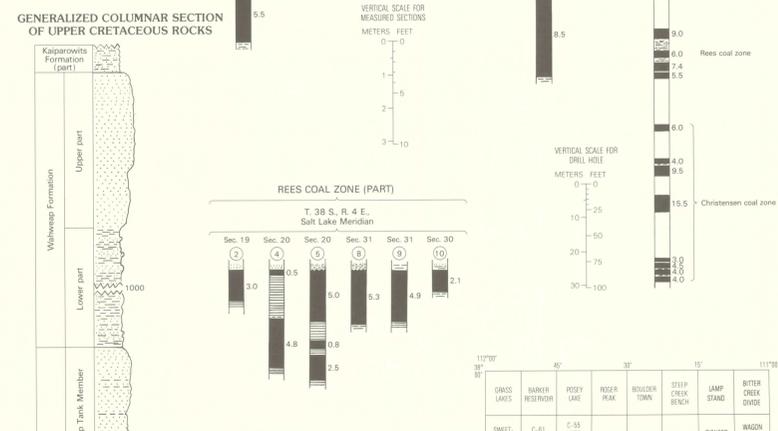
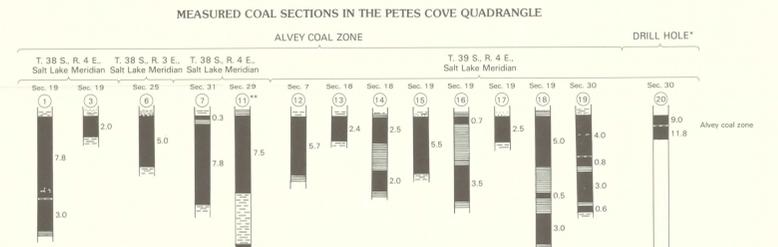
Gregory, H. E., and Moore, R. C., 1931, The Kaiparowits region, a geographic and geologic reconnaissance of parts of Utah and Arizona. U.S. Geological Survey Professional Paper 164, 161 p.

Wood, G. H., Jr., Kohn, T. M., Carter, M. D., and Culbertson, W. C., 1983, Coal resource classification system of the U.S. Geological Survey. U.S. Geological Survey Circular 891, 65 p.

Zeller, H. D., 1973, Geologic map and coal resources of the Carcass Canyon quadrangle, Garfield and Kane Counties, Utah. U.S. Geological Survey Coal Investigations Map C-56, scale 1:24,000.

1978, Composite geophysical and lithologic logs and coal analyses for the core-hole drilling in the Kaiparowits coal field, Garfield County, Utah. U.S. Geological Survey Open-File Report 79-1529, 12 p.

1979, Composite geophysical and lithologic logs and coal analyses for the core-hole drilling in the Kaiparowits coal field, Garfield County, Utah. U.S. Geological Survey Open-File Report 79-1529, 12 p.



## GEOLOGIC MAP AND COAL STRATIGRAPHY OF THE PETES COVE QUADRANGLE, KANE COUNTY, UTAH

By  
H. D. Zeller  
1990

Any use of trade names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.