



**DESCRIPTION OF MAP UNITS**

**CLAY-RICH SOILS, RESIDUAL, AND ALLUVIUM, WITH MINOR AMOUNTS OF SILT AND SAND**—This unit is generalized from the reconnaissance soil survey in Campbell County (Glassey and others, 1955) and consists of 13 of the described 39 map units. The 13 map units taken from Glassey and others (1955) include the following: the Arvada clay, clay loam, and loam; the Laurel clay loam; the Marvel-Melrose silty clay loam; the McKenzie clay; the Orman clay; the Pierre clay; the Reno Hill clay, clay loam, and clay loam rolling hill phase; and the Reno Hill loam, and loam rolling hill phase.

**SANDY SURFICIAL DEPOSITS AND BEDROCK, UNDIFFERENTIATED**—Includes sandstone, conglomerate, coal, chert, limestone, and dolomite.

**SWELLING-CLAY SOILS AND ROCKS**—Chiefly bentonite in marine black shale. Sodium-montmorillonite is the common clay mineral. Contacts approximately located, adapted from geologic map of the northern and western flanks of the Black Hills uplift (Robinson and others 1964, p. 1).

**CONTACT**—Approximately located between gradational units.

**STREAM-SEDIMENT SAMPLE LOCALITY**—The gross mineralogy of four samples of stream sediments and semiquantitative measurements of the clay minerals in two of these samples have been determined by X-ray methods (J. M. McNeil, written commun., 1979) and the percentages are shown here:

Sample No.	Quartz	Clay	Plagioclase	Microcline	Calcite	Dolomite
JM55	47.8	44.4	1.2	4.6	3.8	0.6
JM57	61.4	28.5	1.6	8.5	0	0
JM59	62.8	22.4	1.1	8.4	6.5	8
JM61	45.1	28.1	1.7	2.6	8.7	2.8

Clay minerals in sample JM55 consist in volume percent of the following: calcium montmorillonite, 75; illite, 20; and small amounts of kaolinite and mixed-layer clays. Clay minerals in sample JM57 consist in volume percent of the following: illite, 55; calcium montmorillonite, 40; a moderate amount of kaolinite; a small amount of chlorite; and no mixed-layer clay.

**DRILL HOLES IN THE RECLUSE-WHITE TAIL BUTTE AREA**—Geotechnical properties of cores from these holes in the Paleocene Fort Union Formation (RM holes and 76 holes) have been determined (McGregor and Odum, 1979; Odum and Sebesta, 1979). Methane has been detected in all the RM and 76 holes and in many shallow holes drilled for water (Hobbs, 1978). The concentration of methane in some drill holes was great enough to be considered a hazard.

**SHALLOW GAS WELL**—Taken from Olive (1957).

**COAL-MINE FIRE**—Three fires reported burning in 1949 are in the north-western part of the area (Olive 1957, p. 25). One fire in the south-central part forced the closing of the Black Diamond mine (R. E. Gidroy, Deputy State Mine Inspector, written commun., 1946).

**FLOOD-PRONE AREA**

**DISCUSSION**

There are geotechnical properties of the clay-rich rocks and soils that would adversely affect the construction of roads and open-pit mines, and influence reclamation of overburden and mine dumps for agricultural use; these include low permeability, high potential for shrink and swell, and weakness, especially when wet. Repeated wetting and drying frequently tend to increase the plastic properties of clay materials, particularly those composed of illite, chlorite, and kaolinite (Crain, 1962, p. 217). Measurements of Atterberg limits on cores from the White Tail Butte area show that the rocks with the highest plasticity indices are carbonaceous shale and sandstone with lenses of shale, siltstone, and numerous plant fragments (Odum and Sebesta, 1979, p. 20-21). The sandy rocks and soils are more permeable and stronger than the clay-rich materials. Although they are more resistant to compaction, erosion, and excavation, they are chiefly fine grained and weakly cemented. Tests by Schmidt hammer and point load (Aulmuth, 1974) on drill cores from the Recluse area show that the rocks are not much stronger than some soils (McGregor and Odum, 1979, p. 4).

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**ENGINEERING GEOLOGIC MAP OF THE RECLUSE 1/2° X 1° QUADRANGLE, CAMPBELL AND CROOK COUNTIES, WYOMING**

By  
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