



DESCRIPTION OF MAP UNITS
(Unit symbols queried where identification uncertain)

Qal ALLUVIUM (HOLOCENE)—Light-brown and gray gravel, sand, silt, and clay as much as 12 m (40 ft) thick under flood plain of Powder River; thickness along tributary streams generally less than 3 m (10 ft) but locally as much as 7.5 m (25 ft). Deposits consist of channel and flood-plain alluvium, well to poorly stratified and moderately well sorted. Areas subject to occasional flooding.

Qaf ALLUVIAL-FAN DEPOSITS (HOLOCENE)—Fan-shaped deposits of sand and gravel at base of scarps. Poorly to well stratified. Possibly as much as 6 m (20 ft) thick at apex, thinning to feather edge at borders. Unit interfingers with alluvium and colluvium (Qac). Deposits form simple and coalescing fans.

Qls LANDSLIDE DEPOSITS (HOLOCENE)—Slumps, rockfalls, and earthflows which vary from stable to unstable. Color, texture, and lithology reflect that of parent rock. Particle size ranges from clay to blocks of sandstone and clinker as much as 3 m (10 ft) in diameter near outcrops.

Qac ALLUVIUM AND COLLUVIUM (HOLOCENE AND PLEISTOCENE?)—Brown to gray, poorly stratified to nonstratified gravel, sand, silt, and clay deposited by sheetwash and gravity processes on slopes. Color and texture of colluvium reflect parent rock. May include and interfinger with alluvium (Qal). Includes small alluvial fans. Thickness probably as much as 10 m (33 ft), but generally not more than 5 m (16 ft). May include windblown granules, sand, silt, and clay.

Qat ALLUVIAL-TERRACE DEPOSITS (HOLOCENE AND PLEISTOCENE?)—Light-gray to light-brown, stratified and sorted sand and gravel present at various elevations above Powder River. Includes deposits slightly higher than present flood plain and subject to occasional flooding, but excluded from alluvium and colluvium, and also higher and older deposits of similar lithology. Locally may include alluvial-fan deposits. Local veneer of eolian sand, silt, and clay generally less than 1 m (3 ft) thick. Thickness as much as 6 m (20 ft) but generally less than 3 m (10 ft).

Qe EOLIUM (PLEISTOCENE)—Light-brown to light-gray, nonstratified to crudely stratified deposits of windblown sand, silt, granules, and clay, present mainly as veneer less than 3 m (10 ft) thick. May include some Holocene material.

Qg SAND AND GRAVEL DEPOSITS, UNDIVIDED (PLEISTOCENE)—Light-brown and light-gray, crudely to well-stratified, locally crossbedded sand and gravel capping flat-topped ridges and spurs. Proportion of sand to gravel varies widely, but appears to average 90 percent sand and 10 percent gravel. Gravel is of two types: (1) Round to subangular, mainly subspherical clasts, generally less than 12 cm (5 in.) in diameter; clasts are metamorphic rocks, igneous rocks, and clinker and less commonly sedimentary rocks; present in northeastern and northwestern parts of quadrangle underlying extensive, partially dissected surfaces of what were low-gradient, ancient alluvial fans; maximum thickness may be as much as 18 m (60 ft). (2) Subangular to subround, generally poorly sorted, generally less than 20 cm (8 in.) and mostly less than 12 cm (5 in.) in diameter; clasts are almost entirely clinker, sandstone, and siltstone derived from local source rocks; locally, blocks of clinker are as much as 75 cm (2.5 ft) in diameter; second type of gravel present in northwestern part of quadrangle, where it is probably less than 6 m (20 ft) thick.

CLINKER (HOLOCENE AND PLEISTOCENE)—Resistant, metamorphosed red, orange, gray, and black shale, sandstone, and siltstone that were baked and (or) fused by burning of an underlying coal bed; known locally as "scoria". Basal coal ash locally exposed. Unit formed when coal in all three members of Fort Union Formation was burned. Maximum thickness about 30 m (100 ft) within Tongue River Member (Tftr).

Tftr Tongue River Member—Light-yellow, yellowish-gray, and light-brown sandstone, interbedded with lesser amounts of siltstone, gray to brown shale and carbonaceous shale, light-colored clay, thin beds of limestone and of calcareous shale and siltstone, and thick to thin coal beds. Sandstone, tabular to lenticular, arkosic, friable, fine grained, moderately well sorted, thinly to thickly bedded; locally crossbedded and ripple marked. Plant and freshwater invertebrate fossils common in some beds. The thick Domesy coal zone or bed (bed E) of Collier and Smith (1909), base of which is about 60 m (200 ft) above base of member, is locally burned and overlain by clinker. One or more lower coal beds, partly burned in places, present 27-37 m (90-120 ft) above base of member. Highest exposures of clinker, about 94 m (310 ft) above base near west-central border of quadrangle, may represent burned coal bed F of Collier and Smith (1909). Lower contact is sharp to gradational within vertical interval as much as 18 m (60 ft) thick, and placed at base of dominantly light colored sequence of interbedded sandstone and claystone. Maximum exposed thickness about 94 m (310 ft).

Tfl Lebo Member—Dark- to light-gray shale and claystone, locally carbonaceous; lenticular to tabular, locally calcareous beds of yellow, brown, and gray, locally ledge forming, in part crossbedded sandstone; gray siltstone; lenticular coal beds and zones, commonly impure and shaly; and thin local lenses and stringers of concretionary ironstone. Matrix of some sandstones and finer grained rocks contains abundant swelling clays, mainly smectite. Plant fossils common in some beds. Typically forms badland topography. Weaver coal bed (bed D) of Collier and Smith (1909) is generally well exposed about 27-34 m (90-110 ft) above base of member, and locally burned and overlain by clinker; thin, locally burned coal beds also present about 15-21 m (50-70 ft) above base; coal, also locally burned, is commonly present in lowest 9 m (30 ft) and probably represents upper interbeds of Laney coal bed (bed C) of Collier and Smith (1909), as used by Thom and Dobbin (1924, p. 494). Clinker developed on coal beds of Lebo Member generally less than 6 m (20 ft) thick. In northwestern part of quadrangle, Laney coal bed commonly is in upper part of a sequence of mainly smectitic dark-greenish-gray shale. Thickness of member about 55-73 m (180-240 ft).

Tff Tullock Member—Lithologically similar to overlying unit but strata less lenticular and contain greater proportion of brown and yellow, generally clayey sandstone. Badland topography less developed than on Lebo Member. In northwestern part of quadrangle, top 9 m (30 ft) consists mainly of bench-forming, dark-greenish-gray smectitic clay shale. Unit contains several thin, discontinuous coal beds, locally burned and overlain by clinker. Steeply to vertically walled, trough cross-stratified channel sandstones (cs) present and locally well exposed in southeastern part of quadrangle; unconformably incised into the Tullock sequence about 40 m (130 ft) below member top. Base of member not exposed. Maximum exposed thickness about 52 m (170 ft).

CONTACT—Dashed where uncertain or inferred

SCARP—Tick marks on downward side

W WATER

X GRAVEL PIT

REFERENCES CITED

Collier, A. J., and Smith, C. D., 1909, The Miles City coal field, Montana: U.S. Geological Survey Bulletin 341-A, p. 36-61.

Thom, W. T., Jr., and Dobbin, C. E., 1924, Stratigraphy of Cretaceous-Eocene transition beds in eastern Montana and the Dakotas: Geological Society of America Bulletin, v. 35, p. 481-506.

PHOTOGEOLOGIC AND RECONNAISSANCE GEOLOGIC MAP OF THE LOCATE SE QUADRANGLE, CUSTER COUNTY, MONTANA

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