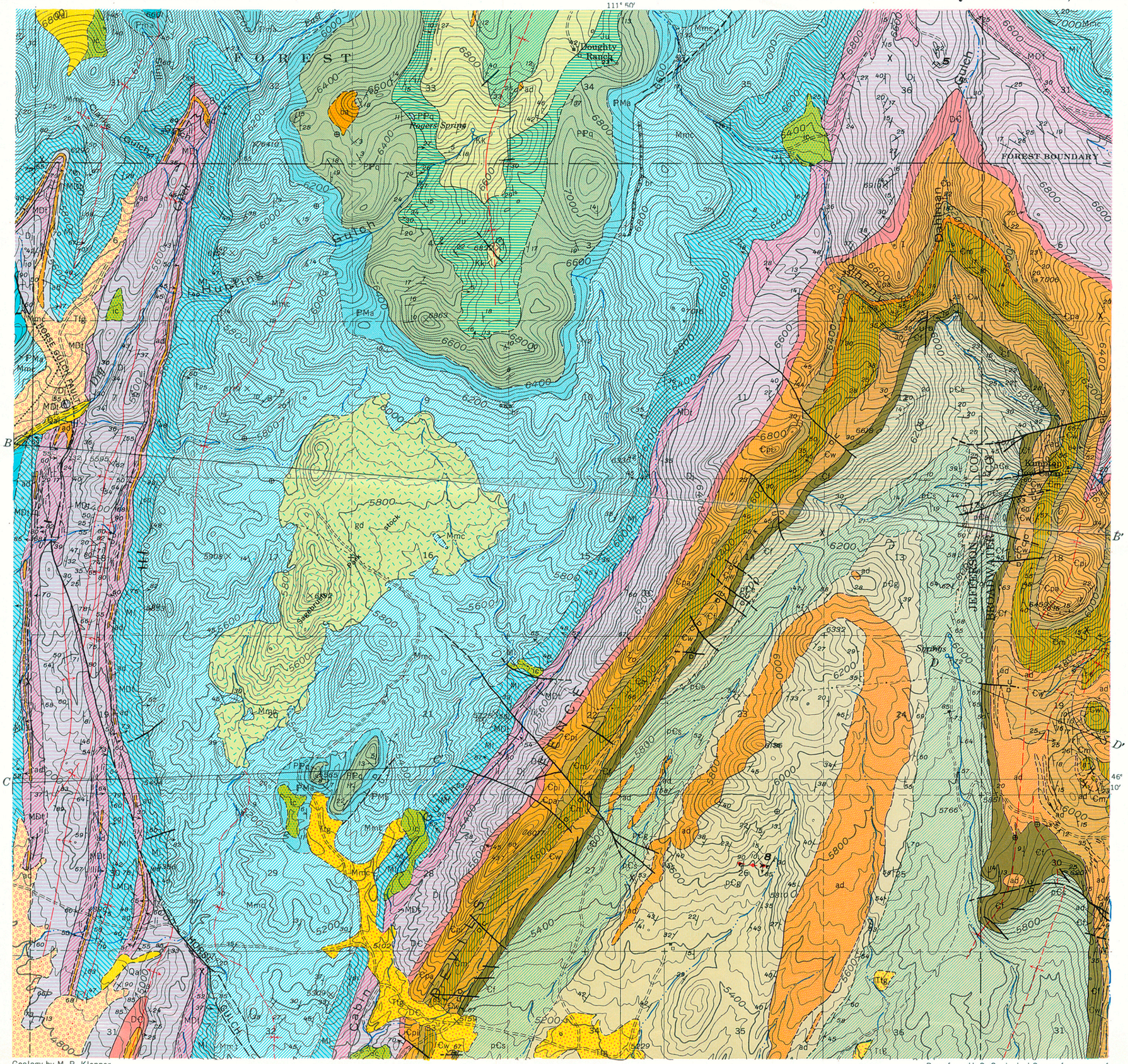
GEOLOGIC MAP OF DEVILS FENCE QUADRANGLE, MONT.

111° 50'



EXPLANATION

QUATERNARY

Recent

- Qal — Alluvium
- Tfg — Fan gravel and pediment gravel. *Unconsolidated or weakly consolidated fan deposits and gravel veneer on pediments*

Pliocene(?) / Miocene(?)

- Tfg — Tuff and gravel. *Light-colored rhyolitic tuff with a few interbeds of stream gravel*

UNCONFORMITY

TERTIARY

CRETACEOUS

Lower and Upper Cretaceous

- Kcm / Kcl — Colorado formation. *Upper black shale unit not mapped. Middle siliceous mudstone and sandstone unit, Kcm, is interlongued marine and nonmarine sandstone, mudstone, and siliceous mudstone, in part of volcanic origin. Lower black shale unit, Kcl, is a basal tan-weathering quartz sandstone, drab and olive-gray blocky siltstone, very dark gray to black shale, and an upper dark-gray carbonaceous, limonitic speckled to mottled sandstone*

EROSIONAL UNCONFORMITY

Lower Cretaceous

- Kk — Kootenai formation. *Comprises three units. Upper unit is 10 to 85 ft of quartzose-bearing limestone overlain by a few feet to 80 ft of drab mudstone; middle unit is red and green mudstone and shale with concretions and lentils of limestone; lower unit is crossbedded "pepper-and-salt" sandstone and interbedded shale and mudstone*

Upper Jurassic

- Ju — Morrison and Swift formations. *Morrison formation: varicolored nonmarine shale, mudstone, and siltstone, with thin beds of limestone and sandstone, and near the top a unit of black shale. Upper hundred feet locally contains thick, lenticular "pepper-and-salt" sandstone and grades into overlying Kootenai formation. Swift formation: grayish-brown punky calcareous marine sandstone, 50 to 85 ft thick, with a basal chert-pebble conglomerate*

JURASSIC

EROSIONAL UNCONFORMITY

PERMIAN

PENNSYLVANIAN

- Pp / PPq — Phosphoria formation. *Brown and gray chert and sandstone, in part phosphatic; may locally contain one or two thin beds of phosphate rock, Pp. In places mapped with the Quadrant formation, PPq*
- Pq — Quadrant formation. *Light-colored quartzitic sandstone and interbedded light-gray sugary-textured sandy dolomite*

MISSISSIPPIAN

CARBONIFEROUS

- PMa — Amsden formation. *Red to grayish-red mudstone, shale, and subordinate amounts of carbonate rock with interbeds of gray, brown, or yellow argillaceous sandstone in upper and lower parts; middle part of medium- to dark-gray thick-bedded dolomite*

EROSIONAL UNCONFORMITY(?)

- Mmc — Mission Canyon limestone. *Medium-gray to light-gray medium-grained thickly and indistinctly bedded limestone, with a few thin siliceous layers in lower 200 ft and sparse gray chert nodules and lentils in upper half. A breccia unit, br, about 200 ft below top of formation has been mapped locally*
- Ml — Lodgepole limestone. *Upper part of medium-gray fine- to medium-grained limestone in distinct beds as much as 2 ft thick alternating with zones of much thinner beds containing rare mudstone partings; lower part of medium-gray limestone in beds 1 in. to 1 ft thick with partings and interbeds of yellow to red calcareous mudstone; grades into Mission Canyon limestone through a 150- to 200-ft zone*

Upper Devonian and Mississippian

- MDt — Three Forks shale. *Predominantly greenish-gray and brown shale with subordinate amounts of interbedded sandstone and limestone. Dolomitic siltstone at top. Locally a 10- to 25-ft fossiliferous limestone unit, li, has been mapped*

DEVONIAN AND MISSISSIPPIAN

Upper Devonian

- Dj — Jefferson dolomite. *Dark-gray granular-weathering fetid well-bedded dolomite with subordinate amounts of dark-gray limestone and light-gray dolomite*

EROSIONAL — UNCONFORMITY

Upper Cambrian and Upper Devonian

- DC — Maywood and Red Lion formations undifferentiated. *Varicolored, generally in shades of red and yellowish-brown, argillaceous, dolomitic, and calcareous rocks; poorly exposed*

DEVONIAN

Upper Cambrian

- Cpi — Pilgrim dolomite. *Comprises three units. Upper unit is light-gray thick-bedded dolomite commonly mottled medium-gray near base. Middle unit is light- to medium-gray crystalline limestone irregularly ribboned with yellowish-gray silty dolomite. Lower unit is mottled light- and dark-gray dolomite with sparse intraformational conglomerate; locally, basal 8 to 10 ft is bluish-gray limestone*
- Cpa — Park shale. *Olive-gray, gray, and light-brown shale with minor amounts of argillaceous limestone, siltstone, and sandstone*

Middle Cambrian

- Cm — Meagher limestone. *Comprises three units. Upper and lower units are medium-gray limestone irregularly ribboned or mottled with yellowish-orange, yellowish-brown, and yellowish-gray dolomite. Middle unit is thickly and indistinctly bedded medium-gray limestone, commonly with oolitic beds*

CAMBRIAN

Middle Cambrian

- Cw — Wolsey shale. *Upper half is interbedded gray argillaceous limestone and greenish- and yellowish-gray calcareous mudstone and shale. Lower half is greenish-gray and drab shale with some interbeds of sandstone and limestone; many beds are micaceous, some are glauconitic*
- Cf — Flathead quartzite. *White to pale shades of gray, pink, brown, and purple medium- to thick-bedded homogenous even-grained quartz sandstone; most beds are cemented to vitreous quartzite; thin, discontinuous coarse pebble zones in lower part; crossbedding common*

CAMBRIAN

UNCONFORMITY

Upper Precambrian (Belt series)

- pCe — Empire shale. *Gray, greenish-gray, and brown, siliceous mudstone or argillite with interbeds of quartzite sandstone and shale. Intertongues with Spokane shale*
- pCs — Spokane shale. *Grayish-red mudstone, shale, and sandstone, with a few thin beds of limestone near base*
- pCg — Greyson shale. *Gray and brown mudstone or shale alternating with sandstone or quartzite. Base not exposed. Grades into Spokane shale*

PRECAMBRIAN

INTRUSIVE ROCKS

YOUNGER INTRUSIVE ROCKS

Lower Tertiary(?)

- gd — Granodiorite and quartz diorite. *In Sagebrush Park stock*
- ic — Composite or hybrid intrusives. *Small plutons containing diverse and unusual rocks including olivine-rich and quartz-rich types*

TERTIARY(?)

OLDER INTRUSIVE ROCKS

Upper Cretaceous

- ba — Basalt and related rocks. *Dark-gray to greenish-black fine- to medium-grained rocks, mainly as sills*
- ad — Andesite porphyry, diorite porphyry, and related rocks. *Greenish-gray to dark-gray porphyritic rocks with phenocrysts of plagioclase and hornblende or augite; mainly as sills*
- hl — Hornblende lamprophyre. *Very fine grained gray rock with conspicuous hornblende phenocrysts*

CRETACEOUS

67 — Contact, showing dip. *Dashed where approximately located; length of dashes indicates relative degree of accuracy; long dash most accurate*

90 — Vertical contact

Overturned contact

U 39 ? D — Fault, showing dip. *Dashed where approximately located; length of dashes indicates relative degree of accuracy; long dash most accurate. Dotted where concealed, queried where doubtful. U, upthrown side; D, downthrown side*

F — Preintrusion fault. *Forming boundary along margin of intrusive body; dashed where approximately located*

Anticline. *Showing crestline and plunge of axis. Dashed where approximately located; length of dashes indicates relative degree of accuracy; long dash most accurate. Dotted where concealed; queried where doubtful*

Syncline. *Showing position of trough and plunge of axis. Dashed where approximately located; length of dashes indicates degree of accuracy; long dash most accurate. Dotted where concealed; queried where doubtful*

Overturned anticline

13 — Strike and dip of beds

90 — Strike of vertical beds

Horizontal beds

50 — Strike and dip of cleavage

17 — Strike and dip of joints

90 — Vertical vein, approximately located

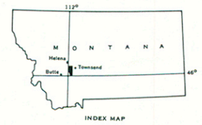
85 — Vein, approximately located, showing dip

Vertical shaft

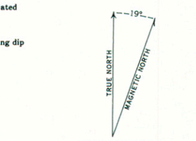
Adit

Prospect pit

Mine



INDEX MAP



APPROXIMATE MEAN DECLINATION 1950

Geology by M. R. Klepper, R. A. Weeks and E. T. Ruppel

Scale 1:31,250

1 0 2 Miles

Contour interval 40 feet
Datum is mean sea level

Base from U. S. Geological Survey from map of Devils Fence quadrangle, Montana.