



**EXPLANATION**

**QUATERNARY**

- Qal Alluvium  
Unconsolidated silt, sand, and gravel along streams; includes Q<sub>1</sub> along part of Yellowstone River east of Livingston
- Ql Landslide
- Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub>, Q<sub>4</sub>, Q<sub>5</sub> Stream terraces  
Q<sub>1</sub>, lowest and youngest; Q<sub>5</sub>, highest and oldest; Q<sub>1</sub> terraces along Mission Creek, Yellowstone River, and south of Livingston; covered by Q<sub>1</sub>
- Q<sub>u</sub> Undifferentiated surficial deposits  
Angular (mostly limestone) debris from mountains lying upon erosional surfaces or, locally, upon Yellowstone River terraces

**TERTIARY**

- Qm Moraine  
Morainal debris from mountain glaciers; mapped only in front of mountains; includes some outwash

**CRETACEOUS**

- TK Livingston formation  
Largely tuffaceous sandstone and shale; base of zone of large round concretions east of longitude of Mission Creek

**UPPER JURASSIC**

- Virgelle sandstone and undivided younger rocks  
Gray Virgelle sandstone overlain by gray shale and sandstone that are probably equivalent to the Single sandstone and Clappert shale, upper part gradational into Livingston formation

**MIDDLE JURASSIC**

- Kc Colorado shale  
Gray shale and sandstone; base of Boulder River sandstone member that was used for contour horizon
- Ks Kootenai formation  
Red and gray sandstone and sandstone, largely concealed; chert-pebble conglomerate at base
- Jm Morrison formation  
Mostly concealed; red shale and brown sandstone crop out locally
- Js Swift formation  
Ledge-forming highly calcareous brown glauconitic sandstone
- Jb Brierley formation  
Mostly concealed; olive-gray shale in upper part; ledge-forming gray oolitic limestone at base
- Jp Piper formation  
Mostly concealed; red soil covers upper part; gray platy limestone in middle; and red to gray shale and siltstone in lower part; chert-pebble conglomerate locally at base

**UNCONFORMITY**

**PENNSYLVANIAN**

- Pt Quadrant quartzite  
Quartzite and sandstone

**MISSISSIPPIAN**

- PMa Amesides formation  
Lower and upper parts generally concealed; includes some red beds; limestones near middle
- Mm Madison limestone  
Mostly light to medium-gray cliff-forming limestone

**UNCONFORMITY**

**DEVONIAN**

- On Three Forks shale and Jefferson limestone, undivided  
Upper 50 feet shaly beds considered to be Three Forks shale; underlying beds are largely shaly and dark-brown sandy to argillaceous limestone and dolomite

**UNCONFORMITY**

**ORDOVICIAN**

- Ob Highhorn dolomite  
Upper part mostly thin-bedded light-gray dolomite; lower part is massive, light-gray dolomite

**UNCONFORMITY**

**CAMBRIAN**

- Gp Grove Creek and Snowy Range formations, undifferentiated  
Grove Creek formation at top is limestone and shale distinguished by rounded limestone pebbles; Snowy Range formation is green shale and gray limestone that is partly a flat-pebble conglomerate; bed of outcrops limestone locally in lower part of Snowy Range
- Cl Pilgrim limestone  
Cliff-forming thin-bedded mottled limestone
- Cm Park shale, Meagher limestone, Wolsey shale, and Flathead quartzite, undifferentiated  
Middle Cambrian formations, predominantly greenish-gray shale and gray limestone, mapped as one cartographic unit

**UNCONFORMITY**

**PRECAMBRIAN**

- Stillwater complex  
Norite and anorthosite, in southeast corner of area
- Gr Granite, gneiss, and miscellaneous metamorphic rocks

**UNCONFORMITY**

- Diabase dikes cut pre-Cambrian rocks; one larger intrusion of gabbro along North Fork Deep Creek

**CONTACT**

- Dashed where inferred

**FAULT**

- High-angle fault  
U, upthrown side; D, downthrown side; dashed where inferred, dotted where concealed
- Showing relative movement

**AXIS OF ANTICLINE**

**AXIS OF SYNCLINE**

**STRIKE AND DIP OF BEDS**

- Strike and dip of overturned beds
- Strike of vertical beds
- Strike and dip of foliation

**CALCITE VEIN**

**DRILLING WELL**

- Suspended 1954
- Dry hole

**STRUCTURE CONTOURS**

- Drawn at 500-foot intervals on the Boulder River sandstone member of the Colorado shale
- Datum is mean sea level

**QUADRANGLE INDEX**

- LIVINGSTON 25,000-10000 25 feet
- BRISBIN 25,000-10000 40 feet

**TRUE NORTH**

**MAGNETIC NORTH**

**APPROXIMATE MEAN DECLINATION, 1951**

110737307 UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY BULLETIN 1021 PLATE 34 (WEST) 110730 45°45' 35' 32°30' 45°45'

Base from U. S. Geological Survey maps of the Livingston and Brinslin quadrangles, Montana, 1:24,000, 1951

Geology mapped by P. W. Richards, G. E. Prichard, and A. A. Meyerhoff

**GEOLOGIC MAP AND SECTIONS OF THE AREA EAST AND SOUTHEAST OF LIVINGSTON, PARK COUNTY, MONTANA**

