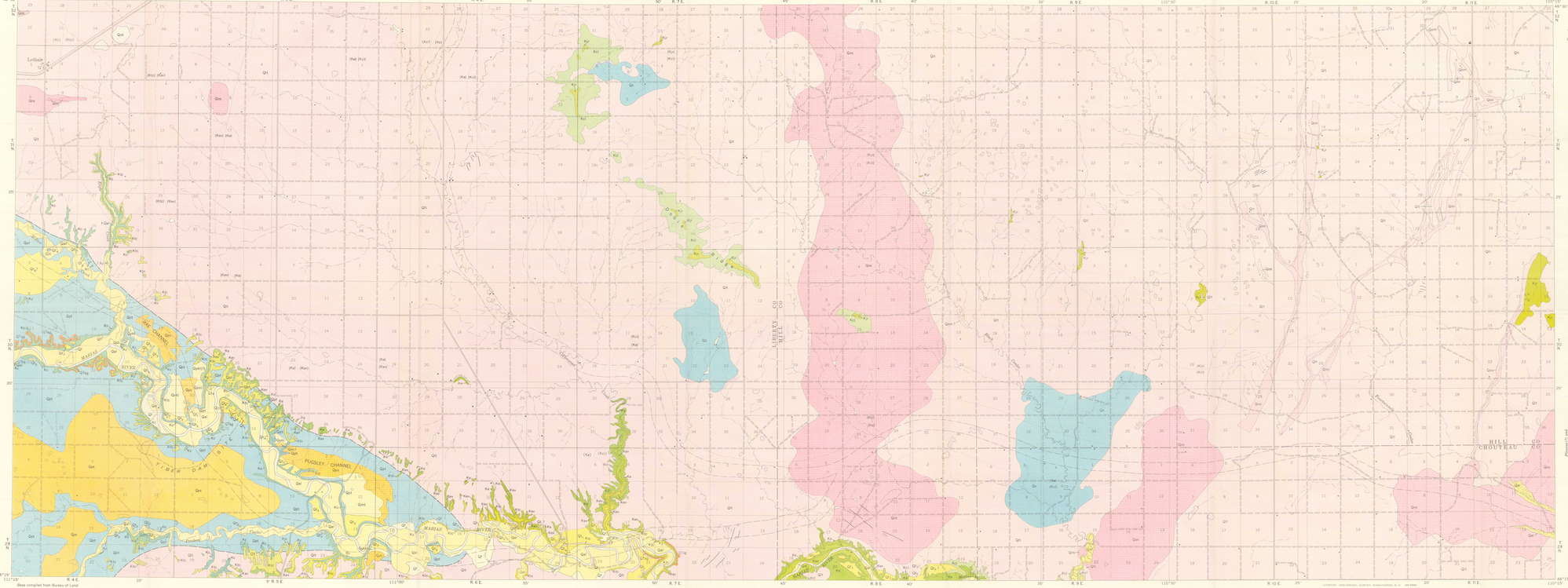

Base compiled from Bureau of Land Management township plats

GEOLOGIC MAP OF THE LOWER MARIAS RIVER AREA, CHOUTEAU, HILL, AND LIBERTY COUNTIES, MONTANA

Scale 1:62 500

1 0 1 2 3 4 5 Miles

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C. 68-5884

Geology mapped in 1946 by J. F. Smith, I. J. Witkind, D. E. Trimble, and E. G. Duckworth.

EXPLANATION

Qal — Alluvium
Interbedded lenses of light-brown to gray unconsolidated silt, sand, and gravel. Gravel consists of regular to well-rounded pebbles of quartzite, dolomite, limestone, and chert, and irregular fragments of granite, trachyte, and porphyry. Thickness commonly 5 to 20 feet within 100 feet of the Marias River

Qs — Imperial silt
Light-tan cemented unconsolidated silt overlying till. Margin of silt uniform in topographic irregularities. Maximum known thickness about 10 feet

Qf — Alluvial-fan deposits
Interbedded lenses of light-brown to gray unconsolidated silt, sand, and gravel. Coarser deposits at the mouth of tributary streams. Maximum thickness unknown

Qt — Terrace deposits
Qt1 (youngest and lowest), **Qt2**, **Qt3**, **Qt4** (oldest and highest)
Interbedded unconsolidated reddish-brown sand and gravel. Gravel consists predominantly of quartzite, dolomite, limestone, and chert, and remnants of other metamorphic rocks, limestone dolomite, chert, granite, porphyry, and sandstone. Sand is fine- to medium-grained sand. Thickness from 15 to 40 feet; average thickness about 20 feet

Qtr — Valley fill
Interbedded lenses of light-brown to gray unconsolidated silt, clay, and sand with some larger rock fragments. Maximum thickness about 50 feet

Qtl — Superficial till
Chocolate-brown cryoturbatic till in lands in areas of shallow substrate at kettles and low isolated mounds. Till is thin and in places is covered by about 4 inches of unconsolidated unsorted sand and gravel

Qtg — Outwash-channel deposits
Unconsolidated poorly bedded brown sand and gravel filling elongate broad, shallow stream valleys. Gravel consists of regular to moderately well rounded pebbles of quartzite, limestone, dolomite, and igneous rocks. Most are 2 inches to 4 inches in diameter. Sand lenses 10 feet long and 3 feet thick interbedded in the gravel. Ranges in thickness from 4 to 15 feet

Qtv — Kame-terrace deposits
Unconsolidated poorly sorted and poorly bedded brown silt, sand, and gravel, containing angular to well-rounded pebbles of quartzite, limestone, dolomite, and igneous rocks. Sand is coarse-grained sand. Silt interstices. Locally silt and sand compose entire deposit. Maximum thickness about 50 feet

Qtvr — Ryan till
Light-brown to chocolate-brown nonplastic heterogeneous mixture of silt and clay, containing scattered pebbles, cobbles, and boulders. Rock types include quartzite, limestone, granite, and foliated metamorphic rocks. Locally includes Lethair till which was not mapped separately from the underlying Lethair till by as much as 10 feet of sand and silt. Ryan till as much as 40 feet thick

Qtvt — Ryan terrace deposits
Unconsolidated poorly sorted and poorly bedded brown silt, sand, and gravel. Gravel consists of regular to well-rounded pebbles of quartzite, limestone, dolomite, and igneous rocks. Most are 2 inches to 4 inches in diameter. Sand is coarse- to medium-grained sand. Silt interstices. Locally silt and sand compose entire deposit. Maximum thickness about 50 feet

Qtp — Pendroy till
Light-brown to chocolate-brown nonplastic heterogeneous mixture of silt and clay, containing scattered pebbles, cobbles, and boulders. Rock types include quartzite, limestone, granite, and foliated metamorphic rocks. Locally includes Lethair till which was not mapped separately from the underlying Lethair till by as much as 10 feet of sand and silt. Pendroy till as much as 40 feet thick

Qtk — Kame deposits
Unconsolidated buff silt, sand, and gravel. Gravel consists of regular to well-rounded pebbles, cobbles, and boulders, and till wedges along smooth flanks

Qtm — Miscellaneous ice-contact deposits
Unconsolidated silt, sand, and gravel deposits in prominent topographic features of irregular shape and 10 feet to 50 feet high. Till and erratic boulders are common on the top and in places on their flanks

Qtc — Outwash-channel deposits
Light-brown to gray unconsolidated silt, sand, and gravel which flow shallow narrow stream over undulate till in till-free areas. Gravel in the channels the deposit, the content of silt and sand increases. Sand and silt is mixed with pebbles and gravel. Gravel is quarter of an inch to diameter. Thickness ranges from a few inches to 4 feet

Qtt — Superficial till
Light-tan indurated till in lands in areas of hummocky topography. Kettles are about 30 to 50 feet in diameter. Till is thin and in places. Some contain crudely stratified gravel lens. Till is thin and in places. Intervening shallow round kettles are floored with subsurface

Qtl — Lethair till
Light-tan to buff indurated massive unsorted mixture of silt and clay containing pebbles, cobbles, and boulders. Contains lenses of silt, sand, and gravel. Rock types include quartzite, limestone, granite, and dolomite. Average thickness is about 10 feet except in buried valleys, where it is as much as 125 feet thick

Qtd — South Saskatchewan(?) gravels of McConnell, 1885
Reddish-brown to brown unconsolidated poorly bedded well-rounded flat sand pebbles and cobbles, which are mostly quartzite, but contain some pebbles of limestone, and dolomite, in a matrix of fine-to-medium-grained sand. Contains local lenses of sand. Gravel about 2 feet thick and locally overlain by about 2 feet of bluish-gray silt, yellow sand, and blue-tinted clay

Ku — Upper Cretaceous, Montana group
Kuj — Judith River formation
Mostly tan friable massive to crossbedded sandstone; contains local thin gray shale layers. Zones of Ostrea shells and concretion structure are common. Massive sandstone but underlain by an Ostrea zone and crossbedded sandstone above. Only the bound 10 feet exposed in the mapped area

Kc — Upper Cretaceous, Colorado group
Kcl — Claggett shale
Upper part consists of buff to gray sandstone, shaly sandstone, and shale. Lower part is dark-brown bentonitic shale that contains both thin bentonite beds and dark-gray septaria. Thickness about 350 feet

Kv — Eagle sandstone
Upper member, Kv, consists of buff, gray, greenish-gray, and brownish-purple mudstone alternating with thin-bedded sandstone. Lower member, Kvr, is buff and buff crossbedded sandstone. Locally contains thin coal seams and carbonaceous shale layers. Lower member, Kvt, is gray to buff shale. Middle shale member, Kp, is gray-to-buff to yellow fine- to coarse-grained, massive to crossbedded sandstone with thin-bedded sandstone and shale. Contains sandstone concretions. Thickness of the Virgelle sandstone member ranges from 65 to 150 feet

Kcp — Lower Cretaceous
Ktg — Telegraph Creek formation
Interbedded sandstone and shale. Sandstone fine-grained gray calcareous sandstone and dark-gray to gray sandy shale. Locally, dark-gray platy calcareous sandstone beds form ledges. Contains a few thin discontinuous bentonite zones and scattered limestone concretions. Lower part of the shale is carbonaceous. Thickness ranges from 100 to 150 feet

Kc — Colorado shale
Dark-gray to black silty marine shale containing thin beds of bentonite. Bentonite beds are as much as 12 inches thick and commonly weather as thin yellow bands, which contrast markedly with adjacent dark shale. Concretions and septaria are scattered throughout formation. Only upper 150 feet exposed in mapped area

QUATERNARY — Recent; Younger drift; Pleistocene; Older drift; Pleistocene; Pliocene(?) and Pleistocene

TERTIARY(?) QUATERNARY

CRETACEOUS

Contact
Dashed where approximately located

(Kcl)
(Kcl)
Concealed bedrock contact
Symbols in parenthesis indicate concealed bedrock

Approximate eastern drift border of Pendroy ice

Strike and dip of beds

Strike of vertical beds

Buried channels of ancestral Marias River and major tributary

Morainal ridges

Gravel pit

Dry hole or abandoned test hole

TRUE NORTH
MAGNETIC NORTH
18½°
APPROXIMATE MEAN DECLINATION 1946