UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geologic Map of the Glasgow 1°X30' Quadrangle, Valley and McCone Counties, Montana

By

Roger B. Colton, Steven T. Whitaker, and William C. Ehler

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DESCRIPTION OF MAP UNITS

af **Artificial fill (Holocene)**--Man-made deposits of silt, sand, and rock in the Ft. Peck Dam and in spoil heaps (pieces of Bearpaw Shale) from the excavation of the spillway. Numerous smaller highway and railroad embankments are not shown. Thickness of fill in dam is approximately 76 m (250 ft)

Qal **Alluvium (Holocene)**--Light-yellowish-gray to medium-brown clay, silt, sand, and fine gravel; vertical and horizontal variations in composition and in bedding. Upper part finer grained than lower part. Thickness is as much as 42 m (164 ft) under floodplain of Missouri and Milk Rivers but generally only 5-8 m (16-26 ft) under floodplains of tributaries

Qe **Eolium (Holocene)**--Light- to dark-brown, medium- to fine-grained windblown silt and sand. Consists of 5 percent clay, 7 percent silt, and 88 percent sand. Thickness is as much as 6 m (20 ft) in dunes but generally less than 2 m (6 ft). General thin blanket of eolium on till not mapped

Qac **Alluvial-colluvial deposits (Holocene)**--Slopewash and creep deposits along valley walls; includes small alluvial fans. Composition and color reflect that of parent material. Deposits are gently sloping, poorly sorted, and stratified; composed of silty clays, sandy silt, pebbly silts, pebbly clays, gravelly clays, and gravels. Composition is variable but size analyses indicate 43 percent clay, 42 percent silt, and 15 percent sand. Thickness is as much as 6 m (20 ft) but thins to feather edge upslope and downslope

Ql **Pond deposits (Holocene)**--Dark-gray plastic clay, silt, and sandy clay. Size distribution: 50 percent clay, 40 percent silt, and 8 percent sand. Thickness is as much as 4 m (13 ft) but thins to feather edge at margin of deposits

Qls **Landslide deposits (Holocene)**--Large slump blocks of various formations such as the Claggett and Bearpaw Shales, and the Fox Hills and Kintyre Formations. Thickness is as much as 30 m (99 ft)

Qta **Alluvial terrace deposits (Holocene)**--Light-brown, light- to dark-gray clay, silt, sand, and sandy gravel. Upper 5-6 m (15-20 ft) consists of fine-grained overbank deposits. This unit is underlain by sand and fine gravel and becomes coarser downward to gravel containing clasts as much as 50 cm (2 in.) in diameter. Thickness under floodplains of Missouri and Milk Rivers is as much as 60 m (180 ft) but averages only 30 m (99 ft). Thickness under tributary floodplains of tributary stream is only 5-10 m (16-33 ft)

Qo **Outwash deposits (Pleistocene)**--Poorly to well-sorted sandy gravel interbedded with well-bedded and well-sorted sand, silt, and clay. Deposits contain numerous glacial erratics. Diameter of clasts in gravel is as much as 10 cm but averages 1.25 cm. Composition varies but averages 6 percent silt, 44 percent sand, 10 percent granules, and 40 percent pebbles. Lithology is approximately 55 percent quartzite, 25 percent limestone and dolomite, and 9 percent granite. Thickness is as much as 8 m (26ft); most deposits are only 4-6 m (13-20ft) thick

Qki **Kintyre Formation (Wisconsin)**--Olive-brown clay, fine-grained sand, sandy silt, clayey silt, clay, medium- to coarse-grained sand, and minor gravel lenses. Lower half is light-brown silt and very fine grained sand interbedded with minor amounts of clay and silty clay. Upper half is dark-olive-brown clay and silty clay. Beds were folded, broken, and contorted on a large scale as underlying ice melted. Thickness is as much as 21 m (70 ft) but most deposits are only 6 m (20 ft) thick

Qic **Ice-contact stratified sand and gravel deposits**--Long sinuous ridges of poorly sorted and poorly stratified ice-contact sand and gravel as much as 20 m (66 ft) thick. Contain boulders as much as 50 cm (2 ft) in diameter. Includes eskers and kames

Qt **Till undifferentiated (Pleistocene)**--Yellowish-brown (oxidized) to bluish-gray (unoxidized) unstratified, unsorted, unconsolidated to moderately consolidated heterogeneous mixture of 25-30 percent clay, 25-40 percent silt, 25-30 percent sand, 1-3 percent granules, 1-2 percent pebbles and cobbles, and less than 1 percent boulders. Lithology of stones in till is: 55 percent quartzite, 26 percent limestone and dolomite, 15 percent igneous and metamorphic (from Canada), and 3-4 percent local sedimentary rocks. Thickness averages 5 m (16 ft) but may be as much as 83 m (280 ft). Includes pre-Illinoian, Illinoian, and Wisconsin tills (Fullerton and Colton, 1986)

Qw **Wiota gravels (Pleistocene)**--Reddish-brown coarse quartzite gravel, sand, and silt. Contains a few Canadian-type erratic stones (granite, gneiss, schist, limestone, and dolomite). Size distribution: 5 percent silt, 15 percent sand, 5 percent granules, and 70 percent pebbles. Thickness is approximately 7.5 m (25 ft). Horizontal and vertical facies changes occur within short distances

Tf **Flaxville Formation (Pliocene)**--Light-reddish-brown sand, volcanic ash, clay, and quartzite gravel. Locally cemented by calcium carbonate to sandstone and conglomerate. Average diameter of pebbles is 3.5 cm (1.4 in.). Contains boulders as much as 31 cm (13 in.) in diameter. Size distribution: 2 percent silt, 36 percent sand, 4 percent granules, and 58 percent pebbles. Thickness is as much as 25 m (82 ft)

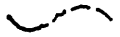
Khc **Hell Creek Formation (Late Cretaceous)**--Brown, gray, and violet claystone and shale, siltstone, and silty fine to medium sandstone. Beds of bentonite and lenticular carbonaceous and lignitic shales present in upper part of formation. Soft and hard, brown, medium-grained, salt-and-pepper sandstone and ferruginous conglomerate in basal unit are 20-30 m (66-99 ft) thick. Total thickness ranges from 51 to 83 m (166 to 270 ft). Size distribution: 30 percent clay, 3 percent silt, 4 percent shale, and 61 percent sand and sandstone

Kfh **Fox Hills Formation (Late Cretaceous)**--Lower third of formation consists of thin yellowish-gray to dark-yellowish-orange soft claystone, siltstone, and fine sandstone. These beds are transitional between the underlying Bearpaw Shale and the overlying two-thirds of the formation. Their composition is 96 percent clay and silt and 4 percent sand. The upper part of the formation consists of fine-grained, thin- to massive-bedded, calcareous, yellowish-brown to orange-brown sandstone. Upper two-thirds consists of 44-52 percent clay and silt and 48-56 percent sand. Thickness of transitional beds is approximately 13 m (40 ft). Upper sandstone part of formation is as much as 26 m (85 ft) thick

Kb **Bearpaw Shale (Late Cretaceous)**--Dark-gray clayey shale with disseminated or distinct beds of bentonite as much as 30 cm (1.2 in.) thick. Contains ovoid and disc-shaped septarian concretions composed of clay-ironstone and limestone. Thickness is approximately 345 m (1,140 ft) (Jensen and Varnes, p. F3-4)

Kjr **Judith River Formation (Late Cretaceous)**--Medium- to dark-gray, brown, and greenish shale and sandstone; bentonitic shale and beds of bentonite are abundant. Shale is thinly interbedded with silt and sandstone. Formation is composed of 73 percent sandstone, 26 percent shale, and 1 percent lignite. Carbonaceous shale grades laterally into lignite. Sandstones are fine to medium grained, well indurated, gray to greenish gray, and weather buff to brown. Glauconitic sandstones are in the basal part. Thickness is approximately 106 m (345 ft) (McLean, 1971)

Kcl **Claggett Shale (Late Cretaceous)**--Soft dark-gray shale and bentonite. Total thickness is approximately 77 m (250 ft) but only the uppermost 10 m (33 ft) is exposed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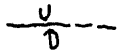


FAULT--Dashed where approximately located; dotted where concealed

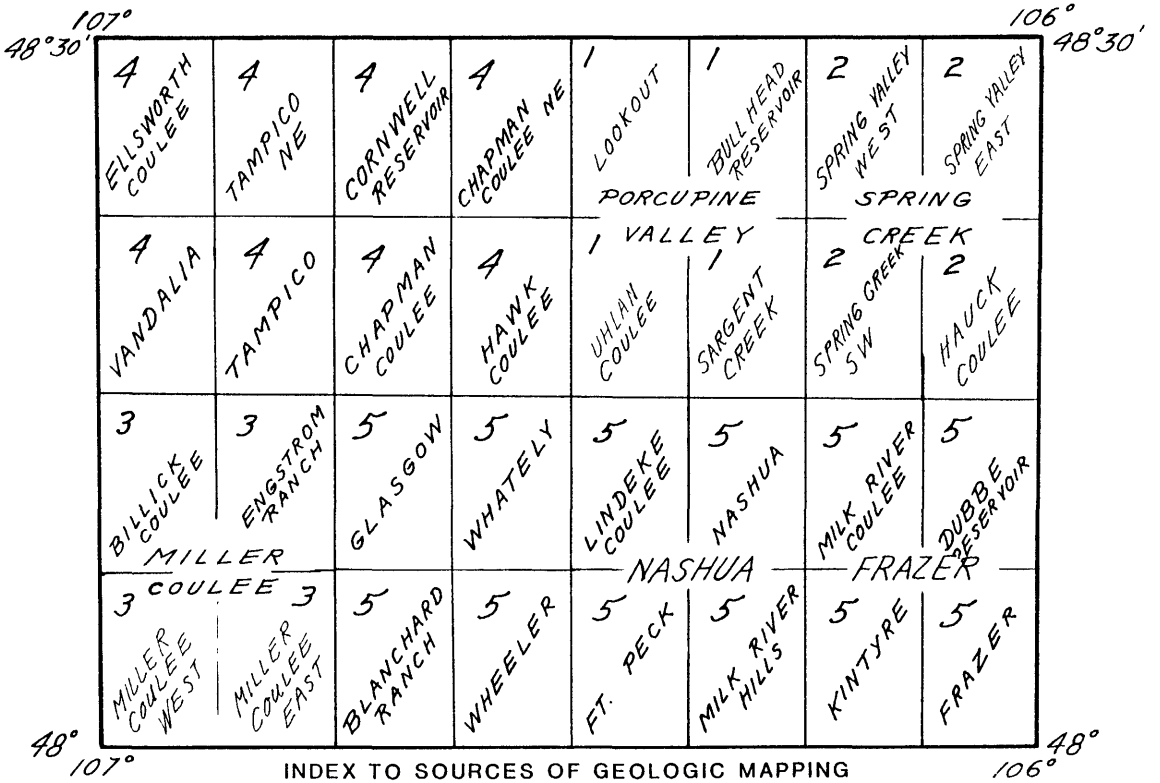

LONG AXIS OF DRUMLIN

WATER

REFERENCES CITED

Fullerton, D.S., and Colton, R.B., 1986, Stratigraphy and correlation of the glacial deposits on the Montana Plains, in Quaternary Glaciations in the Northern Hemisphere: International Geological Correlation Programme Project 24, Pergamon Press.

McLean, J.R., 1971, Stratigraphy of the Upper Cretaceous Judith River Formation in the Canadian Great Plains: Saskatchewan Research Council, Geology Division, Report No. 11.



INDEX TO SOURCES OF GEOLOGIC MAPPING

NUMBERS REFER TO REFERENCES LISTED BELOW

Glas. 10w

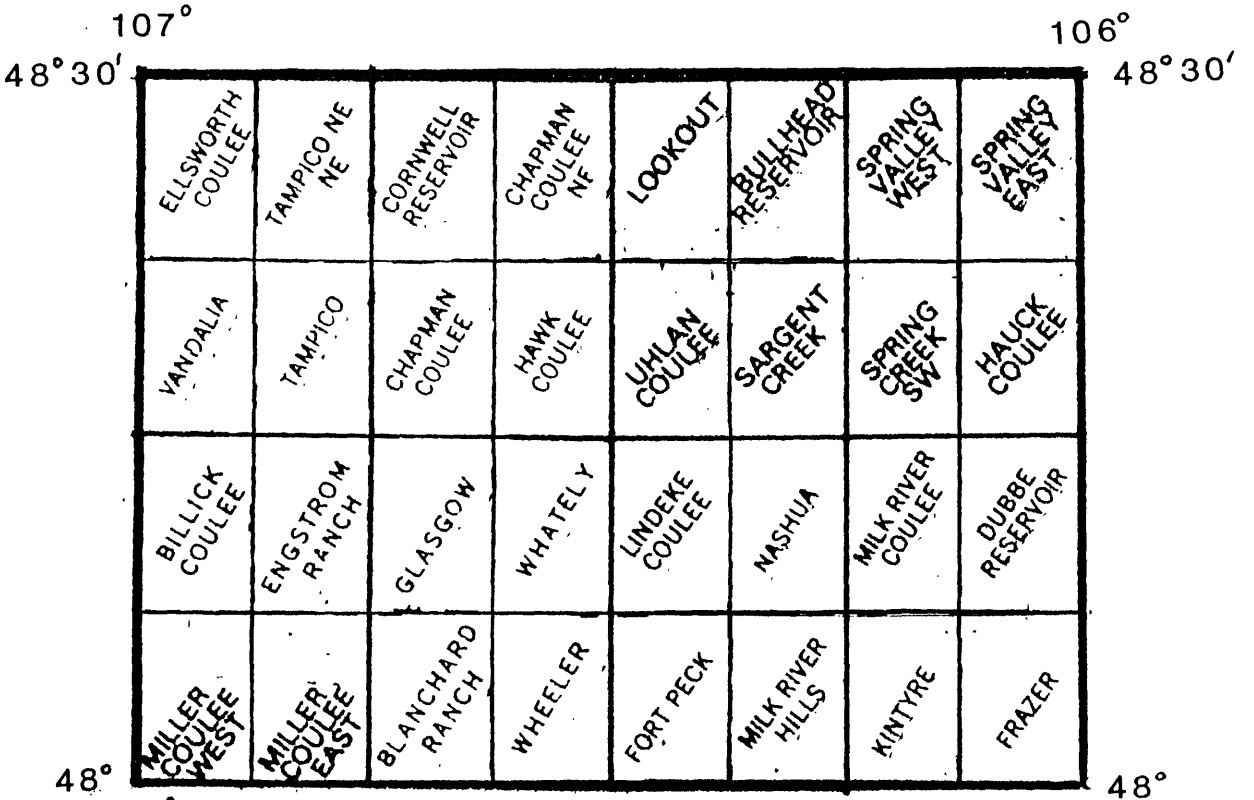
1. Colton, R.B., 1963, Geologic map of the Porcupine Valley Quadrangle, Valley County, Montana: U.S. Geological Survey Miscellaneous Investigations Map I-368.

2. _____1963, Geologic map of the Spring Creek Quadrangle, Valley County, Montana: U.S. Geological Survey Miscellaneous Investigations Map I-369.

3. Colton, R.B., Whitaker, S.T., and Ehler, W.C., 1982, Reconnaissance geologic map of the Miller Coulee 15' Quadrangle, Valley County, Montana: U.S. Geological Survey Miscellaneous Field Studies Map MF-1404.

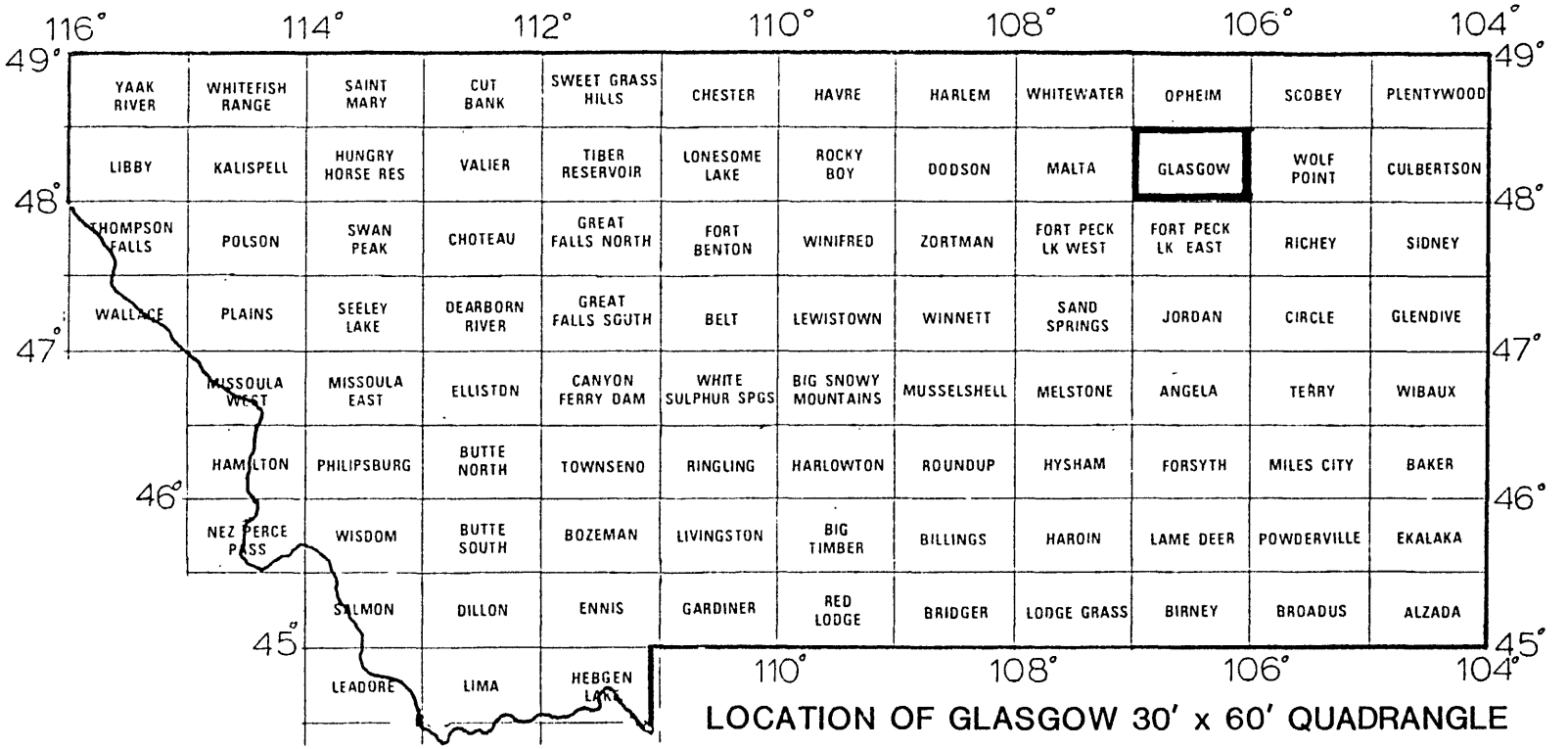
4. _____1979, Geologic maps of the Chapman Coulee and Tampico 15' Quadrangles, Valley County, Montana: unpublished.

5. Jensen, F.S., and Varnes, H.D., 1964, Geology of the Ft. Peck area, Garfield, McCone, and Valley Counties, Montana: U.S. Geological Survey Professional Paper 414-F.



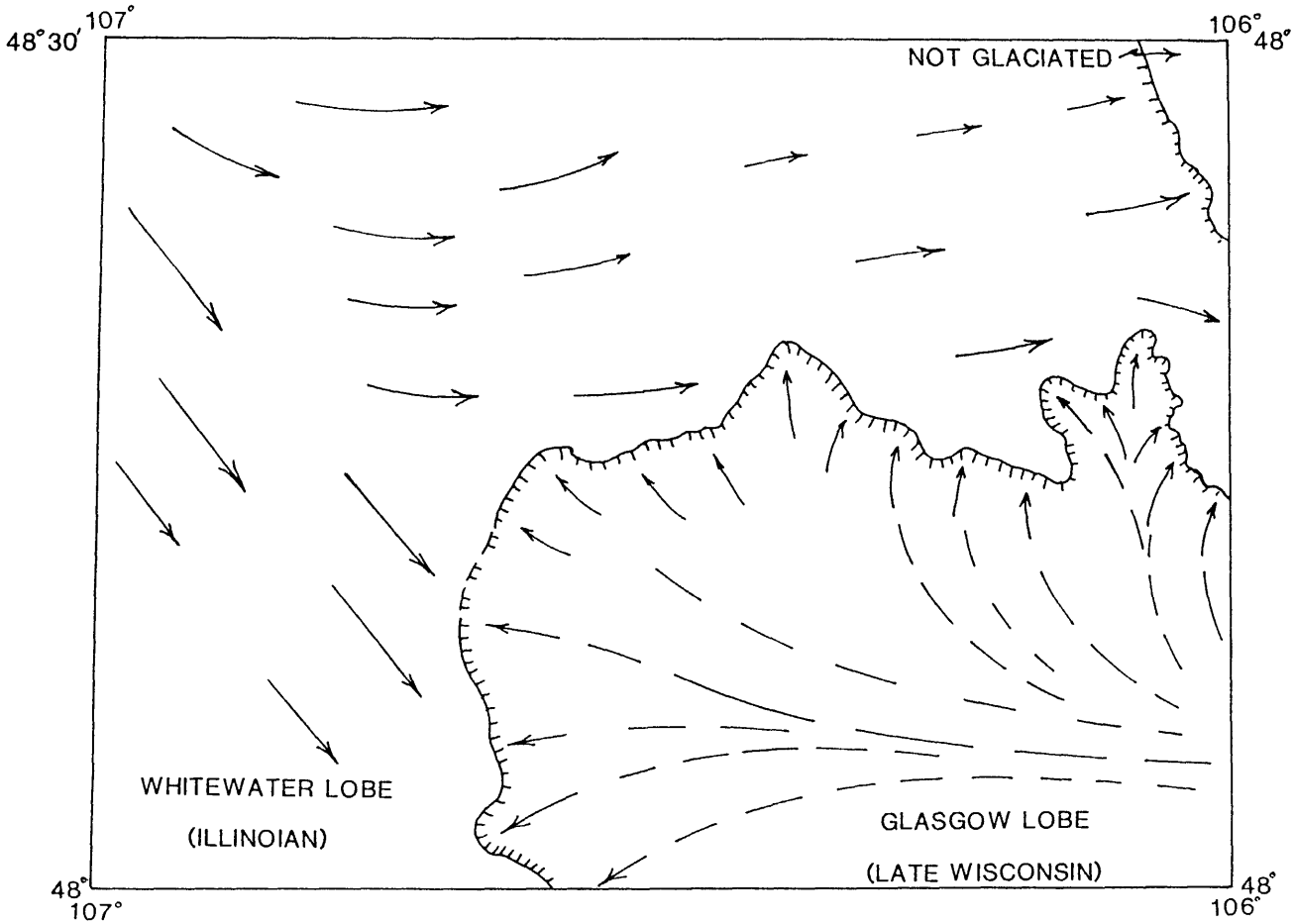
INDEX TO TOPOGRAPHIC MAPPING IN THE

GLASGOW 30′ x 60′ QUADRANGLE, MONTANA



LOCATION OF GLASGOW 30' x 60' QUADRANGLE

AND NAMES OF NEARBY QUADRANGLES



INFERRED DIRECTIONS OF ICE MOVEMENT IN THE GLASGOW 30′ x 60′ QUADRANGLE

CORRELATION OF MAP UNITS