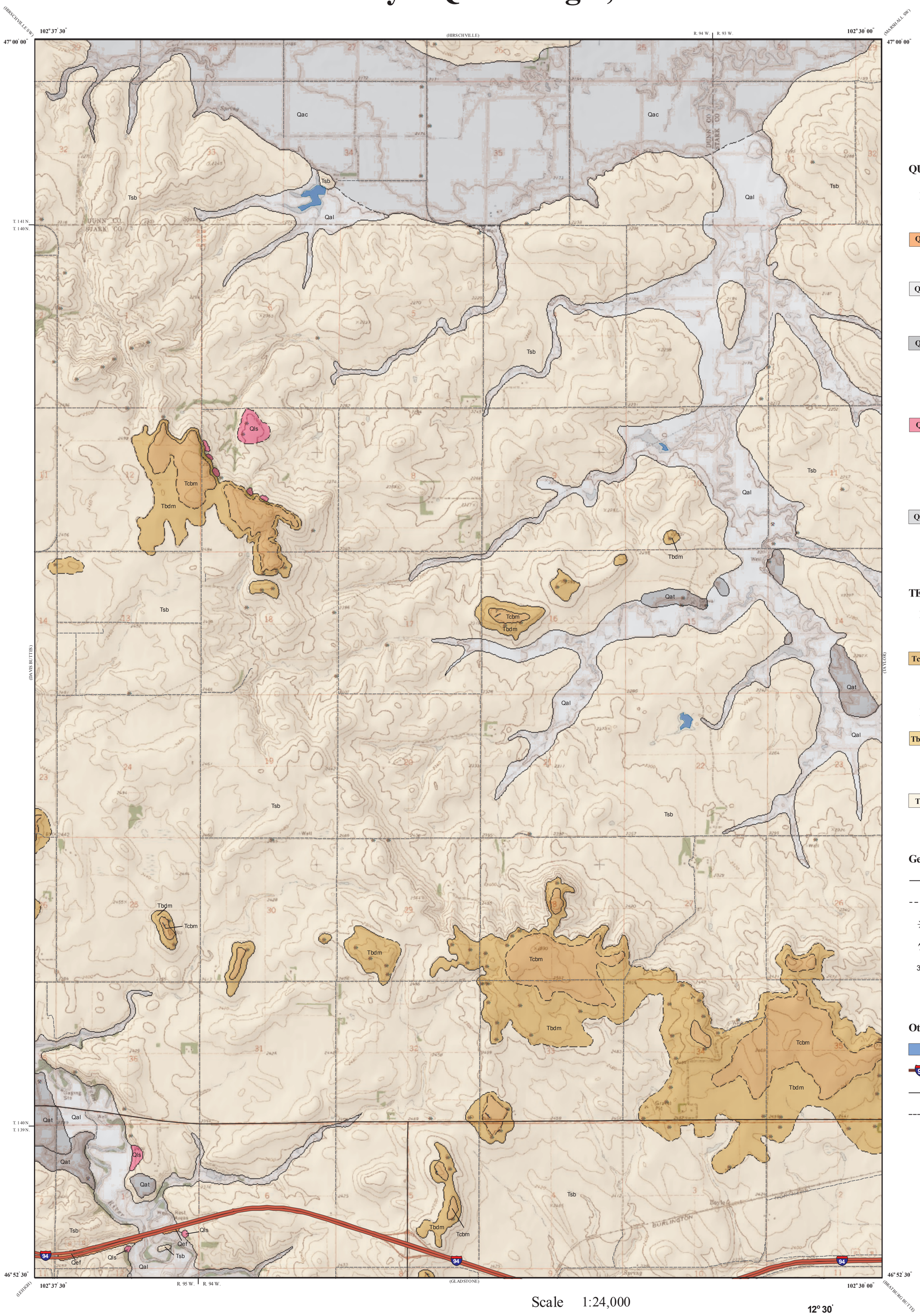
North Dakota Geological Survey
24K: Byle - sg

Edward C. Murphy, State Geologist
Lynn D. Helms, Director Dept. of Mineral Resources

Surface Geology

Boyle Quadrangle, North Dakota



Edward C. Murphy
2006

EXPLANATION

QUATERNARY SYSTEM

RECENT

Manmade Features or Deposits

Qef **Engineered Fill**

OAHE FORMATION

Qal **Alluvium**

Brownish gray to black sand, silt, clay, and lenses of gravel; flood-plain deposits along recent drainages. Includes lower terrace deposits. Typically less than 50 feet thick.

Qat **Terrace Deposits**

Five- to 10-foot-thick layers of sand and gravel (consisting primarily of silcrete, chert, flint, agate, petrified wood, and siltstone) found beneath flat to gently undulating slopes adjacent to creeks in the area.

RECENT/PLEISTOCENE

Qls **Landslide Deposits**

Variable mixture of strata and deposits that have slid to the base of steep slopes. Typically rotational slump blocks.

PLEISTOCENE

COLEHARBOR GROUP

Qac **Proglacial Channels**

These channels contain 50 to 200 feet of sand and gravel, silt, clay, and till (meltwater-channel fill). Overlain by Recent alluvium (Qal) of variable thickness. This map was created to distinguish between these very thick channel deposits and the moderate to thin deposits mapped as Qal.

TERTIARY SYSTEM

EOCENE

GOLDEN VALLEY FORMATION

Tcbm **Camels Butte Member**

Alternating beds of brown to grayish brown sandstone, siltstone, mudstone, claystone, and lignite. The coals are generally thinner than the underlying Sentinel Butte Formation and the siltstones and sandstones are micaceous.

PALEOCENE

Tbdm **Bear Den Member**

Brightly colored (white, orangish yellow to purple) kaolinitic claystone, mudstone, and sandstone typically overlain by a thin silicious bed (Taylor Bed) or lignite (Alamo Bluff). Forms vertical to near vertical slopes. This member is 20 to 25 feet thick in the area.

Tsb **SENTINEL BUTTE FORMATION**

Alternating beds of grayish brown to gray sandstone, siltstone, mud-stone, claystone, and lignite. The sandstones are fine to very fine grained, moderately to poorly cemented, and contain cross- stratification.

Geologic Symbols

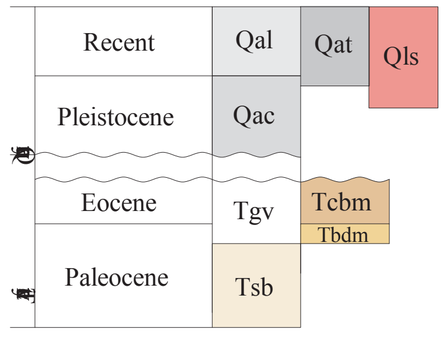
- Known contact between two geologic units
- Approximate contact between two geologic units
- Control point; typically an outcrop, drill hole, or excavation
- Gravel Pit
- 3° Strike and Dip

The strike is the compass bearing of the line formed by the intersection of an inclined layer of rock and a horizontal plane and the dip is the angle of inclination of a rock layer. The dip is always perpendicular to strike.

Other Features

- Water
- Interstate Highway
- Paved Road
- Unpaved Road

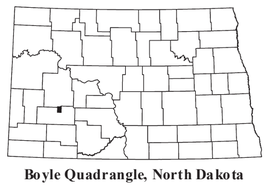
Correlation of Map Units



This geologic map was funded in part by the
USGS National Cooperative Geologic Mapping Program.

Cartographic Compilation: Elroy L. Kadrmas

NORTH DAKOTA GEOLOGICAL SURVEY 1895



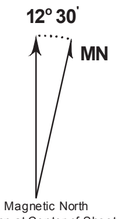
Boyle Quadrangle, North Dakota

Scale 1:24,000

0 0.5 1

Miles

Lambert Conformal Conic Projection Standard Parallels 46° 52' 30" and 47° 00' 00"
1927 North American Datum NGVD 1929
USGS 7.5 Minute Topographic Map Contour Interval 20 Feet
Road and Hydrologic Layers Rectified to 2003 NAIP Digital Orthophoto



1973 Magnetic North
Declination at Center of Sheet