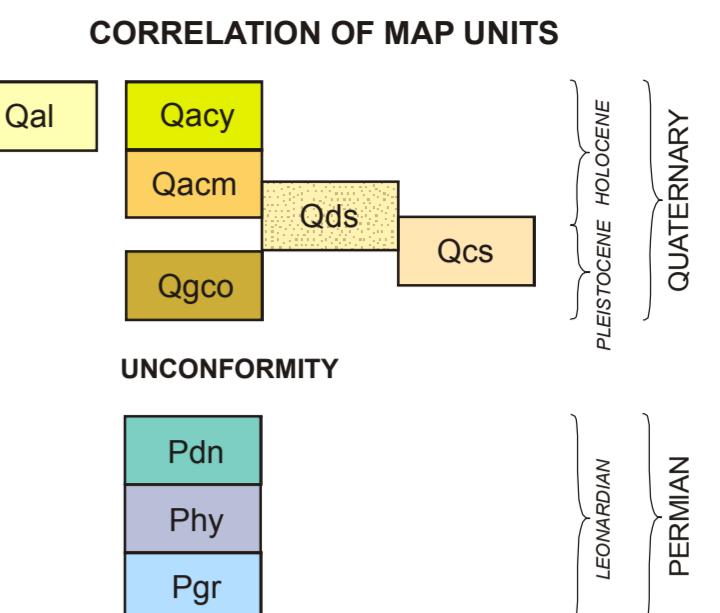


**GEOLOGIC MAP OF THE NORMAN 7.5' QUADRANGLE,  
CLEVELAND AND McCLAIN COUNTIES, OKLAHOMA**

Thomas M. Stanley and Galen W. Miller

2002

10x vertical exaggeration  
Formation names based on wireline-log interpretations  
by T.M. Stanley and surface mapping by authors.  
Vertical lines show logs used in interpretations.

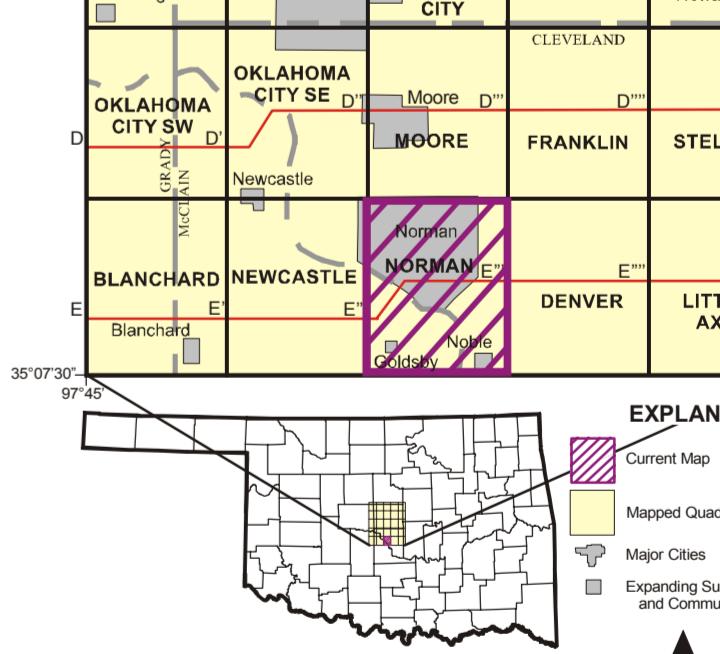
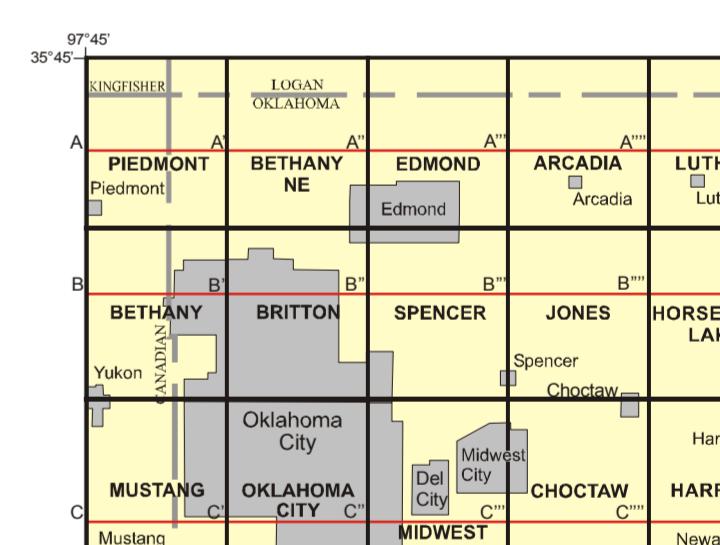


#### DESCRIPTION OF UNITS

- Qal** ALLUVIUM (Holocene)—Clay, silt, sand, and gravel in channels and on flood plains of modern streams. Includes terrace deposits of similar composition located directly above and adjacent to modern channels and flood plains. Thickness: 0 to about 30 ft
- Qacy** ALLUVIUM OF CANADIAN RIVER (Holocene)—Clay, silt, sand, and gravel in channels and on flood plain of the Canadian River. Area probably subject to frequent flooding. Thickness: generally 0 to 40 ft, rarely more than 40 ft
- Qacm** ALLUVIUM OF CANADIAN RIVER (Holocene)—Clay, silt, sand, and gravel on recent flood plain of the Canadian River and about 5-10 ft above Qacy. Area rarely subject to flooding. Thickness: unknown, possibly as much as 40 ft
- Qds** DUNE SAND (Holocene and Pleistocene)—Fine- to coarse-grained, moderately to poorly sorted, unconsolidated sand. Consists mainly of rounded to subrounded quartz grains of some silt- and clay-size material. Probably represents aeolian reworking of Pleistocene terrace deposit Ogco. Thickness: 0 to 40 ft
- Qcs** COVER SAND (Holocene and Pleistocene)—Unconsolidated, very fine grained sand to coarse-grained silt and clay, moderately to poorly sorted. Consists mainly of rounded to subrounded quartz grains, with abundant silt- and clay-size material. Forms extensive nearly flat topographic surfaces as much as 80 ft above modern alluvial valleys. Probably represents aeolian reworking of older Pleistocene-aged terrace and sand dune deposits. Thickness: from a thin veneer to as much as 30 ft, averages closer to 5 ft
- Qgco** REMNANTS OF OLDER TERRACE DEPOSITS (Pleistocene)—Clay, silt, sand, and gravel adjacent to the flood plain of the Canadian River. Sand common is medium- to coarse-grained and light brown to buff colored; gravel locally consists of concentrations of distally derived pebbles and cobbles, mostly well-rounded, and sub-diagonal quartz and metaqueartzites more commonly found near base of deposit. Base of unit is about 30 ft to 60 ft above the modern flood plain and ranges in elevation from 1100 ft to 1150 ft above sea level. The top of the unit is as much as 100 ft above the modern flood plain and is as high as 1200 ft above sea level. Thickness: 0 to 30 ft
- Pdn** DUNCAN FORMATION (Permian)—Sandstone, fine- to very fine grained, rarely medium-grained, with mudstone- and siltstone-pebble conglomerates; thin siltstone interbeds locally. Basal parts of unit consist of moderate reddish orange (10R6/6) to light brown (5YR6/4), thin- to medium-bedded, fine-grained sandstone, siltstone, and siltstone-pebble conglomerates that locally fine upward to moderate reddish brown (10YR5/4) to moderate reddish orange (10R6/6) very fine grained sandstone. Troug cross-lamination and parting lineations common. Conglomerates consist of indurated siltstone and shale clasts set within a fine-grained, quartz-rich sandstone matrix; typically pale brown (5YR5/2) in color; clasts may be imbricated or loosely oriented into planar crossbedded beds and irregular splotches occur in sandstones, siltstones, and shales; burrows common. Contact with underlying Hennessey Formation placed at base of lowest mappable fine-grained sandstone. Thickness: only basal 30 ft exposed in far southwest corner of map
- Phy** HENNESSEY FORMATION (Permian)—Mostly a poorly exposed, moderate reddish brown (10R4/6), moderate red (5R4/6), to moderate reddish orange (10R6/6) muddy siltstone, silty shale, with minor very fine grained sandstone; locally with conspicuous light greenish gray (5GY3/1) to pale green (10G6/2) iron-reduction spots and bands. Spots average ½ in. in diameter, common throughout; bands usually parallel to bedding and more common in lower third of unit. Interbeds of very fine-grained siltstone and siltstone-pebble conglomerates also occur, with conglomerates common in basal half, rare in upper half. Where exposed, shales common in upper 20 ft of unit; locally interbedded with more resistant siltstone beds; shale typically unstratified with small-scale slickensides that are indicative of paleosol development. Siltstone moderately to well stratified with thin to laminated trough-cross-stratification and/or rippled marks; typically weathers to bench-and-slope topography, particularly common in basal 30 ft of formation. Locally, sandstone cross-stratified, but rarely forming channel deposits. Siltstone and sandstone exhibit platy to flaggy weathering, muddy soil. Contact with Garber Formation placed at top of highest mappable fine-grained sandstone. Thickness: 430 ft
- Pgr** GARBER FORMATION (Permian)—Sandstone, mostly fine-grained to less common very fine to medium-fine-grained; appears to be very fine grained near base; moderate reddish brown (10R4/6), moderate reddish orange (10R6/6), moderate red (5R5/4), light brown (5YR5/6), and dark yellowish orange (10YR6/6); minor siltstone, shale, and siltstone-pebble conglomerate. Sandstone typically porous and friable; commonly weathers to smooth, rounded outcrops; locally with platy to flaggy to rarely slabby appearance. Locally, weathers to hard, dark-colored (grayish black (N2)) beds composed of hematite, calcite, barite, and/or rarely dolomite. Dark-colored sandstone blocks locally lag deposit on weathered surface. Common near base contact with Hennessey Formation. Shale common, many outcrops characterized by inclined beds and channel-form deposits, although plane-parallel stratification also present. A fairly widespread moderate red (5R5/4) to pale red (5R6/2), 2 to 3 ft thick conglomerate bed occurs within 15 ft of the top of the formation. The bed consists of pebble-size siltstone and shale clasts, rarely dolomite and limestone clasts set in a medium to coarse-grained sandstone matrix. Sandstone locally color-banded (e.g., moderate reddish brown (10R4/6), grayish red purple (5RP4/2), and grayish yellow green (5GY7/2)) or with mottled appearance. Small calcareous and iron-oxide spheres occur locally on weathered surface. Circular iron-reduction spots very common in upper half of unit. Near contact with Hennessey Formation, shales and sandstones are very sandy color-banded (e.g., moderate reddish brown (10R4/6) and yellowish gray (5Y7/2)), stratified to unstratified, and with uncommon iron-reduction spots as large as 2 in. in diameter. Siltstone with minor shale common near top of formation. In places, siltstone and shale contain evidence of paleosol development such as blocky weathering; fractures with surfaces marked by small slickensides; through-going curved fractures; and calcrite deposits. Thickness: about 1030 ft based on cross-section; basal 970 ft not exposed in map area

#### SYMBOLS

- Unit contact; dashed where approximate
- × Outcrop, geologic observation
- Petroleum well. Includes oil, gas, oil and gas, dry service (water supply or injection), junked and abandoned, unknown. Modified from Natural Resources Information System database
- Municipal water well



The base map was compiled by the U.S. Geological Survey from 1:24000-scale topographic maps dated 1962. Planimetry revised from aerial photographs taken 1995. Universal Transverse Mercator (UTM) projection, 1983 North American Datum, 10-meter grid. Map is based on Oklahoma State Boundary, south zone, 100-meter UTM grid, zone 14.

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