

PRELIMINARY SURFICIAL GEOLOGY OF THE EFFINGHAM QUADRANGLE, ATCHISON COUNTY, KANSAS

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CENOZOIC ROCKS

Quaternary

Qal Alluvium and terrace deposits

Holocene
Alluvium — Brown to bluish-gray sandy pebbly clay deposits. Thin beds of gravel composed of limestone, chert, and glacial material may be interspersed throughout deposits or rest directly on bedrock. Thickness: 0-105 ft (0-32 m)

Pleistocene and Illinoian and Wisconsin Glaciation

Terrace deposits — Discontinuous deposits of brown sandy clay on stream-valley walls. Deposits may contain reddish-brown silt resembling loess. Thickness: 0-70 ft (0-21 m)

Ql Loess and Nortonville Clay

Pleistocene and Illinoian and Wisconsin Glaciation

Loess — Aeolian deposits of brown to reddish-brown non-calcareous slightly sandy silt generally found in upland positions. Locally, loess may be older than Wisconsin age. Thickness: 0-40 ft (0-12 m)

Pleistocene

Nortonville Clay — Light-gray compact clay that may be slightly sandy and contain sparse pebbles. Reddish-brown weathered streaks may be present throughout the clay. Thickness: 0-45 ft (0-14 m)

Qg Glacial till and glaciofluvial deposits

Pleistocene

Cedar Bluffs Till — Mixture of clay, silt, and gravel with colors of brown to reddish-brown, yellowish-brown, or light gray. Contains erratics and lenses of gravel. Thickness: 0-100 ft (0-30 m)

Pleistocene and Kansan Glaciation

Glaciofluvial deposits — Outwash of fine to coarse quartz sand, silt, gravel, and boulders occurring between the Cedar Bluffs and Nickerson Tills. Thickness: 0-70 ft (0-21 m)

Pleistocene and Kansan Glaciation

Nickerson Till — Mixture of clay, silt, sand, and gravel with color of dark gray to bluish-gray with some reddish-brown streaks. Contains lenses of gravel and less erratics than Cedar Bluffs Till. Thickness: 0-90 ft (0-27 m)

PALEOZOIC ROCKS

Pennsylvanian — Virgil Series — Wabunsee Group

Pzpsr Root Shale, Stotler Limestone, Pillsbury Shale, and Zeandale Limestone

Root Shale (Friedrich Shale Member) — Gray to yellowish-brown calcareous micaceous sandy shale. Thickness: 5-10 ft (1.5-3 m)

Stotler Limestone (Grandhaven Limestone, Dry Shale, and Dover Limestone Members) — Tannish-gray fossiliferous hard massive limestone and gray calcareous sandy shale. Thickness: 5-10 ft (1.5-3 m)

Pillsbury Shale — Light-brown to bluish-gray noncalcareous sandy shale and locally contains soft brown sandstone. Thickness: 15-30 ft (4.5-9 m)

Zeandale Limestone (Maple Hill Limestone, Wamego Shale, and Tarkio Limestone Members) — The upper Maple Hill Limestone is tannish-gray, impure, medium hard, and fossiliferous. The Wamego Shale is brown, non-calcareous, silty, and sandy and contains a thin coal bed near the top. The lower Tarkio Limestone is one bed of grayish-brown fossiliferous hard massive limestone. Thickness: 15-20 ft (4.5-6 m)

Pwn Willard Shale, Emporia Limestone, Auburn Shale, and Bern Limestone

Willard Shale — Gray to brownish-gray non-calcareous micaceous sandy shale and locally contains an impure sandstone in upper part. Thickness: 30-40 ft (9-12 m)

Emporia Limestone (Elmont Limestone, Harveyville Shale, and Reading Limestone Members) — The upper Elmont Limestone is bluish-gray to brown, hard, and fossiliferous and the intervening Harveyville Shale is gray to greenish-gray, calcareous, and blocky. The lower Reading Limestone is two or three beds of bluish-gray to brown slightly fossiliferous hard, dense limestone. Thickness: 20-30 ft (6-9 m)

Auburn Shale — Gray to light-gray shale, limy in lower part, silty and sandy in middle part, and very limy in upper part. A thin black play shale is present near the middle part. Thickness: 30-40 ft (9-12 m)

Bern Limestone (Wakarusa Limestone, Soldier Creek Shale, and Burlingame Limestone Members) — The upper Wakarusa Limestone is a bluish-gray to brown fossiliferous hard dense limestone. The Soldier Creek Shale is a gray to greenish-gray shale and the lower Burlingame Limestone is a gray to brown fossiliferous medium-hard limestone. Thickness: 20-30 ft (6-9 m)

Pws Scranton Shale, Howard Limestone, and Severy Shale

Scranton Shale (Silver Lake Shale, Rulo Limestone, Cedar Vale Shale, Happy Hollow Limestone, and White Cloud Shale Members) — Tan to bluish-gray silty sandy shale Members. The limestones are 1 to 3 feet (0.3-1 m) thick, gray, fossiliferous, and silty. A thin coal bed is present just below the Rulo Limestone Member. Thickness: 50-80 feet (~15-24 m)

Elevation contours are presented for general reference. They are generated from U.S. Geological Survey National Elevation Dataset (NED) digital elevation models (DEMs) with 1/3 arc-second resolution, which are in turn generated from high-resolution elevation data and other USGS DEMs. In some places the contours may be more generalized than the base map used for compilation of geologic outcrop patterns. Outcrop patterns on the map will typically reflect topographic variation more accurately than the associated contour lines. Repeated fluctuation of an outcrop line across a contour line should be interpreted as an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

Geology was mapped in the field using a USGS 7.5-minute 1:24,000-scale topographic map.

Roads and highways are shown on the base map as represented by data from the Kansas Department of Transportation (KDOT), TeleAtlas, and other sources. U.S. Department of Agriculture — Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) imagery also was used to check road locations.

Shaded relief is based on U.S. Geological Survey digital elevation model (DEM) with 1/3 arc-second resolution. The 1/3 arc-second data, in ESRI GRID format, were converted to a hillshade, a multidirectional shaded-relief image using angles of illumination from 0°, 225°, 270°, and 315° azimuths, each 45° above the horizon, with a 4x vertical exaggeration.

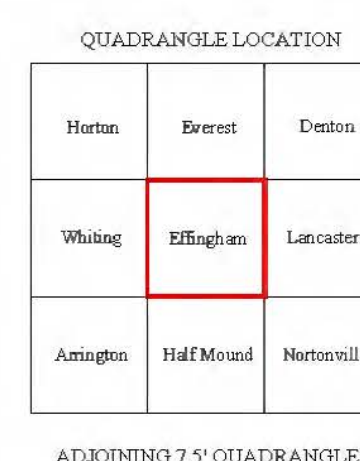
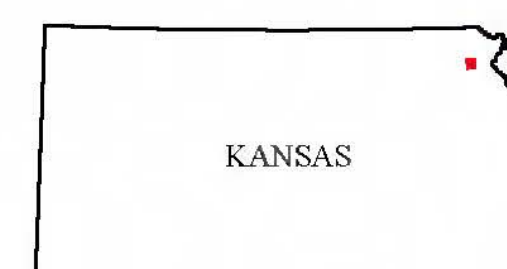
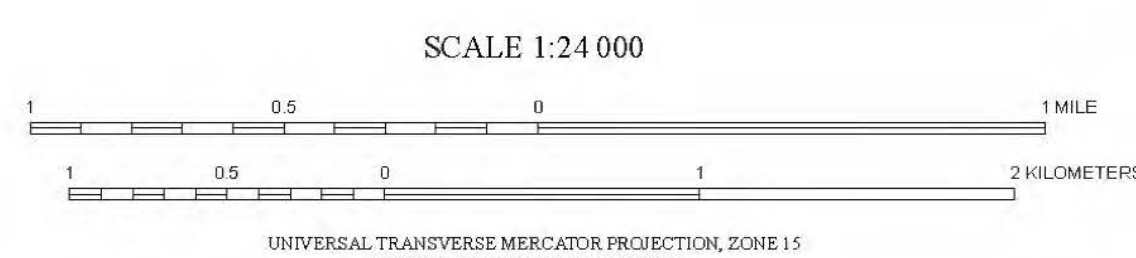
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award number G12AC20279 (FY2012).

This map was produced using the ArcGIS system developed by Esri (Environmental Systems Research Institute, Inc.).

This map is a preliminary product and has had less scientific and cartographic review than the Kansas Geological Survey's M-series geologic maps. KGS does not guarantee this map to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations made from the map or decisions based thereon.

SUGGESTED REFERENCE TO THIS MAP

Johnson, W. C., and Koop, A., 2013, Preliminary surficial geology of the Effingham quadrangle, Atchison County, Kansas: Kansas Geological Survey, Open-file Report 2013-4, scale 1:24,000, unpublished.



EXPLANATION

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|---------------------------------|---|
| Boundaries and Locations | Geologic Unit Boundaries |
| — Township/range line | — Observed contact |
| — Section line | Hydrology and Topography |
| ○ City | — Perennial stream |
| ▨ Built-up area | — Intermittent stream |
| Transportation | — Water body |
| — U.S. highway | — Elevation contour (50-meter interval) |
| — State highway | — Elevation contour (10-meter interval) |
| — Medium-duty primary road | Resource Development |
| — Medium-duty secondary road | — Open gravel pit |
| — Light-duty road | |
| — Unimproved road | |

TRUE NORTH
MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 2013