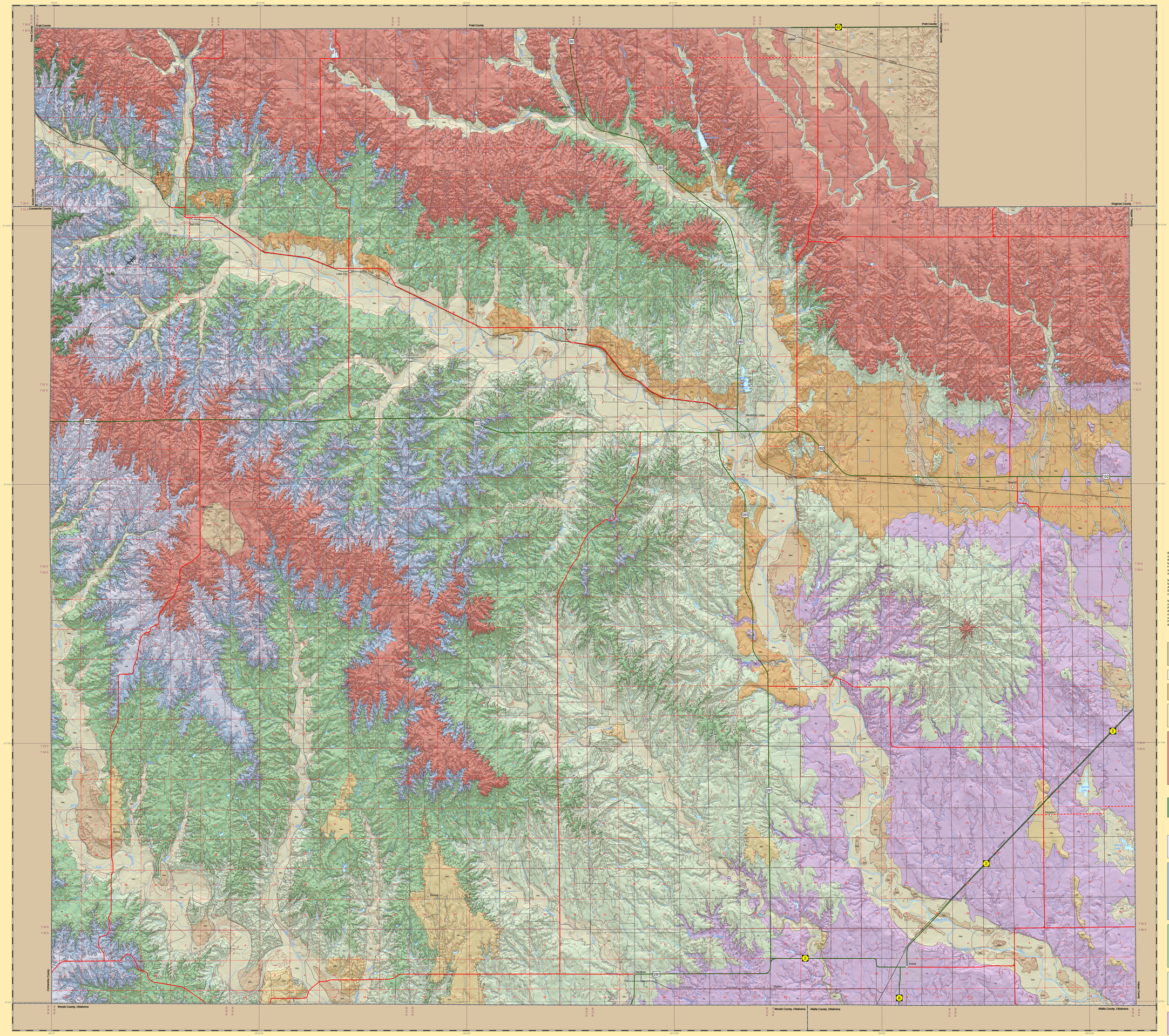
KANSAS GEOLOGICAL SURVEY
THE UNIVERSITY OF KANSAS
MAP M-106



GEOLOGIC MAP OF BARBER COUNTY, KANSAS

2007

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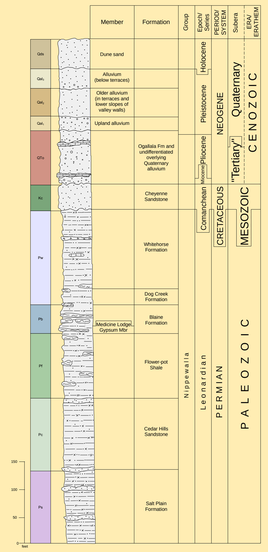

Lithographic Explanation

- Sand and gravel, conglomerate, or "mortar beds"
- Sandstone or sand
- Limestone
- Cherty dolomite
- Dolomite
- Gypsum or anhydrite
- Red beds

Geography

Barber County is the sixth largest county in Kansas, covering 1,136 mi^2 (2,942 km^2), and is located along the Oklahoma border in south-central Kansas. It is bordered on the west by Comanche and Kiowa counties, on the north by Pratt and Kingman counties, on the east by Harper County, and on the south by Woods and Alfalfa counties in Oklahoma. Medicine Lodge is the county seat and the largest city in Barber County. Other smaller communities are Isabel in the northeast; Sharon in the east-central part of the county; Hardtner, Kiowa, and Hazelton in the southeast; and Lake City and Sun City in the northwest. US-281 crosses the county north and south and US-160 crosses the county east and west. These highways intersect in Medicine Lodge. State highway K-2 crosses the southeast corner of the county connecting Kiowa and Hazelton.

Major streams include the Salt Fork of the Arkansas River, which crosses and drains the southwest corner of the county, and the Medicine Lodge River, which flows diagonally across the county northwest to southeast. Large tributaries of the Salt Fork of the Arkansas River include Mule Creek, Big Sandy Creek, and Hackberry Creek. Large tributaries of the Medicine Lodge River include Elm Creek and Little Mule Creek. Little Sandy Creek drains the eastern edge of the county and Sand Creek drains the northeast corner.

Most of Barber County is in the Red Hills physiographic region. The Red Hills of south-central and southwestern Kansas get their name from the extensive outcrops and badlands formed on the Permian red beds. All the Paleozoic rocks in Barber County are Permian red beds. The High Plains physiographic region occupies large areas in the norther part of the county and a smaller area on the uplands in the western part of the county that divides the drainage of the Medicine Lodge and the Salt Fork of the Arkansas rivers. Areas of low relief are found on the High Plains surfaces and in east-central and southeastern Barber County. Much of the rest of the county is highly dissected by erosion including the High Plains margin in the north and west-central areas. The Blaine Formation forms a prominent escarpment in the west-central, northwest, and southwest parts of the county that is known locally as the Gyp Hills. Here local relief can be up to 200 to 300 ft (61-92 m).

Cenozoic Rocks

Qds — **Dune Sand** – Windblown sand is found in two general areas in Barber County: on the High Plains physiographic region surfaces and near large streams. Two areas of dune sand are found on the High Plains, in the northeastern corner of the county and on the High Plains extension into the west-central part of the county near Deerhead, Kansas. Dune-sand areas are found in the valleys of several streams in Barber County, including Mule Creek, Salt Fork of the Arkansas River, Medicine Lodge River, Elm Creek, and the Little Sandy Creek and its tributaries. These dune-sand deposits are stabilized for the most part by vegetation including stands of sand sage and plum thickets. Dune sand is generally less than 50 ft (15 m) thick, and the deposits form a hillocky terrain that still reflects some subdued dune forms.

Qal_4 — **Alluvium below terraces** – is the reddish-brown sand and silt found in the floodplains of the larger streams in Barber County. These deposits are a source of sand and gravel in the county. The Medicine Lodge River alluvial aquifer provides water for a few center-pivot irrigation systems located upstream from Medicine Lodge.

Qal_3 — **Alluvium (in terrace and lower slopes of valley walls)** – is silt, sands, and gravels generally found adjacent to and slightly above stream floodplains. These deposits are numerous along Elm Creek and the Medicine Lodge River and in the broad low area east of Medicine Lodge. This unit is reddish brown in color and may contain igneous rocks and dolomite fragments. Both Qal_3 and Qal_4 are quarried for sand and gravel. Qal_3 provides irrigation water for a few center pivots between Medicine Lodge and Sharon.

Qal_1 — **Upland Alluvium** – The Upland alluvium unit represents sand, gravels, and cobbles found in the southern part of Barber County that are generally found in upland locations well above and often distant from stream floodplains. These deposits are reddish brown in color and contain rocks with various provenances. Quartz, quartzite, granite, and chert in this unit indicate derivation from the Rocky Mountains. Dolomite fragments and chert may be derived from the Permian outcrops of the Kiowa Formation that may have covered Barber County at one time and which crops out to the west in Comanche and Kiowa counties. Dolomite fragments most likely weathered out of surrounding Permian red beds. Some of these accumulations may be lag deposits left from the erosion of overlying rocks.

QTo — **Ogallala Formation and Undifferentiated Overlying Quaternary Alluvium** – The Ogallala Formation (Miocene-Pliocene) underlies the High Plains physiographic surface in northern Barber County and the high divide between the valleys of the Medicine Lodge River and the Salt Fork of the Arkansas River. A small outcrop occurs on the highest part of the Cedar Hills 5 mi (8 km) south-southwest of Sharon, sec. 7 and 18, T.33 S., R.10 W. The Ogallala/Quaternary unit (QTo) may contain Pleistocene sediments that are lithologically very similar to the Ogallala and overlie the Ogallala in some areas. This unit is a mixture of cobbles, gravel, sand, silt, loess, clay, and caliche beds. Mortar beds can also be found in the Ogallala. The cobbles are composed of quartzite, chert, igneous rocks, petrified wood, and various metamorphic rocks as well as quarzites and quartz. The color ranges from white calliche beds to buff to reddish brown. The thickness of the QTo reaches 160 ft (49 m) in the north-central and northeast parts of the county. This unit is an aquifer where it is thick enough to maintain a usable saturated thickness and supplies water to several center-pivot irrigation systems in the northern parts of the county. The base of the QTo cuts downwart topographically and stratigraphically from the west to the east across Barber County. In the northwest corner of Barber County, the QTo rests on the Cheyenne Sandstone, Whitehorse Formation, Dog Creek Formation, Blaine Formation, Flower-pot Shale, and Cedar Hills Sandstone, and rests on the Salt Plain Formation at the eastern border of Barber County at an elevation of 1,600 ft (488 m) – 400 ft (122 m) lower than at the western border. Numerous sand and gravel pits can be found in the QTo.

Mesozoic Rocks

Kc — **Cheyenne Sandstone** – The Cheyenne Sandstone crops out in far northwestern Barber County. The type locality of the Cheyenne Sandstone is Cheyenne Rock west of Belvidere in Kiowa County. This location is about 4.5 mi (7.2 km) west of the northwest corner of Barber County. The Cheyenne Sandstone is up to 50 ft (15 m) thick and is composed of white to light-gray quartz sand. Some weathered outcrops have a yellowish to buff color. The Cheyenne Sandstone in Barber County is weakly cemented and erodes easily forming small badland areas. The best exposures in Barber County are found along the appropriately name White Sands road southwest of Sun City in secs. 7, 18, and 19, T. 31 S., R. 15 W.

Paleozoic Rocks

Pw — **Dog Creek and Whitehorse Formations** – The Dog Creek Formation of the Nippewalla Group and the Whitehorse Formation (Custerian Stage) are found in the western third of Barber County on the tablelands supported by the Blaine Formation. The Dog Creek is named for exposures along Dog Creek in the west-central part of the county and constitutes up to 30 ft (9 m) of red sandstone, siltstone and silty shale. The White Horse Formation overlies the Dog Creek Formation and is made up of red sandstone, siltstone, shale, and a few thin beds of dolomite. The contact between these formations is difficult to observe in the field and thus these two very similar formations were mapped as one unit. The Dog Creek-Whitehorse reaches a combined thickness of up to 160 ft (49 m) along the western border near US-160.

Pb — **Blaine Formation** - The Blaine Formation of the Nippewalla Group is up to 50 ft (15 m) thick and is most notable for thick beds of gypsum. Although up to four gypsum members have been named in the Blaine, only the lowest, the Medicine Lodge Gypsum Member is prominent in Barber County. The Medicine Lodge Gypsum Member is named for exposures in the Medicine Lodge River valley. The Blaine Formation forms a prominent escarpment in the west, northwest, and southwest. The Blaine also contains thin beds of dolomite, often at the base, and interbedded red and green shale. The gypsum in the Blaine is the caprock of upland areas in the western half of Barber County. One such area is north of the Medicine Lodge River in the northwest part of the county. Another is a much larger plateau in the west-central part of the county separating the drainage of the Medicine Lodge River and the Salt Fork of the Arkansas River. Another small upland is in the far southwestern corner of the county. The Blaine also caps many outlying buttes and mesas that have been isolated from the larger uplands by erosion. The Medicine Lodge Gypsum Member of the Blaine forms outcrops that can be seen along the Gyp Hills Scenic Drive southwest of Medicine Lodge, along US-160 west of Medicine Lodge and along the Sun City road that leads north from US-160 to Sun City. The Medicine Lodge Gypsum Member is best exposed on north- and east-facing slopes, forming a sharply defined escarpment. Dissolution of the gypsum appears to be more active on south- and west-facing slopes resulting in fewer prominent outcrops and a more subdued, less rugged escarpment. The Medicine Lodge Gypsum Member was quarried in actively mined Z mi (3.X km) southwest of Sun City in northwestern Barber County. Both open-pit and underground mining methods are used. Much of the gypsum is trucked to a plant in Medicine Lodge for the manufacturing of wallboard.

Pt — **Flower-pot Shale** - The Flower-pot Shale of the Nippewalla Group overlies the Cedar Hills Sandstone and underlies the Blaine Formation. It is mostly a reddish-brown to red, easily eroded shale that forms the steep badland slopes below the Blaine escarpment in the rugged areas of Barber County. It contains much gypsum in the form of veins of satin spar and selenite that weather out and litter the outcrops. It contains a few thin, well-cemented siltstone beds that form prominent ledges on the steep slopes west of Medicine Lodge. With the exception of some outcrops east of Elm Creek in the north-central part of the county, the Flower-pot Shale is restricted to that part of Barber County west of US-281. The Flower-pot Shale is up to 170 ft (55 m) thick in Barber County and excellent exposures are abundant on the slopes of the butte and mesas west of Medicine Lodge. Prominent outcrops can be seen along the Gypsum Hills Scenic Drive southwest of Medicine Lodge (the Gyp Hills Scenic Drive which makes a loop south of US-160 a few miles west of Medicine Lodge. The type locality for the Flower-pot Shale is Flower-pot Mound, 8 mi (12.9 km) southwest of Medicine Lodge in SW sec. 26, T. 32 S., R. 13 W. Flower-pot Mound is a butte capped by the Blaine Formation. The terra cotta color of the shaly slopes of this butte and a lone tree that grew on its summit in the late 1800's suggested a potted plant to the early settlers and is the source of the name.

Pc — **Cedar Hills Sandstone** – The Cedar Hills Sandstone of the Nippewalla Group is found throughout Barber County except for the west-central and northwest portions of the county. It forms the lower slopes of upland areas. It is composed of red sandstone and siltstone and contains some thin beds of shale. It forms a cliff-and-slope topography where it is exposed in the steep-walled canyons in some of the high-relief areas. Extensive outcrops can be found in an isolated upland area 4 mi (6.4 km) south-southwest of Sharon known locally as the Cedar Hills. This is the type locality of the Cedar Hills Sandstone. The Cedar Hills Sandstone is exposed in numerous scenic canyons that have been carved by streams flowing away from this upland area in a radial pattern. The Cedar Hills Sandstone also crops out in the hills 2 mi (3.2 km) north of Sharon. Numerous good exposures also are found in the lower, eroded slopes of the prominent escarpment capped by the Blaine Formation which rises west and southwest of Medicine Lodge. Up to 180 ft (55 m) of Cedar Hills Sandstone is exposed in Barber County.

Ps — **Salt Plain Formation** - The oldest rock unit exposed in Barber County is the Salt Plain Formation of the Nippewalla Group. The Salt Plain is composed of red-brown siltstones, fine sandstones, clays, and shales. These rocks are weakly cemented and easily eroded and form the broad, low-relief areas in southeastern Barber County. Prominent outcrops are rare and much of the outcrop area is under cultivation. Outcrops of the Salt Plain Formation can be found at the base of the hills 2 mi (3.2 km) north of Sharon. Hard resistant beds of red siltstone with some thin white siltstone can be found capping the low bluffs that line the west side of the Medicine Lodge River 3-4 mi (4.8-6.4 km) north of Kiowa and the east side 6-8 mi (9.7-12.9 km) north. Approximately 160 ft (55 m) of the Salt Plain Formation is exposed in Barber County.

General Source

Swineford, Ada, 1955, Petrography of Upper Permian rocks in south-central Kansas: Kansas Geological Survey, Bulletin 111, 179 p.

Elevation contours are presented for general reference. They are taken from USGS Digital Line Graph (DLG) files compiled from base maps at a scale of 1:100,000. In some places the contours from the DLG's are more generalized than the base maps 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 across a single contour line should be interpreted as an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

The geology was mapped in the field using USGS 7.5-min 1:24,000-scale topographic maps.

Roads and highways are shown on the base map as represented by data in the Kansas Cartographic Database. These roads were compiled from base maps at a scale of 1:100,000. Some recently constructed roads may not be adequately the base map will be revised to reflect new highway construction (not yet represented on USGS maps).

Shaded relief is based on U.S Geological Survey digital elevation model (DEM) data with 1/3 arc-second resolution. The 1/3 arc-second data, in ESRI GRID format, were converted to a hillshade, which was then resampled to approximately 1/6 arc-second and smoothed using cubic convolution, with each cell value based on fitting a smooth curve through the 16 nearest input cell centers.

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

The Kansas Geological Survey 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:
McCauley, J.R., 2007, Geologic Map of Barber County, Kansas: Kansas Geological Survey, Map M-106, scale 1:50,000.

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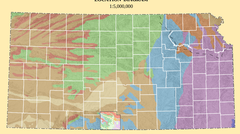
LOCATION DIAGRAM
15,000,000



GENERALIZED GEOLOGY OF KANSAS

NEOGENE SYSTEM
Quaternary subsystem
Holocene - Pleistocene Series
Loess and river-valley deposits
Sand dunes
Glacial-drift deposits
Limit of Kansas glaciation
NEOGENE - PALEOGENE SYSTEM
Pliocene - Miocene Series
Ogallala Fm
CRETACEOUS SYSTEM
PERMIAN SYSTEM
CARBONIFEROUS SYSTEM
Pennsylvanian subsystem
Mississippian subsystem

Index to 1:24,000 scale maps

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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

1 - Belvidere - 1968
2 - Sun City - 1968
3 - Isabel SE - 1973
4 - Sharon - 1973
5 - Nashville - 1973
7 - Zenda - 1973
8 - Wilmore SE - 1968
9 - Sun City SW - 1968
10 - Sun City NW - 1968
11 - Medicine Lodge SW - 1973
12 - Medicine Lodge - 1973
13 - Sharon North - 1973
14 - Zenda SE - 1973
15 - Indian Creek - 1980
16 - Deerhead - 1973
17 - Hardtner NW - 1973
18 - Hardtner NW - 1973
19 - Gerlane - 1973
20 - Sharon South - 1972
21 - Coldwater - 1972
22 - Fancy Canyon - 1980
23 - Stunkard - 1973
24 - Hackberry Creek - 1973
25 - Hardtner - 1973
26 - Stubble - 1973
27 - Kiowa - 1972
28 - Cowsin - 1972

CONVERSION TABLE

	feet	meters	kilometers	miles
feet	1	0.3048	0.00305	0.00019
meters	3.2808	1	0.001	0.00062
kilometers	3280.8	1000	1	0.6214
miles	5280	1609.4	1.6094	1

To convert feet to meters multiply by 0.3048
To convert meters to feet multiply by 3.2808
To convert kilometers to miles multiply by 0.6214
To convert miles to kilometers multiply by 1.6094

Kilometers
1 0.5 0 1 2 3
Miles
1 0.5 0 1 2 3

GN
MN
9°11'
7.5°
Convergence (GN) and 1991 magnetic declination (MN) at center of map
Diagram is approximate

1:50,000

Lambert Conformal Conic Projection with standard parallels at 33° and 45°
North American Datum of 1927

Illumination azimuth 0°
Elevation 45°

Geologic Unit Boundaries

1 - Observed contact
2 - Inferred contact

Hydrology and Topography

1 - Intermittent stream
2 - Perennial stream
3 - Canal
4 - Abandoned canal*
5 - Areal hydrology
6 - Shoreline (to boundaries*)
7 - Dam*
8 - Elevation contours (50-meter interval)
9 - Elevation contours (10-meter interval)
* Does not appear on this map

Transportation

1 - Interstate highway*
2 - Federal highway
3 - State highway
4 - Medium-duty primary road
5 - Medium-duty secondary road
6 - Light-duty improved road
7 - Unimproved secondary road
8 - Railroad
9 - Landing strip
10 - Airport
* Does not appear on this map

Boundaries and Locations

1 - State line
2 - County line
3 - Township/Range line
4 - Section line
5 - Park boundary*
6 - County seat
7 - Lake
8 - Locality
9 - City boundary
* Does not appear on this map

Resource Development

1 - Quarry*
2 - Mine
3 - Pit
4 - Oil wells*
5 - Gas wells*
6 - Oil and gas wells*
g - Gravel
* Does not appear on this map

Index Reference Features

1 - 1:24,000 map edge
2 - Line of cross section*
* Does not appear on this map

Townships

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Diagram of a township showing numbering of sections

Last Updated April 23, 2007