PRELIMINARY SURFICIAL GEOLOGY OF THE MIAMI COUNTY PORTION OF THE LANE QUADRANGLE, KANSAS

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2014

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KANSAS GEOLOGICAL SURVEY
The University of Kansas

Open-file Report 2014-10

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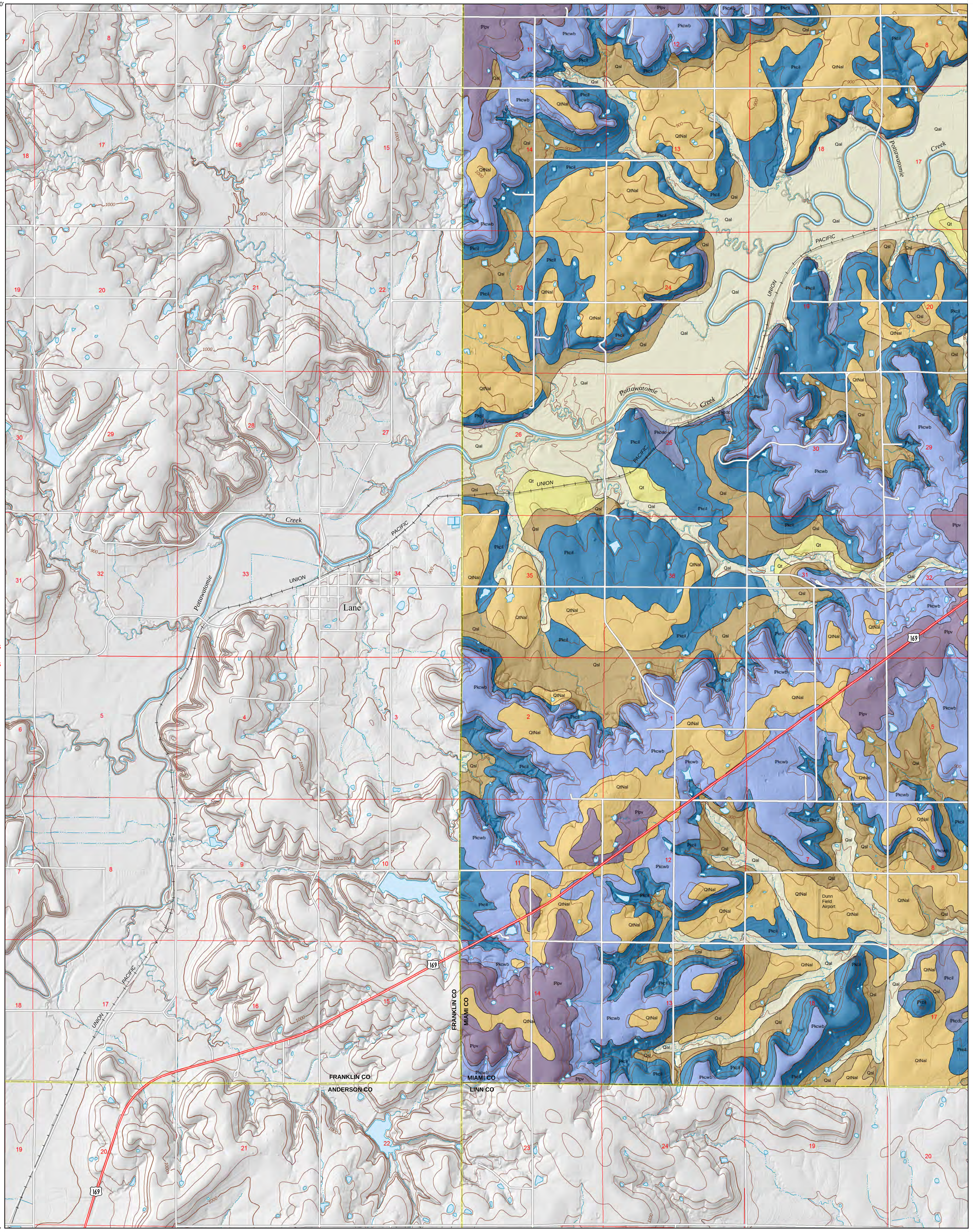


Qal

Qt

QtNal

Qsl

Plpv

Pkcwb

Pkcil

Pkcdc

GEOLOGIC UNITS

CENOZOIC

Quaternary System

Undifferentiated Alluvium — Undifferentiated alluvium that typically is less than 4,000 years old comprises valley fills beneath the modern floodplain of the Marais des Cygnes River and its tributaries. This alluvium consists of clay, silt, sand, and gravel, with the coarsest sediments comprising the lower 3-6 ft (0.9-1.8 m) of the valley fills. The fine-grained floodplain facies are mostly dark gray, gray, dark grayish brown, and grayish brown silty clay, and silty clay loam. These deposits can reach thicknesses greater than 50 ft (15 m) in the Marais des Cygnes River valley.

Alluvial Terraces — Alluvium that typically is 4,000 to 11,000 years old comprises valley fills beneath a low terrace (T-1) of the Marais des Cygnes River and its tributaries. This alluvium consists of clay, silt, sand, and gravel, with the coarsest sediments comprising the lower 3-6 ft (0.9-1.8 m) of the terrace fills. The fine-grained alluvium is mostly brown, dark yellowish brown, and yellowish brown silty clay loam. These deposits can reach thicknesses greater than 70 ft (21 m) in the Marais des Cygnes River valley.

Quaternary and Neogene Alluvium — Clayey alluvium often interbedded with cherty gravel is common beneath high terraces and on hilltops in Miami County. The numerical age of these alluvial deposits is unknown. However, based on their position in the landscape, the deposits on the hilltops probably aggraded during the Neogene (Aber, 1998), and it is likely that the high-terrace fills date at least to the middle Pleistocene. The lower 3-6 ft (0.9-1.8 m) of the terrace fills and hilltop deposits consist of cherty gravel. The overlying fine-grained alluvium mostly consists of dark gray, gray, dark grayish brown, and pale brown silty clay. The distribution of fine-grained alluvium interbedded with cherty alluvial gravels is indicated by the Kenoma soil series, as shown on the *Soil Survey of Linn and Miami Counties, Kansas* (Penner, 1981). Redoximorphic features, including strong brown and reddish brown mottles and iron and manganese oxide concretions, are common in the upper 3-10 ft (0.9-3 m) of the fine-grained alluvium. Alluvial deposits comprising the fills of high terraces are typically 20-30 ft (6-9 m) thick, but the alluvial deposits on hilltops generally are less than 15 ft (4.5 m) thick. A veneer of loess that is less than 3 ft (0.9 m) thick often caps the high-terrace and hilltop alluvial deposits.

Colluvial Apron and Alluvial Fan Deposits — Deposits of clay, silt, sand, and gravel occur on footslopes and toeslopes in valley landscapes. These deposits mostly accumulated during the early and middle Holocene, although some may date back to the terminal Pleistocene, and they comprise both colluvial aprons and alluvial fans. The colluvial aprons consist of massive deposits of poorly sorted sediments that include many angular, bedrock-derived pebbles and cobbles. The alluvial fans formed where small, intermittent streams enter the Marais des Cygnes River valley and the valleys of its major tributaries. The fan deposits are stratified and consist of well-sorted alluvium dominated by brown, dark yellowish brown, and yellowish brown silty clay, silty clay loam, and silt loam. Thin lenses of gravel are common, and buried soils often occur at the top of upward-fining sequences.

PALEOZOIC

Carboniferous System –Pennsylvanian Subsystem
(descriptions from Miller, 1966)

Lansing Group

Plattsburg Limestone/Vilas Shale — The lower part of the Lansing group is composed of the Plattsburg Limestone and overlying Vilas Shale (~35 ft; 11 m thick). The **Plattsburg Limestone** (~16 ft; 5 m) is composed of two limestone members and intervening shale member. In ascending order, these units are Merriam limestone, Hickory Creek shale, and Spring Hill limestone. The **Merriam Limestone Member**, averaging 3.5 ft (1 m), but ranging from 1- 9.5 ft (0.3-3 m), is commonly a single, massive bed of bluish-gray to light-gray, fine-grained, dense limestone. The lower part (3.6 ft; 1.1 m) of the Merriam limestone is a massive, bluish-gray to light-gray, cross-bedded, oolitic limestone, locally with black, fossiliferous chert. It is commonly a resistant unit, forming scarps and outcrops. Coated grains and *Osagia*-like forms are usually present and in some places these constitute a large part of the limestone. Myalinid pelecypods and productid brachiopods can be common. The upper part of the Merriam limestone is a light- to medium-gray, fine-grained, massive, locally cherty limestone, but usually not fossiliferous. "Worm tubes" are present in some localities on the upper surface. The **Hickory Creek Shale Member** (locally absent to 2 ft;0.6 m) is yellowish-gray to orangish-gray, clayey, nodular, and calcareous. A thin, nodular limestone bed locally occurs near the middle of the unit. The shale is fossiliferous, commonly with crinoid remains and bryozoans. The **Spring Hill Limestone Member** (4-17 ft; 1.2-5 m) is light olive-gray to yellowish-gray, fine- to coarse-grained, thin- to medium-bedded, and sandy. It contains chert locally and may be oolitic in places at its top or conglomeratic with limonite pebbles, shale and ironstone fragments, and small abraded calcite crystals. Shale partings and thin, wavy carbonaceous streaks may be present within this member. *Triticites* sp. and *Osagia*-like forms and echinoid spines are locally abundant. A zone of large *Composita* sp. is commonly found near the base of the unit. The **Vilas Shale** (5 ft; 1.5 m, thickening westward to 30 ft; 9 m) is grayish-olive to light-gray, sandy, and blocky. In the western part of the county it contains a considerable amount of moderate yellowish-brown siltstone and orangish-gray cross-bedded sandstone, which may be up to 4 ft (1.2 m) thick. Plant remains are common in the sandy layers, but otherwise it is relatively unfossiliferous.

Kansas City Group

Wyandotte Limestone/Bonner Springs Shale — The uppermost part of the Kansas City Group is composed of the **Wyandotte Limestone** and the overlying Bonner Springs Shale. The Wyandotte Limestone is composed of five alternating shale and limestone members. From the base upward, these five units are the Frisbie limestone, Quindaro shale, Argentine limestone, Island Creek shale, and Farley limestone. The Wyandotte is a cuesta-forming formation, ranging in thickness from about 10 to 80 ft (3 to 24 m). The shale members are present only locally in Miami County. The absence of the shale members and the similarity in the lithology of the two upper limestone members make identification of the units difficult. The **Frisbie Limestone Member** (2.5-3.6 ft; 0.8-1.1 m) is a light olive-gray to light brownish-gray, fine-grained, massive limestone. Locally, thin shales (<0.5 ft; 0.15 m) thick) can be present in the Frisbie. Crinoid stems and small productid brachiopods are the most common fossils and locally *Osagia*-like forms (coated grains) may be present. The **Quindaro Shale Member** (locally absent to 3.3 ft; 1 m) is a dusky-yellow to dark yellowish-orange, sandy shale. In places the lower part of this unit is composed of very dark gray shale. The Quindaro is very fossiliferous with *Heterocoelia* sp., *Dielasma* sp., and *Phricodothyris* sp. being the most common forms. Crinoid fragments and bryozoans are also abundant. The **Argentine Limestone Member** (~35 ft; 11 m) is probably the most persistent member of the Wyandotte. It is lithologically similar to the Farley limestone which is normally the uppermost limestone member of the Wyandotte. Locally the Farley limestone can be missing and the Argentine limestone is the uppermost member. The Argentine is a light olive-gray to grayish-orange, medium-grained, thin-bedded, locally cherty limestone, which weathers into thin fragments. The Argentine has a varied fauna with the brachiopods *Composita* sp., *Echinaria* sp., *Antiquatonia* sp., and *Phricodothyris* sp. being most common. *Enteletes* sp. is abundant west and south of Paola. The fusulinid *Triticites* sp. is common locally. The **Island Creek Shale Member** (~1.5 ft; 0.5 m) is not well exposed. It is a grayish-orange clayey shale containing abundant gastropods. The **Farley Limestone Member** (locally absent to ~15 ft; 4.6 m), where present, is the uppermost member of the Wyandotte Limestone. It is a light olive-gray to pinkish-gray coarse-grained, wavy, thin- to thick-bedded limestone. Locally the lower part of this unit can be oolitic. The Farley limestone contains much the same fauna as the Argentine limestone. The **Bonner Springs Shale** (0.9-31.5 ft; 0.3-9.6 m) is the uppermost formation of the Kansas City Group. The lower part is composed of pale olive- to light-gray sandy shale which in places is a thin-bedded micaceous siltstone. The upper part is an olive-gray to yellowish-brown clayey shale in the upper part. Varying lithologies can be present near the contact with the ~ unfossiliferous grayish-red clayey shale or medium-gray clayey shale containing carbonaceous streaks, plant rootlets, and leaf impressions, or medium-grained, medium-bedded, calcareous sandstone is found in this interval. In areas where the Bonner Springs is primarily clayey shale, scattered limestone nodules are present, and a thin, argillaceous limestone bed (~1 ft; 0.3 m) is present 2.0 ft (0.6 m) below the top of the formation. The limestone bed is very fossiliferous and contains abundant pelecypods, algae, brachiopods, gastropods, and bryozoan fragments.

Iola Limestone/Lane Shale — The **Iola Limestone** (10-12 ft; 3-3.7 m) is composed of two limestone members and an intervening shale member – the lower limestone is the Paola limestone, the middle shale is the Muncie Creek shale, and the upper limestone is the Raytown limestone. The **Paola Limestone Member** (absent to ~2.5 ft; 0.8 m) is composed of a massive bed of dark-gray to brownish-gray, fine-grained, dense limestone. The contact with the underlying shale is fairly smooth, but the upper surface of the unit is very irregular. Locally, iron-stained "worm tubes" extend downward 1 to 3 inches (2.5-7.6 cm) from the upper surface of the Paola. Crinoid stems and small productid brachiopods are the most abundant fossils. Coated grains and bryozoans are common. The **Muncie Creek Shale Member** (0.5 ft; 0.15 m) is a bluish-gray to dusky-yellow sandy shale that locally has a dark-gray, carbonaceous, fissile facies that contains small (0.4-1.2 inches; 1-2 cm) phosphatic nodules. The **Raytown Limestone Member** (5-24 ft; 1.5-7 m) is a light olive-gray to light-gray medium- to coarse-grained limestone with numerous silty shale partings and abundant vugs lined with crystalline calcite. The Raytown is medium bedded in the northern part of Miami County but becomes progressively thin bedded toward the southern part. Abundant large productid brachiopods occur in the Raytown, with *Echinaria* sp. and *Linoproductus* sp. being the most common. The **Lane Shale** (25 ft; 8m, increasing in thickness westward to 80 ft; 24 m) is lithologically variable. In the western half of the county is an olive-gray to dusky-yellow silty to sandy shale and thin-bedded siltstone. In the eastern half it is an olive-gray to light-gray clayey shale. Thin carbonaceous streaks 1/16- to 1/4-inch (1.6- to 6.4 mm) thick are found locally in the Lane. In east-central Miami County, a thin light-gray, clayey shale containing laminae of reddish-brown calcareous silt occurs just below the overlying Wyandotte Limestone. The Lane is unfossiliferous except for sparse plant remains, and locally, small brachiopods and crinoids are present in the upper few feet of the formation.

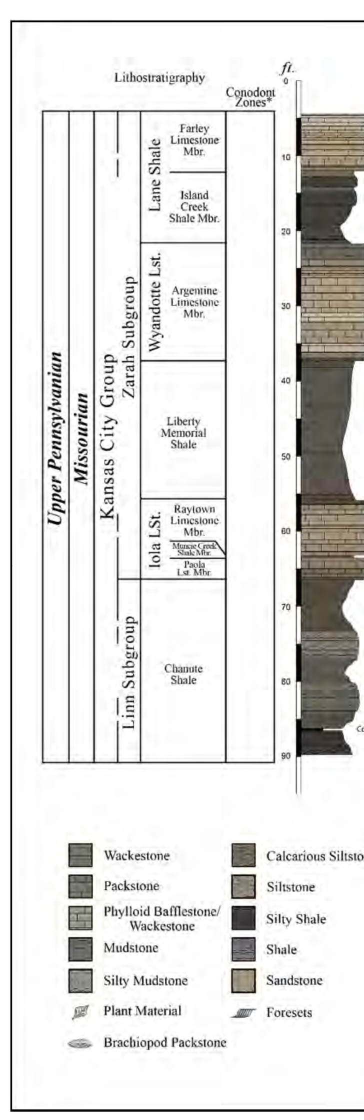
Drum Limestone/Chanute Shale — The **Drum Limestone** (1.7-8 ft; 0.5-2.4 m) consists of a single massive bed of yellowish-gray to reddish-brown fine- to medium-grained cross-bedded limestone that is uniform in lithology and weathers into thin slabs. The most characteristic feature of this unit is abundant, small, white crinoid segments scattered throughout the limestone. Other fossils are *Neospirifer* sp., *Marginifera* sp., and *Composita* sp., and locally the small sponge *Heliospongia* sp. The **Chanute Shale** (8- 38 ft; 2.4-12 m) varies greatly in thickness and lithology over short lateral distances. It is yellowish-brown to greenish-gray sandy to clayey shale, which locally contains sandstone in the lower and middle parts and commonly in the upper part. The Chanute Shale is a relatively unfossiliferous unit except for plant impressions found locally in the sandy layers. The Chanute Shale contains the Thayer coal (0- 0.5 ft; 0.15 m), 11 to 15 feet (3.4-4.6 m) above the base of the formation. The Thayer occurs at differing stratigraphic positions in respect to the upper formational boundary, but is absent where the Chanute is thinner than 11 ft (3.4 m).

REFERENCES

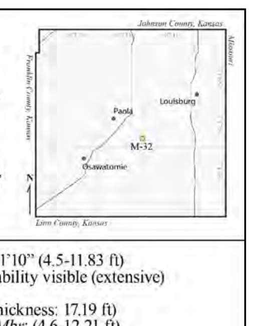
Aber, J. S., 1998, Chert Gravel and Neogene Drainage in East-Central Kansas: *Current Research in Earth Sciences*, Bulletin 240, part 3, Kansas Geological Survey, pp. 29-41.

Miller, D. E., 1966, Geology and ground-water resources of Miami County, Kansas: Kansas Geological Survey, Bulletin 181, 66 p.; http://www.kgs.ku.edu/ General/Geology/Miami/ index.html.

Penner, H. L., 1981, *Soil Survey of Linn and Miami Counties, Kansas*: U.S. Department of Agriculture, Soil Conservation Service, U.S. Government Printing Office, Washington, D.C., 102 p.



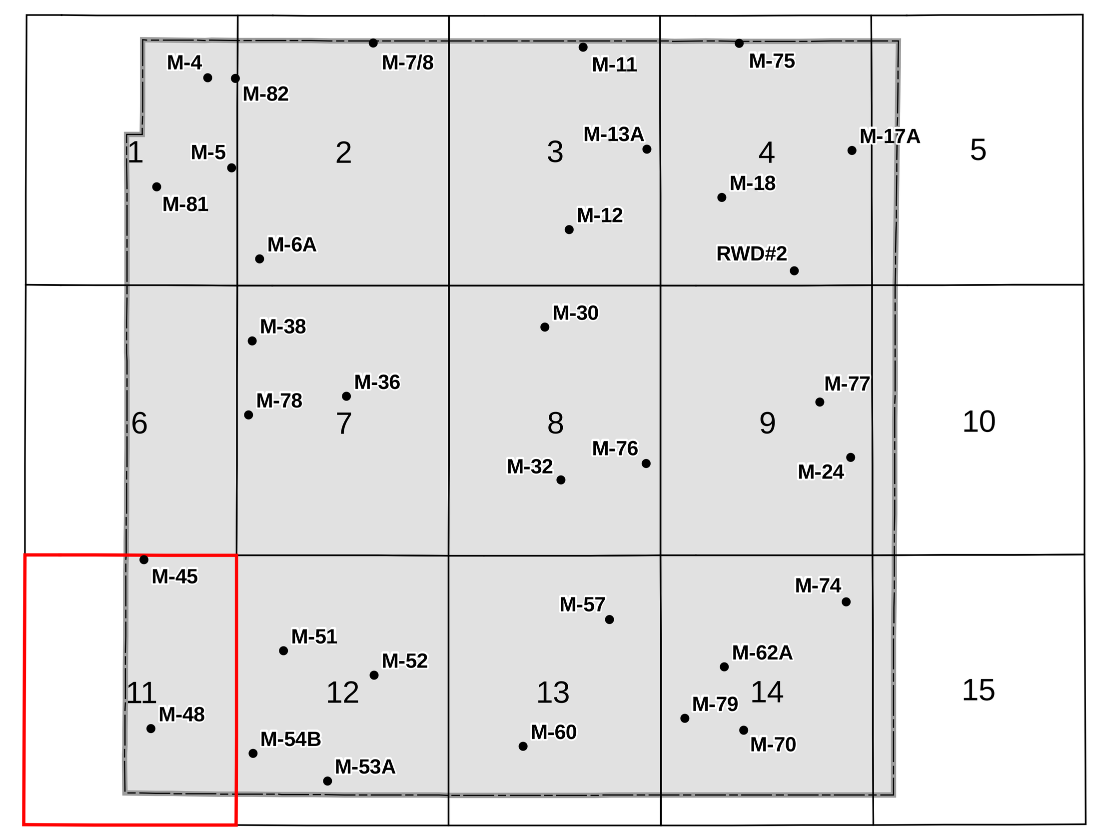
KID: 1035180059
Location: T17S R23E, Sec. 25 SE SE SE
Longitude: -94.8089828
Latitude: 38.5351282
Elevation: 1032 GL
Total Depth: 90 feet
Note: N side of 327th Rd, 100 ft W of Block Rd



Fe-Staining: 4'6"- ~11'10" (4.5-11.83 ft)
Dissolution and friability visible (extensive)

Lane Shale: (Total Thickness: 17.19 ft)
Farley Limestone Mbr: (4.6-12.21 ft)
Phylloid Bafflestone/Wackestone
Island Creek Shale Mbr.: (12.21-21.79 ft)
Fossiliferous Shale (12.21-12.87 ft)
Calcareous Siltstone (12.87-13.37 ft)
Silty Mudstone (13.37-13.92 ft)
Calcareous Siltstone (13.92-16.79 ft)
Silty Mudstone (16.79-19.29 ft)
Shale (19.29-21.12 ft)
Fossiliferous Shale (21.12-21.79 ft)
Wyandotte Limestone: (Total Thickness: 15.58 ft)
Argentine Limestone Mbr: (21.79-37.37 ft)
Phylloid Bafflestone/Wackestone (21.79-37.04 ft)
Packstone (37.04-37.37 ft)
Liberty Memorial Shale: (Total Thickness: 18.34 ft)
Fossiliferous Shale (37.37-38.37 ft)
Silty Shale (38.37-55.12 ft); horizon of hematitic staining at 46.62 ft (0.33" thick)
Fossiliferous Shale (55.12-55.71 ft)
Iola Limestone: (Total Thickness: 10.62 ft)
Raytown Limestone Mbr: (55.71-63.17 ft)
Packstone (55.71-56.33 ft)
Phylloid Bafflestone/Wackestone (56.33-63.17 ft)
Muncie Creek Shale Mbr.: (63.17-63.42 ft)
Shale (63.17-63.42 ft)
Paola Limestone Mbr.: (63.42-66.33 ft)
Phylloid Bafflestone/Wackestone(63.42-66.0 ft)
Packstone (66.0-66.33 ft)
Chanute Shale (Total Thickness: 23.42 ft)
Silty Shale (66.33-73.33 ft)
Calcareous Siltstone (73.33-77.08 ft)
Silty Shale (77.08-80.17 ft)
Calcareous Siltstone (80.17-83.75 ft)
Silty Shale (83.75-86.08 ft); horizons of hematitic staining throughout (up to 0.33" thick)
Coal (86.08-86.33 ft)
Shale (86.33-89.75 ft)

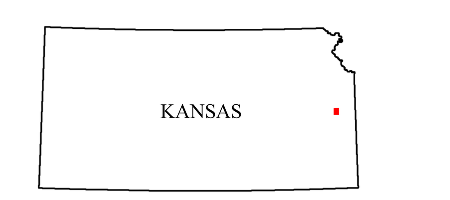
KANSAS DEPARTMENT OF TRANSPORTATION (KDOT) M-32 CORE



Core	Latitude	Longitude
RWD#2	N38.632°	W94.671°
M-4	N38.721°	W95.018°
M-5	N38.68°	W95.004°
M-6A	N38.637°	W94.987°
M-7/8	N38.737°	W94.92°
M-11	N38.736°	W94.796°
M-12	N38.651°	W94.804°
M-13A	N38.688°	W94.758°
M-17A	N38.688°	W94.637°
M-18	N38.666°	W94.714°
M-24	N38.545°	W94.638°
M-30	N38.606°	W94.818°
M-32	N38.535°	W94.809°
M-36	N38.574°	W94.936°
M-38	N38.599°	W94.991°
M-45	N38.498°	W95.055°
M-48	N38.42°	W95.051°
M-51	N38.456°	W94.973°
M-52	N38.445°	W94.919°
M-53A	N38.396°	W94.947°
M-54B	N38.408°	W94.991°
M-57	N38.47°	W94.78°
M-60	N38.412°	W94.831°
M-62A	N38.448°	W94.713°
M-70	N38.419°	W94.701°
M-74	N38.478°	W94.641°
M-75	N38.737°	W94.703°
M-76	N38.543°	W94.759°
M-77	N38.571°	W94.656°
M-78	N38.565°	W94.993°
M-79	N38.425°	W94.736°
M-81	N38.671°	W95.048°
M-82	N38.721°	W95.002°

MIAMI COUNTY QUADRANGLES AND DRILL HOLE LOCATIONS

1 Wellsville
2 Antioch
3 Spring Hill
4 Bucyrus
5 West Line MO-KS
6 Rantoul
7 Paola West
8 Paola East
9 Louisburg
10 Freeman
11 Lane
12 Osawatomie
13 Fontana
14 New Lancaster
15 Drexel



QUADRANGLE LOCATION

In 2002, the Kansas Department of Transportation (KDOT) began a project with the Kansas Geological Survey (KGS) to investigate the construction aggregate properties of limestones of the Pennsylvanian Kansas City Group in Miami County. That project involved drillcore donations with over 2,700 linear feet of core now housed at the KGS. That older project documented engineering properties of drillcore samples, but improved stratigraphic correlations were needed. The KGS is subcontracting with former KGS postdoctoral researcher Dr. Bradley Cramer of the University of Iowa to refine stratigraphic interpretations of Pennsylvanian bedrock units in Miami County. The work performed under the subcontract includes description and analysis of a series of 33 drill cores from throughout Miami County (see Table 1 and labels on index map). Descriptions of the cores include detailed cm-scale core logging and the production of high-resolution stratigraphic columns for each core. Analysis of the core suite will eventually include two primary data sets: carbon isotope chemostratigraphy and micropaleontological biostratigraphy using conodonts. These two data sets will be combined as bio-chemostratigraphy and integrated into a comprehensive synthesis of the chronostratigraphic correlation of the units contained within the cores. This synthesis will directly inform the surficial mapping and geospatial understanding of both the surface and shallow subsurface geology of Miami County.

Elevation contours are presented for general reference. Used in the U.S. Geological Survey's current US Topo 1:24,000-scale topographic map series, they were generated from hydrographically-improved 1/3 arc-second National Elevation Dataset (NED) data, and smoothed during processing for use at 1:24,000 scale. In some places the contours may be more generalized than the base data 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), U.S. Census Bureau, 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 1-meter hydroflattened bare-earth DEMs from the State of Kansas LiDAR Database. The DEM images, in ERDAS IMAGINE format, were mosaicked into a single output DEM, downsampled to 5-meter resolution, and reprojected to decimal degrees. The output DEM was then 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.

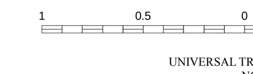
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award number G13AC00168 (FY2013).

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

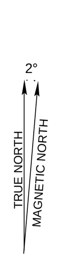
SUGGESTED REFERENCE TO THE MAP

Mandel, R. D., and Newell, K. D., 2014, Preliminary surficial geology of the Miami County portion of the Lane quadrangle, Kansas: Kansas Geological Survey, Open-file Report 2014-10, scale 1:24,000, unpublished.

SCALE 1:24 000



UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 15
NORTH AMERICAN DATUM OF 1983



APPROXIMATE MEAN DECLINATION, 2014

EXPLANATION

Boundaries and Locations
County boundary
Township/range line
Section line

Transportation
U.S. highway
Local road
Railroad

Geologic Unit Boundaries
Observed contact

Hydrology and Topography
Perennial stream
Intermittent stream
Water body
Elevation contour (100-meter interval)
Elevation contour (20-meter interval)