

Preliminary Structure Contour Map of the Top of the Mississippian Meramecian Stage in Northeastern and Southeastern Kansas

Diana Ortega-Ariza, Angela Torres-Zamora, Eliot Manning, and Kolbe Andrzejewski

Abstract

This report accompanies two preliminary subsurface geologic maps depicting the top of the Meramecian Stage in northeastern and southeastern Kansas. The maps represent a continuation of the Mississippian subsurface mapping completed in southwestern Kansas in 2025 as a part of the U.S. Geological Survey (USGS) STATEMAP program. The northeastern map covers Atchison, Jefferson, and Leavenworth counties. The southeastern map covers Sedgwick, Butler, Sumner, and Cowley counties. The maps illustrate the top of the Meramecian Stage (Upper Mississippian Series), which is equivalent to the top of the St. Louis Limestone in Kansas. In Kansas, the Meramecian is generally conformably overlain by rocks of the Ste. Genevieve Limestone (Chesteran Stage). The St. Louis Limestone, which forms the uppermost Meramecian unit in the state, consists mostly of non-cherty limestone with widespread areas of oolitic limestone and calcarenite. Chert, limestone breccias, and anhydrite are locally preserved in the St. Louis Limestone. The data shown are composed of well tops from the Kansas Geological Survey (KGS) oil and gas database (Master List of Oil and Gas Wells). The structural map illustrates the regional distribution of the top of the Meramecian across northeastern and southeastern Kansas. For the northeastern map, depths range from approximately -850 ft in the west to -350 ft in the east. For the southeastern map, depths range from -1750 ft in the southwest to -1450 ft in the northeast. Additionally, we constructed two structural cross sections, one for each map, both oriented northwest-southeast to illustrate the lateral continuity and vertical geometry of the Meramecian Stage. The cross sections corroborate the regional structural trend observed in the top structure map, providing a three-dimensional interpretation of the distribution of Meramecian strata across northeastern and southeastern Kansas.

Methodology

Subsurface data from the KGS oil and gas database were used to construct structural contour maps of the top of the Meramecian Stage and two structural cross sections illustrating the lateral and vertical distribution of the Meramecian across northeastern and southeastern Kansas. The northeastern and southeastern structural contour maps have scales of 1:100,000 and 1:225,000, respectively.

Well top compilation and Structural mapping: Approximately 59 Meramecian well tops (38 for the northeastern map and 21 for the southeastern map) were exported from the KGS oil and gas database and compiled in Microsoft Excel for quality control prior to import into ArcGIS Pro and Petrel. The database was reviewed to correct typographical errors, verify surface elevations and formation-top depths, and remove irrelevant data.

The cleaned and interpreted well-top dataset was imported into ArcGIS Pro and Petrel to generate structural surfaces for the top of the Meramecian Stage. In Petrel, the surface was generated using the convergent interpolation algorithm, whereas ArcGIS Pro used the inverse distance weighting (IDW) interpolation method. Structural contours were then generated at 50-ft

intervals. Because data were limited in these two areas, we compared contours generated by both interpolation methods, and selected the Petrel contours as the most reliable surface for both maps. The Petrel contours were then exported to ArcGIS Pro and manually refined where necessary, using the published Mississippian structural map (Merriam, 1960) as a regional reference.

Well logs: Wells with available log data were used to verify formation top picks. In many wells, the logs did not extend below the Meramecian, so the Osagian top (base of the Meramecian) could not be picked. We selected a consistent and easily recognizable reference top above the Meramecian Stage for validation in each area. The top of the Cherokee Shale was selected for the northeastern map, and the top of the Mississippian Subsystem was selected for the southeastern map.

Structural cross sections: To illustrate the depth variation of the Meramecian Stage across both maps, we generated one structural cross section in Petrel for each map. Both cross sections are oriented northwest–southeast. To provide consistent regional coverage, we selected five wells for each cross section.

We constructed cross sections primarily from digital LAS files using depth as the datum. If LAS files were unavailable, raster well logs were digitized and converted to LAS format for incorporation into the cross sections. Gamma-ray (GR) logs were preferentially used because they were the most commonly available logs and provided the most consistent lithologic correlation across the study area. If available, spontaneous potential (SP) logs were used alongside GR logs. In wells lacking GR logs, SP logs served as the primary correlation tool. We identified the formation top of the Meramecian Stage and the reference top for each area and generated two structural cross sections.

Results

This study produced two preliminary structural contour maps of the top of the Meramecian Stage in northeastern and southeastern Kansas (PDF; this OFR). Because Meramecian data are limited in eastern Kansas, the available data were insufficient to construct a continuous structural contour map across the entire area.

The northeastern map illustrates the regional distribution of the top of the Meramecian Stage across three counties and shows a general trend of progressively greater depths toward the northwest. The southeastern map illustrates its distribution across five counties and shows a general trend of progressively greater depths toward the western and southeastern margins of the map. To complement each map, we constructed one regional structural cross section using geophysical well logs. Both cross sections are oriented northwest–southeast. The cross sections illustrate the lateral continuity of the Meramecian Stage and support the structural trends observed in each map.

Coordinate Reference System

- i. Units: Field-UTM. Units of distance in the X, Y, and Z (lateral and vertical) directions are in field units (feet or miles).
- ii. Datum: NAD83 (North American Datum 1983) with “UTM83-14” used as the coordinate reference system (CRS).
- iii. Depth: Mean sea level (MSL) at 0 ft.

References

Kansas Geological Survey. “Master List of Oil and Gas Wells.” Database. Accessed 2025 and 2026. <http://www.kgs.ku.edu/Magellan/Qualified>.

Merriam, D. F., 1960, Preliminary regional structural contour map on top of Mississippian rocks in Kansas (Oil and Gas Investigations No. 22): Kansas Geological Survey, scale 1:615,000.

Funding

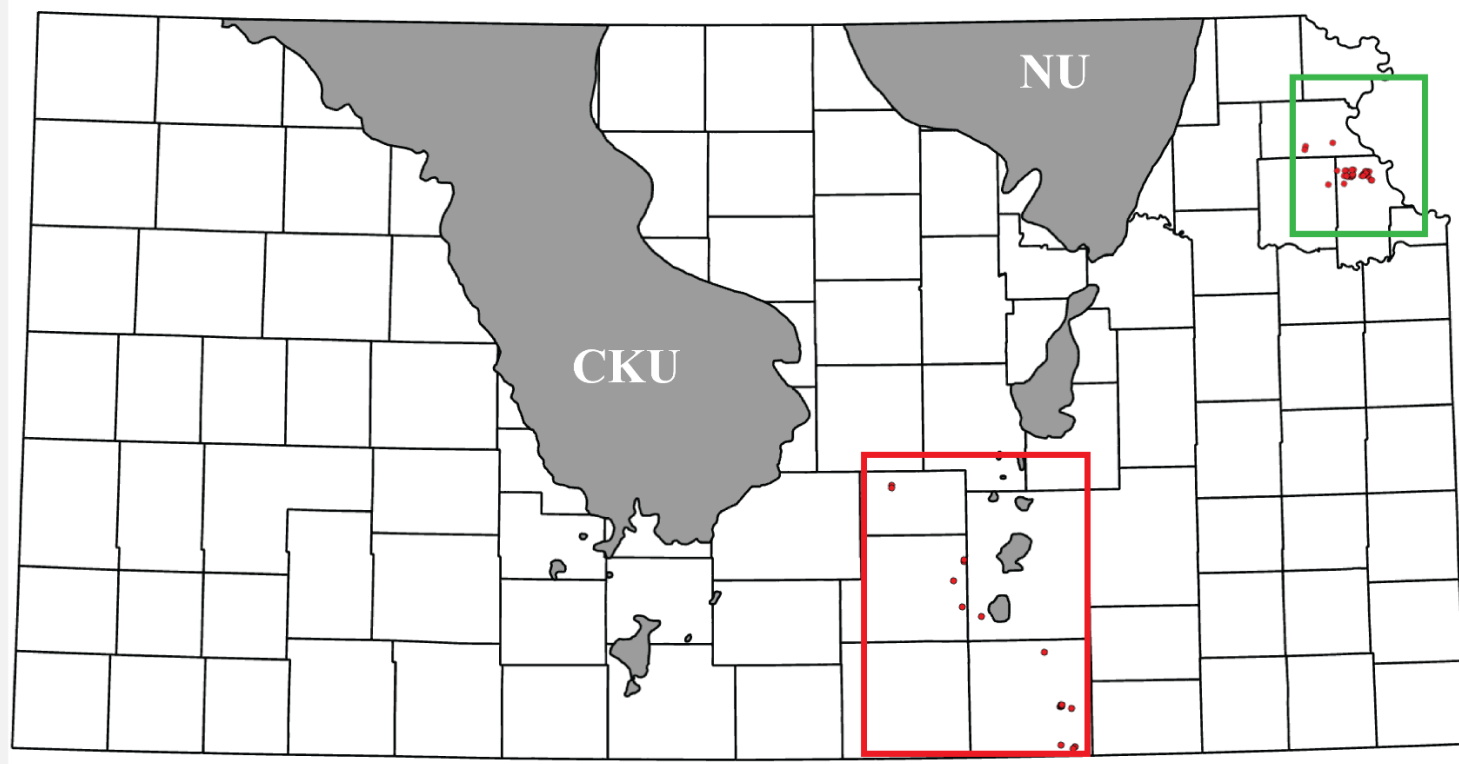
This work was funded by the state of Kansas and the U.S. Geological Survey National Cooperative Geologic Mapping Program, STATEMAP award number G25AC00518 (FY2025).

Acknowledgements

The authors thank the KGS staff whose contributions made this project possible. We are grateful to Jon Smith for managing the STATEMAP program and associated project funding. We also thank the personnel at the Data Resource Library for locating paper copies of selected well logs and providing access to log digitization software. Rhonda Houser is acknowledged for editorial review. The map and interpretations presented in this report were developed using SLB Petrel subsurface interpretation software and ArcGIS Pro (Esri).

Suggested reference to This Report: Ortega-Ariza, D., Torres-Zamora, A., Manning, E., and Andrzejewski, K., 2026, Preliminary structure contour map of the top of the Mississippian Meramecian Stage in northeastern and southeastern Kansas: Kansas Geological Survey, Open-File Report 2026-32, 6 p.

Meramecian Well Tops Map

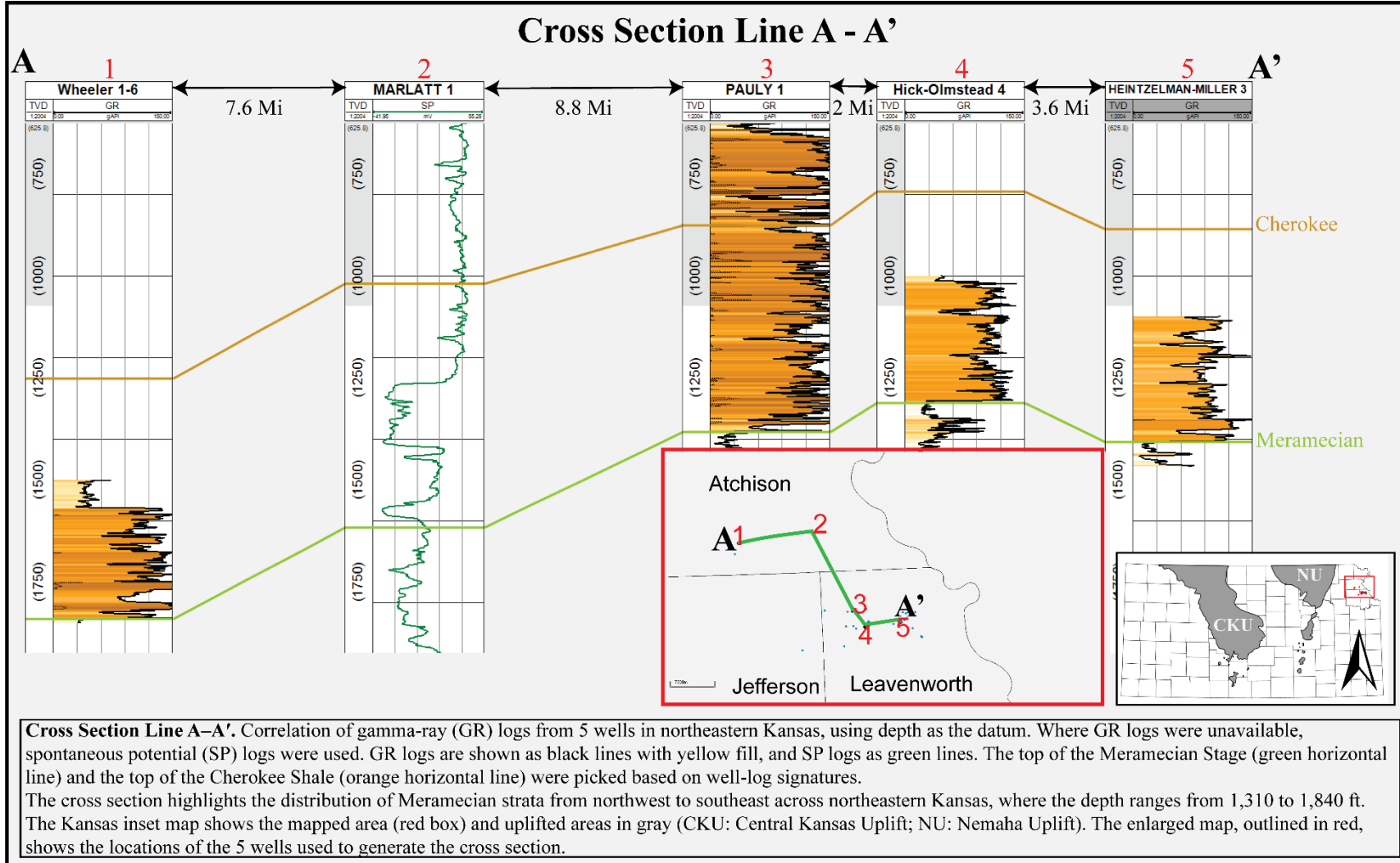


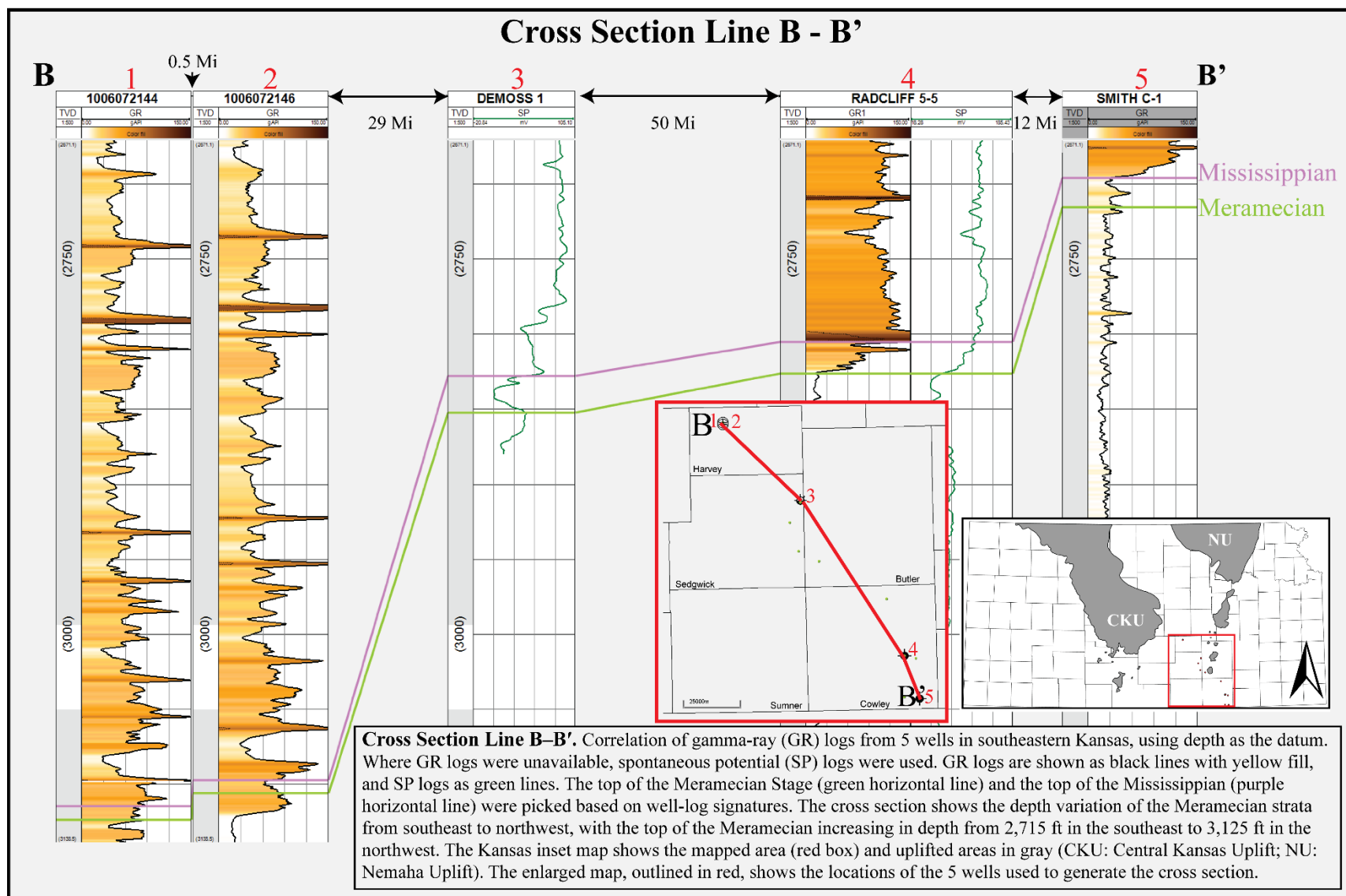
30 Miles



Legend

- Wells with Meramecian tops
- Area mapped in northeastern Kansas
- Area mapped in southeastern Kansas
- CKU: Central Kansas Uplift. NU: Nemaha Uplift





PRELIMINARY STRUCTURE CONTOUR MAP OF THE TOP OF THE MISSISSIPPIAN MERAMECIAN STAGE IN NORTHEASTERN AND SOUTHEASTERN KANSAS

Diana Ortega-Ariza, Angela Torres-Zamora, Eliot Manning, and Kolbe D. Andrzejewski
2026

Open-File Report 2026-32

Funded in part by the
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References

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Merriam, D. F., 1960, Preliminary regional structural contour map on top of Mississippian rocks in Kansas (Oil and Gas Investigations No. 22): Kansas Geological Survey, scale 1:615,000.

Zeller, D. E., ed., 1968, The stratigraphic succession in Kansas: Kansas Geological Survey, Bulletin 189, 81 p.,
<https://doi.org/10.17161/kgsbulletin.no.1189.22214>

About

This map was funded in part by the USGS National Cooperative Geologic Mapping Program, STATEMAP award number G25AC00518 (FY2025).

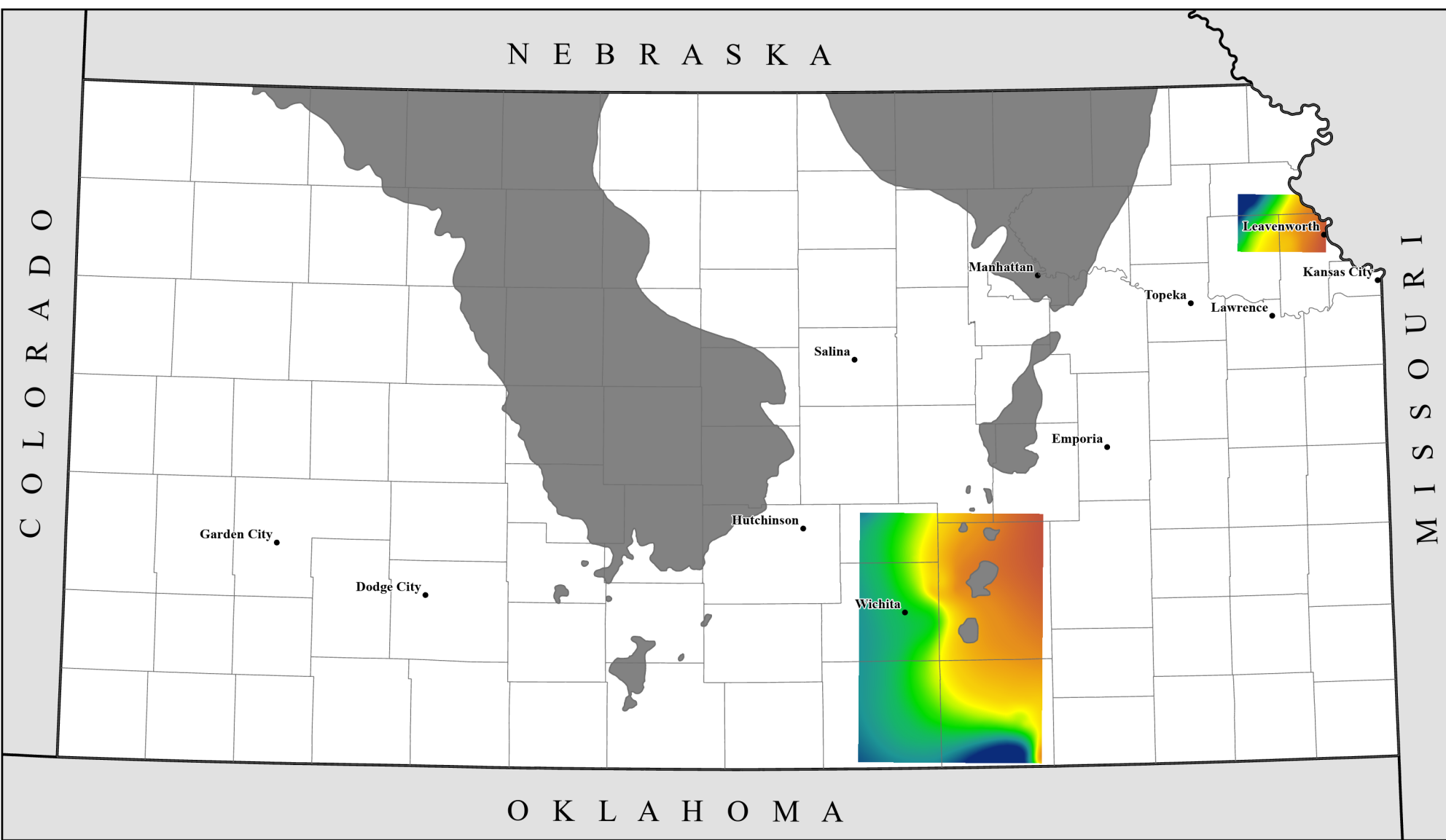
This map was produced using ArcGIS® software by Esri. ArcGIS® is the intellectual property of Esri and is used herein under license. Copyright © Esri. All rights reserved.

This map is a preliminary product and has had less scientific and cartographic review than the Kansas Geological Survey's M-series geologic maps. The 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.

Acknowledgements

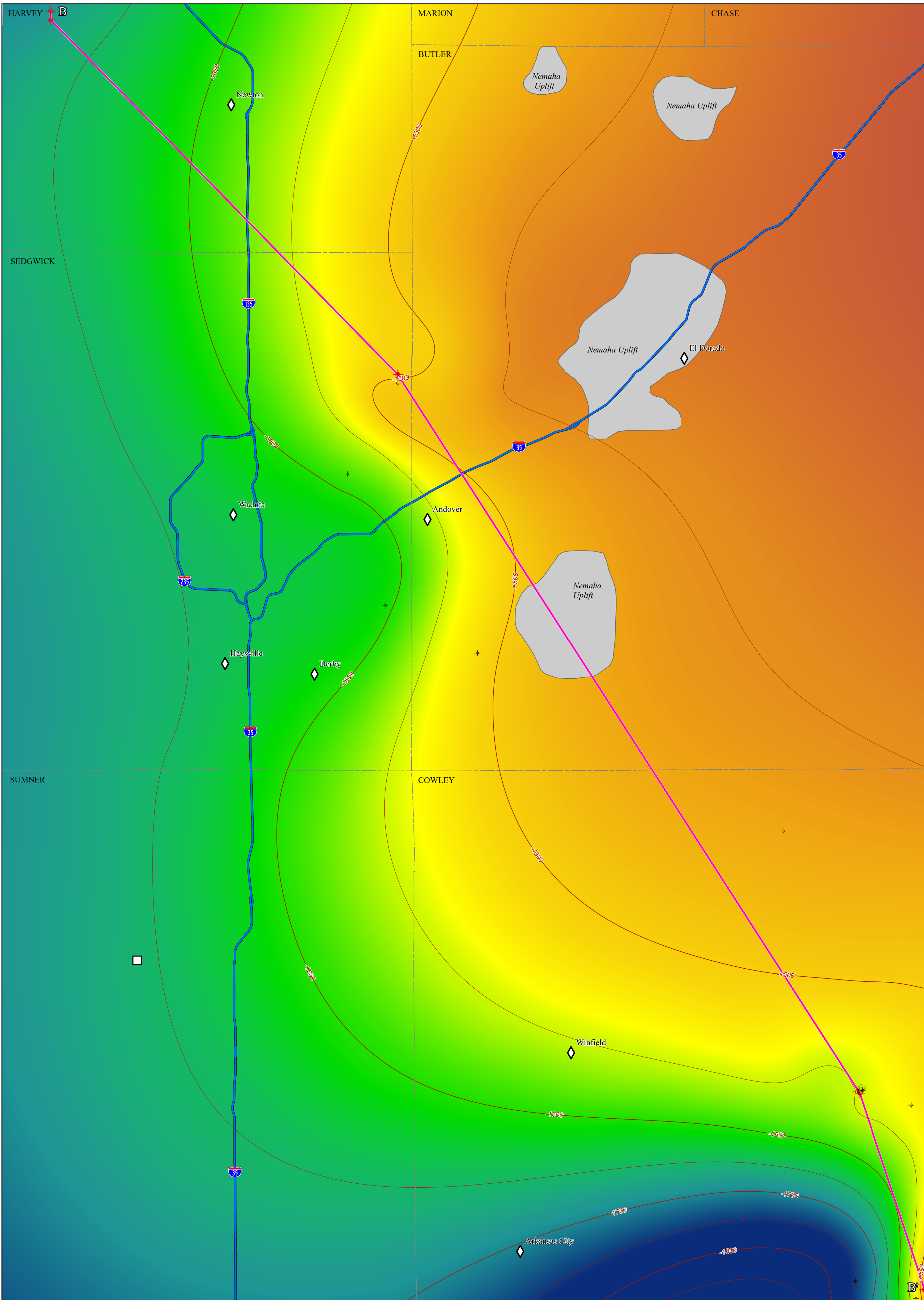
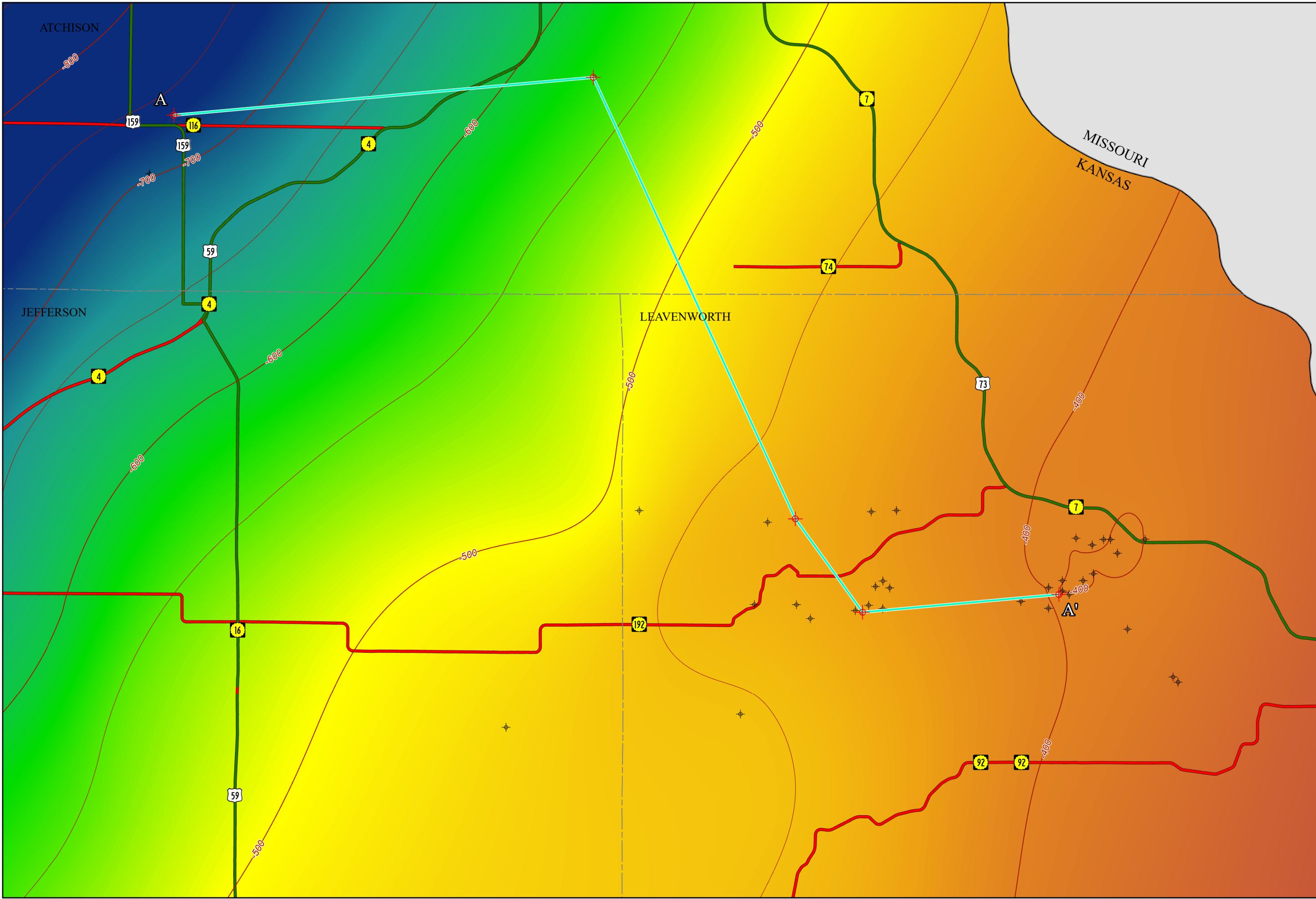
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MAP LOCATIONS



SUGGESTED REFERENCE TO THE MAP

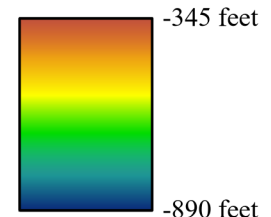
Ortega-Ariza, D., Torres-Zamora, A., Manning, E., and Andrzejewski, K., 2026, Preliminary structure contour map of the top of the Mississippian Meramecian Stage in northeastern and southeastern Kansas: Kansas Geological Survey, Open-File Report 2026-32, unpublished.



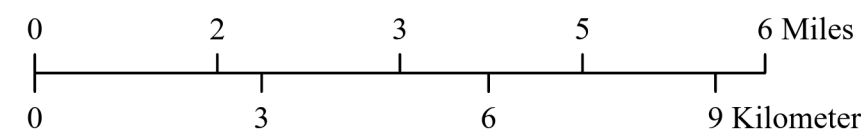
EXPLANATION

- Boundaries and locations**
 - City
 - County boundary
 - State boundary
- Topography**
 - Index elevation contour (100 feet)
 - Elevation contour (50 feet)
- Transportation**
 - State highway
 - US highway
- Geology**
 - Well (n = 38)
 - Cross section well
 - Cross section line A - A'

Contour Interval = 50 ft
Depths at Mean Sea Level (MSL)



SCALE 1:100,000
LAMBERT CONFORMAL CONIC PROJECTION
WITH STANDARD PARALLELS AT 33 AND 45 N
CENTRAL MERIDIAN 97 15' W
NORTH AMERICAN DATUM OF 1983



CURRENT KGS STRATIGRAPHIC NOMENCLATURE CHART (SUBSET)

Salem Limestone	Cedar Formation	MERAMECIAN STAGE	MIDDLE MISSISSIPPIAN SERIES	MISSISSIPPIAN SUBSYSTEM	CARBONIFEROUS SYSTEM
Warsaw Limestone					
Short Creek Oncline Mbr.					
Keokuk Limestone					
?					
Burlington Limestone					
Reeds Spring Limestone Mbr.	Fern Glen Limestone	OSAGIAN STAGE	LOWER MISSISSIPPIAN SERIES		
St. Joe Limestone Mbr.					
Gilmore City Limestone					
Sedalia Formation (Northview Formation)					
Chouteau Limestone (Compton Limestone)					
Boice Shale					
?					

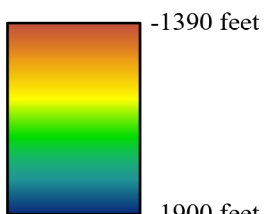
EXPLANATION

- Shale or claystone
- Limestone
- Cherty limestone
- Sturdy limestone
- Cherty dolomite
- Dolomite
- Dolomitic limestone
- Unconformity

EXPLANATION

- Boundaries and locations**
 - City
 - County boundary
- Topography**
 - Index elevation contour (100 feet)
 - Elevation contour (50 feet)
- Transportation**
 - Interstate
- Geology**
 - Well (n = 21)
 - Cross section well
 - Cross section line B - B'
 - Nemaha Uplift (NU) (Mississippian rocks absent)
 - Photo location

Contour Interval = 50 ft
Depths at Mean Sea Level (MSL)



SCALE 1:225,000
LAMBERT CONFORMAL CONIC PROJECTION
WITH STANDARD PARALLELS AT 33 AND 45 N
CENTRAL MERIDIAN 97 15' W
NORTH AMERICAN DATUM OF 1983

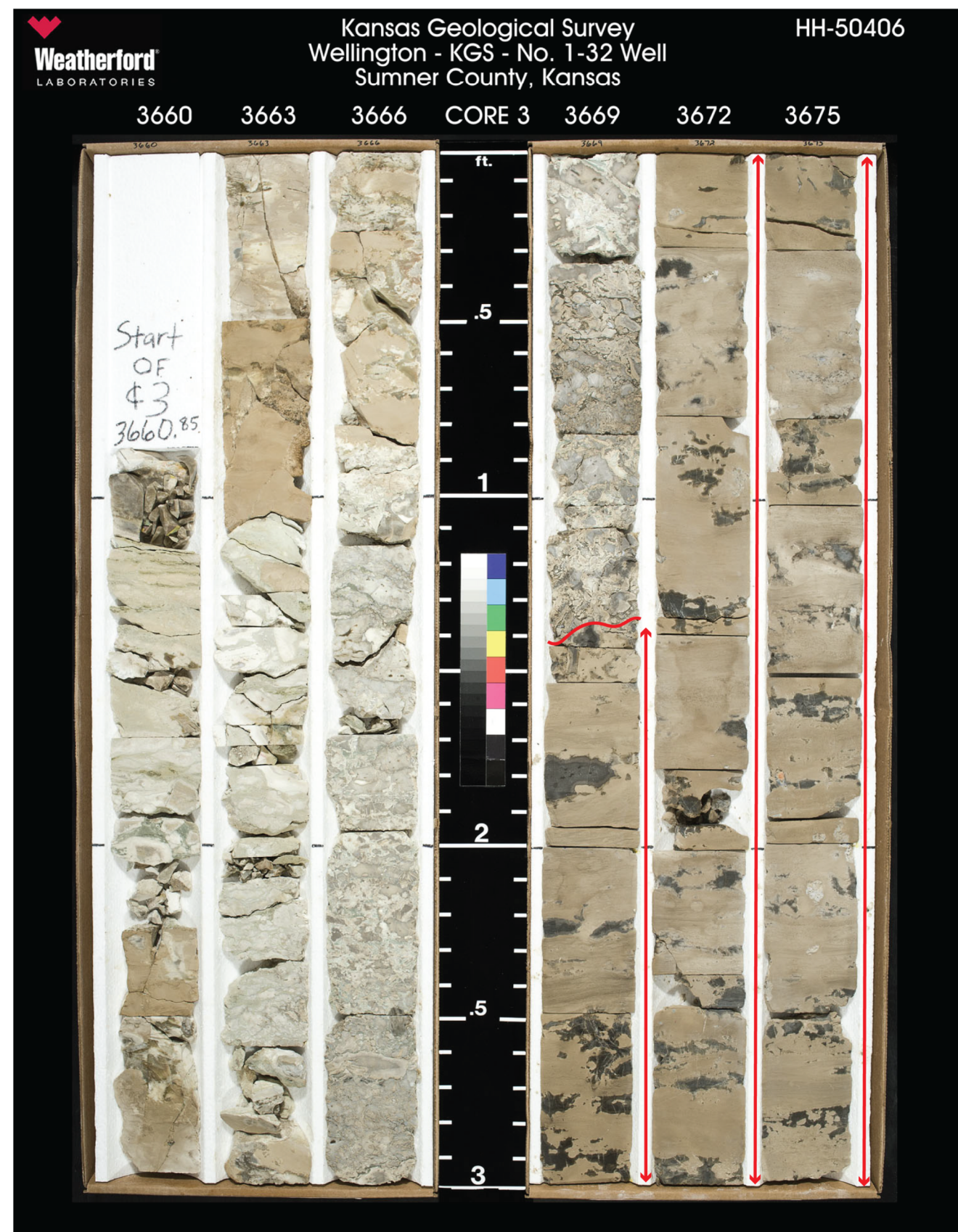
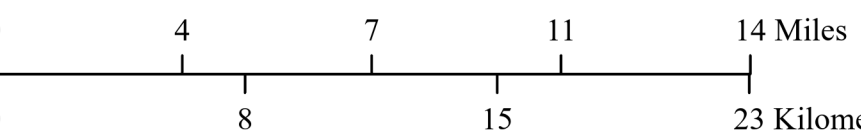


Figure 1. Core photograph showing a portion of the Wellington KGS 1-32 from 3,660 to 3,678 ft depth in Sumner County, Kansas (see location on map). Meramecian rocks, indicated by continuous red arrows, extend from 3,678 to approximately 3,670 ft and are marked by the red undulating line. These rocks are characterized primarily by dolomite (light tan to brown) and chert (black). The overlying interval, from approximately 3,670 to 3,660 ft, consists predominantly of light-gray conglomerate, with locally preserved dolomite, and is associated with a major regional unconformity and significant erosion at the top of the Mississippian Subsystem. Photo modified from KGS, Images of Core, https://kgsimages.blb.com/windows.net/web/web_1/WebDocs/Images/2011/1044064164_orig.jpg