

Base map compiled by Illinois State Geological Survey from digital data (2011 TIGER/Line Shapefiles) provided by the United States Census Bureau. Hillshade and contours derived from 2012 ISGS LiDAR source data.

North American Datum of 1983 (NAD 83) Projection: Transverse Mercator 10,000-foot ticks: Illinois State Plane Coordinate system, west zone (Transverse Mercator) 1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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BASE MAP CONTOUR INTERVAL 10 FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929

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This map has not undergone the formal Illinois Geologic Quadrangle map review pro-cess. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

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fine grained well sorted quartz sand yields salt and pepper appearance due to dark minerals. Chert, limestone and sandstone clasts occur in the lower part of unit can

400 feet sea level. Dark gray to black, reduced clay skins present down to about 6 feet below surface and contains modern soil. This unit directly covers unit D (Equal-

C Cahokia Formation Fan deposits Qc(f) Clay, Sand, Gravel, sediment forms a subconical apron where steep gradient streams flow off of bluff areas. Poorly sorted

D Equality Formation Qe Silty Clay, light olive brown to dark bluish gray. Forms a higher terrace at 420 feet above sea level. This unit is generally oxidized and

		H Vienna Limestone Limestone and Shale, light gray, crinoidal, brachiopod pack- stone lenses interbedded with cummy claystone. Gradational with unit below
		storie lenses interseduce with guniny daystorie. Cradational with unit below.
C	G	I Tar Springs Sandstone Shale, dark gray, non-calcareous claystone to shale
	Н	with carbonized plant remains. The shale also contains slickensides. Conformable with lower unit
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b		L Clan Deen Limestone Limestone and Chale dominated by limestone but up

J Glen Dean Limestone Limestone and Shale, dominated by limestone but upper part contains shale with limestone lenses. Shale is gray to greenish gray, nonfissile some fossil bearing: contains ramose and fenestrate bryozoanz, pelmatozoans, *Pentremites*, (blastoid heads), brachiopods. Limestone is composed of dark gray lime-musdtones and light gray crinoidal wackestone and oolitic grainstone facies. The primary allochem is pelmatozoan grains (crinoid and blastoid disarticulated columns). Other fossils include *Pterotocrinus* "wing plates". An oil show was observed at 190 feet below the surface in a porous grainstone facies in the lower



Introduction

SYSTEM

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The Evansville Quadrangle is located in the southwestern part of Illinois about 40 miles south of St. Louis, Missouri. The quadrangle is bisected by the Kaskaskia River. This river is near the confluence with the Mississippi River which occurs in the northern part of the Kaskaskia Quadrangle just south of the study area. The quadrangle contains glacial deposits from the Illinoisan Episode and Hudson Episode terraces, wind-blown silt and alluvium which mantle the underlying bedrock. Natural exposures are seen along the southern bluff-line in the quadrangle. This bluff was carved by glacial melt-waters that once flowed down the Mississippi River. Other exposures occur in some of the deeply cut ravines. Man-made exposures are also found in road cuts and a quarry at Roots, Illinois. The bedrock is predominantly composed of limestone but some sandstone and shale is also present in the quadrangle.

Generally, the rocks strike north 40 degrees west and dip regionally from 0.5 to 1 degree to the northeast into the Illinois Basin. The oldest stratum exposed is the upper part of the West Baden Formation which is the Gasperian Stage of the Chesterian Series i.e. upper Mississippian Period. This can be observed along the bluff on the southwestern side of the quadrangle. No structure was found and the rocks are nearly horizontal. The youngest rocks are Basal Pennsylvanian (Morrowan), (Weller and Sutton 1940).

shales near the top of the Fraileys. The Fraileys Shale is a complex unit with a lowstand event that occurs within the lower shale sequence. The shales have been found to be separated by local small channels filled with rounded carbonate clastics and rounded chert clasts in various parts of the Illinois Basin. Red and green claystones may be lateral equivalents. Plant fossils have been found within the dark gray shales of the Fraileys. Limestone facies reflect the paralic nature of this unit as well.

The Haney Member of the Golcanda Formation (Hombergian Stage) is dominated by limestone but contains some fossiliferous shales. An oolitic grainstone, called the Marigold Oolite Bed, Sutton (1934) varies from 25 feet thick on the western side of the quadrangle to 40 feet thick at the Roots Quarry to 10 feet in the Holloway #1 core in the northeastern part of the study area. The oolite is a shoaling facies that was deposited on a shallow carbonate platform that interfingered with fossil grainstone/packstone facies. The overlying Hardinsburg Sandstone (Hombergian Stage) is reduced to 10 feet of laminated, calcareous siltstone. The lower portion is a red claystone with slickensides and mottled with a green claystone and represents another lowstand event (fig. 1).





Surficial Deposits

The thickness of surficial sediments in and along the Kaskaskia River ranged from 30 to 60 feet. No loess or Glasford Formation (Illinoisan till) was mapped but does occur in the quadrangle (Kolb 2010). Wisconsin Episode slackwater lake deposits of the Equality Formation were mapped as Qe based on a terrace that consistently occurred at 420 feet above sea level. The Equality Formation is composed of silty clay loam that is olive brown to dark gray, laminated and typically oxidized and leached.

Hudson Episode sediments were mapped as a lower terrace Qct at 400 feet above sea level. These lower terrace deposits were called Cakokia Terrace and are composed of modern silts and fine sand that covers the Equality Formation in places. Fan deposits were mapped as Qcf along the Mississippi River bluff. Fan deposits are broad conical aprons that are composed of bedrock clasts and loess. Cahokia Alluvium (Qc) was mapped in creeks and rivers. Alluvium deposits are reworked loess, till, slackwater lake deposits and some local bedrock material. Thickest Cahokia deposits occur in the Mississippi and Kaskaskia River floodplains.

Stratigraphy of Bedrock and Depositional Setting

Only the upper-most part of the West Baden (Gasperian Stage) outcrops on the west side of the quadrangle. It is composed of shale and siltstone. This unit probably represents a paralic marine environment because of calcareous siltstones that contain small brachiopods and macerated plant debris. The Beach Creek Member (upper-most Gasperian Stage) of the Golcanda Formation is 10 feet thick and is composed of light gray fossil packstones with greenish shales and lime mudstones at the base. The Beach Creek is a pervasive thin limestone known as "Barlow" in petroleum terminology where a map of its surface has been extensively used in the search for structures in the Illinois Basin. This unit represents a rapid marine transgressive event over a shallow ramp.

The Fraileys Member of the Golcanda Formation (Hombergian Stage) is 50 feet of dark gray shale with limestone lenses. Some red and green claystones occur in the upper parts with articulated plant fossils in the dark

Figure 1 Showing red claystone with slickensides at the base of the Hardinsburg Sandstone

The Glen Dean Limestone (Hombergian Stage) is a 70-foot thick limestone dominated unit with some fossiliferous shales in the upper part. Limestone packages are composed of pelmatozoan-fenestrate bryozoanooid grainstones. Also lime-mudstone facies interbedded with grainstone facies are found as shoaling platform carbonate rocks.

The Elviran Stage in the Evansville Quadrangle is represented by the Tar Springs, Vienna, Waltersburg and Menard formations. The Tar Springs through Waltersburg is a condensed section in the study area and was mapped together as a single unit. The Tar Springs is represented by about 20 feet of non-calcareous shale with plant remains and a slickensided claystone; whereas, the Vienna interval is composed of lenticular crinoidalbrachiopod packstone facies. The Waltersburg phases back into terrestrial shale with abundant carbonized lycopod leaves. The Menard Limestone is dominated by shallow lime-mudstones and tidal dominated laminated carbonates. Shales are fossiliferous composed of brachiopods and bryozoans.

Economic Geology

Industrial Minerals

The primary industrial mineral in this quadrangle is limestone mainly used for aggregate. There is only one quarry at Roots, Illinois in the southern part of the Evansville Quadrangle. The quarry at Roots is in the Golcanda and Glen Dean Limestones. Here the lower part of the quarry contains the "Marigold Oolite" seen as a white cross-bedded 30 to 40 foot unit (fig. 2). This oolite is a calcium-rich deposit that locally thickens in the area and extends from the south at the quarry to the north about four to five miles around Marigold, Illinois. In the Holloway Borehole, which is seven miles northeast of the quarry the oolite is ten feet thick. The quarry is only intermittently active.

Figure 2 Showing the Quarry at Roots, Illinois with three distinctive units 1) Loess on top, 2) Shaly, Glen Dean Limestone in the center and 3) "Marigold" Oolite Bed of the Golcanda Formation at the base

Oil and Gas

Four oil and gas test holes were drilled in the Evansville Quadrangle. The Salger # 1, located in Section 30, T5S, R7W, was drilled to 728.5 feet then plugged because salt water was encountered. Leifer # 1, located in Section 15, T5S, R8W, was a Trenton test (Kimmswick Limestone) and drilled to a total depth of 1,405 feet. This hole was dry and abandoned. The Derringer # 1, located in Section 5, T6S, R7W, was drilled to a depth of 300 feet had a show of gas (2 minutes produced 4 inches of gas in one quart container) between 290 and 300 feet which is approximately at the Cypress interval (West Baden on this map). The Kueker # 1, located in Section 32, T5S, R7W, went to a total depth of 835 feet. The Kueker # 1 had a show of oil in the Salem at 710 feet but the hole was plugged.

The ISGS drilled a stratigraphic core test on the Holloway property, Section 16, T5S, R7W, to a depth of 285 feet below the surface. A good show of oil was observed at 190 feet within a porous grainstone facies of the Glen Dean Limestone (fig. 3). Just above the grainstone that contained oil was a calcareous cemented, dense crystalline grainstone which acted like an impermeable layer that sealed the oil below. Oil was observed just after coring. It was light tan, "sweet" crude, blistering up from the core. Figure 3 shows the horizon weeks after drilling. This probably represents a stratigraphic "pinch-out" of the grainstone facies in the Glen Dean Limestone because no structure is seen in the area. Regional dip is less than one degree.

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Figure 3 Showing oil stained limestone of the Glen Dean.

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