GEOLOGY OF THE TURNER TURNPIKE

WITH NOTES ON HISTORY AND BOTANY

PREPARED FOR THE

Field Conference of the Oklahoma City Geological Society,
the Tulsa Geological Society, and the Oklahoma
Geological Survey

APRIL 13, 1956

OKLAHOMA GEOLOGICAL SURVEY
Guide Book IV
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GEOLOGY OF THE TURNER TURNPIKE

Road Log, Geologic Profile, Route Map

WITH ARTICLES ON

VEGETATION ALONG THE TURNER TURNPIKE
by Elroy L. Rice

HISTORY OF THE TURNER TURNPIKE
by Gaston Litton

STRATIGRAPHY ALONG THE TURNER TURNPIKE
by Malcolm C. Oakes and Carl C. Branson

SUBSURFACE GEOLOGY
by R. P. Clinton, Louise Jordan, Harry Christian

SUBSURFACE GEOLOGY OF A PART OF LINCOLN COUNTY
by Daniel A. Busch

Guide Book IV

OKLAHOMA GEOLOGICAL SURVEY
1956
Airplane photograph of the Stroud area. Scale 1 inch equals 2000 feet. (Courtesy U. S. Dept. Agriculture, Production and Marketing Administration)
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THE TURNER TURNPIKE OF OKLAHOMA

Guide book and road log of the geology, botany, and history along the highway.

INTRODUCTION

The Turner Turnpike is the first unit of a network of superhighways to be constructed between larger cities in the State and adjacent states. The Oklahoma Turnpike Authority was established by the state legislature in 1947. Bonds to the amount of 38 million dollars were sold to finance the construction.

The Highway

Turner Turnpike is a modern, limited-access highway with two lanes each way separated by a grassed median 15 feet wide. No grade is more than 3 percent and there are but two curves of more than 30 minute curvature. The surface is of asphaltic concrete. All roads and railroads are crossed by separated grade. The highway is 87.5 miles long from gate to gate, but mileage is counted from the west edge of the authorities property, which edge is at the paved road from Witchen to Guthrie. This point is 0.2 miles west of the west gate. Mileages are indicated along the turnpike, the even miles by green plaques below the reflectors in the median, and mileage is shown by black painted figures on each bridge and overpass. The reflectors in the median and along the shoulders are 200 feet apart. The entire length has surfaced shoulders 12 feet wide.

The road was opened to traffic at 3:00 P. M. on May 16, 1953. From that date to January 31, 1956 it has carried a total of 5,328,317 vehicles and $6,403,084.37 in tolls have been collected. Entrances and exits are:

- East gate on Creek-Tulsa county line, 9 miles from downtown Tulsa
- Sapulpa in Creek County at 81.2 miles
- Bristow in Creek County at 60.2 miles
- Stroud in Lincoln County at 44.2 miles
- Chandler in Lincoln County at 31.3 miles
- West gate in Oklahoma County, 13 miles from downtown Oklahoma City

Actual cost of construction was $29,265,483.98. Right-of-way costs were $1,399,242.13. Several obstacles of unusual character had to be overcome. One oil operator made a high claim of values for his property and received an award from a commission of $5,000,000. This award was reversed and a jury set the value at $23,400. Certain people in one of the towns insisted upon a dogleg through the main part of town and almost blocked the project with the excessive costs involved. One area obtained an injunction from a district judge, but the injunction was dissolved three days later by the State Supreme Court.

The maintenance staff are all instructed to help motorists and they carry ice-water and gasoline for stalled motorists. The toll booth attendants are specially selected and trained in courtesy. The metal fingers at the booths are designed to discharge static from your car in order to protect the attendants. The accident rate is low and you can count on traveling 2,900,000 miles on the turnpike before you will have an accident in which someone is injured. The death rate is 7.3 per 100 million vehicle miles. If you are over 30 and drive in daylight hours you are safer on the turnpike than at home. Incidentally, if your toll bill is more than $4,000 per month you are entitled to a 17% discount.
**Speed Limits** - Maximum speed at all times is 70 miles per hour, minimum speed is 40 miles per hour.

**Toll charges** - Toll charge for the entire length is $1.40 for passenger cars. Charges to and between intermediate points are proportional. Tulsa to Sapulpa is 10 cents, Bristow to Chandler is 50 cents, etc.

**Facilities** - The service station concession is held by Phillips Petroleum Co. Service stations are 9 miles west of Sapulpa (west-bound traffic), Bristow (east-bound traffic), Stroud, Chandler (east-bound traffic), and Wellston (west-bound traffic). Howard Johnson, Inc. holds the restaurant concession and has snack bars adjacent to each of the service stations and a restaurant at Stroud. The Stroud restaurant is reached by west-bound travelers over an elevated foot-bridge. It is open 24 hours a day.

**Safety patrol** - The turnpike patrol consists of a lieutenant and 14 patrolmen. The patrol has five patrol cars and the road is continuously patroled by sections. The officers stop at every parked car in order to render assistance if needed. They are a special part of the Oklahoma Highway Patrol, trained by that organization and operating under it through a Supervisor. The Turnpike Authority is billed monthly for salaries, equipment, and expenses of the patrol unit.
VEGETATION ALONG THE TURNER TURNPike

by Elroy L. Rice

In introducing the subject of the vegetation along the Turner Turnpike, the author wishes to point out first that it is his strong conviction based on a number of years of study of the vegetation of Oklahoma that the chief correlation between geological outcrops and the vegetation is based on soil water relations. At least in the eastern three-fourths of the state, forests occur on upland soils which have a very coarse texture having been derived from sandstones or granite whereas grasslands occur on upland soils derived from limestones or shales and which, therefore, have a very fine texture. In the extreme eastern section of Oklahoma, forests do occur on the lower portions of rather steep north- or northeast-facing slopes even though the soils are derived from limestones. The rainfall is sufficiently high there and the runoff from the upper reaches of the slopes is great enough to support tree growth even on tight soils in such areas. The reason that rather loose, coarse-textured soils have more available water on the uplands in Oklahoma is that the rainfall usually comes in torrents when it does fall and, consequently, a higher percentage of the water from such "gully-washers" can infiltrate in the coarse soils than in fine textured soils. It should be pointed out here that fine textured soils actually can hold more available water for plant growth if they ever reach field capacity, but such a condition would be rare on the uplands of Oklahoma.

There are definite correlations between some species of plants and geological outcrops which may be dependent on pH, minerals, or some factor or factors other than soil water. For example, some species of plants appear to be always associated with gypsum outcrops; others with limestone outcrops, etc. From the standpoint of the general vegetation of an area, however, such possible correlations do not seem to be as important as that associated with available soil moisture as discussed in the previous paragraph.

The original upland vegetation along the Turner Turnpike, with the exception of one short stretch, was post oak-blackjack oak forest, or oak-hickory savannah as some have termed it. The exception mentioned above was a band of tall-grass prairie about 3-4 miles wide, the western border of which is encountered about 8-10 miles northeast of the Chandler access to the turnpike. Most of the band of tall-grass prairie has been destroyed and the land cultivated for many years now. Moreover, much of the original forest has either been completely destroyed and the land placed in cultivation; or it has been severely cut-over and heavily grazed to the point where the present vegetation does not resemble the original type very closely.

Many areas along the turnpike were cultivated for many years and then abandoned. The vegetation on such areas is quite variable depending on the period of time since cultivation and on whether or not the soils are sandy. Sandy upland areas which have been abandoned for several years will usually have considerable grass cover with scattered persimmons and sometimes other trees. These sandy areas, if undisturbed, will eventually become covered with forests again while the areas with relatively tight soils which have been abandoned from cultivation will eventually return to tall-grass prairie.

A careful study of the upland forests of Oklahoma which has been underway for three years has indicated that the original forest along the turnpike consisted of widely spaced, fairly large post oaks or blackjack oaks with an excellent cover of tall grasses between and even under the trees. The grass was so tall and thick that fires set regularly by the Indians were hot enough to kill out any tree seedlings, root sprouts of trees, or shrubs which would get started. With the coming of the white man and overgrazing due to his domestic animals, more tree seedlings and shrubs could get started because of less competition from the thick stand of grass; and moreover, any fires which were started were not hot enough to kill off any such seedlings or shrubs which did get started. Most heavily grazed areas of forest have now, therefore, a thick cover of shrubs and many small trees.

Analyses of relatively undisturbed stands of upland forest distributed along the Turner Turnpike (Rice, E. L. and Penfound, Wm. T., unpublished) have indicated that
the most prominent species of trees in Oklahoma and Lincoln Counties are post oak
(Quercus stellata) and blackjack oak (Quercus marilandica). These same species are
usually most common in the upland forest in Creek and Tulsa Counties. Black hickory
(Carya texana) usually occurs along with the other two species in these counties,
however, and is sometimes more common even than blackjack oak. Less common trees
that occur generally in the upland forests in all the above counties are: black oak
(Quercus velutina), redbud (Cercis canadensis), black haw (Viburnum rufidulum), persimmon
(Diospyros virginiana), Texas hackberry (Celtis laevigata texana), red mulberry (Morus
rubra), and chittamwood (Humelia lanuginosa). Shrubs and woody vines common to the
upland forests of the area are: poison ivy (Rhus radicans), dogwood (Cornus Drummondi),
Virginia creeper (Parthenocissus quinquefolia), buckbrush (Symphoricarpos orbiculatus),
smooth sumac (Rhus glabra), winged sumac (Rhus copallina), grape vine (Vitis supp.),
greenbrier (Smilax Bona-nox), and blackberry (Rubus sp.). Huckleberry (Vaccinium
arboresum) is common in Creek and Tulsa Counties.

The most common species of plants in the tall grass prairie are: little bluestem
(Andropogon scoparius), switch grass (Panicum virgatum), Indian grass (Sorghastrum
mutans), and big bluestem (Andropogon Gerardi). Common forbs in the relatively
undisturbed prairie are: many-flowered aster (Aster ericoides), lespedeza (Lespedeza
spp.), sage (Artemisia gnaphalodes), evening primrose (Oenothera serrulata), wild
alfalfa (Psoralea floribunda), and wild petunia (Ruellia humilis).

The bottomland forests along the creeks and rivers vary considerably in plant
composition from place to place. Along the turnpike probably the most common species
of trees in such forests are the following: American elm (Ulmus americana), red or
slippery elm (U. rubra), southern hackberry (Celtis Laevigata), and green ash
(Fraxinus pennsylvanica). Other trees which would often be present would be: cottonwood
(Populus spp.), black willow (Salix nigra), pecan (Carya illinoensis), and sycamore
(Platanus occidentalis). Common shrubs and vines would be essentially the same as
listed above for the upland forests.

The grass which is most common on the median of the turnpike right-of-way is
Bermuda grass which was planted there, of course.
HISTORICAL NOTES

by Gaston Litton

History of the Turner Turnpike.

The long-held dream of Oklahomans, who wished for a curveless four-lane super highway connecting Tulsa and Oklahoma City, was finally realized in 1953 with the completion of the Turner Turnpike.

The origin of the Turnpike may be said to date from a meeting held with Governor Roy J. Turner on February 21, 1947. A group of civic leaders from Oklahoma City and Tulsa presented to the governor a plan by which they argued that the toll road could be constructed and paid for by its users. After a careful study of the proposal, Governor Turner gave the project his full endorsement. Legislation necessary to activate the project was introduced in the State Legislature and a suitable bill was signed by Governor Turner on April 29, 1947. Surveys and traffic counts were made and on May 3, 1950 the Turnpike Authority let a contract for the sale of $31 million in bonds. Two weeks before the end of Governor Turner's term of office, groundbreaking ceremonies were held. Construction was begun immediately and completed during the gubernatorial administration of Johnston Murray.

The new route was completed in early May of 1953. The Turnpike was named for Roy J. Turner who had taken such energetic steps to carry the toll road idea into reality. Inauguration ceremonies were held on Saturday, May 16, 1953. Because Stroud was the mid-point of the highway, it was chosen for the statewide ceremonies which were held in the presence of some 7,500 persons. Ribbons were cut simultaneously at Oklahoma City, Tulsa, Chandler, Bristow, and Sapulpa. Official caravans moved from these cities to Stroud. Former Governor Turner cut the ribbon at Oklahoma City before some 2,000 people and led the caravan to Stroud. Governor Murray participated in similar ribbon-cutting ceremonies at Tulsa and headed the parade of vehicles to the mid-way point. R. P. Matthews, Sapulpa publisher and vice-chairman of the Oklahoma Turnpike Authority, presided at the dedication. The program included an interlude devoted to the development of transportation in Oklahoma from territorial days to the present, which included the participation of an ox-drawn cart, a covered wagon, a surrey, and Indian travois dragging behind a pony. Roberta Bushyhead, of Tulsa, of the distinguished Cherokee family, who was dressed in buckskin with a feather in her hair for the occasion, represented all Indians of the State in the ceremonies inaugurating traffic on the road.

The booths at the entrances of the Turnpike were opened simultaneously at 3 P.M. on the day of the inauguration. The first cash was collected on the toll road at that moment. At the end of the first twenty-four hours, a total of 10,012 vehicles were counted on the Turnpike turnstiles. Thus, the Turnpike was on its way toward a repayment of the six-year investment of time and money that had gone into the construction of the enterprise.

Route of the Turnpike.

Contemporary road maps, generously made available to today's users of the Turner Turnpike by oil companies supplying the State, provide a sufficient orientation of the motorist in relation to present-day Oklahoma.

It might be helpful, however, to made a passing reference to Oklahoma as it was in territorial times. The route of the Turner Turnpike is associated with portions of Oklahoma that are as old as the Indian Territory itself. Originally, this section of the State belonged to the Creeks and Seminoles, who held this area in common until they were forced to share it with other tribes following the Civil War. It was across this very section of the State, now spanned by the Turnpike,
that Washington Irving traveled in 1832. The famed author of the Legend of Sleepy Hollow and numerous other classics of American literature, and a few choice companions set out by horseback from Fort Gibson. They made a circle trip roughly paralleling the route of the Turnpike, traveling as far west as present-day Oklahoma City, at a distance of some miles south of the Turnpike route. The distinguished American writer has left an account of this region as it was in 1832, which may be of special interest to today's travelers on the Turnpike. Published in various editions under the title of A Tour on the Prairies, this account contains descriptions of the adventures of the travelers, the animals they saw (including a herd of wild horses), and the landscape, which afford a comparison with present-day Oklahoma.

The Turnpike originates not far from an imaginary point in downtown Tulsa where the boundaries of the Cherokee, Osage, and Creek nations once met. Today's road begins a short distance from the Arkansas River, just inside the old Creek Nation. The route crosses the upper northwest corner of that tribal domain and then traverses the old Sac and Fox Indian Nation. It leaves the domain of the latter tribes at a point not far from the boundary separating the old territory of the Iowas and Kickapoos. It also skirts the northwestern edge of the old Potawatomi reservation. The western boundary of the latter three Indian nations was also the eastern boundary of the region known as the Oklahoma District or the Unassigned Lands. It was this latter region, as all Oklahomans must know, which was opened to settlement under the homestead laws on April 22, 1889. Those who made the now-famous Run, which has been re-enacted so many times in literary and dramatic productions, are affectionately referred to as '89ers.

**Oklahoma City.**

Oklahoma City, which literally sprang up between noon and sunset on April 22, 1889, became the capital of Oklahoma three years after statehood when the people voted it away from Guthrie. The transfer was made in spectacular manner by Oklahoma's colorful first governor, C. N. Haskell, who set up his executive office in a second floor suite at the Huckins Hotel in 1910. Oklahoma City has been the scene of many historic happenings but, perhaps, none were more exciting than the eleven days in March of 1930 when Wild Mary Sudik was a roaring black-gold geyser and the winds carried its precious spray as far away as Norman, twenty miles distant.

Oil wells surrounding the State Capitol are in the Oklahoma City pool which was discovered in 1928. This large pool covers nearly 15,000 acres and produces from various Pennsylvanian sands, the Simpson group, and the Arbuckle. To January 1, 1954, it had produced nearly 700,000,000 barrels of oil.

The State Capitol, an example of neoclassic architecture, was constructed between 1914 and 1917. In the corridors leading to the legislative chambers, the Governor's suite, and the offices of the various agencies of the State Government, are located three murals which are memorials to Oklahoma's dead of the First World War. These paintings were done by Gilbert White, of the conservative French school, and they were purchased and presented to the State by the philanthropist and famous oil producer, Frank Phillips.

The Governor's mansion, done in Dutch colonial architectural manner, was completed in October of 1928. It was first occupied for a period of five months, by Governor and Mrs. Henry S. Johnston. The grounds around the Mansion and the Capitol were beautifully landscaped with shrubs and trees which were a gift of Governor E. W. Marland and were transported by truck from his palatial home in Ponca City.

Oklahoma Historical Society is housed in a three-story neoclassic structure located on Lincoln Boulevard to the left of the State Capitol and directly facing the State Office Building. Completed in 1930, this building houses one of the major museums of the state, in which are preserved many mementoes of Oklahoma's historic unfolding. In a gallery adjacent to the museum hang portraits of early-day personages whose contributions to the State's development entitle them to a place in Oklahoma's hall of fame.
Tulsa.

Tulsa was settled by members of the Creek tribe who called their place after their former home in Alabama—Tallassee or Tulsey. As late as 1879 Tulsey Town was little more than a post office stop on the pony mail route across the Indian Territory. After the Atlantic and Pacific Railroad laid its tracks to this settlement in 1882, Tulsa became a terminal with a roundhouse and a cattle loading point. The phenomenal growth of the city did not begin until after the discovery of the famed Red Fork oil well on June 25, 1901.

Tulsa is headquarters of the American Association of Petroleum Geologists, which numbered nearly 12,000 members at home and abroad in 1955. This organization, which assumed its present name in 1915, was conceived by Charles H. Taylor and E. L. DeGolyer. Taylor, who headed the department of geology at the University of Oklahoma, planned a convention of geologists of the Southwest. The same idea apparently was held by J. Elmer Thomas, a Tulsa oil man, who issued a call for a dinner meeting of geologists which occurred at about the same time. The new organization celebrated its first annual meeting on January 7-8, 1916, and elected Thomas as its president.

Tulsa is headquarters for numerous serial publications relating to petroleum industry, including among others: "Bulletin of the American Association of Petroleum Geologists," which commenced publication in 1917; "Geophysics," first published in 1936; "Independent Petroleum Monthly," (1930); "Journal of Paleontology," (1927); "Mid-Continent Purchaser," (1920); "Oil and Gas Journal," (1902); "Petroleo Interamericano," (1943)

The University of Tulsa, now one of the great metropolitan institutions of higher learning in the State, is an outgrowth of Henry Kendall College which was founded in Muskogee in 1894 and moved to Tulsa just before statehood. The news of statehood was announced to Tulsaans by the ringing of the historic bell which hangs in Kendall Hall, the original brick building which is the keystone of today's impressive physical plant. This privately-endowed institution of higher learning which offers fully accredited work in various fields, is justly famous for its College of Petroleum Engineering to which students are attracted from all over the world.

Gilcrease Art Gallery of Tulsa was established on November 17, 1942, by Thomas Gilcrease, who is of Creek Indian blood. Housed in a building constructed of native sandstone by local Indian labor, the museum is divided into seven major galleries and two small ones. There, on public display, are priceless paintings, sculpture, artifacts, books and manuscripts concerning the American Indian and the West.

Philbrook Art Museum of Tulsa was opened in the Fall of 1939 in what had been the elaborate and beautiful private residence of Mr. and Mrs. Waite Phillips who gave it to the City of Tulsa and thereby established a suitable precedent for other patriotic Oklahomans. Since its opening, Philbrook has emphasized Indian art and has supported state and regional artists by regularly exhibiting their work.

Sapulpa.

Sapulpa was named for a member of the Creek tribe, Jim Sapulpa, who settled there about 1850. He was a merchant who operated a small store and hauled his merchandise overland from Fort Smith by wagon and pack horses. With the construction of the railroad through this region, Sapulpa became a shipping point for cattle much like the cow towns of western Kansas, although on a much smaller scale. Here, too, was located for many years a school for an alien tribal fragment, known as the Euchees, whom the Creeks had incorporated into their tribe.
Chandler.

Chandler, which came into being with the opening of the Sac and Fox lands on September 22, 1891, was named for George Chandler, of Kansas, who was a top Department of the Interior official under President Benjamin Harrison. Six years after the town was founded, it was almost completely destroyed by a cyclone. Some years after the advent of statehood in 1907, Chandler became an important center for the processing and marketing of pecans and honey.

Bristow.

Bristow was founded in 1901, when the present Frisco Railway was built through this section of Oklahoma. The station on the railroad was named for Joseph L. Bristow, a top official in the United States Post Office Department. Although located in the old Creek Nation, this settlement was like so many other towns that came into being with the completion of the railroad and the great influx of white settlers.

Stroud.

Stroud was settled in 1896, soon after this part of Oklahoma was opened to white homesteaders. It was named for J. W. Stroud, owner of a country store and operator of a post office there. For the next 11 years, Stroud was a source of supply for much whisky bootlegged into the nearby Creek Nation which was dry. After statehood, which brought prohibition for all of Oklahoma, the saloons of Stroud were closed and the town became a trading center in an extensive farming region.

About four miles from Stroud, the Government established the Sac & Fox Agency in 1870. Some twenty-one years later, this agency was headquarters for the allotment of the lands to the tribal members. After this was completed, there was a surplus of lands which were opened to the settlement of white homesteaders in the Run of 1891. Not far from Stroud there was born the internationally famous Sac and Fox athlete, Jim Thorpe, who was Pentathlon and Decathlon winner at the World’s Olympic Games in Sweden in 1912.
TURNER TURNPIKE STRATIGRAPHY

Malcolm C. Oakes and Carl C. Branson

Checkerboard Limestone. In the vicinity of Tulsa, the Checkerboard limestone is a single bed of dense, dark-blue limestone about 2.5 feet thick. It is fossiliferous, but there are not many good collecting localities. It crops out on the turnpike at the junction with U. S. Highway 169 and rims the hill to the south. At low water, it can be seen along the shore of the Arkansas River under the east end of the railroad bridge.

Coffeyville Formation. From the outcrop of the Checkerboard westward through Red Fork the road is on the shaly lower part of the Coffeyville formation. The east gate of the Turner Turnpike is on the Coffeyville formation, composed of sandstone and shales of shallow water origin about 300 feet thick. Buff to gray, fine-grained sandstones interbedded with shales occur along the route to Sapulpa; shale east of the gate and sandstone from the gate to the railroad overpass near the northeast edge of Sapulpa. Shale, mostly covered, occupies the east slope of the hill west of the overpass and sandstone in the uppermost part of the Coffeyville rims the escarpment. This sandstone has the stratigraphic position of the True Layton sand (Dodds Creek sandstone).

Hogshooter Formation. In the vicinity of Sand Springs, southern Tulsa County, the Hogshooter is good pure limestone and more than 40 feet thick, but it thins rapidly southward and is represented on the Turner Turnpike in Sapulpa by a few feet of limy sandstone. Farther south across Creek County it is represented by occasional lenses of impure limestone or limy sandstone, and the Hogshooter limestone is represented on maps by a line connecting outcrops of these representatives.

At the base of the Hogshooter is a carbonaceous zone, representing the Cedar Bluff coal. The coal zone is well exposed high in the cuts at the Sapulpa exit overpass.

Nellie Bly Formation. The Nellie Bly formation is about 400 feet thick. The lower part of the Nellie Bly contains several thick relatively resistant sandstone beds separated by sandy, silty shale and soft, nonresistant sandstone. The top of this division is marked by a sandy dolomite bed about 1.5 feet thick at 75.8 miles. The next 57 feet of the Nellie Bly contains thin, silty, calcareous beds, a coal layer and abundant fossils. Species identified are:

- Isogramma millepunctata
- Myalina (Myalina) arbala
- Myalina (Myalina) wyomingensis
- Nuculopsis girtyi
- Nuculana ventricosa
- Astartella vera
- Murchisonia terebra
- Pharkidionotus percarnatus
- Mooreoceras tuba
- Pseudorthoceras knoxense

Above the dark shale is a dense, buff, dolomitic limestone 2 feet thick. Above this limestone the shales are calcareous, ferruginous, and fossiliferous for about 2 feet, and grade upward into barren, blue-gray shale with siltstone beds. Fifteen feet above the limestone is a massive, fine- to medium-grained, buff sandstone 10 feet thick. The upper part of the Nellie Bly is gray shale with an increasing proportion of siltstone and sandstone in lenses and bands.
Dewey Formation. The Dewey formation in this area is about 40 feet thick. The lower 10 feet is sandstone and the upper 30 feet is shale, somewhat silty and sandy.

Chanute Formation. The Chanute is about 140 feet thick. The lower part is sandstone which locally, at least, channels down into the Dewey formation, and in northeastern Nowata County, near the Kansas-Oklahoma line, extends as low as the Hogshooter limestone, replacing all of the Dewey and the Nellie Bly. The upper part is shale.

Iola Formation. The upper and lower limits of the Iola formation cannot be mapped exactly in this area, but known representatives are at least 50 feet thick at some places. In southern Tulsa County the Iola formation consists of a thin, platy limestone, the Paola, at the base, the Muncie Creek shale with some phosphate nodules, and the Avant limestone at the top. Along the escarpment which crosses the Turner Turnpike at about 67.2 miles one can find a thin, fossiliferous sandy limestone probably representative of the Paola, succeeded by silty shale, probably Muncie Creek. The escarpment is capped by sandstone the lower part of which is locally little more than a weathered limy siltstone containing fusuline molds, as well as other fossil molds, and the unit can be traced northward into the Avant limestone.

Wann Formation. Repetition by faulting across the Turner Turnpike precludes exact description of the Wann formation especially as to thickness; however three miles south of the turnpike it is about 100 feet thick. At the base is a sandstone about 10 feet thick, resting upon and continuous with the siltstone representative of the Avant limestone member of the Iola formation. Above this is a sandy shale about 20 feet thick followed by a sandstone about 10 feet thick, and this by a sandy shale about 60 feet thick.

Barnsdall Formation. Alternating resistant sandstone beds and sandy, silty shale and nonresistant siltstone about 150 feet thick.

The resistant beds are generally brown to brownish red, the nonresistant shale and sandstone beds are red, lavender and purple at many places. Farther north the Barnsdall consists of the Okesa sandstone member at the base and an unnamed shale member at the top. However the top of the Okesa sandstone is not a stratigraphic line, the Okesa increasing in thickness at the expense of the shale member by the addition of sandstone lenses at the top. Along the Turner Turnpike there is little of the upper shale member.

Tallant Formation. The Tallant formation in the vicinity of Bristow is about 60 feet thick. At the base is a resistant sandstone bed 5 to 25 feet thick, the remainder is sandy, silty shale and nonresistant silty sandstone in discontinuous lenses.

The basal bed of the Tallant in Osage County is the Bigheart sandstone member, and it contains other named and unnamed sandstone beds, but these persistent sandstone beds cannot be identified in Creek County. The Tallant is overlain unconformably by the basal beds of the Vamoosa formation. From a few miles south of Creek County to the north flank of the Arbuckle Mountains, the Tallant was completely removed by pre-Virgil erosion.

Vamoosa Formation. The Vamoosa formation, the basal formation of the Virgil series, is about 225 feet thick. It lies unconformably upon the Tallant formation and cuts it off only a few miles south of Creek County. The basal bed of the Vamoosa
in Okfuskee County, to the south, is chert conglomerate known as the "Boley conglomerate". The "Boley conglomerate" extends into southern Creek County and supplies much gravel for county roads. Where it crosses the turnpike and northward the basal bed is a gray to light tan, fine-grained, massive sandstone 10 to 20 feet thick. In Osage County the basal bed of the Vamoosa is the Cheshewalla sandstone, but it is probably not continuous with the "Boley conglomerate".

The Vamoosa formation extends up to the base of the Lecompton limestone, the basal member of the Pawhuska formation. It contains several resistant sandstone beds, not all of which are continuous across Creek County, separated by sandy to silty shale and nonresistant, silty sandstone lenses. The less resistant shale and sandstone beds are various shades of red, purple and lavender. Owing to the great distance between resistant beds and considerable changes in dip it is difficult to estimate the thickness of the Vamoosa and the figure given above is only a tentative approximation.

Pawhuska Formation. The Pawhuska formation in western Creek County, near and along the turnpike, has a total thickness of about 75 feet as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird Creek? limestone, not on the turnpike, gray to red, sandy.</td>
<td>2.0</td>
</tr>
<tr>
<td>Covered, shale, not along the turnpike.</td>
<td>40.0</td>
</tr>
</tbody>
</table>
| Pawhuska Formation
  Turkey Run limestone, on turnpike, about | 1.0   |
| Shale. crops out on turnpike. | 14.0  |
| Sandstone. crops out on turnpike. | 3.0   |
| Shale. crops out on turnpike. | 15.0  |
| Lecompton limestone. crops out on turnpike. | 1.0   |

A section of the upper part of the Vamoosa and the Pawhuska along the turnpike is as follows (Rambo and Ewbank):

<table>
<thead>
<tr>
<th>Description</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shale, dark red to maroon, about 10% of section is red fine-grained sandstone.</td>
<td>31</td>
</tr>
<tr>
<td>Limestone, red, impure fossiliferous (Turkey Run).</td>
<td>1</td>
</tr>
<tr>
<td>Shale, maroon, some sandstone lenses.</td>
<td>33</td>
</tr>
<tr>
<td>Sandstone, gray to tan, ferruginous.</td>
<td>2</td>
</tr>
</tbody>
</table>
| Lecompton limestone
  Limestone, light-gray, coarsely crystalline, fossiliferous. | 0-1.5 |
| Shale, light-gray to maroon, platy. | 4     |
| Limestone, light-gray, coarsely crystalline, fossiliferous | 0.5-1.5 |
| Shale, maroon to red, platy, grading into gray shale with selenite. | 16    |
| Sandstone, light-red, fine- to medium-grained, locally in two beds, fills channel. | 6-15  |
| Shale, maroon, and thin sandstone layers. | 70    |

11
Sandstone, light-red to tan, cross-bedded, fine-grained, a channel filling. ........................................ 1-25

Shale, maroon, with light-tan fine-grained sandstone beds about 20% of section .................................. 96

Sandstone, gray to tan, massive, fine-grained. ............ 13

Unnamed Formation. It appears necessary in order to designate mappable units in the area to divide the section into local formations. Farther north there are numerous marker beds. Farther south the sediments are in a basinal facies divided only into Ada and Vanoss formations. The unit from the base of the Bird Creek limestone to the base of the Wakarusa limestone is a workable unit. It consists of:

Wakarusa limestone

Unnamed formation
Shale, red to gray, with sandstone lenses to about 30% of total section. ........................................ 78

Bird Creek limestone, light-tan to gray, finely crystalline, fossiliferous. ..................................... 2.5

80.5

Unnamed Formation. A second mappable unit includes the Wakarusa limestone at the base and extends upward to the base of the Emporia formation.

Emporia formation

Unnamed formation
Shale, red, with sandstone beds up to 30% of total. ..... 76

Sandstone, gray ferruginous, asphalitic, with Linoproduc tus molds ............................................... 1

Shale, gray ...................................................... 3

Limestone, tan to light-gray, with clay parting near middle ... 4

84

Emporia Formation. The Stonebreaker limestone was inexactingly defined when proposed. The type section on the old Stonebreaker Ranch in Osage County is now relatively inaccessible. The older name Emporia, from Emporia, Kansas, is a clearly defined unit, and by agreement between the Kansas, Nebraska, Oklahoma, and Federal surveys is officially used for the unit. On the turnpike, the Emporia formation is as follows:

Elmont limestone member
Limestone, gray to tan, nodular, fossiliferous. ............ 0.7

Shale, dark gray to black, coaly at places .................. 1.0

Shale, red, with sandstone lenses ........................... 61.0

Reading limestone member
Limestone, tan to light-red, shaly, fossiliferous .......... 0.7

Shale, gray to brown ........................................... 1.5
<table>
<thead>
<tr>
<th>Sandstone, light-gray, fine-grained.</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shale, light-gray to brown</td>
<td>4.0</td>
</tr>
<tr>
<td>Limestone, blue-gray, shaly, nodular, fossiliferous.</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Unnamed Formation.** The rock unit including strata from the top of the Emporia formation to the top of the Brownville limestone is the uppermost part of the Virgil series. Along the turnpike it consists of:

<table>
<thead>
<tr>
<th>Strata</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brownville limestone</td>
<td></td>
</tr>
<tr>
<td>Limestone, red, shaly</td>
<td>0.5</td>
</tr>
<tr>
<td>Shale, gray</td>
<td>1.5</td>
</tr>
<tr>
<td>Limestone, red, compact, with crinoid stem ossicles.</td>
<td>1.0</td>
</tr>
<tr>
<td>Sandstone, buff, massive</td>
<td>10.0</td>
</tr>
<tr>
<td>Shale, gray</td>
<td>9.0</td>
</tr>
<tr>
<td>Shale, gray, calcareous, with <em>Septimyalina</em></td>
<td>1.0</td>
</tr>
<tr>
<td>Coal</td>
<td>0.1</td>
</tr>
<tr>
<td>Shale, red with sandstone beds 10% of section</td>
<td>44.0</td>
</tr>
</tbody>
</table>

**Lower part of Wolfcampian Series.** Along the turnpike, the highest identifiable marker bed in the Wolfcampian is the Red Eagle limestone. The Herington limestone loses identity in Noble County, the Fort Riley in northwest Payne County, the Wreford and Cottonwood in Pawnee County, the Neva in northern Creek County. The Wolfcamp rocks above the Red Eagle are at present undivided and have not been distinguished from the lower part of the Wellington. The Red Eagle limestone is the Cushing lime of plane-table parties. The section along the turnpike is as follows:

<table>
<thead>
<tr>
<th>Strata</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Eagle limestone</td>
<td></td>
</tr>
<tr>
<td>Limestone, red, dense, dolomitic</td>
<td>0.3</td>
</tr>
<tr>
<td>Clay shale, gray</td>
<td>2.5</td>
</tr>
<tr>
<td>Limestone, red, dense, fossiliferous</td>
<td>1.7</td>
</tr>
<tr>
<td>Siltstone, purplish, platy</td>
<td>0.1</td>
</tr>
<tr>
<td>Clay shale, gray, silty</td>
<td>3.5</td>
</tr>
<tr>
<td>Limestone, red, dense, dolomitic</td>
<td>0.4</td>
</tr>
<tr>
<td>Clay shale, red, with sandstone lenses.</td>
<td>23.0</td>
</tr>
<tr>
<td>Shale, bluish gray</td>
<td>4.0</td>
</tr>
<tr>
<td>Shale, red.</td>
<td>6.0</td>
</tr>
<tr>
<td>Sandstone, mottled red to light-gray, calcareous.</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Shale, red, with sandstone lenses. .......................... 19.0
Long Creek limestone
   Limestone, maroon, dense, fossiliferous .................. 1.0
   Shale, dark bluish gray .................................. 1.0
   Shale, red .................................................. 2.0
   Limestone, maroon, dense, fossiliferous .................. 0.4
Coal .......................................................... 0.1
Shale, gray .................................................. 5.0
Sandstone, pale maroon .................................... 4.0
Shale, maroon ................................................ 6.0
Sandstone, buff, thin-bedded ............................... 0.5
Shale, tan .................................................... 6.0
Shale, pale maroon, with sandstone lenses ............... 160.0
Sandstone, buff to red, massive to cross-bedded .......... 20.0
                        269.5

Lower part of Wellington Formation and Upper Part of Wolfcampian Series. From the base of the Fallis sandstone member of the Wellington to the top of the Red Eagle limestone, no consistent marker has been found in the vicinity of the turnpike. The measured section is as follows:

    Feet
Fallis sandstone
   Shale, dark red, with sandstone lenses .................. 183
   Sandstone, gray, channel filling ....................... 19
   Shale, dark red .......................................... 7
   Sandstone, light-gray, fine-grained ................... 11 to 25
   Shale, dark red to maroon ................................ 110
   Sandstone, dark red, conglomeratic .................... 2
   Shale, dark red .......................................... 5
   Sandstone, buff to red, cross-bedded ................... 3
   Shale, light-red to pink, platy .......................... 5
   Sandstone, light-tan to red, massive, fine-grained ...... 12
   Sandstone, gray to tan, cross-bedded, interbedded with 
      light-red shale ........................................ 64
   Shale, dark red to maroon, with local sandstone lenses .. 180
   Sandstone, light-tan, fine-grained ..................... 12
Black oaks growing on fixed dunes at 30.2 miles.

Bottom cross-bedded sandstone in Wellington formation at 9.2 miles.
Shale, light-red, silty, platy .................................. 10
Sandstone, light tan, fine-grained, channel .................. 0-10
Shale, orange-red, platy ....................................... 2
Shale, red, with sandstone channel fill edged by reduced zone ...... 45
Red Eagle limestone

Wellington Formation from Base of Fallis Member.

Garber sandstone

Wellington formation
Shale, light red, platy, sandy ................................... 8
Sandstone, light red, cross-beded ............................... 12
Shale, light red to pink ....................................... 45
Sandstone, light red, cross-beded, channel .................... 7
Shale, dark red to maroon, with local lenses of light red and gray sandstone in channels ..................... 96
Shale, light gray, sandy ...................................... 5
Sandstone, dark gray to maroon, conglomeratic, cross-beded, with calcareous zone ....................... 13
Sandstone, maroon, indurated, ferruginous .................... 2
Sandstone, light red, pyritic at base ......................... 24
Shale, dark red to maroon, platy ............................... 11
Sandstone, light red, calcareous at top, crinoid columnals .... 16
Sandstone, gray to light red, in lensing bodies in dark red shale . 126
Sandstone, light red, cross-beded ............................... 9
Shale, light red to maroon, some sandstone lenses .......... 69
Sandstone, light red, massive .................................. 10
Shale, light red to maroon, with several sandstone lenses .... 113
Sandstone, light red, massive .................................. 14
Shale, dark to light red ....................................... 28
Sandstone, light red, massive .................................. 12
Shale, red and light red sandstone ......................... 40
Fallis sandstone, gray ....................................... 9 to 26

691
Sandstone channel in red shale opposite service area at Chandler. Note white border possibly by reduction of iron oxide.

Remnant of indurated sandstone on eroded dip slope at 25.3 miles. Sandstones are characteristically cemented in breached downdip hillsides.

Fossiliferous shale and tan dolomitic limestone in Nellie Bly formation at Stop 2.
**Garber Sandstone Formation.** The Garber sandstone is exposed from 6.0 miles to its contact with the Hennessey shale near the city limits of Oklahoma City. The type locality is the city of Garber in Garfield County. In that area the lower member is predominantly shale, called the Lucien shale. The upper member is predominantly sandstone, called the Hayward sandstone. The members are probably not recognizable near Oklahoma City. Travis placed the top of the Garber at the top of a five-foot red shale above a massive red sandstone and below a dolomitic conglomerate. The base is placed at the base of a persistent sandstone. The total thickness of the Garber is about 600 feet.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hennessey</td>
<td></td>
</tr>
<tr>
<td>Garber</td>
<td>600</td>
</tr>
<tr>
<td>Wellington above base Fallis</td>
<td>691</td>
</tr>
<tr>
<td>Lower Wellington and upper Wolfcamp</td>
<td>694</td>
</tr>
<tr>
<td>Red Eagle to top Brownville</td>
<td>269.5</td>
</tr>
<tr>
<td>Brownville to top Emporia</td>
<td>67.1</td>
</tr>
<tr>
<td>Emporia</td>
<td>70.9</td>
</tr>
<tr>
<td>Base Emporia to base Wakarusa</td>
<td>84.0</td>
</tr>
<tr>
<td>Base Wakarusa to Bird Creek</td>
<td>80.5</td>
</tr>
<tr>
<td>Base Bird Creek to top Pawhuska</td>
<td>40</td>
</tr>
<tr>
<td>Pawhuska formation</td>
<td>75</td>
</tr>
<tr>
<td>Base Pawhuska to base Vamoosa</td>
<td>225</td>
</tr>
<tr>
<td>Tallant formation</td>
<td>60</td>
</tr>
<tr>
<td>Barnsdall formation</td>
<td>150</td>
</tr>
<tr>
<td>Wann shale</td>
<td>100</td>
</tr>
<tr>
<td>Iola formation</td>
<td>50</td>
</tr>
<tr>
<td>Chanute formation</td>
<td>140</td>
</tr>
<tr>
<td>Dewey formation</td>
<td>40</td>
</tr>
<tr>
<td>Nellie Bly shale</td>
<td>398</td>
</tr>
<tr>
<td>Hogshooter formation</td>
<td>10</td>
</tr>
<tr>
<td>Coffeyville formation</td>
<td>300</td>
</tr>
<tr>
<td>Checkerboard limestone</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4297.5</strong></td>
</tr>
</tbody>
</table>
REFERENCES


Merritt, John W. and McDonald, O. G., 1926. Oil and gas in Creek County, Oklahoma. Okla. Geol. Survey, Bull. 40-C.


<table>
<thead>
<tr>
<th>PENNSYLVANIAN SYSTEM</th>
<th>MISSOURIAN SERIES</th>
<th>TURNPIKE</th>
<th>OSAGE-KAY COUNTIES</th>
<th>SUBSURFACE</th>
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<td></td>
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<td>Hennessey sh.</td>
<td>Hennessey fm.</td>
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<tr>
<td></td>
<td></td>
<td>Garber ss.</td>
<td>Garber ss.</td>
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</tr>
<tr>
<td></td>
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<td>Fallis mem.</td>
<td>Wellington fm.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Wellington fm.</td>
<td></td>
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<td></td>
<td></td>
<td>Pearl sh.</td>
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<tr>
<td>PERMIAN</td>
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<td>Herington ls.</td>
<td>Winfield ls.</td>
<td>Hoy sand</td>
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<tr>
<td></td>
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<td>Ft. Riley ls.</td>
<td></td>
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<tr>
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</tr>
<tr>
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<td></td>
<td>Crouse ls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cottonwood ls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neva ls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Eagle ls.</td>
<td></td>
<td>Belveal sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long Creek ls.</td>
<td></td>
<td>Hoxey sand</td>
</tr>
<tr>
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<td>Red Eagle ls.</td>
<td></td>
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</tr>
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<td></td>
<td></td>
<td>Foraker ls.</td>
<td>Hughes Cr.</td>
<td>Vann sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Admire group</td>
<td>Americus</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Admire group</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brownville ls.</td>
<td>Brownville ls.</td>
<td>Crews sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grayhorse ls.</td>
<td></td>
<td>Sams sand</td>
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<tr>
<td></td>
<td></td>
<td>Wakarusa ls.</td>
<td></td>
<td>Ragan sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elmont ls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emporia ls.</td>
<td>Harveyville sh.</td>
<td>Vertz sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reading ls.</td>
<td>Reading ls.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bird Creek ls.</td>
<td>Turkey Run ls.</td>
<td>Covington sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pawhuska fm.</td>
<td>Deer Creek ls.</td>
<td>Barnes sand</td>
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<tr>
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<td>Lecompton ls.</td>
<td></td>
<td>Hoover sand</td>
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<td></td>
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<td>Elgin ss.</td>
<td></td>
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</tr>
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<td></td>
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<td>Oread ls.</td>
<td></td>
<td>Lovell sand</td>
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<td>Wynona ss.</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Tallant fm.</td>
<td>Wildhorse dolo.</td>
<td>&quot;Avant&quot; lime</td>
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<tr>
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<td>Revard ss.</td>
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<td>Perry gas sand</td>
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<tr>
<td></td>
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<td>Highheart ss.</td>
<td></td>
<td>True Avant ls.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barnsdall fm.</td>
<td></td>
<td>Osage Layton sand</td>
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<tr>
<td></td>
<td></td>
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<td>Birch Creek ls.</td>
<td>Avant-Dewey lime</td>
</tr>
<tr>
<td></td>
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<td>Wann fm.</td>
<td></td>
<td>Hogshooter lime</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iola ls.</td>
<td></td>
<td>True Layton sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avant ls.</td>
<td></td>
<td></td>
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<td></td>
<td>Muncie Creek sh.</td>
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<td></td>
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<td>Paola ls.</td>
<td></td>
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</tr>
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<td>Chanute fm.</td>
<td>Coconut Grove ss.</td>
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<td></td>
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<td>Dewey ls.</td>
<td>Thayer coal</td>
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<tr>
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<td>Dewey ls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nellie Bly sh.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hogshooter ls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hogshooter ls.</td>
<td>Dodds Creek ss.</td>
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<tr>
<td></td>
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<td>Coffeyville fm.</td>
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<tr>
<td></td>
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<td>Checkerboard ls.</td>
<td>Checkerboard ls.</td>
<td>Checkerboard lime</td>
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<td>Seminole fm.</td>
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<td></td>
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<td>Seminole fm.</td>
<td></td>
<td>Jones sand</td>
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<tr>
<td></td>
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<td>Dawson coal</td>
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</table>
SUBSURFACE GEOLOGY ALONG THE TURNER TURNPIKE

At the eastern end of the turnpike the Coffeyville formation is at the surface and Precambrian rocks have been reached at 4,272 feet. Near the west of the turnpike the Coffeyville is about 4,500 feet deep. According to Gerald C. Maddox, there are several persistent limestone beds in the subsurface Pennsylvanian and Permian and these can be carried eastward to surface with remarkable agreement. There is an oil or gas field in sight at most points along the turnpike. From Glenpool, not far east of the turnpike eastern gate, to Oklahoma City field with its wells surrounding the State Capitol there are numerous individual pools producing from a variety of traps and from many pay sands.

Exploratory activity is still high. H. E. Christian has reported that during 1955 the following tests were successful within sight of the highway:

Altus Drilling No. 1 Garlin, SW\(\frac{1}{4}\)SW\(\frac{1}{4}\)NW\(\frac{1}{4}\) sec. 17, T. 14 N., R. 3 E.  
Discovery of natural gas in Cleveland sand

Kewanee Oil No. 1 Vaught, SE\(\frac{1}{4}\)SE\(\frac{1}{4}\)NW\(\frac{1}{4}\) sec. 4, T. 16 N., R. 9 E.  
Discovery of natural gas in Second Cleveland sand

Cobb No. 1 Nelson, SE\(\frac{1}{4}\)NE\(\frac{1}{4}\)SW\(\frac{1}{4}\) sec. 3, T. 13 N., R. 1 W.  
Discovery of natural gas and distillate in Lower Skinner sand

The sequence of field discoveries along the belt adjacent to the turnpike is given below with a listing of the pay zones (data from Hubert G. Wessman and Louise Jordan):

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Pay Zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>1905</td>
<td>Glenpool</td>
<td>Oswego, Prue, Red Ford, Bartlesville, Booch, Datcher, Mississippian, Simpson, Turkey Mt.</td>
</tr>
<tr>
<td>1906</td>
<td>Bowden</td>
<td>Bartlesville, Booch, Datcher, Simpson, Turkey Mt.</td>
</tr>
<tr>
<td>1909</td>
<td>Sapulpa</td>
<td>Peru, Oswego, Prue, Red Fork, Bartlesville, Booch, Datcher, Mississippian, Simpson, Turkey Mt.</td>
</tr>
<tr>
<td>1915</td>
<td>Kellyville</td>
<td>Layton, Prue, Red Fork, Bartlesville, Datcher, Mississippian</td>
</tr>
<tr>
<td>1915</td>
<td>Depew</td>
<td>Bartlesville, Datcher, Simpson</td>
</tr>
<tr>
<td>1916</td>
<td>Lin Creek</td>
<td>Bruner, Bartlesville, Simpson</td>
</tr>
<tr>
<td>1916</td>
<td>Bristow</td>
<td>Pennsylvanian, Mississippian, Simpson</td>
</tr>
<tr>
<td>1918</td>
<td>Red Bank</td>
<td>Bartlesville, Datcher, Simpson</td>
</tr>
<tr>
<td>1918</td>
<td>North Bristow</td>
<td>Layton, Oswego, Red Fork, Datcher, Simpson</td>
</tr>
<tr>
<td>1920</td>
<td>Poor Farm</td>
<td>Layton, Prue, Bartlesville, Datcher, Simpson</td>
</tr>
<tr>
<td>1923</td>
<td>Mercer</td>
<td>Simpson</td>
</tr>
<tr>
<td>1923</td>
<td>Stroud</td>
<td>Layton, Prue, Skinner, Bartlesville, Hunton, Simpson</td>
</tr>
<tr>
<td>1923</td>
<td>West Kellyville</td>
<td></td>
</tr>
<tr>
<td>1924</td>
<td>Chandler</td>
<td>Oswego, Prue, Skinner, Red Fork, Bartlesville, Viola, Simpson</td>
</tr>
<tr>
<td>1924</td>
<td>Davenport</td>
<td>Cleveland, Prue</td>
</tr>
</tbody>
</table>
Stratigraphic Subsurface section along Turner Turnpike
Oklahoma - Lincoln counties segment
<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Township(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>South Davenport</td>
<td>Cleveland, Prue, Bartlesville</td>
</tr>
<tr>
<td>1936</td>
<td>North Wellston</td>
<td>Bromide</td>
</tr>
<tr>
<td>1939</td>
<td>Jones</td>
<td>Cleveland</td>
</tr>
<tr>
<td>1940</td>
<td>West Davenport</td>
<td>Cleveland, Prue, Red Fork, Simpson</td>
</tr>
<tr>
<td>1941</td>
<td>Milfay</td>
<td>Simpson</td>
</tr>
<tr>
<td>1947</td>
<td>Witcher</td>
<td>Bois d'Arc</td>
</tr>
<tr>
<td>1947</td>
<td>East Edmond</td>
<td>Bartlesville, Hunton, Simpson</td>
</tr>
<tr>
<td>1949</td>
<td>East Arcadia</td>
<td>Bromide</td>
</tr>
<tr>
<td>1951</td>
<td>South Chandler</td>
<td>Red Fork, Bromide</td>
</tr>
<tr>
<td>1953</td>
<td>Northwest Depew</td>
<td>Prue</td>
</tr>
<tr>
<td>1953</td>
<td>Luther</td>
<td>Skinner</td>
</tr>
<tr>
<td>1953</td>
<td>West Wellston</td>
<td>Checkerboard, Cleveland</td>
</tr>
<tr>
<td>1955</td>
<td>Northeast Luther</td>
<td>Checkerboard, Skinner, Hunton</td>
</tr>
</tbody>
</table>

Data on individual fields and on deep wells are given in the road log, much of the material modified from "Highway Geology of Oklahoma", published by the Oklahoma City Geological Society in 1955.
GENERAL SUBSURFACE GEOLOGY ALONG THE
TURNER TURNPIKE, LINCOLN COUNTY, OKLAHOMA

by

Daniel A. Busch

The Turner turnpike runs west-southwest through the center of Lincoln County and in so doing either crosses or passes three oil pools of considerable importance, namely, the Davenport, Chandler, and West Wellston pools.

The subsurface strata dip generally to the southwest where the Turner turnpike crosses Lincoln County, as illustrated by a map of the Viola limestone in Figure 1. The Viola on the eastern margin of Lincoln County has a subsea elevation of approximately -2700 feet and a subsea elevation of -4400 feet where the turnpike crosses the western boundary of the county. Thus, the rate of southwest dip of the Viola along the Turner turnpike in Lincoln County is approximately 57 feet per mile. The rate of dip of the younger beds of Pennsylvanian and Permian age is considerably less than that of the Viola. The rate of southwest dip of the Viola is not uniform but is locally interrupted by normal faults and reversal of dip. An example of the latter is illustrated clearly by "Chandler Ridge" which is a pronounced east-west trending anticline interrupting the southwest regional dip.

The Davenport pool was discovered in September, 1924, and had produced 20,684,069 barrels of oil by December 31, 1955. Production is from the Prue sandstone. The Davenport and Chandler pools appear to exhibit a direct relationship between accumulation and structure, the former pool occurring on a south-plunging structural nose and the latter following the axial trend of the Chandler Ridge. Since most of the production, however, is from lenticular Pennsylvanian sands a knowledge of structure is perhaps less important than an understanding of the sand bodies themselves. More specifically, sand thickness and lines of selective permeability, the latter determined from a comparative study of the initial productivity of the individual wells, are measurable factors which lend themselves to contouring.

Figure 2 is a detailed structure map of the Prue sandstone in the region of the Davenport pool, T. 14 N., R. 5 E. Such an "amoeboid" structure could in no wise be the result of tectonic forces but, rather, reflects variations in the topographic upper surface of the sand. In other words this map is a combination of structure and topography, the latter being the result of variations in sand thickness. Areas that are relatively high structurally are generally coincident with areas of thicker sand; conversely, low areas generally are devoid of much Prue sand in the Davenport region. These structurally low areas consist principally of shale at the horizon of the Prue. Differential compaction of this shale, as opposed to the non-compressibility of the Prue sandstone, affords the best explanation for the "amoeboid" aspect of the structure map of the Davenport pool. The sinuous trends of the structural contours (like pseudopodia of an Amoeba) suggest a delta with the apex to the northeast.

Figure 3 is an isopotential map of the area of the Davenport pool drawn with a geometric contour interval to the base of 100 barrels of oil. The principal advantage of the geometric, rather than the arithmetic, contour interval when so employed is to obviate the necessity of cluttering the map with an overabundance of contour lines in areas of high initial productivity. In addition, the error resulting from occasional spurious data is minimized. This initial potential map serves to illustrate more clearly the deltaic aspect of this Prue sand body than the structure map. There is, however, a striking similarity in the axial positions and trends of the distributary channels shown in Figures 2 and 3.

Areas of high initial productivity generally are coincident with areas that are relatively high structurally; conversely, those areas of low initial productivity (as well as dry holes) coincide with structurally low areas. Initial productivity
in itself is an indirect measure of the relative permeability of a sand in the vicinity of the bore hole. In deltaic sands (which are characteristically lenticular) trends of high initial potential are coincident with axial trends of maximum sand thickness and structure.

The Chandler pool was discovered in July, 1927, and development has been sporadic. Cumulative production to December 31, 1955, was 17,556,573 barrels of oil. This pool presents a real challenge to the geologist who would understand it in its entirety. Production is from the Cleveland, Oswego, Prue, Lower Skinner, Red Fork, Hunton, and Wilcox formations. The Lower Pennsylvanian sands are lenticular and contain oil and gas only where they wedge out across noses on the Chandler Ridge. Hunton and Wilcox accumulation is from structural closure. Suites of maps have been drawn for each of the producing formations which are lenticular in character. A

Figure 1: Viola Structure Along Turner Turnpike
combination of maps such as sand thickness, structure, and reciprocal isopachs of related genetic intervals are essential to a complete understanding of any one of the producing lenticular sands. Limited space will not permit their inclusion in this general treatment.

The West Wellston pool was discovered in June, 1953, and development has been rapid. On December 31, 1955, there were 66 producing wells which had a cumulative production on that date of 653,525 barrels of oil. The southern portion of the pool produces from a sand lens known as the Checkerboard sandstone. Stratigraphically it occurs directly above the Checkerboard limestone. The northern one-half of the pool produces from the Checkerboard, Cleveland, and Lower Skinner sandstones, all of which are very lenticular and afford good reservoirs by virtue of their updip wedgeouts of porosity and permeability.

in Lincoln Co., Okla. Contour Interval = 50
Figure 2: Prue Structure of Davenport Pool. C.I. = 25'
Figure 3: Prue Isopotential, Davenport Pool. Geometric Contour Interval to Base 100 in Barrels.
ROAD LOG, STRIP MAP, AND PROFILE

Mileages on the turnpike are marked from the west end by markers and painted numerals. The figure in parentheses is the mileage from the east end. The scale of the strip map is 3 inches to 1 mile excepting that of the approach maps.

The geologic profile was prepared by Neville M. Curtis of the Oklahoma Geological Survey. He was aided by use of the plane-tabled section prepared for the Survey by Daniel Rambo and James Ewbank with the assistance of Frances Taaffe.

Geologic material in Tulsa County and in Creek County is from the work of Malcolm C. Oakes. Geologic data in eastern Lincoln County are from the master's theses of Alvin West and Kenneth Masters. Much of the geologic information in Oklahoma County is from published work of Abe Travis.

Subsurface information is from R. P. Clinton, Harry Christian, and Louise Jordan.

Drafting of the maps, geologic profile, and subsurface profile was done by Roy Davis, Helen Anderson, and Kenneth Bewley of the Oklahoma Geological Survey. Outcrop photographs were taken by Harry Smith, Jr.

The profile is schematic and its accuracy is not detailed. The vertical scale is 1 inch to 100 feet, which with a horizontal scale of 1 inch to 1,760 feet gives a vertical exaggeration of 17.6 times.
Airplane photograph of area in Creek County showing topographic expression of Iola and Dewey formations. Note graben in lower left part of photographs.
Witcher Field, discovered 1947. Produces from Bartlesville sand, from unconformity sand at the base of the Pennsylvanian, and from the Bois d'Arc pinch-out. Field has 6,600 proven acres yielding 1,241 BCFD from 173 wells. Hunton is at 6,360 feet. Cumulative production 11,112,270 bbls.
East Edmond Field is 4 miles north. 126 wells produce 630 BOPD from Bartlesville, Hunton, and Second Wilcox. The field was discovered in 1947 and has yielded 5,603,492 bbls.
fields cultivated and abandoned 15 to 20 years ago. Scattered black jack, wire grass, little bluestem, sunflower, soapweed

Good exposure of Garber ss. beds and red shales

Red cedar (juniper)

Dense growth of black jack

Garber 10 ss in red sh

Upland forest post oak black jack

4.1 (82.2)
abandoned field
persimmons

land cut over, overgrazed, now has scrub blackjack

light red basal bed of Garber sandstone

base Garber

It red sh, gray calc red

road cuts

Wellington

Brea Crest C. O S

TI3N RIW

(62.2)

(62.3)

(80.6)

(80.3)
In 1965 flowed 5 bbls. distillate and 3 millionCFG (est.) from Lower Skinner at 5467-5493. TD 6,107 feet in Second Wilcox; still in process of completion.
East Arcadia field 3 miles north is an abandoned field discovered in April, 1949. Ten wells in the Second Wilcox (Bromide) sand at 5,975 feet yielded 447,000 bbls. Closure in the pay was provided by thinning between the Viola and the Second Wilcox.
Jones Field is 4 miles south. Discovered October, 1939. 121 wells with 3,300 proven acres. Oil is from a stratigraphic trap at 4,750 feet. Total production is 4,526,873 bbls.
Northeast Luther field to north. Discovered January 1955. Has 2 Hunton wells, 2 Skinner wells, and 1 Checkerboard sand well. Production is 129 BOPD, total 28,248 bbls.

Luther Field to north. Discovered March, 1953, yields 90 BOPD from 5 wells in the Skinner sand at 4,995 feet. A total of 113,118 bbls. has been produced.
Field discovered June 1955
Cumulative prod. 653,925 bbls from Checkerboard and Cleveland sands. Probably a stratigraphic trap in localized porosities. 66 wells produce 466 BCPD
North Wellston Field 3 miles north discovered April, 1936, produced 1,533,857 bbls. from First Wilcox sand and Marshall zone at 4,000 feet, then was abandoned. In 1955 Frankfort reopened Wilcox production and has obtained 1,871,875 bbls. from 4 wells, open fields, Anticlinal trap.
Altus Dlg No. 1 Garlin
Completed 1955. 615 MCFG from
Cleveland sand at 3526-34 and
3542-50. TD 4,750 in Miss.

WARWICK
Chandler Field discovered in 1924 on an anticlinal surface structure trending NW-SE. Production from Oswego, Prue, Skinner, Red Fork, Bartlesville, and from Viola, First Wilcox and Second Wilcox at 4,900 to 5,010 feet. 115 wells yield 1,345 bbls. per day. Accumulative production is 17,556,573 bbls.
3 miles south is South Chandler Field. Has 15 wells producing 69 BGPD from Red Fork sand, Bromide dolomite, and First Bromide sand at depths from 4,200 to 5,060 feet. Discovered in December, 1951, the field has produced 556,914 barrels from 175 acres.
Although thin, the Red Eagle is a prominent marker because it lies in a shale sequence. The three limestone beds rim the salients and the soil on them supports grasslands.

West Davenport Field 2 miles to south. Discovered in 1940 and has produced 3,048,312 bbls. Now yielding 735 BOPD from 96 wells. Pay sands are Cleveland, Prue, and Red Fork below 2,700 feet, and First Bromide at 4,700 feet. Combination of stratigraphic and structural trap.
Davenport Field to southeast was discovered in 1924 and has produced 3,891,000 bbls. Wells in Cleveland sand at 2,600 feet and Prue sand at 3,300 now yield 2,118 BOPD from 163 wells. A stratigraphic trap in the Prue, the accumulation is also anticlinal at the Cleveland horizon.
South Davenport Field is 3 miles south. Discovered in 1926 the field has produced 3,891,000 bbls. from Cleveland, Frue, and Bartlesville sands at 2,700 to 3,700 feet. This stratigraphic and structural trap still yields 654 BOPD from 126 wells.
Stroud Field to south was discovered October 1923 and has produced 22,382,620 bbls. From Layton, Prue, Skinner, Bartlesville, Hunton, First Wilcox, Second Wilcox, and Tyner. Now has 391 wells yielding 1,889 BOPD from sands 1,550 to 3,850 feet. Subsurface anticline slightly expressed on surface. Sand pinch-outs form traps in some Pennsylvanian pays.
Linacre Field 1 mile NE. Discovered 1916. Marked by surface anticline trending NE-SW, in subsurface a horst from which 250 feet of Mississippian has been eroded. Produced gas from Bruner sand, Bartlesville sand, Simpson sands. 8 wells in Bartlesville, Butcher, Simpson dolomite, Second Wilcox now yielding 20 BOPD. Since 1932 Simpson sands have yielded 313,300 bbls. of 40° oil from 3,770 feet on 240 proved acres.

Miflay Field to east discovered January, 1941; now has 41 wells producing 245 BOPD from 520 acres. On surface the field is marked by an anticline with E-W trend. Pay is a Simpson sand at 3,900 feet. Total production 2,635,684 bbls. 36° oil.
NW Depew Field has 20 wells producing 209 BOPD from Frue sand at 2,625 feet. Disc. 1953, 167,180 bbls.
Texas Co. dry hole to north cut 110 feet of Arbuckle to 4,200 TD in 1951 (NW4 SE4 SW4 19-16N-8E).
Red Bank and S Red Bank Fields to north. Discovered in 1918, now produces 310 BOPD from 31 wells on 1,040 proven acres. Gas in Bartlesville and Dutcher sands; oil in Dutcher and Simpson sands from 2,100 to 3,800 feet. A northeasterly-trending fault passes through the field in subsurface.

Mercer Pool discovered by Atlantic on A. Grayson lease in 1921. 5 wells have produced 374,489 bbls.

3 wells now pumping from a Simpson sand at 3,740 feet.

Depew Field, to south, discovered in 1915. 83 wells produce 1,034 BOPD from Bartlesville at 2,700', Dutcher at 3,100', Simpson (Second Wilcox) at 3,775'. A north-trending fault passes east of Depew and Mercer fields in subsurface.
Poor Farm Field. Discovered 1920. Gas in Layton at 850 feet, oil in Prue at 1,425, Bartlesville at 2,400, Dutcher at 2,800, Simpson at 3,100. Ten wells of the original 50 now produce 22 BOFPD.
North Bristow Field discovered in 1918 (Prairie No.1 Leets). Gas in Layton and Oswego; oil in Red Fork, Bartlesville, Guthers, Simpson. Bormell, upper sh.

Bristow Municipal Airport

Wilcox Oil Co. 7,000 bbl. refinery
Kewanee No. 1 Vaughan completed in 1955 (SE 
SE 
N W 4-16N-9E) made 7,120,000 CFD from
Second Cleveland from 1500-2 feet
TD 2,936' in Arnoa.

Field produces 480 BOPD from 96
wells. En echelon faults have
been mapped on surface.
Bristow Field, disc. 1916, Layton gas at 1,395'

discovered in 1909. Oil in several Pennsylvanian sands and in Mississippian and Simpson from 1,200 to 3,200'.
Two miles NW Prairie drilled a dry hole in 1924 which penetrated 660 feet of Arbuckle and reached Precambrian at 4,325 feet.
Kellyville Field discovered 1915.
Production from Layton at 600', from
Prue at 1,500', from Red Fork (main par),
from Bartlesville at 2,300',
from Dutcher at 2,700', from
Mississippi Lime at 2,800'.
With N Kellyville, 265 wells give
1,121 BOPD.
SAPULPA FIELD

Discovered in 1909, Sapulpa and S. Sapulpa now produce 691 BPD from 225 wells, on 4,860 acres.
Productive zones are Poco (673 feet), Oswego, Poco Red Fork, Bartlesville, and Poco Black Fork.

Note: This diagram illustrates the geological and geographical features of the Sapulpa Field, including the Nellie Bly area and the surrounding area.

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72
Pottery famous for unique design. Founded in Norman by Prof. Frank in 1933, moved to Sapulpa 1938. Plant now has more than 80 workers.

Glenpool is oldest major field in the state. Discovered in 1905, has had at least 4,075 wells and has yielded 252,039,329 bbls. Proven acres 21,000 with 1,715 wells producing 5,469 BOPD. Pay zones are Osage, True (Perryman), Red Fork, Bartlesville (Glenn), Booch Tanahe, Dutcher, Mississippi lime, Simpson (Wilcox, Hominy), and Arbuckle (Turkey Mountain).

In 1954 three water floods in Bartlesville gave 1,860,875 bbls. In 1955 Gulf drilled to igneous at 3,925' after logging 1,460' of Arbuckle.
Bowden Field, discovered in 1906. Proven acres 6,080, producing 430 BOPD from 160 wells. Field has yielded 22,074,132 bbls. Pay zones are Bartlesville, Booch, Dutcher, Simpson, Tucker Mountain at depths from 1,325 to 2,300'.

Arbuckle group has been topped at less than 2,000' in this area.