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)

CONTENTS

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 Witcher 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 maintainance 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 (Bumelia lanuginosa). Shrubs and woody vines common to the upland forests of the area are: poison ivy (Rhus radicans), dogwood (Cornus Drummondii), 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 arboreum) 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 nutans), 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 (Fraximus 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, ground-breaking 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 Pottawatomie 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 Tulsans 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
Pharkidonotus percarinatus
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 expecially 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 silty sandstone 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 Vamossa 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:

		Feet
Bird Creek? limestone, not on the turnpike, gray to red, sandy.		2.0
Covered, shale, not along the turnpike.		40.0
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):

Shale, dark red to maroon, about 10% of section is red fine-grained sandstone.	31
Limestone, red, impure fossiliferous (Turkey Run)	1
Shale, maroon, some sandstone lenses.	33
Sandstone, gray to tan, ferruginous	2
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

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, asphaltic, with Linoproductus molds	1
Shale, gray	3
Limestone, tan to light-gray, with clay parting near middle . . .	4
	84

Emporia Formation. The Stonebreaker limestone was inexactly 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

Sandstone, light-gray, fine-grained	1.0
Shale, light-gray to brown	4.0
Limestone, blue-gray, shaly, nodular, fossiliferous	1.0
	70.9

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:

	Feet
Brownville limestone	
Limestone, red, shaly	0.5
Shale, gray	1.5
Limestone, red, compact, with crinoid stem ossicles	1.0
Sandstone, buff, massive	10.0
Shale, gray	9.0
Shale, gray, calcareous, with Septimyalina	1.0
Coal	0.1
Shale, red with sandstone beds 10% of section	44.0
	67.1

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:

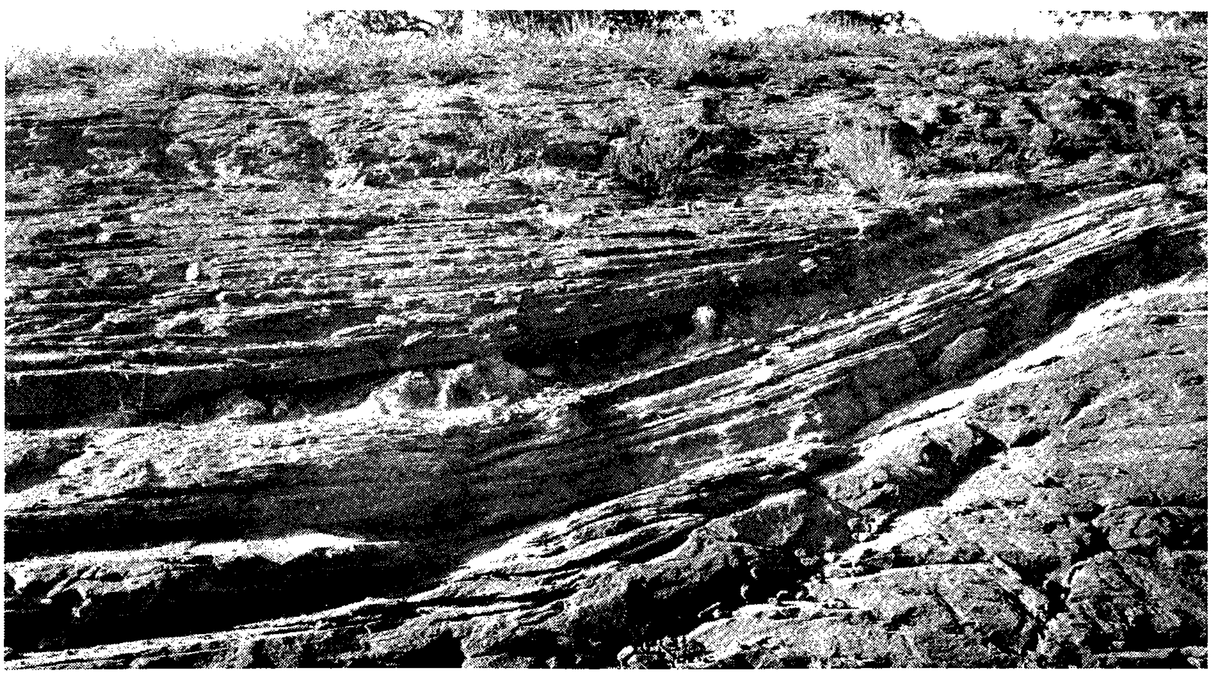
	Feet
Red Eagle limestone	
Limestone, red, dense, dolomitic	0.3
Clay shale, gray	2.5
Limestone, red, dense, fossiliferous	1.7
Siltstone, purplish, platy	0.1
Clay shale, gray, silty	3.5
Limestone, red, dense, dolomitic	0.4
Clay shale, red, with sandstone lenses	23.0
Shale, bluish gray	4.0
Shale, red	6.0
Sandstone, mottled red to light-gray, calcareous	3.0

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	
	694

<u>Wellington Formation from Base of Fallis Member</u>.

Garber sandstone	
Wellington formation	
Shale, light red, platy, sandy	8
Sandstone, light red, cross-bedded	12
Shale, light red to pink	45
Sandstone, light red, cross-bedded, 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-bedded, 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-bedded	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.

Totals from Base of Garber

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

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System	Series	TURNPIKE	OSAGE-KAY COUNTIES	SUBSURFACE
PERMIAN	LEONARDIAN	Hennessey sh.	Hennessey fm.	
		Garber ss.	Garber ss.	
		Fallis mem.		
		Wellington fm.	Wellington fm.	
			Pearl sh.	
	WOLFCAMPIAN		Herington ls. Winfield ls.	
			Ft. Riley ls.	Hoy sand
			Wreford ls.	Whitney sand
			Crouse ls.	Hotson sand
			Cottonwood ls.	
			Neva ls.	Belveal sand Hoxey sand
		Red Eagle ls.	Red Eagle ls.	Vann sand
		Long Creek ls.	Long Cr. Foraker ls. Hughes Cr. Americus	
		Admire group	Admire group	
PENNSYLVANIAN SYSTEM	VIRGILIAN SERIES	Brownville ls.	Brownville ls. Grayhorse ls.	
				Crews sand Sams sand Ragan sand
			Wakarusa ls.	Vertz sand
		Elmont ls. Reading ls.	Elmont ls. Emporia ls. Harveyville sh. Reading ls.	
				Covington sand
		Bird Creek ls. Turkey Run ls.	Bird Creek ls. Turkey Run ls.	Barnes sand
		Lecompton ls.	Pawhuska fm. Deer Creek ls. Lecompton ls.	
			Elgin ss. Oread ls. Wynona ss.	Hoover sand
		Vamoosa fm.	Cheshawalla ss.	Endicott sand Lovell sand Tonkawa sand
	MISSOURIAN SERIES	Tallant fm.	Wildhorse dolo. Revard ss. Bigheart ss.	"Avant" lime
		Barnsdall fm.	Barnsdall fm. Birch Creek ls.	Perry gas sand
		Wann fm.	Wann fm.	
		Iola ls.	Avant ls. Iola ls. Muncie Creek sh. Paola ls.	True Avant ls.
		Chanute fm.	Chanute sh. Cottage Grove ss. Thayer coal	Osage Layton sand
		Dewey ls.	Dewey ls.	Avant-Dewey lime
		Nellie Bly sh.	Nellie Bly sh.	
		Hogshooter ls.	Hogshooter ls.	Hogshooter lime
			Dodds Creek ss. Coffeyville fm. Cedar Bluff coal	True Layton sand
		Checkerboard ls. Seminole fm.	Checkerboard ls. Seminole fm.	Checkerboard lime Cleveland sand Jones sand Dillard sand
			Dawson coal	

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

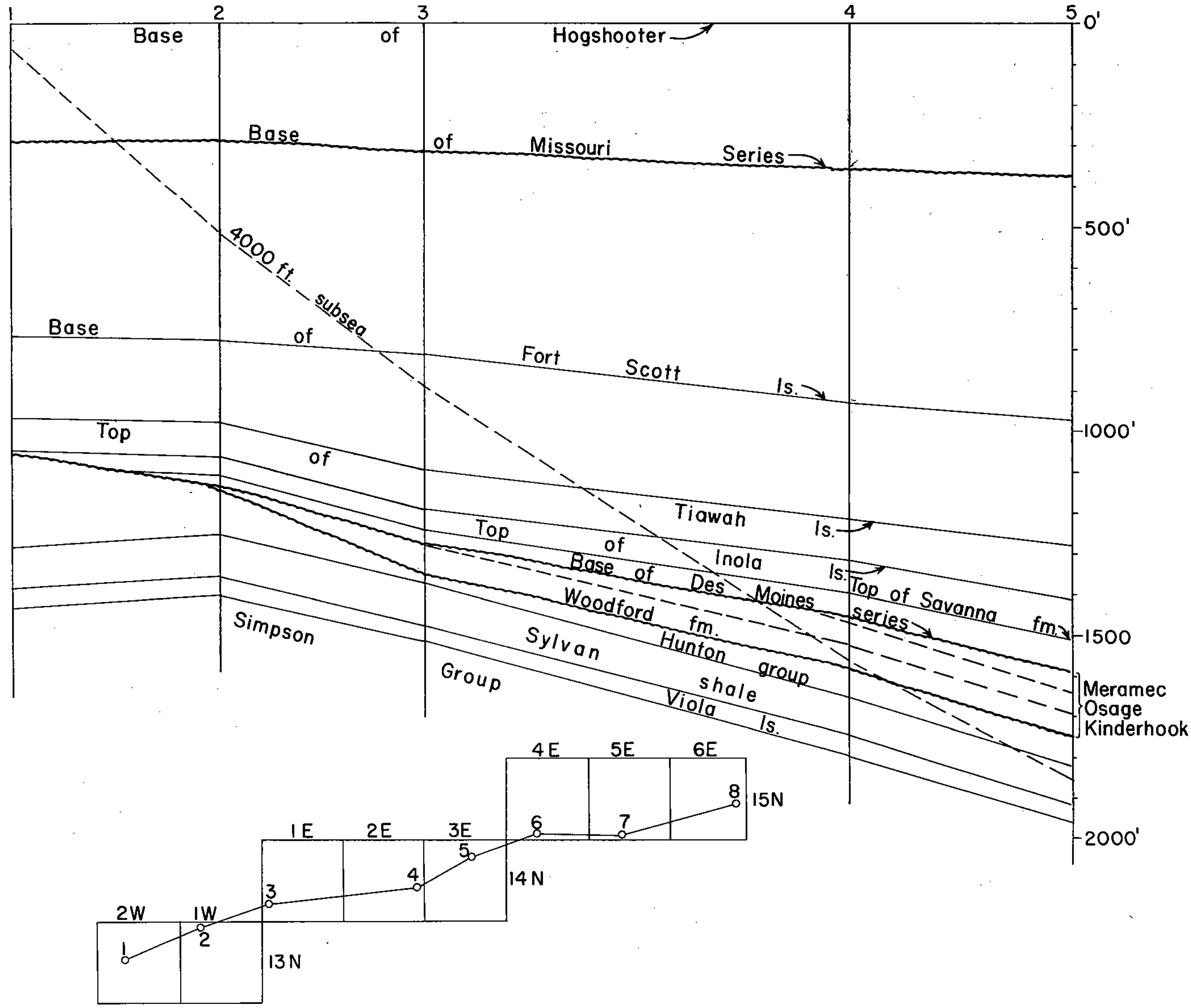
Kewanee Oil No. 1 Vaughn, SE$\frac{1}{4}$SE$\frac{1}{4}$NW$\frac{1}{4}$ sec. 4, T. 16 N., R. 9 E.
Discovery of natural gas in Second Cleveland sand

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

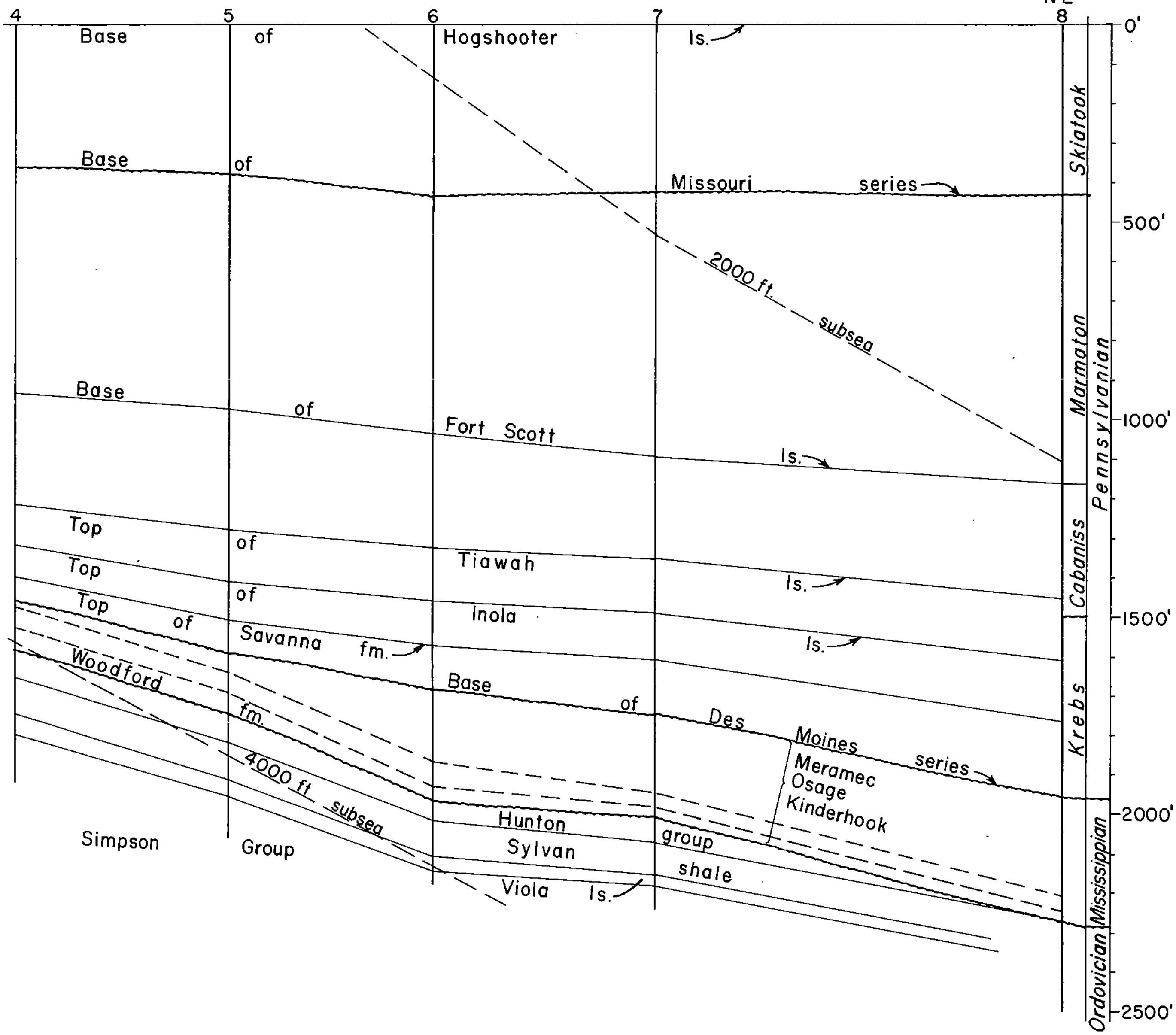
The sequence of field discoveries along the belt adjacent to the turnpike is given below with a listing of the pay zones (data from Hubert G. Wessman and Louise Jordan):

1905	Glenpool	Oswego, Prue, Red Ford, Bartlesville, Booch, Dutcher, Mississippian, Simpson, Turkey Mt.
1906	Bowden	Bartlesville, Booch, Dutcher, Simpson, Turkey Mt.
1909	Sapulpa	Peru, Oswego, Prue, Red Fork, Bartlesville, Booch, Dutcher, Mississippian, Simpson, Turkey Mt.
1915	Kellyville	Layton, Prue, Red Fork, Bartlesville, Dutcher, Mississippian
1915	Depew	Bartlesville, Dutcher, Simpson
1916	Lincreek	Bruner, Bartlesville, Simpson
1916	Bristow	Pennsylvanian, Mississippian, Simpson
1918	Red Bank	Bartlesville, Dutcher, Simpson
1918	North Bristow	Layton, Oswego, Red Fork, Dutcher, Simpson
1920	Poor Farm	Layton, Prue, Bartlesville, Dutcher, Simpson
1923	Mercer	Simpson
1923	Stroud	Layton, Prue, Skinner, Bartlesville, Hunton, Simpson
1923	West Kellyville	
1924	Chandler	Oswego, Prue, Skinner, Red Fork, Bartlesville, Viola, Simpson
1924	Davenport	Cleveland, Prue

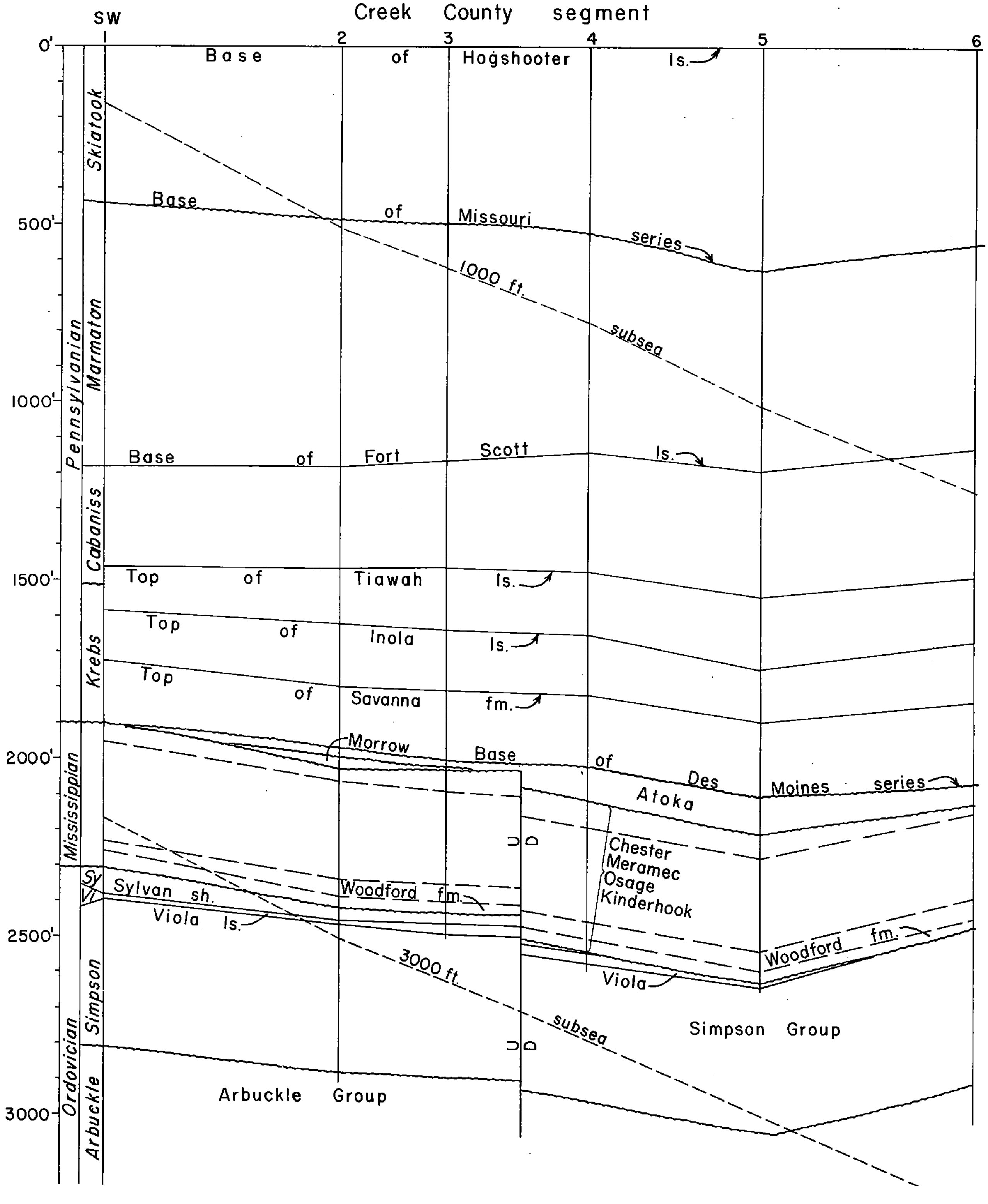
Stratigraphic Subsurface section along Turner Turnpike
Oklahoma — Lincoln Counties segment



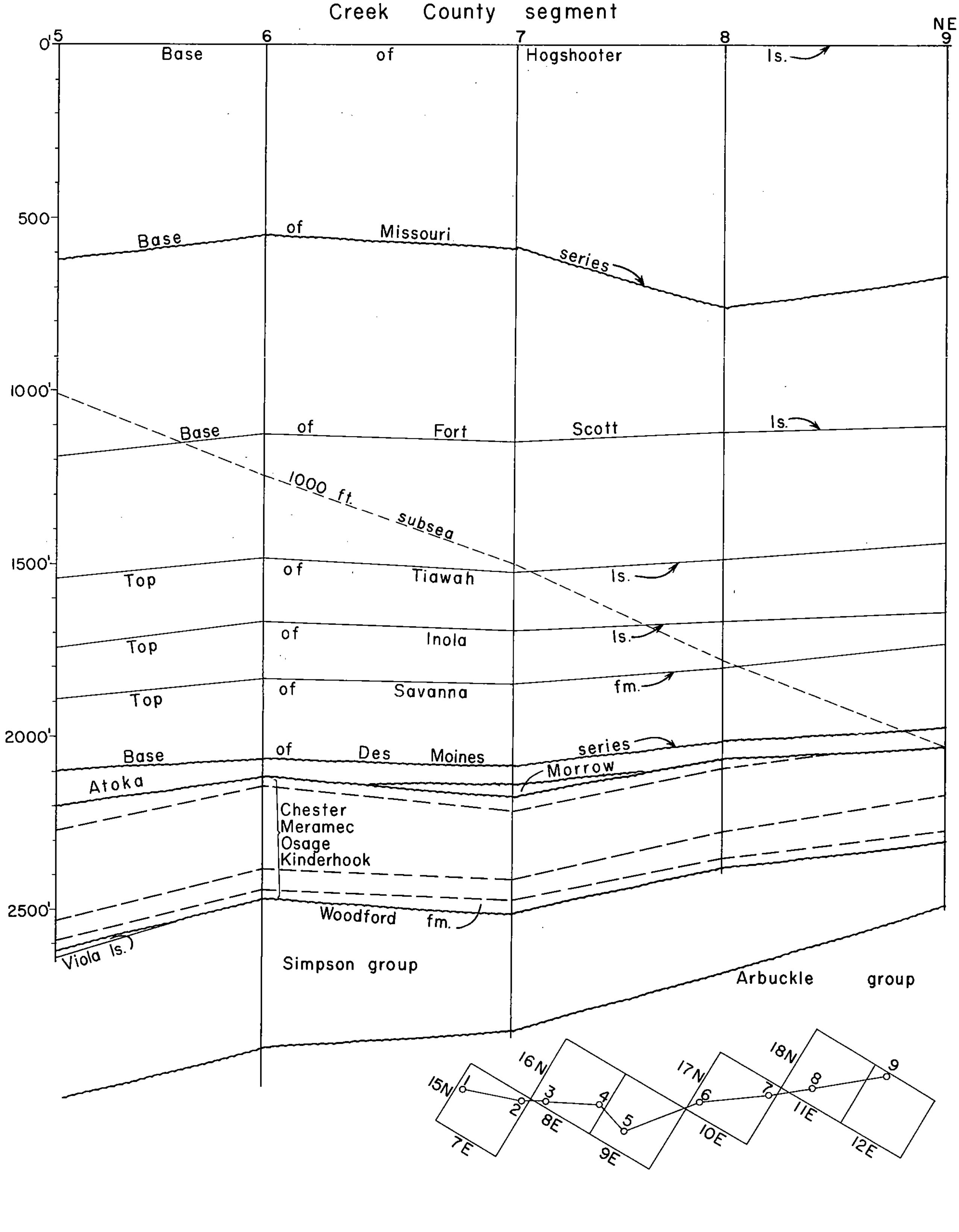
Stratigraphic Subsurface section along Turner Turnpike
Oklahoma - Lincoln counties segment



Stratigraphic Subsurface section along Turner Turnpike
Creek County segment



Stratigraphic Subsurface section along Turner Turnpike
Creek County segment



1926	South Davenport	Cleveland, Prue, Bartlesville
1936	North Wellston	Bromide
1939	Jones	Cleveland
1940	West Davenport	Cleveland, Prue, Red Fork, Simpson
1941	Milfay	Simpson
1947	Witcher	Bois d'Arc
1947	East Edmond	Bartlesville, Hunton, Simpson
1949	East Arcadia	Bromide
1951	South Chandler	Red Fork, Bromide
1953	Northwest Depew	Prue
1953	Luther	Skinner
1953	West Wellston	Checkerboard, Cleveland
1955	Northeast Luther	Checkerboard, Skinner, Hunton

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

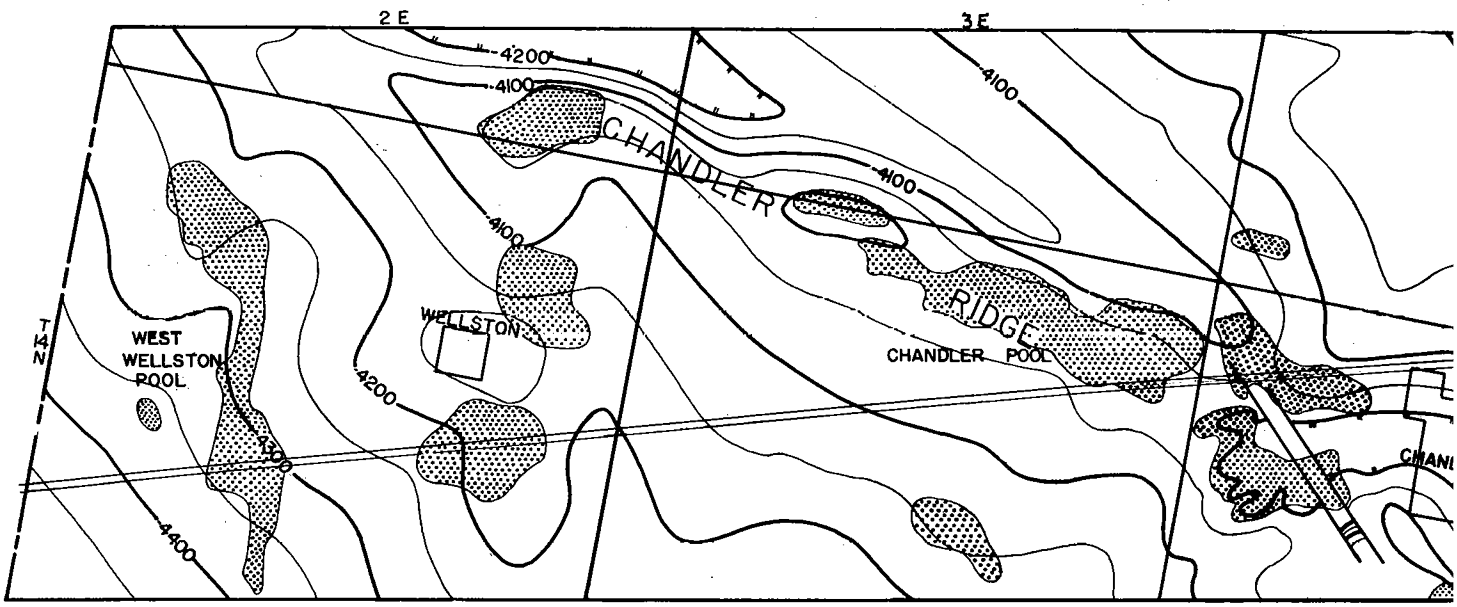
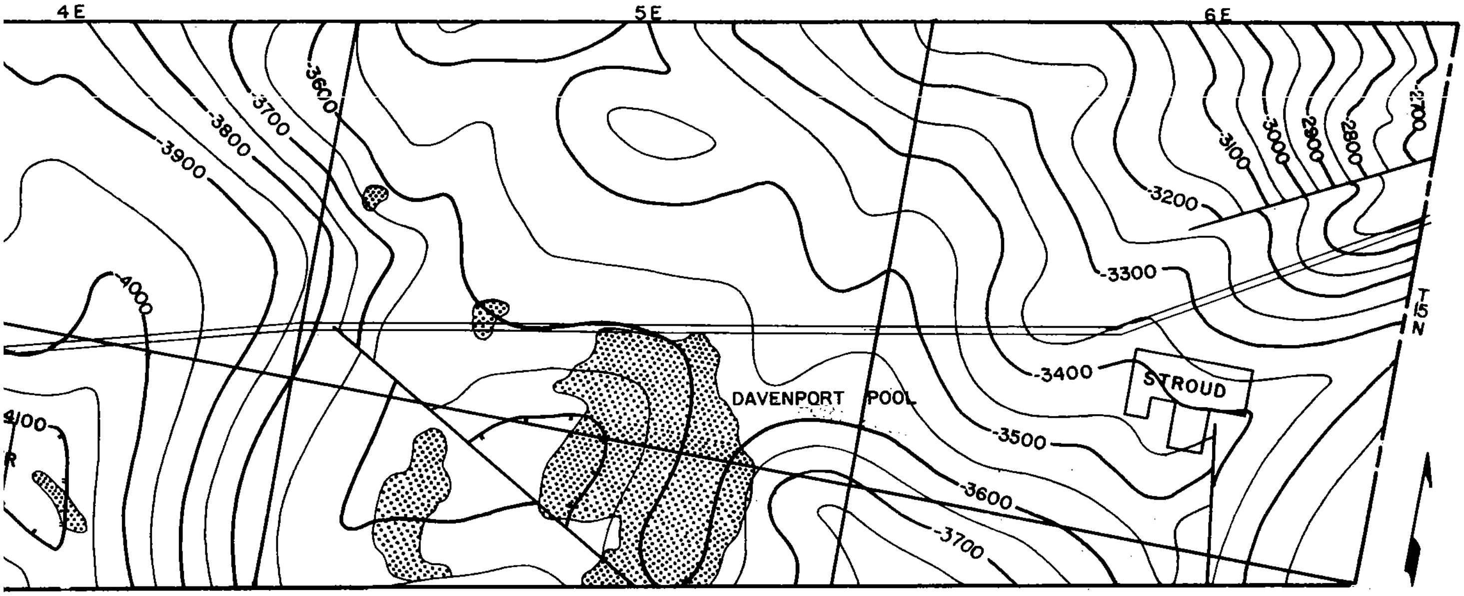


Figure 1: Viola Structure Along Turner Turnpike

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

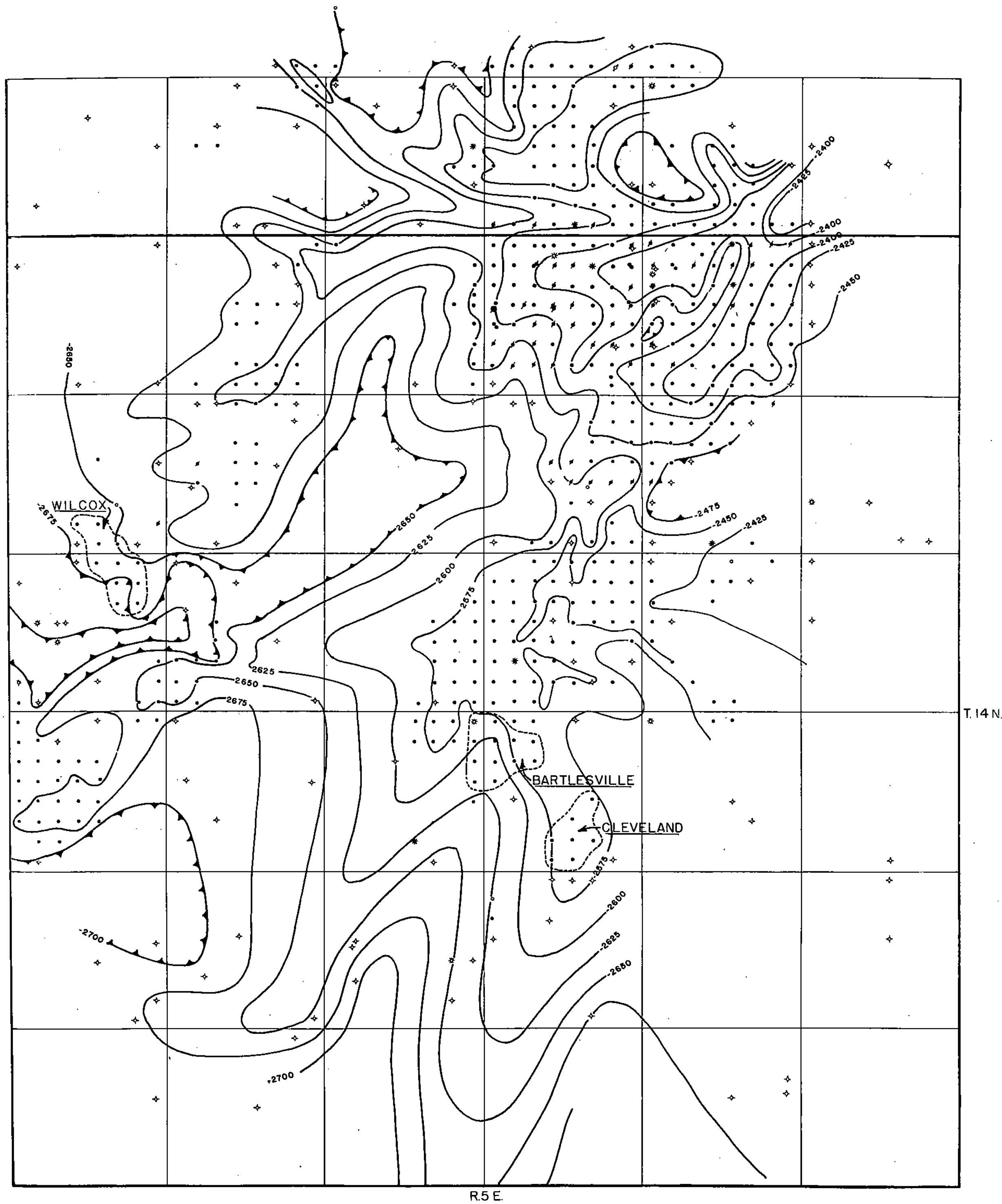


Figure 2: Prue Structure of Davenport Pool. C.I. = 25'

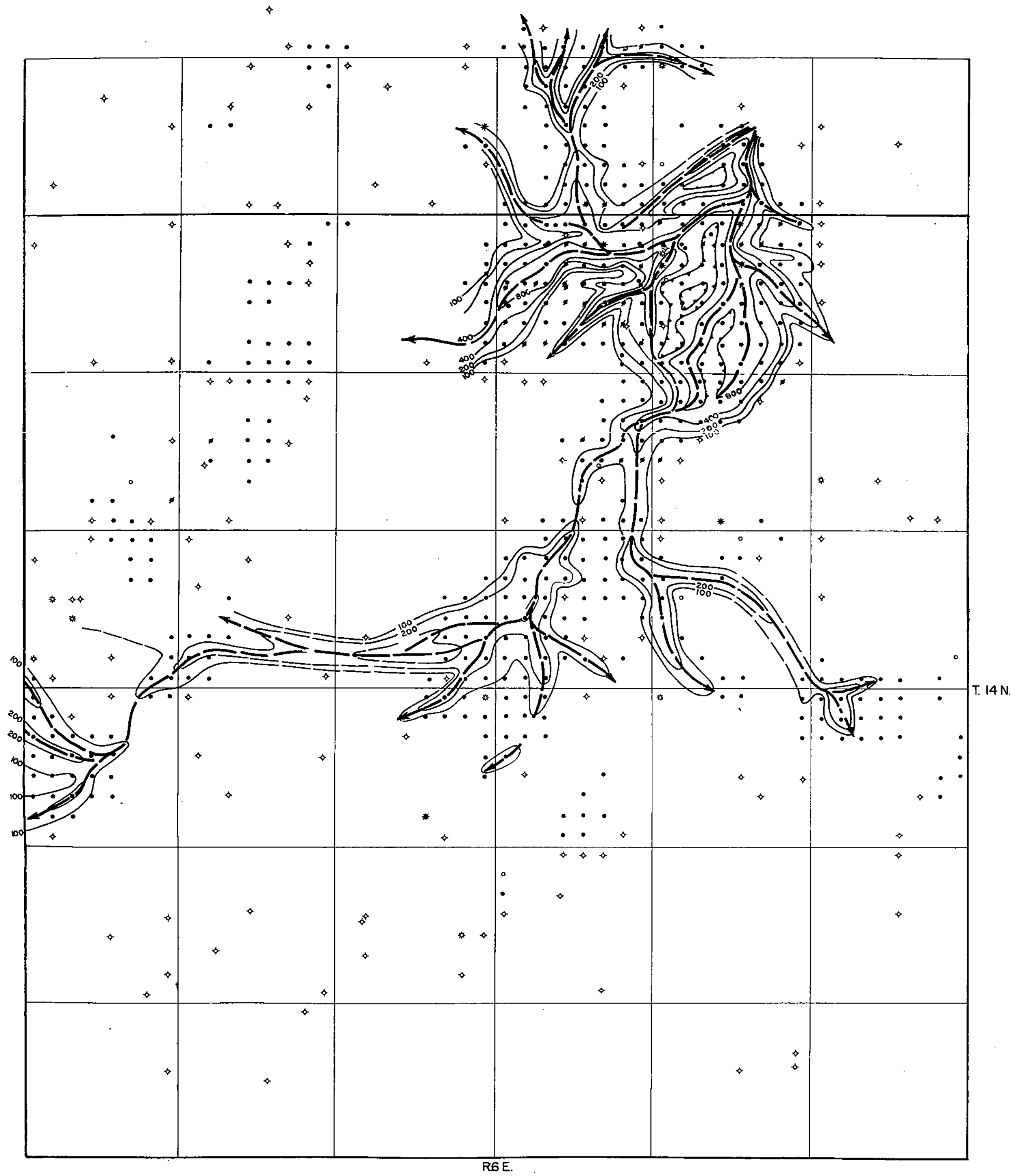


Figure 3: Prue Isopotential, Davenport Pool. Geometric Contour Interval to Base 100 in Barrels.

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.

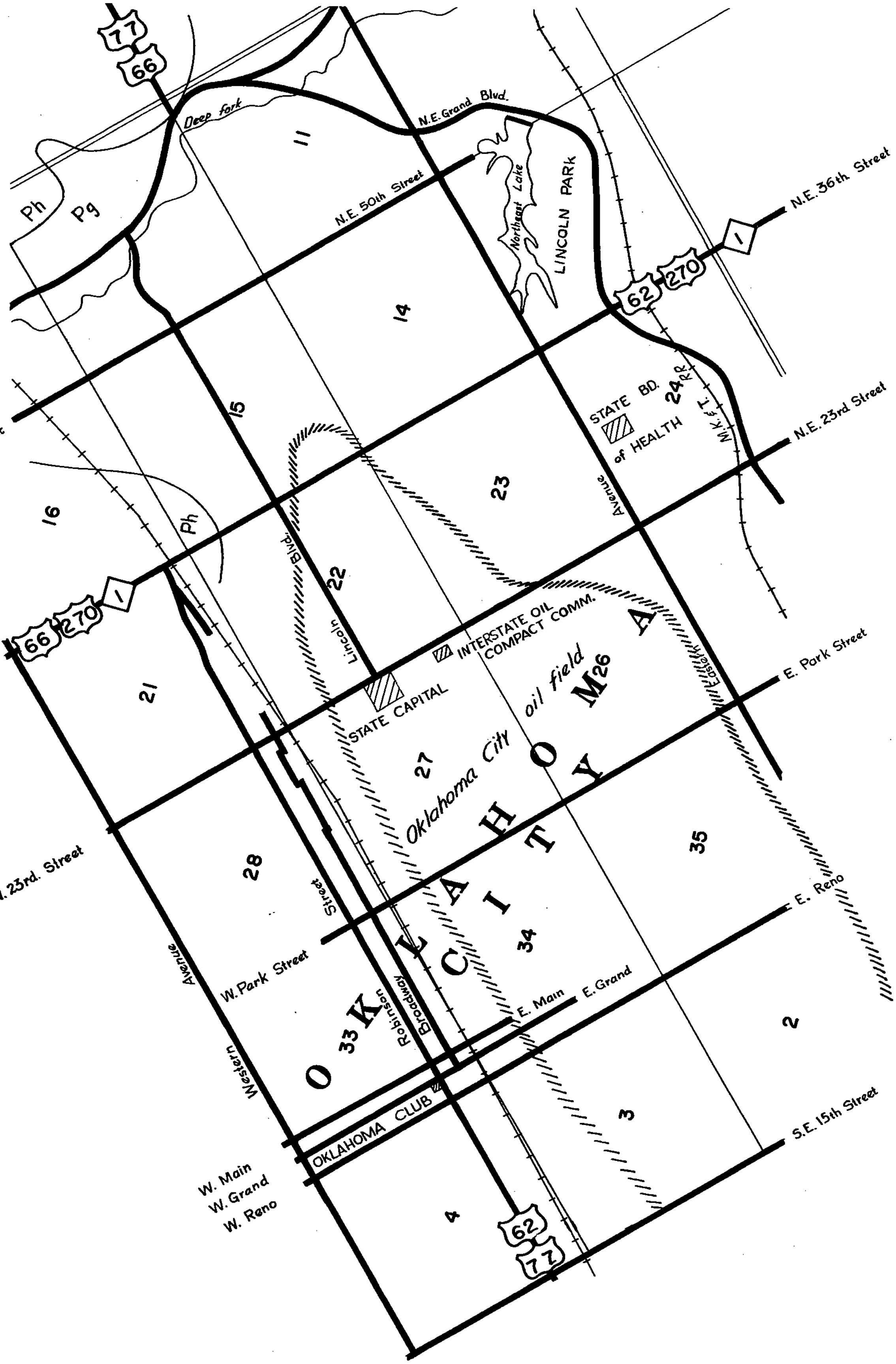
Geologic material in Tulsa County and in Creek County is from the work of Malcolm C. Oakes. Geologic data in eastern Lincoln County are from the master's theses of Alvin West and Kenneth Masters. Much of the geologic information in Oklahoma County is from published work of Abe Travis.

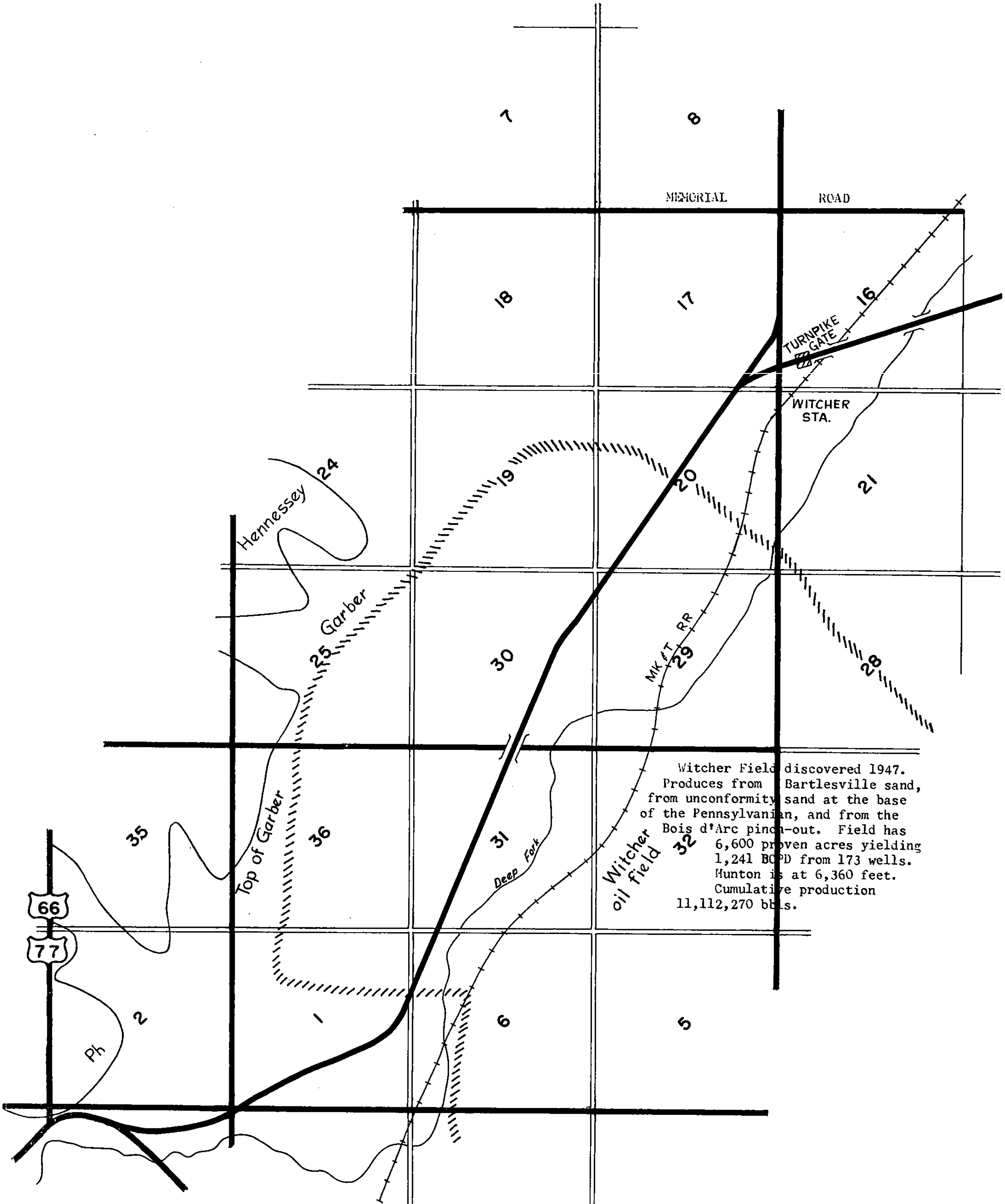
Subsurface information is from R. P. Clinton, Harry Christian, and Louise Jordan.

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.

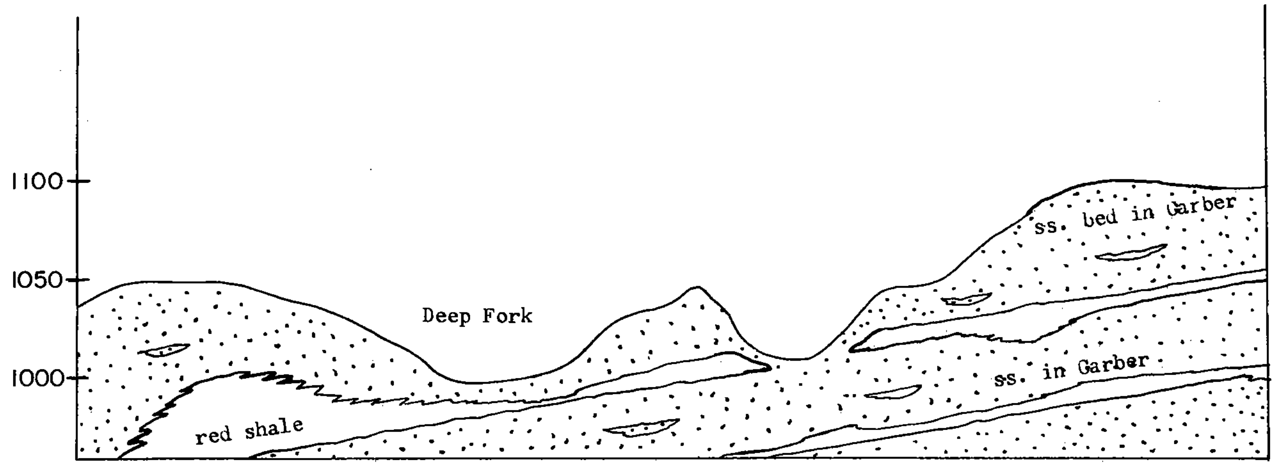
The profile is schematic and its accuracy is not detailed. The vertical scale is 1 inch to 100 feet, which with a horizontal scale of 1 inch to 1,760 feet gives a vertical exaggeration of 17.6 times.

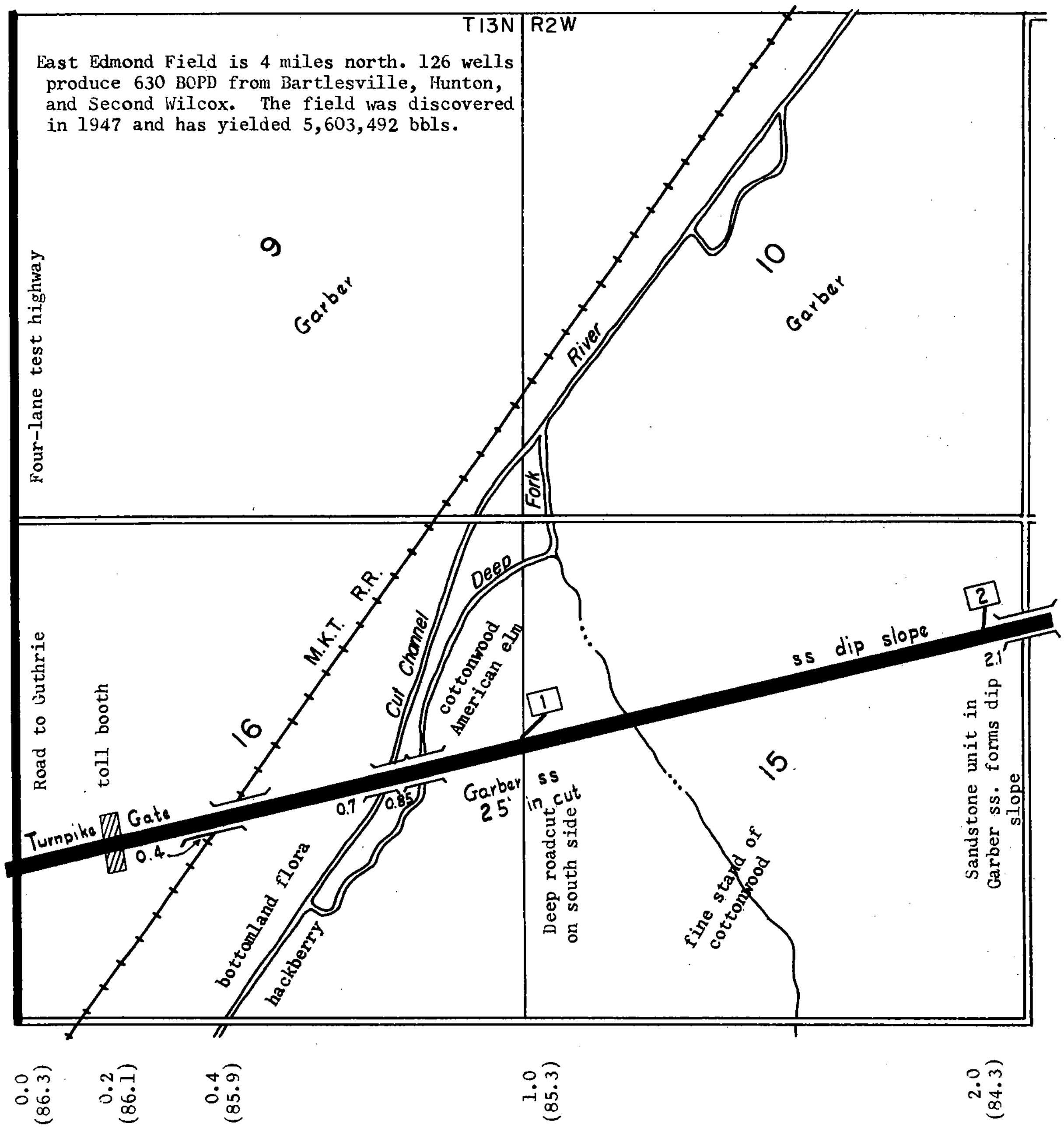
Airplane photograph of area in Creek County showing topographic expression of Iola and Dewey formations. Note graben in lower left part of photographs.

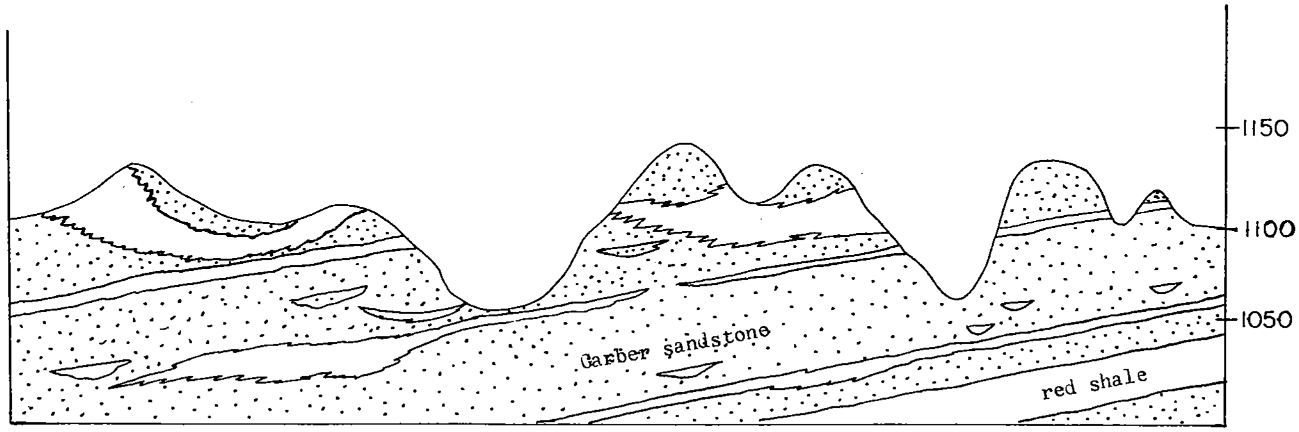

77
66
Deep Fork
N.E. Grand Blvd.
Ph
Pg
N.E. 50th Street
Northeast Lake
LINCOLN PARK
N.E. 36th Street
62
270
1
14
15
N.W. 50th Street
STATE BD. of HEALTH
24
M.K.&T. R.R.
N.E. 23rd Street
16
Ph
23
Avenue
22
Blvd.
Lincoln
66
270
1
N.W. 36th Street
INTERSTATE OIL COMPACT COMM.
STATE CAPITAL
Oklahoma City oil field
26
Eastern
E. Park Street
21
27
OKLAHOMA CITY
N.W. 23rd. Street
28
35
Street
E. Reno
W. Park Street
34
Robinson
Broadway
E. Main
E. Grand
33
Avenue
Western
2
OKLAHOMA CLUB
3
S.E. 15th Street
W. Main
W. Grand
W. Reno
4
62
77

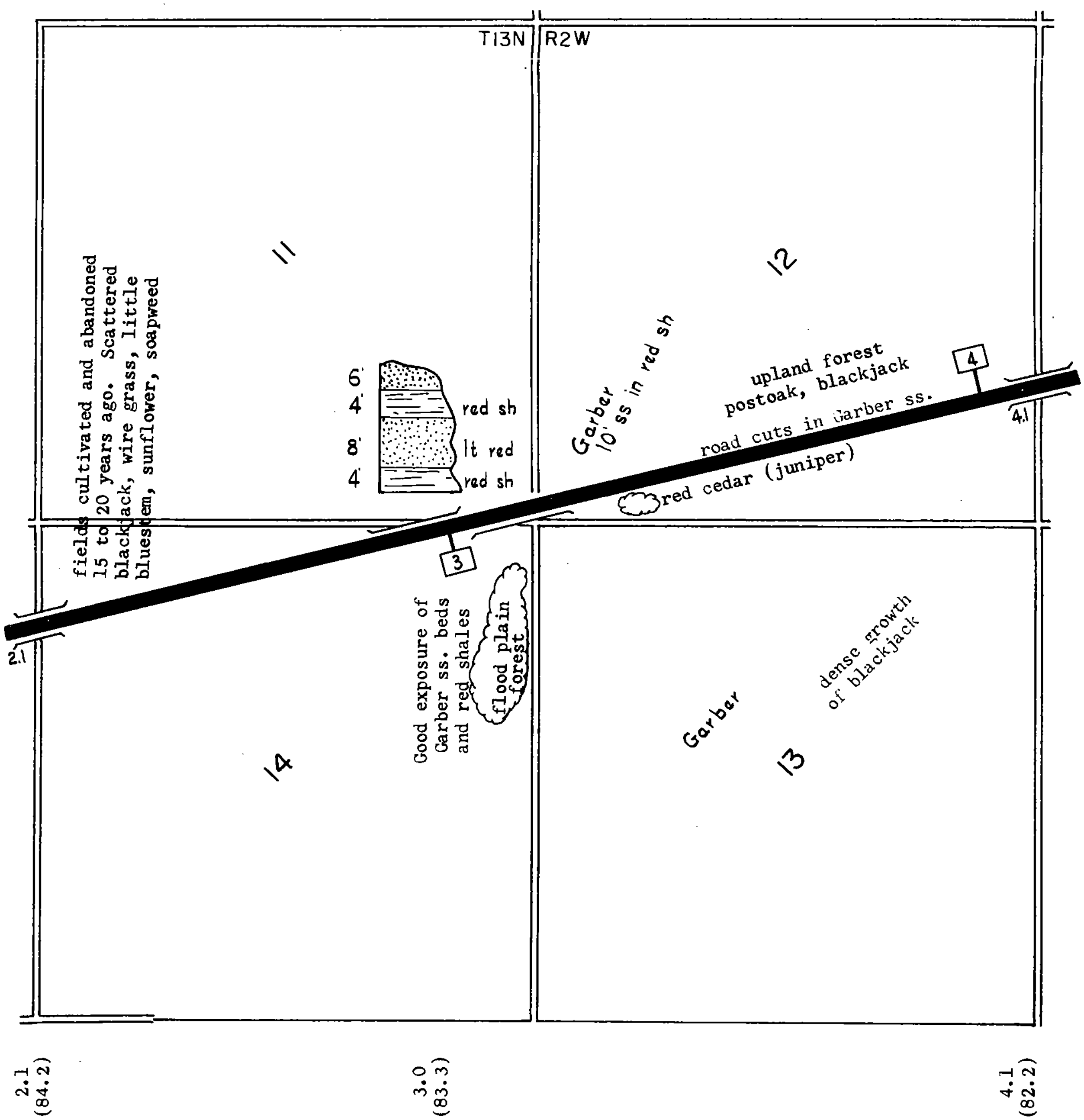


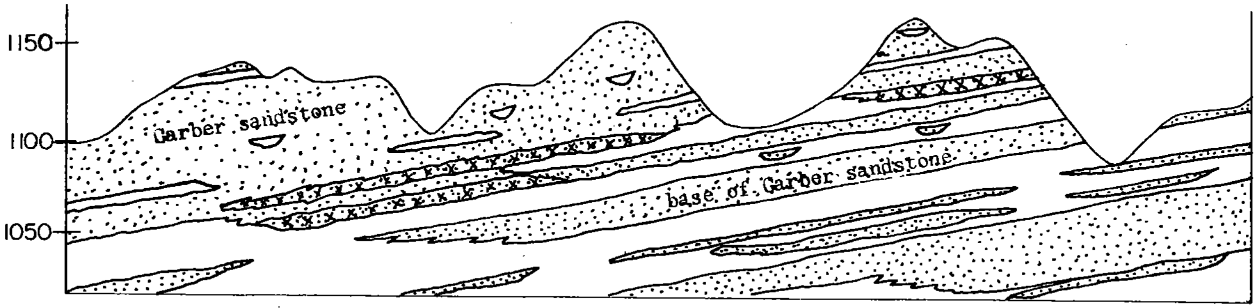
MEMORIAL ROAD
7
8
18
17
16
TURNPIKE GATE
WITCHER STA.
Hennessey
24
19
20
21
Garber
25
30
MK&T RR
29
28
35
36
31
32
Top of Garber
Deep Fork
Witcher oil field
66
77
2
1
6
5
Ph
Witcher Field discovered 1947.
Produces from Bartlesville sand,
from unconformity sand at the base
of the Pennsylvanian, and from the
Bois d'Arc pinch-out. Field has
6,600 proven acres yielding
1,241 BOPD from 173 wells.
Hunton is at 6,360 feet.
Cumulative production
11,112,270 bbls.

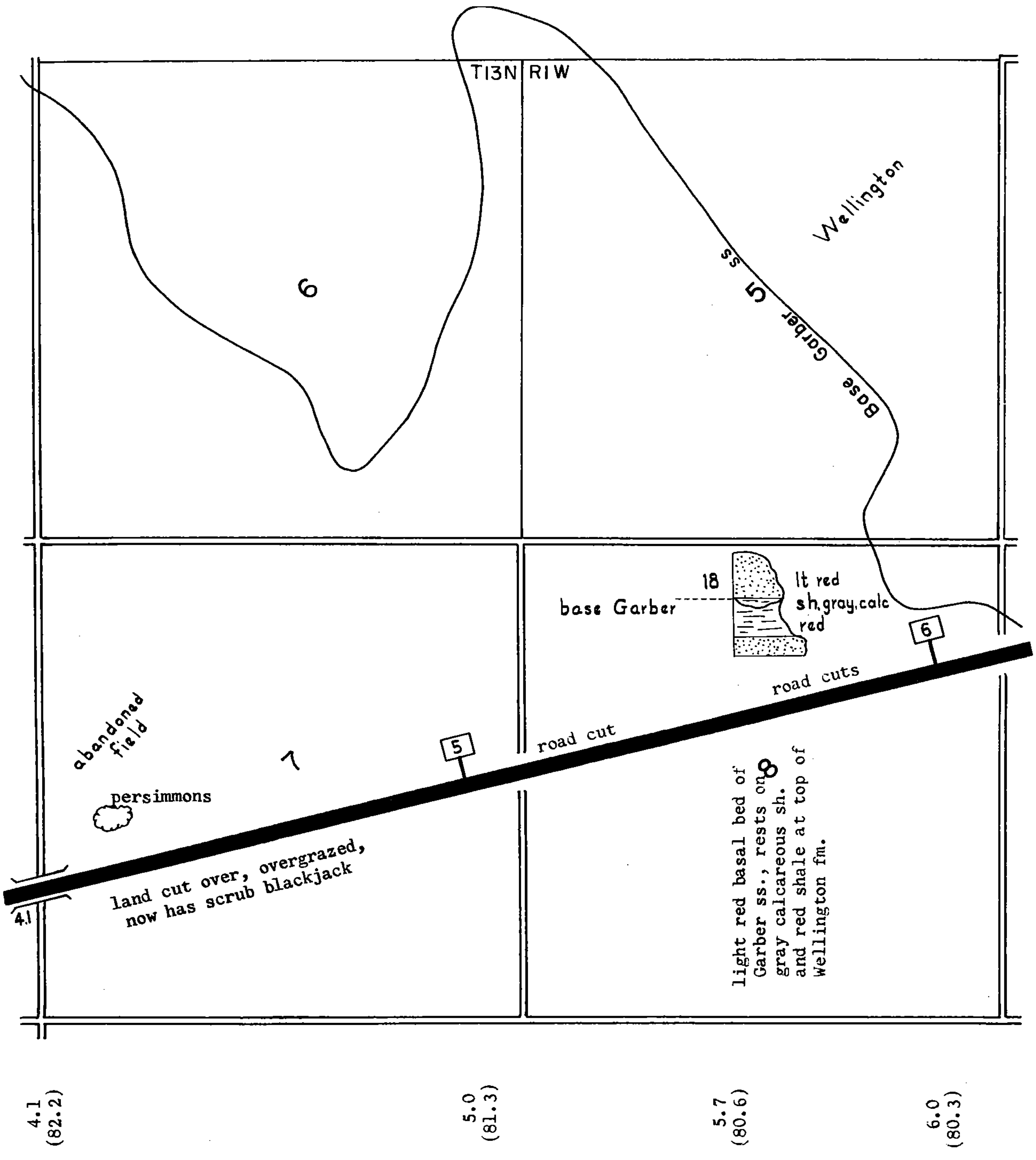

1100
1050
1000
Deep Fork
ss. bed in Garber
ss. in Garber
red shale

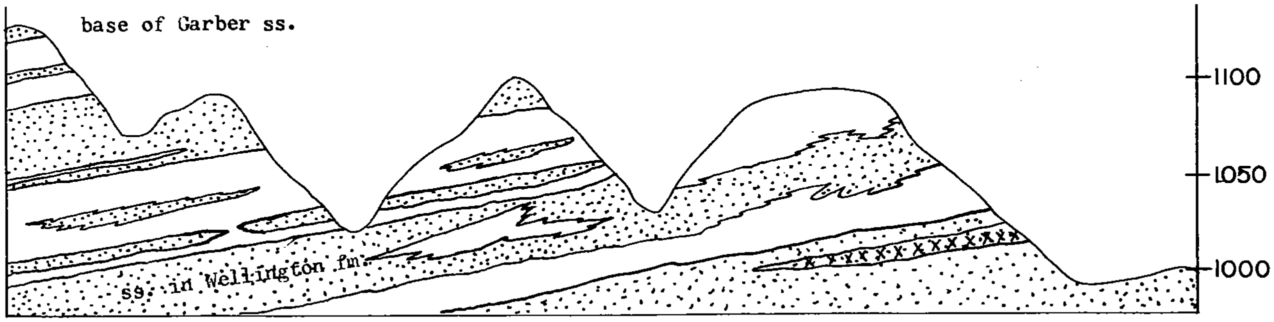

T13N
R2W
East Edmond Field is 4 miles north. 126 wells produce 630 BOPD from Bartlesville, Hunton, and Second Wilcox. The field was discovered in 1947 and has yielded 5,603,492 bbls.
Four-lane test highway
9
Garber
10
Garber
River
Fork
Deep
M.K.T. R.R.
Cut Channel
cottonwood
American elm
Road to Guthrie
toll booth
16
Turnpike Gate
0.4
0.7
0.85
Garber ss
25'
in cut
1
2
ss dip slope
2.1
15
Sandstone unit in Garber ss. forms dip slope
bottomland flora
hackberry
Deep roadcut on south side
fine stand of cottonwood
0.0 (86.3)
0.2 (86.1)
0.4 (85.9)
1.0 (85.3)
2.0 (84.3)

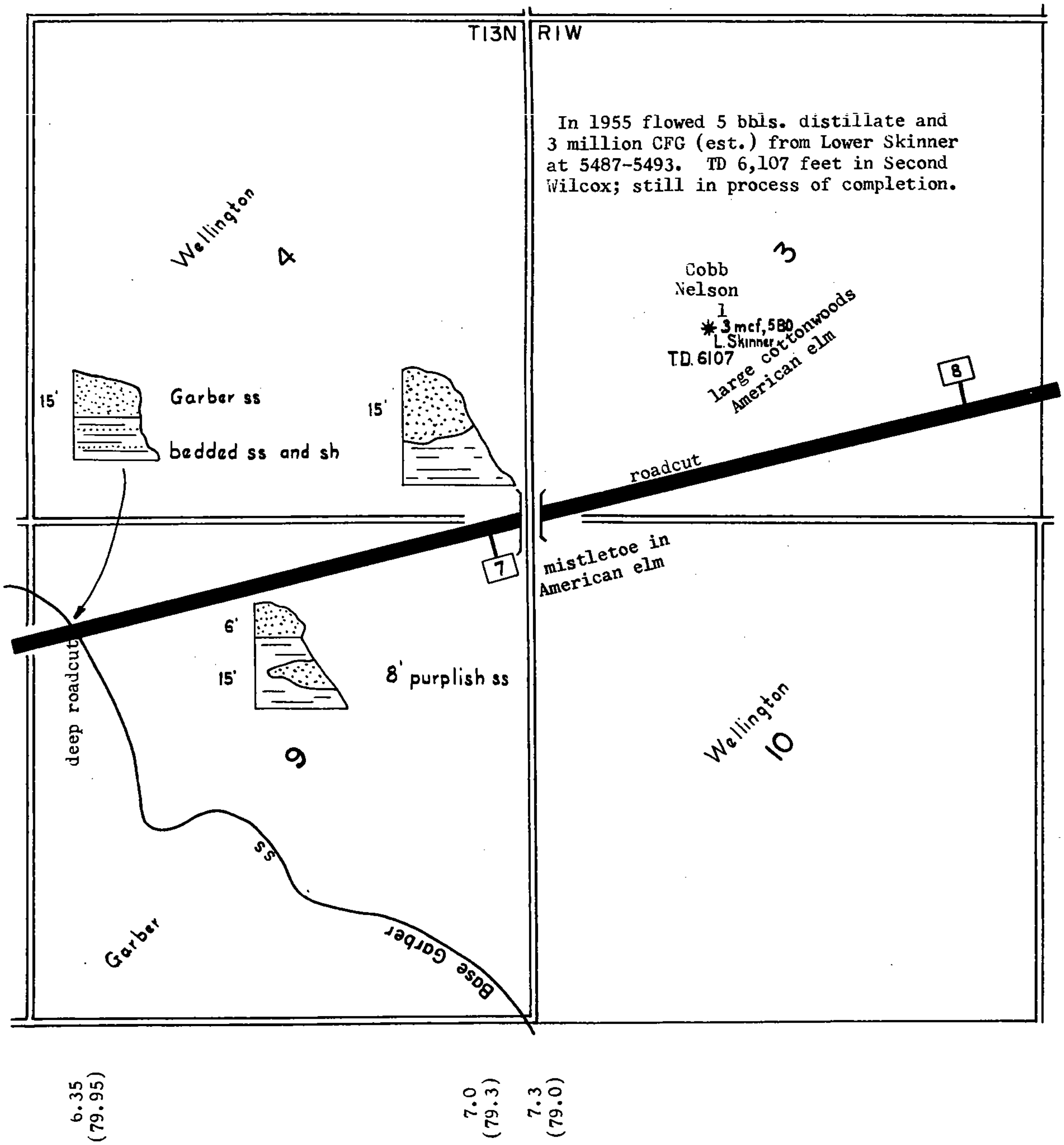

1150
1100
1050
Garber sandstone
red shale

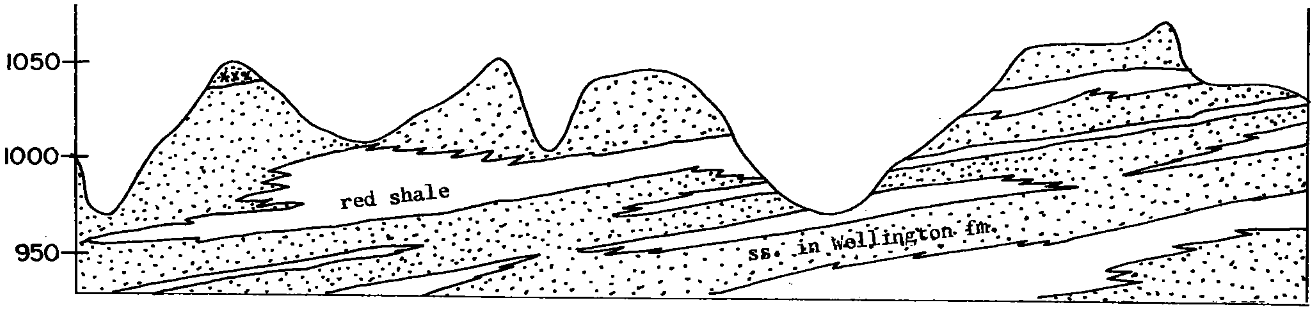

T13N
R2W
11
12
14
13
fields cultivated and abandoned 15 to 20 years ago. Scattered blackjack, wire grass, little bluestem, sunflower, soapweed
6'
4' red sh
8' lt red
4' red sh
Garber 10' ss in red sh
upland forest postoak, blackjack
road cuts in Garber ss.
red cedar (juniper)
4
3
Good exposure of Garber ss. beds and red shales
flood plain forest
dense growth of blackjack
Garber
2.1
4.1
2.1 (84.2)
3.0 (83.3)
4.1 (82.2)

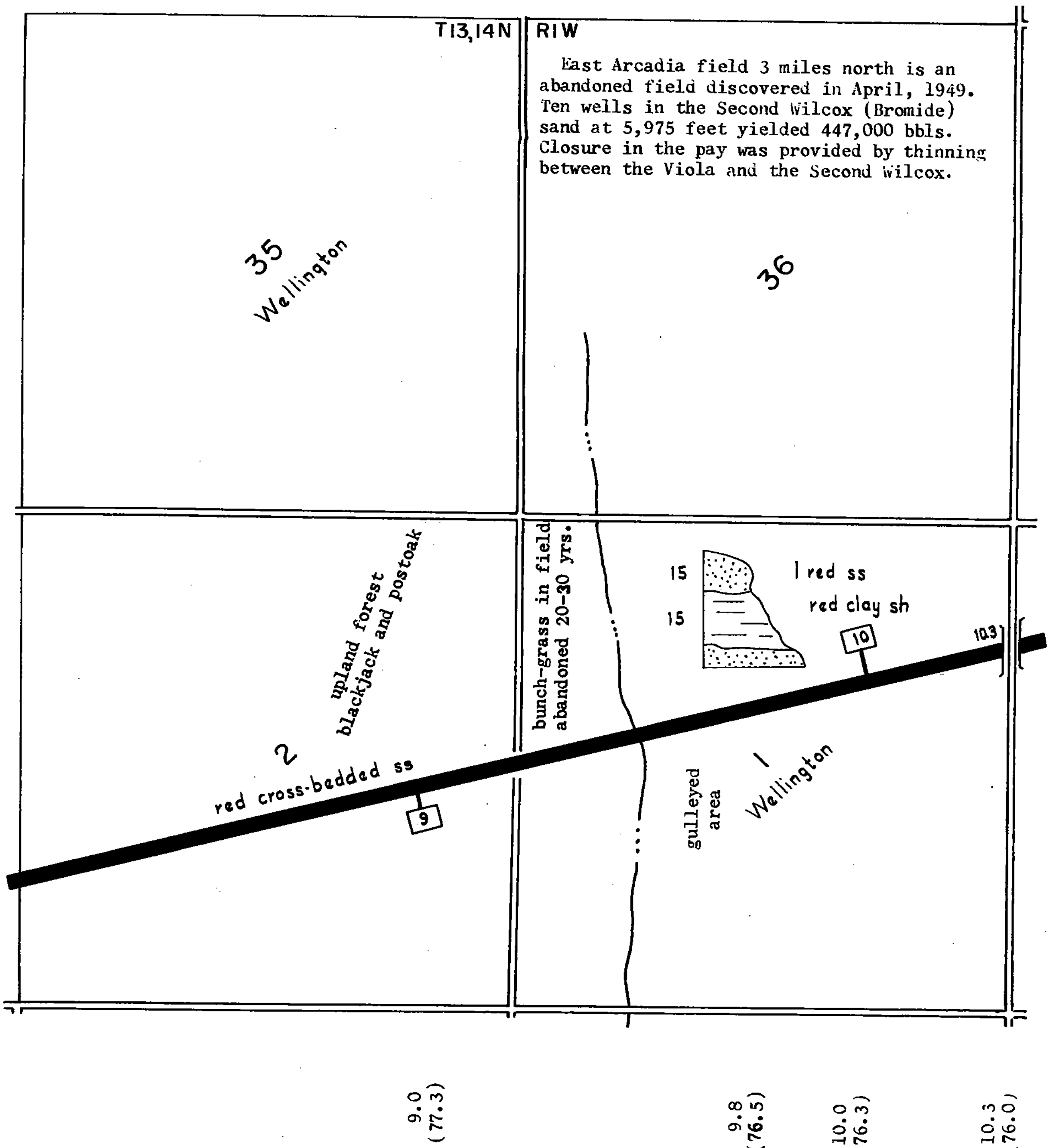

1150
1100
1050
Garber sandstone
base of Garber sandstone

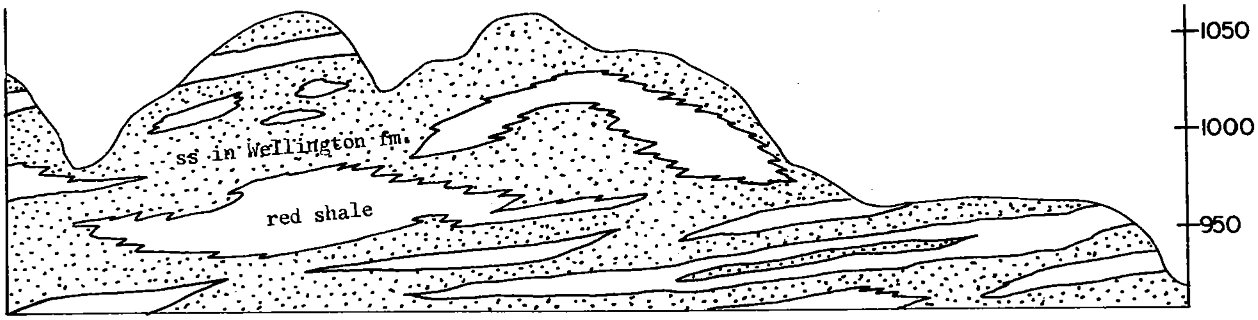

T13N R1W
Wellington
Base Garber ss.
5
6
7
8
18
base Garber
lt red
sh, gray, calc
red
abandoned field
persimmons
road cut
road cuts
land cut over, overgrazed, now has scrub blackjack
light red basal bed of Garber ss., rests on gray calcareous sh. and red shale at top of Wellington fm.
4.1
4.1 (82.2)
5.0 (81.3)
5.7 (80.6)
6.0 (80.3)

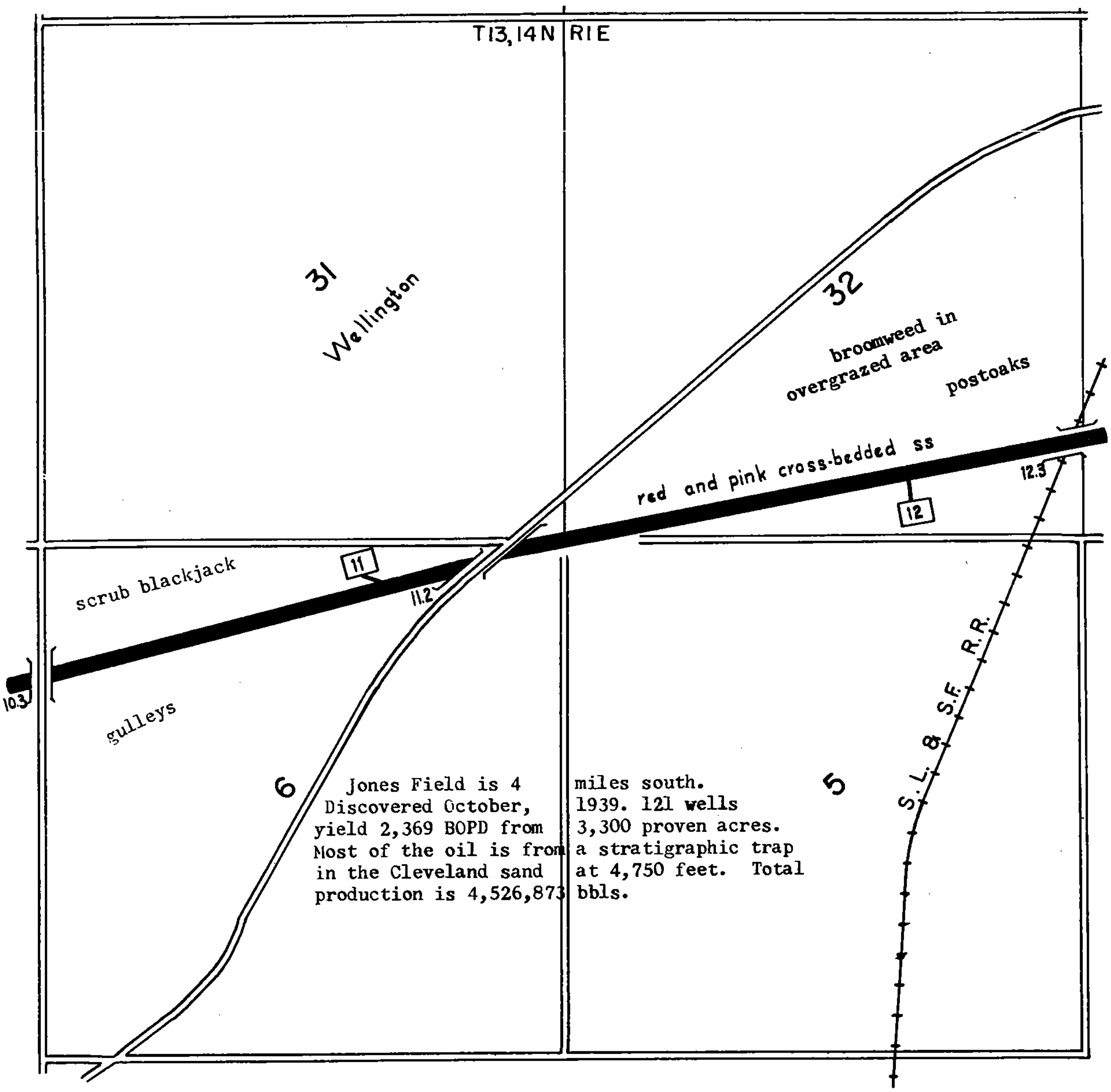

base of Garber ss.
ss. in Wellington fm.
1100
1050
1000


T13N
R1W
In 1955 flowed 5 bbls. distillate and 3 million CFG (est.) from Lower Skinner at 5487-5493. TD 6,107 feet in Second Wilcox; still in process of completion.
Wellington
4
3
Cobb
Nelson
1
3 mcf, 5 B0
L. Skinner
T.D. 6107
large cottonwoods
American elm
8
15'
Garber ss
bedded ss and sh
15'
roadcut
7
mistletoe in
American elm
6'
15'
8' purplish ss
deep roadcut
9
Wellington
10
ss
Garber
Base Garber
6.35
(79.95)
7.0
(79.3)
7.3
(79.0)


1050
1000
950
red shale
ss. in Wellington fm.


T13,14N
R1W
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.
35
Wellington
36
upland forest
blackjack and postoak
bunch-grass in field
abandoned 20-30 yrs.
15
15
1 red ss
red clay sh
10
10.3
2
red cross-bedded ss
9
1
Wellington
gulleyed
area
9.0
(77.3)
9.8
(76.5)
10.0
(76.3)
10.3
(76.0)





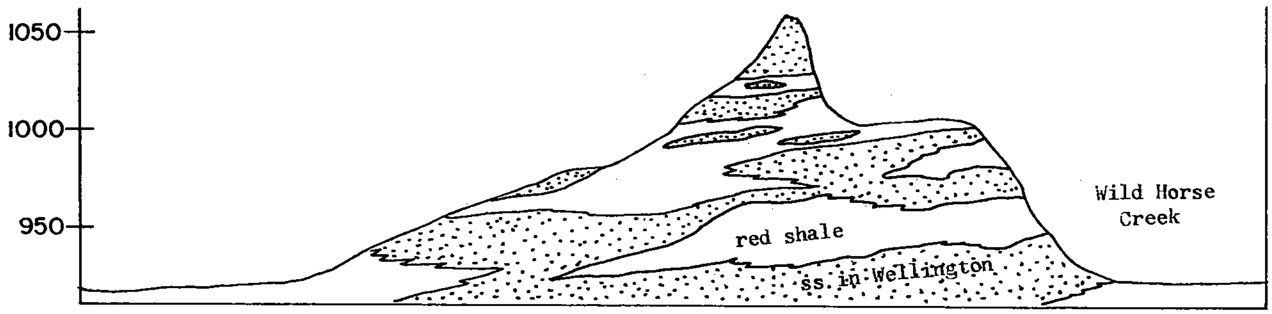
10.3 (76.0)

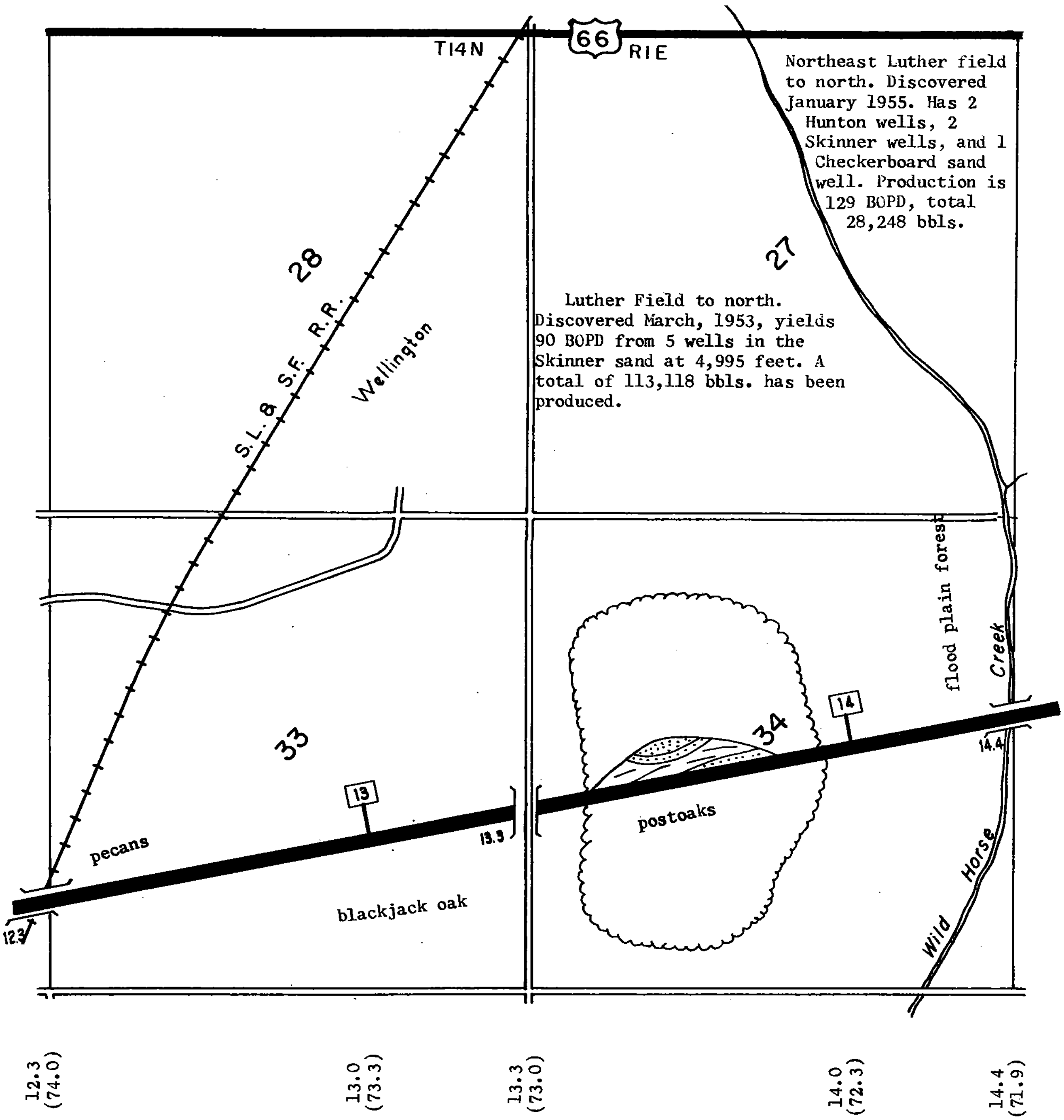
11.0 (75.3)

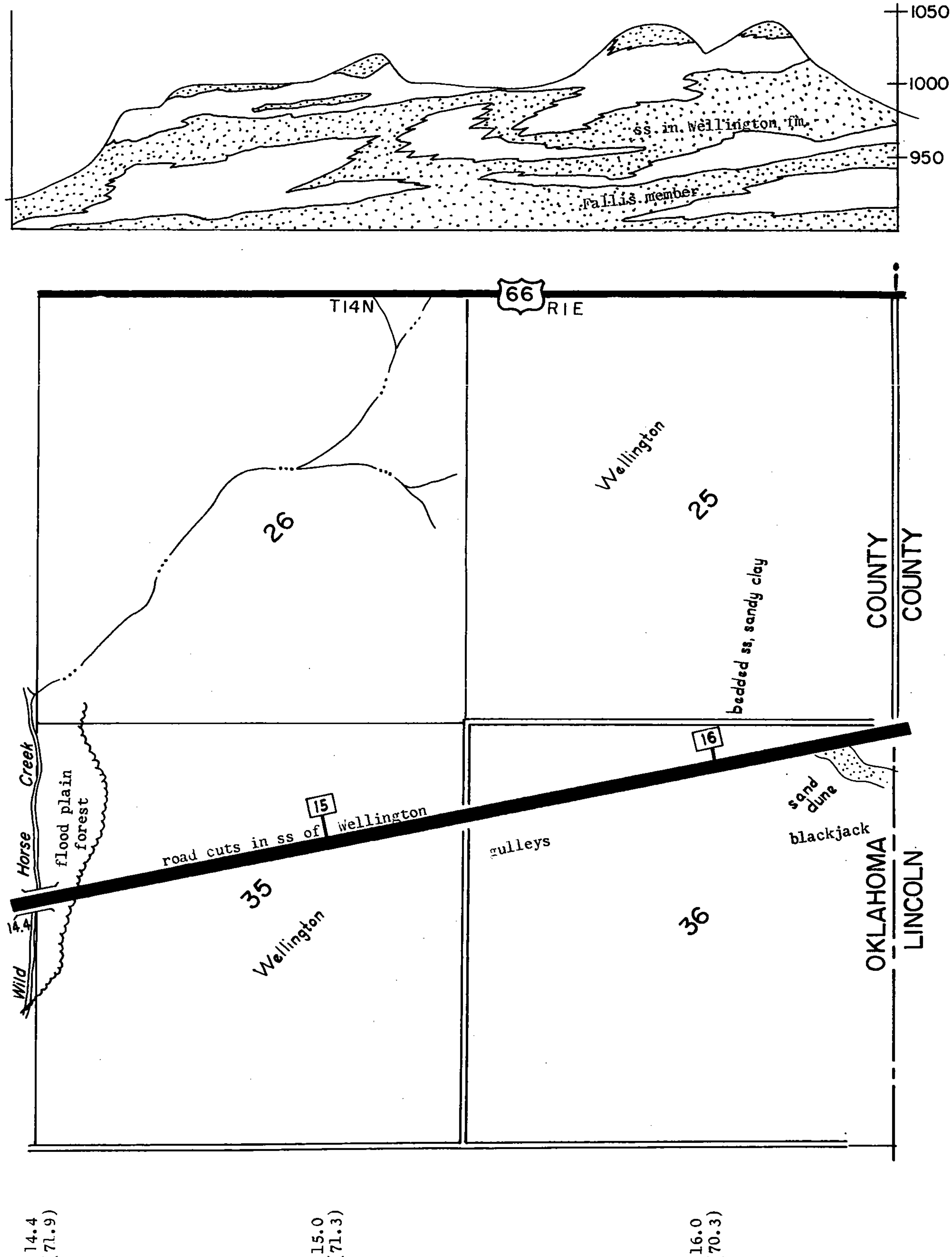
11.2 (75.1)

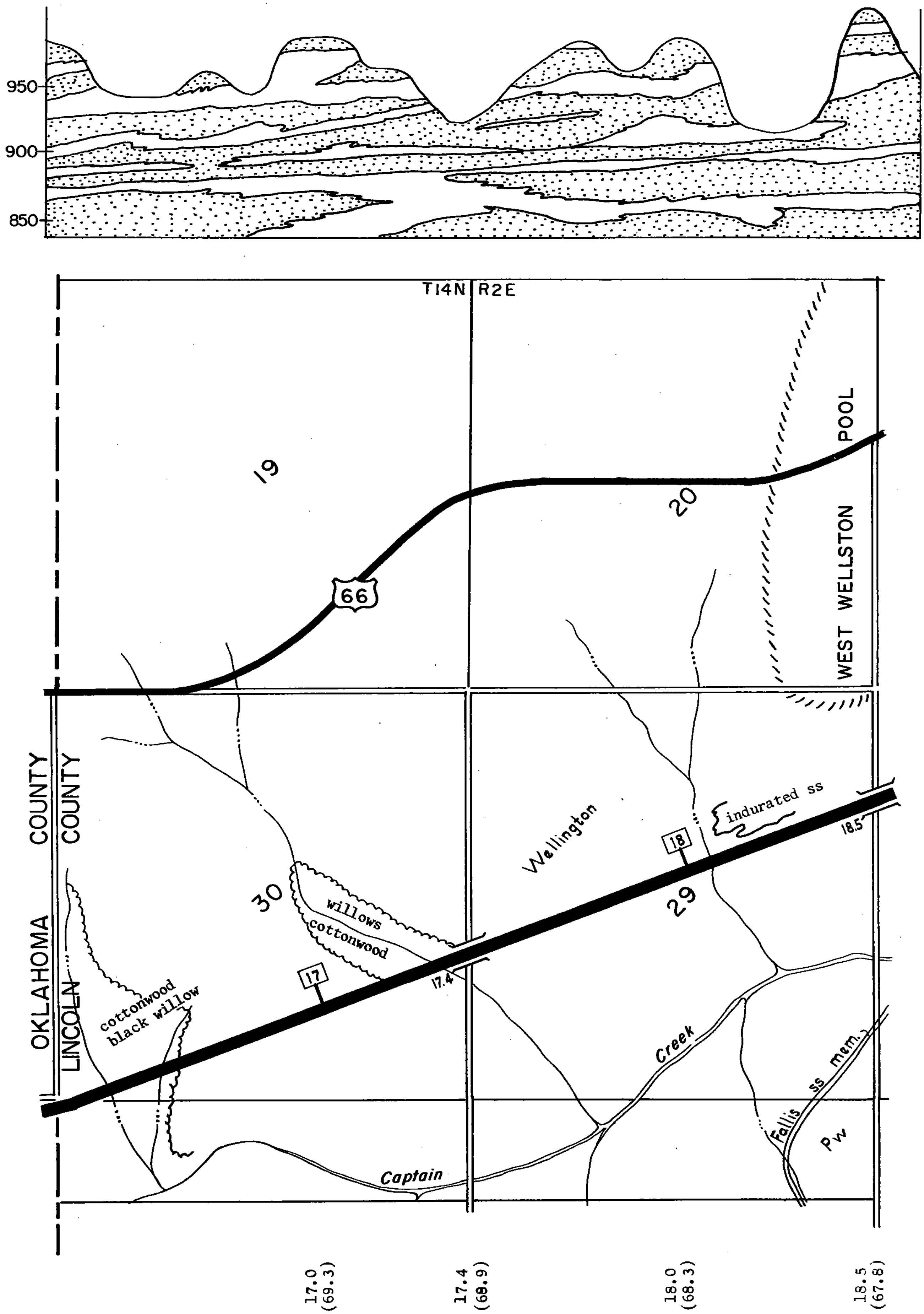
12.0 (74.3)

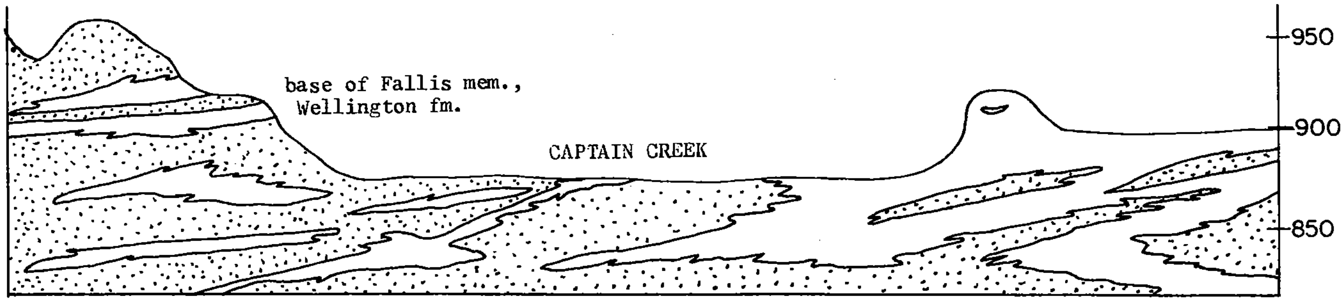
12.3 (74.0)

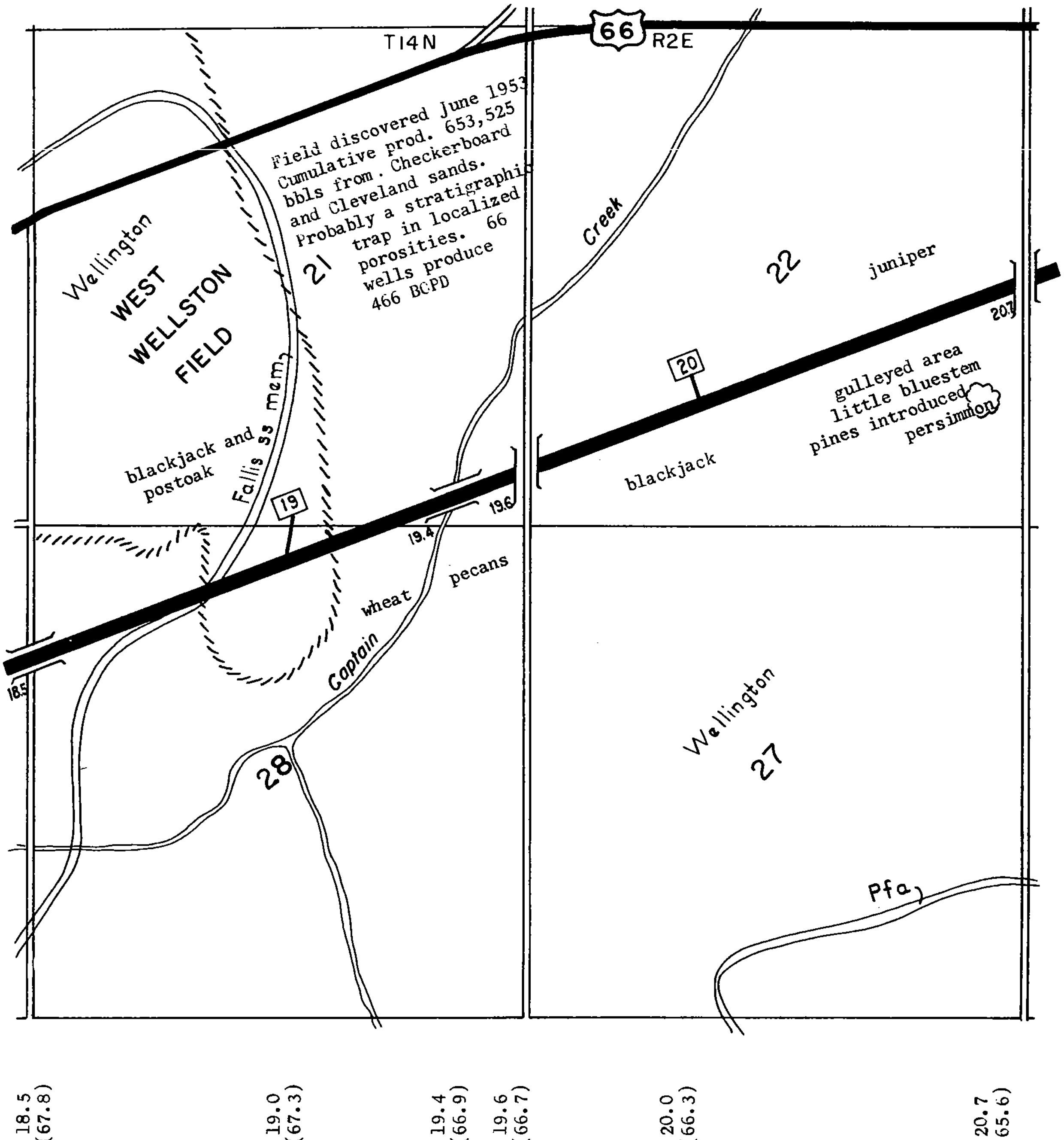

1050
1000
950
Wild Horse Creek
red shale
ss. in Wellington

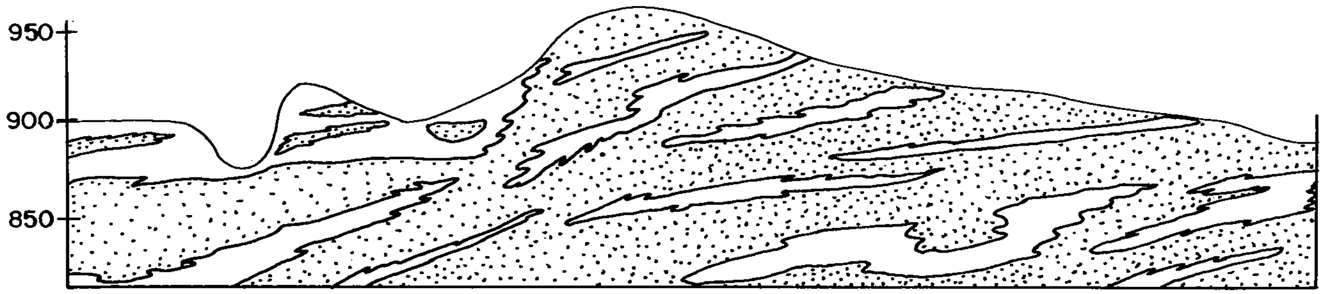

66
T14N
R1E
Northeast Luther field to north. Discovered January 1955. Has 2 Hunton wells, 2 Skinner wells, and 1 Checkerboard sand well. Production is 129 BOPD, total 28,248 bbls.
28
27
S.L. & S.F. R.R.
Wellington
Luther Field to north. Discovered March, 1953, yields 90 BOPD from 5 wells in the Skinner sand at 4,995 feet. A total of 113,118 bbls. has been produced.
flood plain forest
Creek
14
34
33
13
13.3
14.4
pecans
postoaks
blackjack oak
12.3
Wild Horse
12.3 (74.0)
13.0 (73.3)
13.3 (73.0)
14.0 (72.3)
14.4 (71.9)


1050
1000
950
ss. in Wellington fm.
Fallis member
66
T14N
R1E
26
Wellington
25
bedded ss, sandy clay
OKLAHOMA COUNTY
LINCOLN COUNTY
Wild Horse Creek
flood plain forest
14.4
15
road cuts in ss of Wellington
16
sand dune
blackjack
gulleys
35
Wellington
36
14.4 (71.9)
15.0 (71.3)
16.0 (70.3)

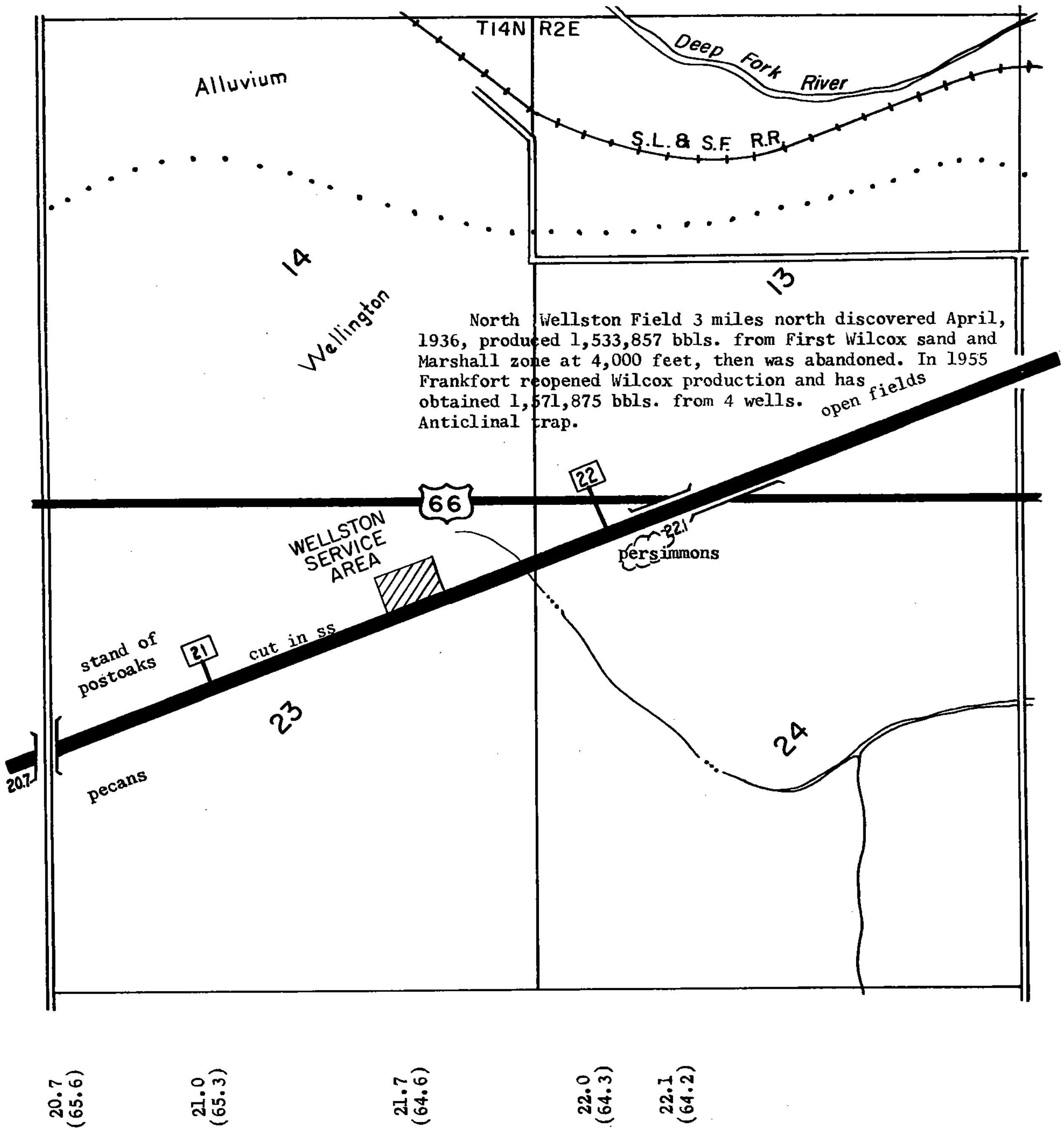

950
900
850
T14N R2E
19
20
66
POOL
WEST WELLSTON
OKLAHOMA COUNTY
LINCOLN COUNTY
indurated ss
Wellington
18
18.5
30
29
willows
cottonwood
17
17.4
cottonwood
black willow
Creek
Fallis ss mem.
Pw
Captain
17.0 (69.3)
17.4 (68.9)
18.0 (68.3)
18.5 (67.8)


950
900
850
base of Fallis mem.,
Wellington fm.
CAPTAIN CREEK

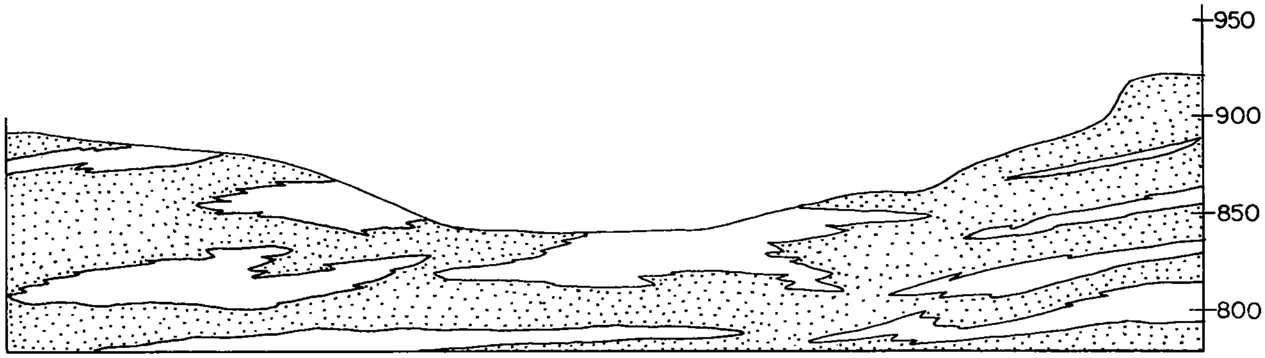

T14N
66
R2E
Field discovered June 1953
Cumulative prod. 653,525
bbls from Checkerboard
and Cleveland sands.
Probably a stratigraphic
trap in localized
porosities. 66
wells produce
466 BCPD
Wellington
WEST
WELLSTON
FIELD
21
22
Creek
juniper
20.7
20
gulleyed area
little bluestem
pines introduced
persimmon
blackjack and
postoak
Fallis ss mem.
19
19.6
19.4
blackjack
wheat
pecans
Captain
18.5
28
Wellington
27
Pfa
18.5
(67.8)
19.0
(67.3)
19.4
(66.9)
19.6
(66.7)
20.0
(66.3)
20.7
(65.6)

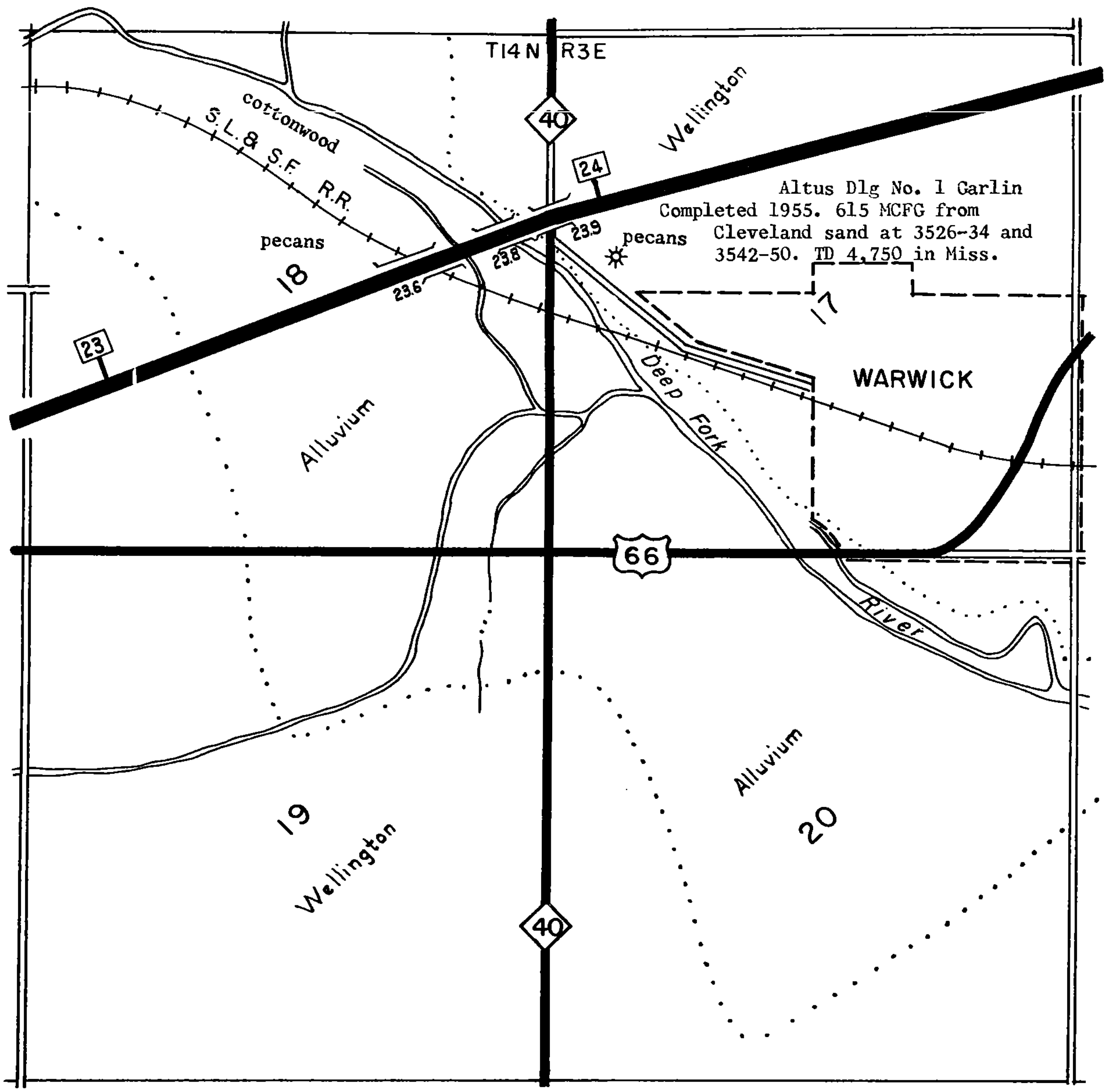


950
900
850



T14N R2E
Deep Fork River
Alluvium
S.L. & S.F. R.R.
14
13
Wellington
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 1,571,875 bbls. from 4 wells. Anticlinal trap.
open fields
66
22
22.1
persimmons
WELLSTON SERVICE AREA
stand of postoaks
21
cut in ss
23
24
20.7
pecans
20.7 (65.6)
21.0 (65.3)
21.7 (64.6)
22.0 (64.3)
22.1 (64.2)





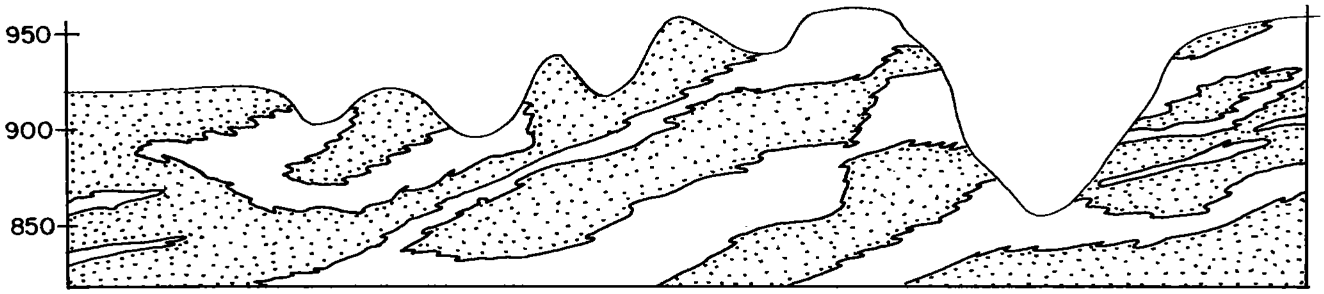
23.0 (63.3)

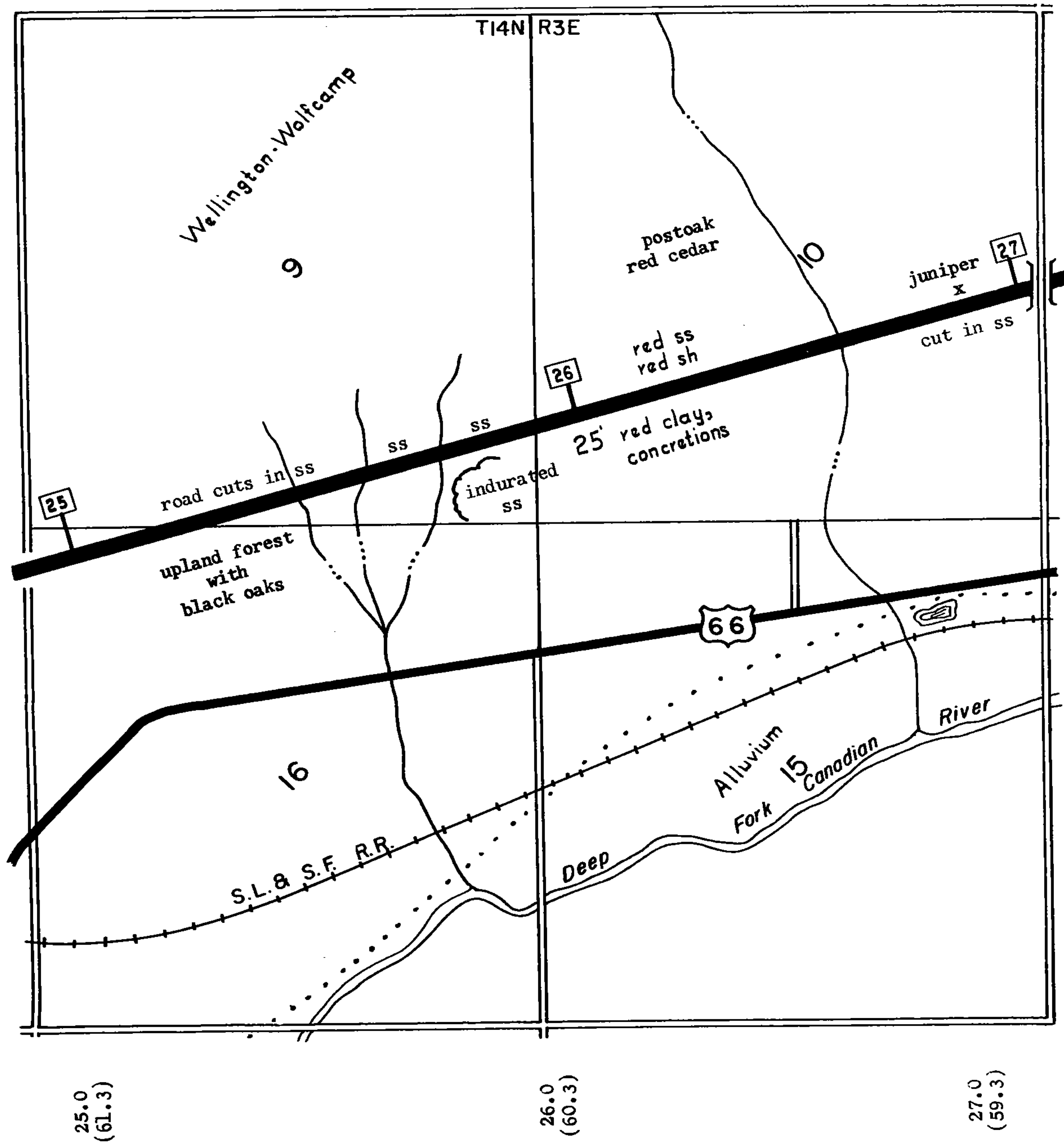
23.6 (62.7)

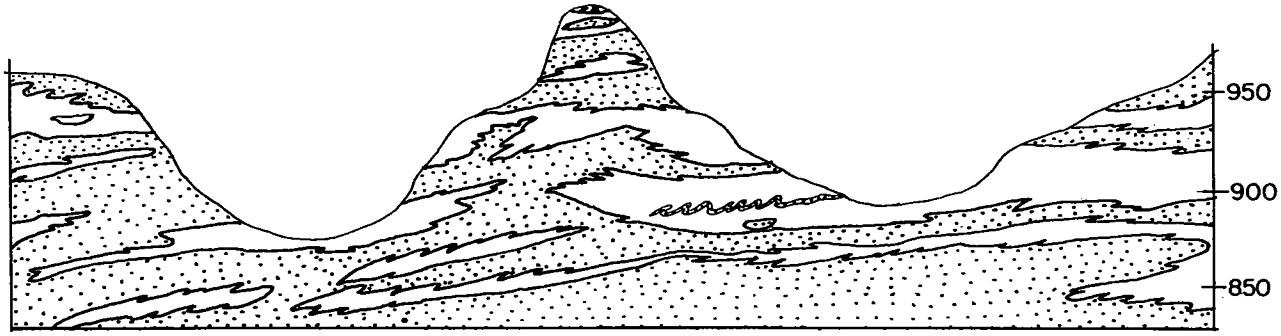
23.8 (62.5)

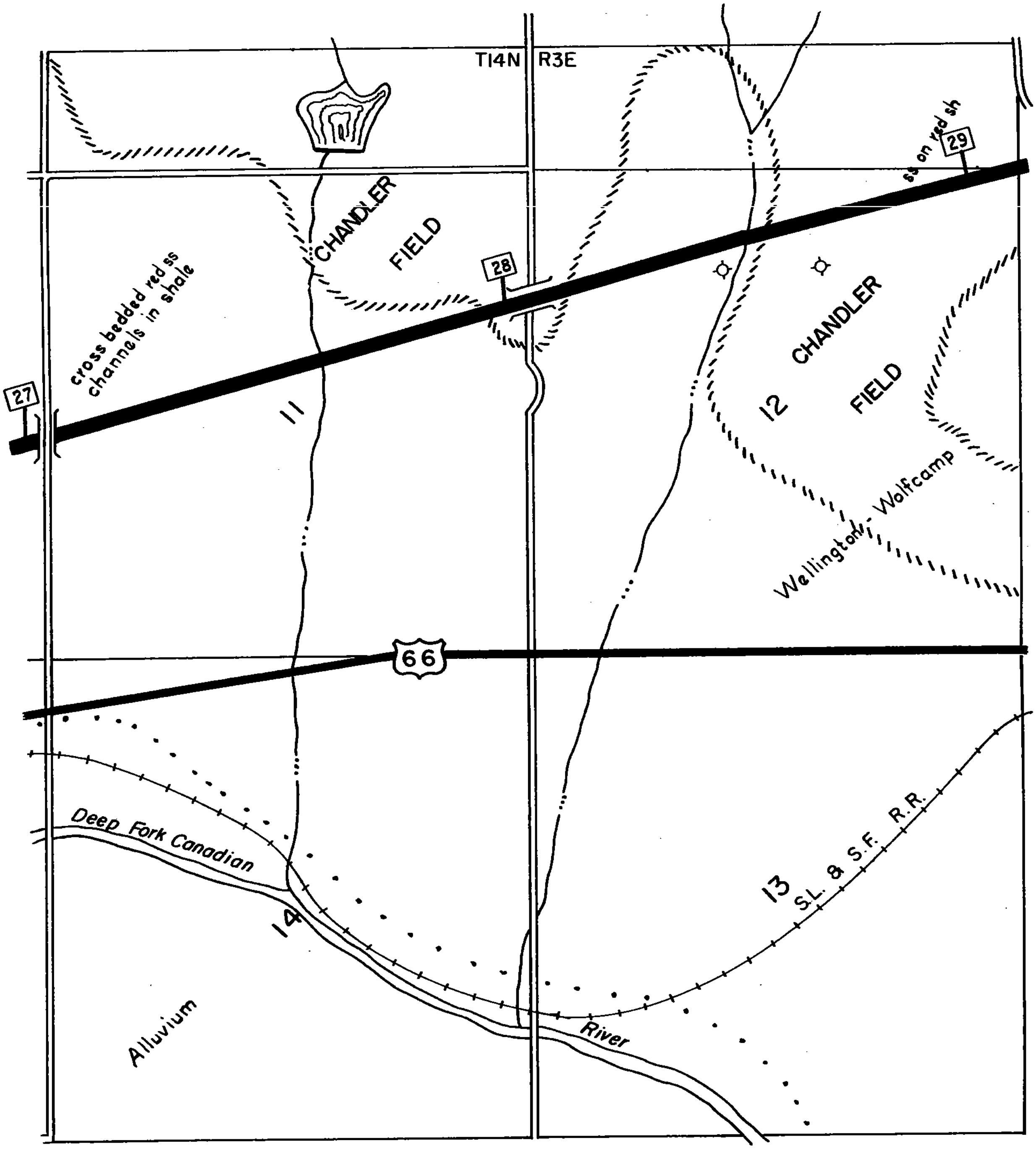
23.9 (62.4)

24.0 (62.3)


950
900
850


T14N R3E
Wellington-Wolfcamp
9
10
16
15
postoak
red cedar
juniper
x
cut in ss
27
26
25
red ss
red sh
25' red clay,
concretions
ss
ss
road cuts in ss
indurated
ss
upland forest
with
black oaks
66
S.L.& S.F. R.R.
Alluvium
Deep Fork Canadian River
25.0
(61.3)
26.0
(60.3)
27.0
(59.3)

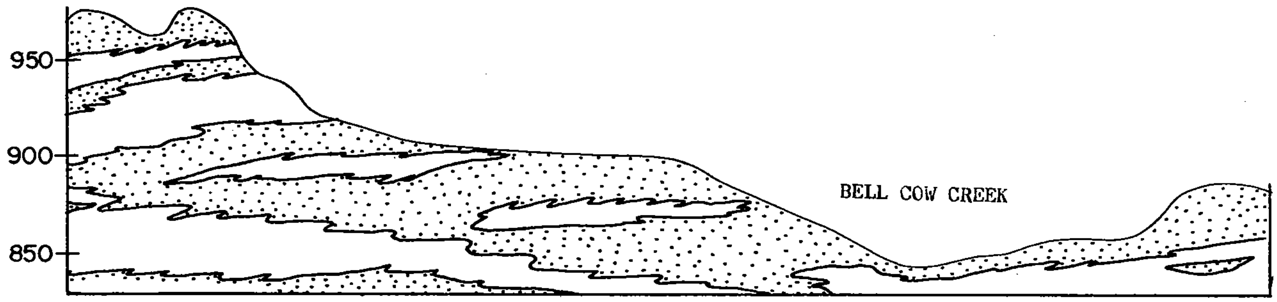


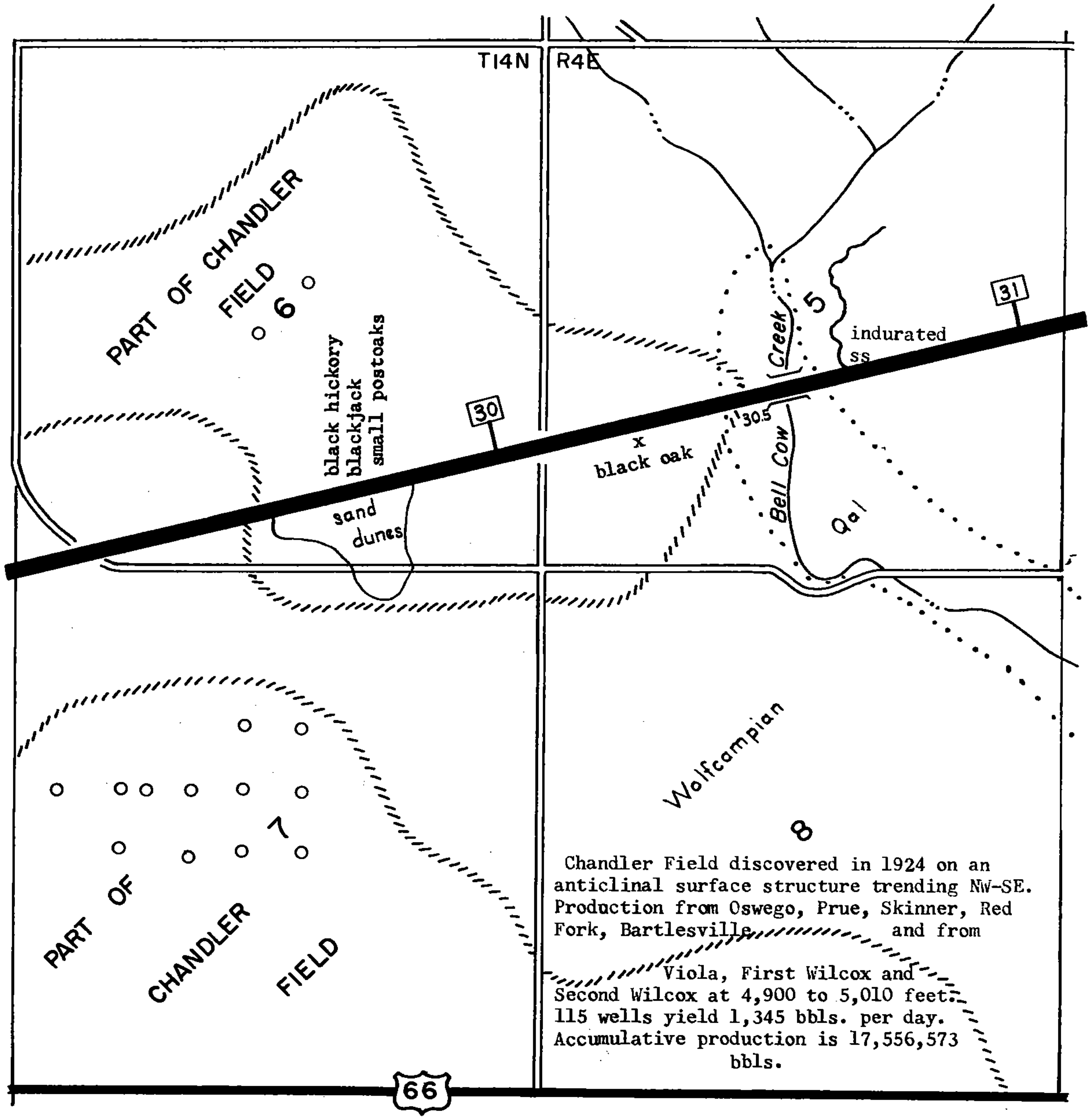


27.0 (59.3)

28.0 (58.3)

29.0 (57.3)

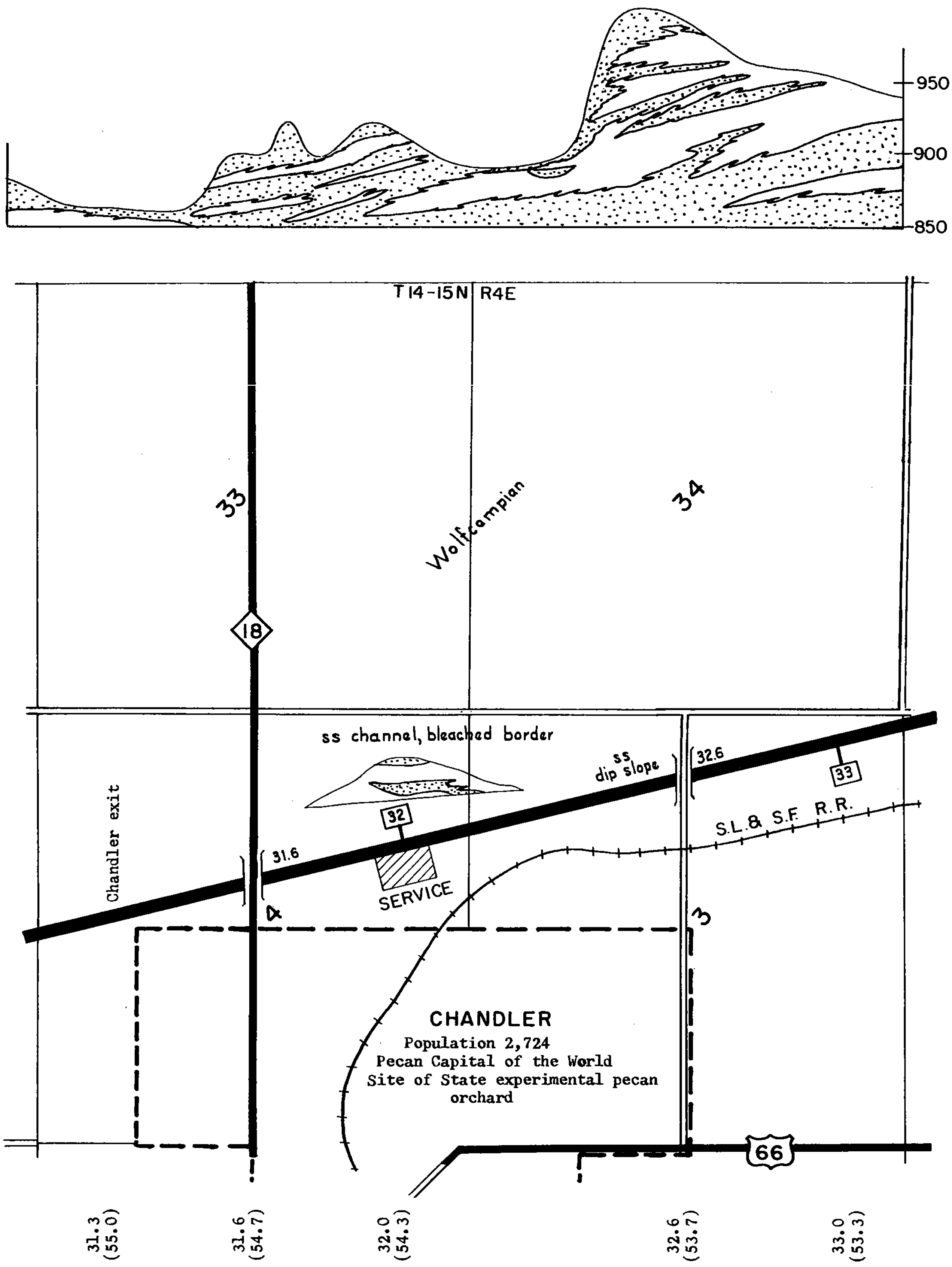




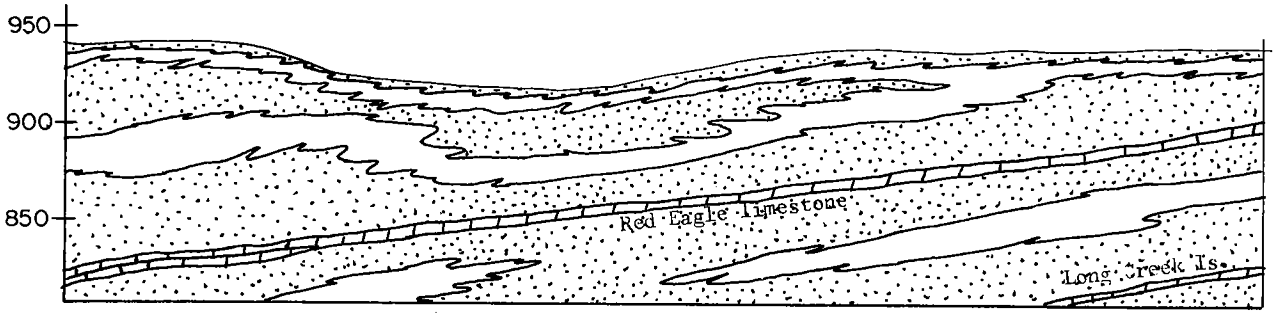
30.0 (56.3)

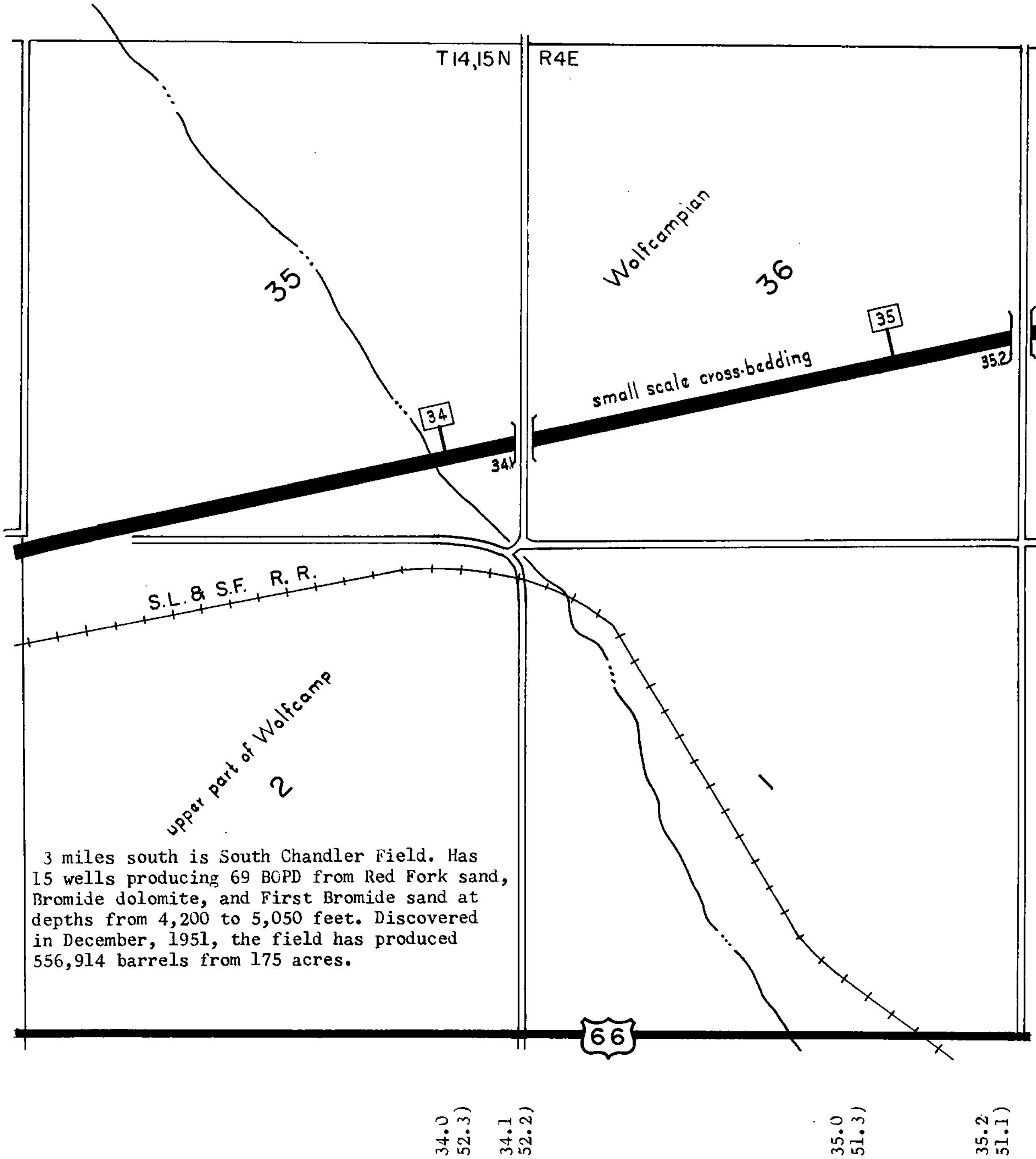
30.5 (55.8)

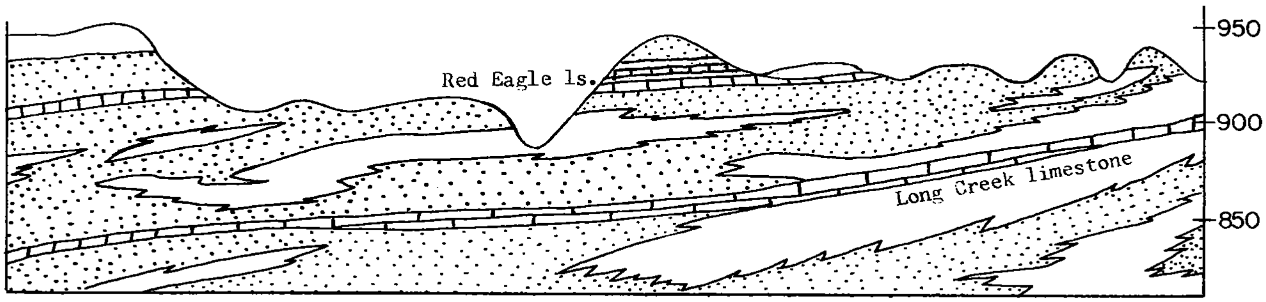
31.0 (55.3)

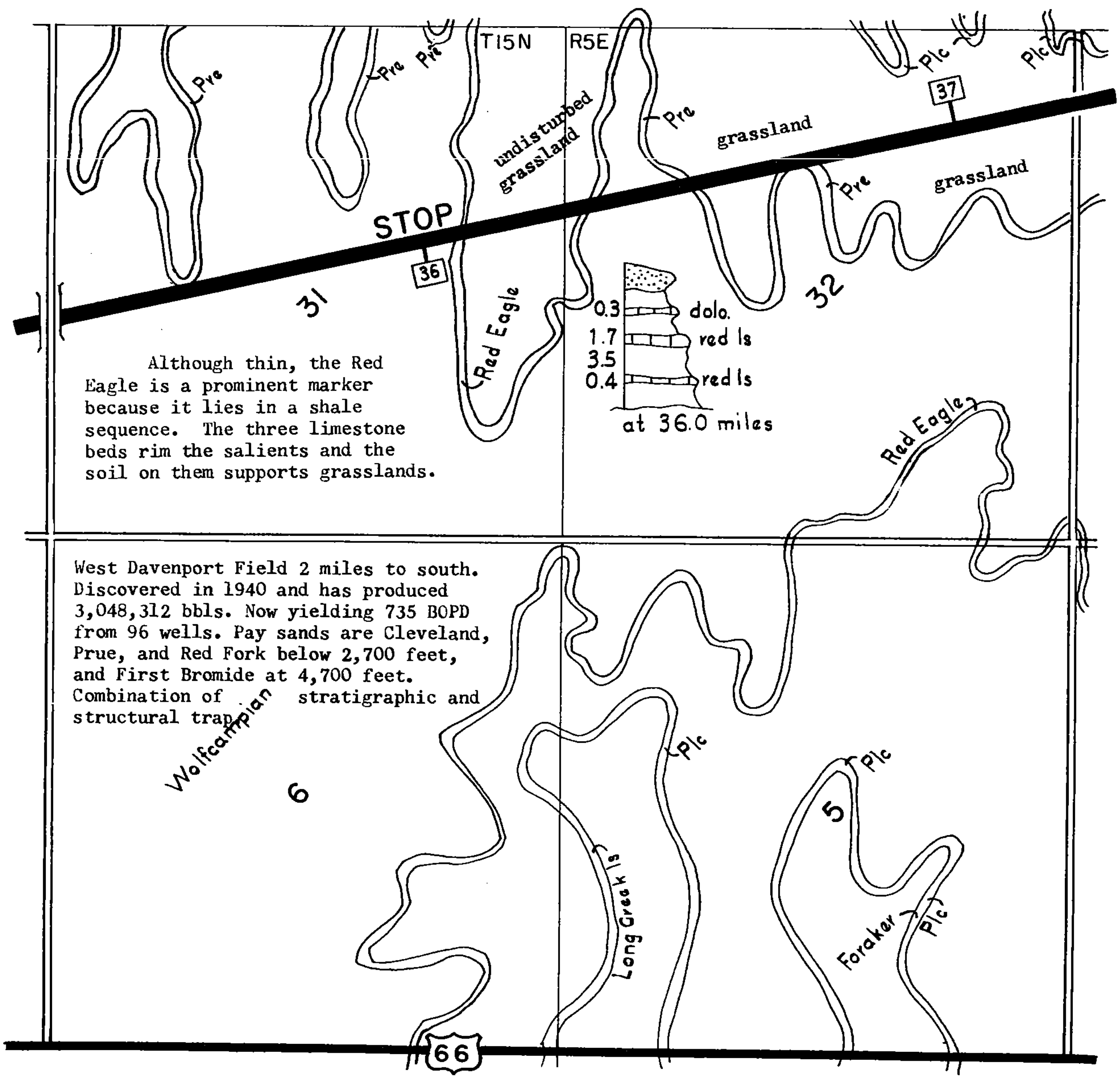


950
900
850
T14-15N R4E
33
34
Wolfcampian
18
ss channel, bleached border
ss dip slope
32.6
33
32
31.6
Chandler exit
S.L.& S.F. R.R.
SERVICE
4
3
CHANDLER
Population 2,724
Pecan Capital of the World
Site of State experimental pecan orchard
66
31.3 (55.0)
31.6 (54.7)
32.0 (54.3)
32.6 (53.7)
33.0 (53.3)


950
900
850
Red Eagle limestone
Long Creek ls.


T14,15N
R4E
35
36
Wolfcampian
34
35
small scale cross-bedding
34.1
35.2
S.L. & S.F. R.R.
upper part of Wolfcamp
2
1
3 miles south is South Chandler Field. Has
15 wells producing 69 BOPD from Red Fork sand,
Bromide dolomite, and First Bromide sand at
depths from 4,200 to 5,050 feet. Discovered
in December, 1951, the field has produced
556,914 barrels from 175 acres.
66
34.0 (52.3)
34.1 (52.2)
35.0 (51.3)
35.2 (51.1)

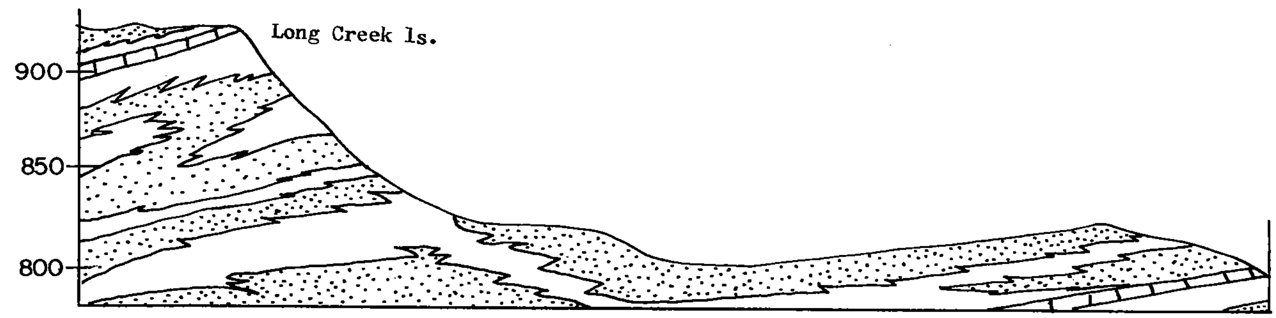


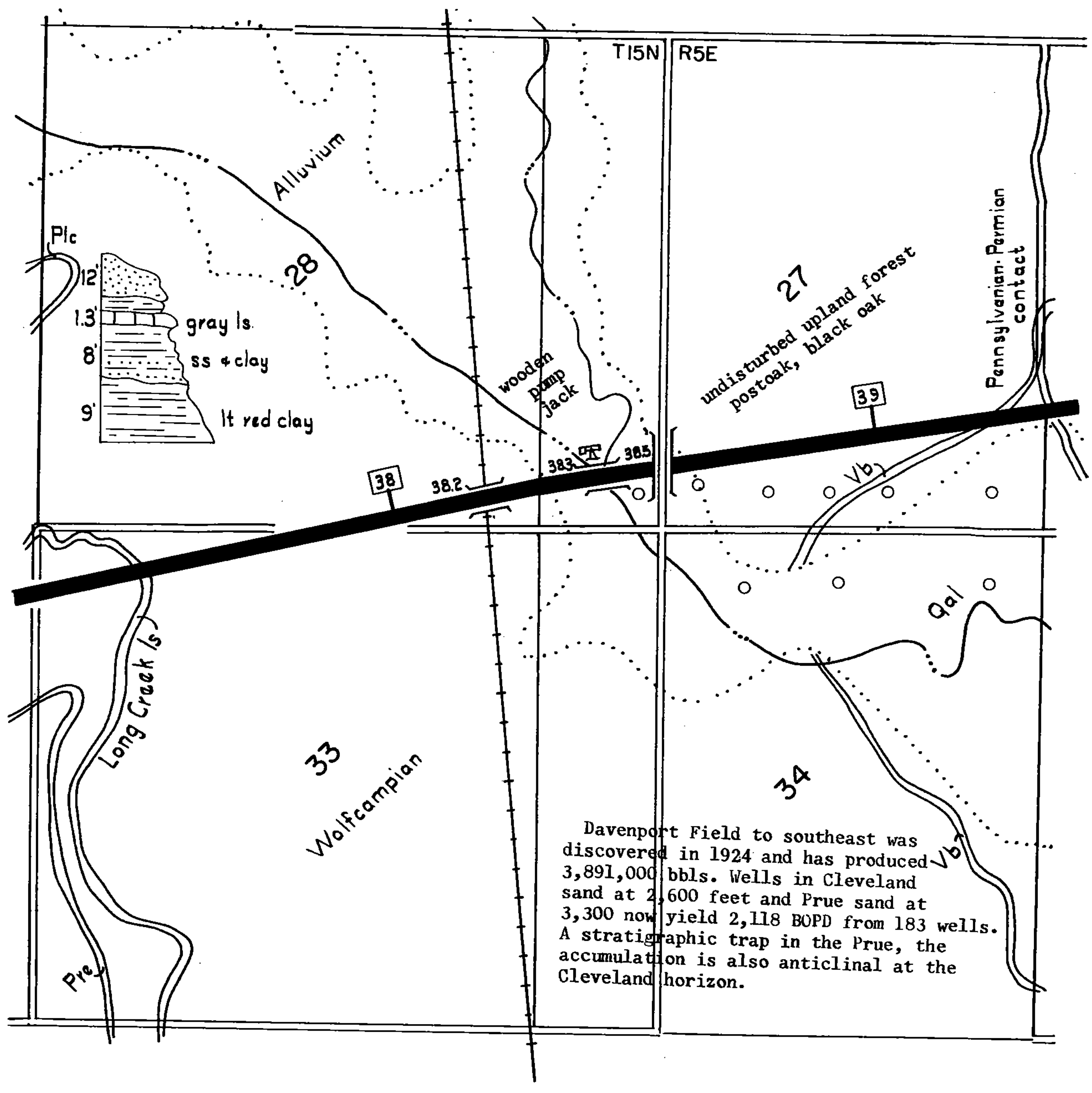


35.2 (51.1)

36.0 (50.3)

37.0 (49.3)





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 183 wells. A stratigraphic trap in the Prue, the accumulation is also anticlinal at the Cleveland horizon.

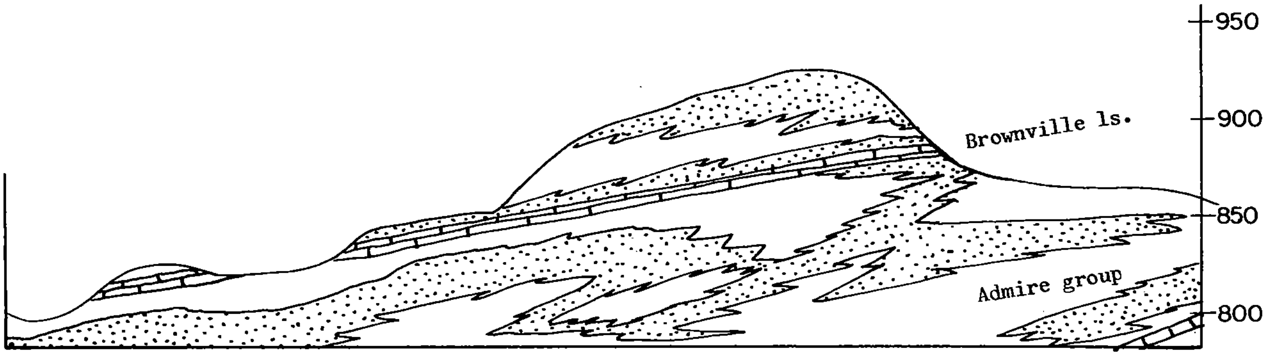
38.0 (48.3)

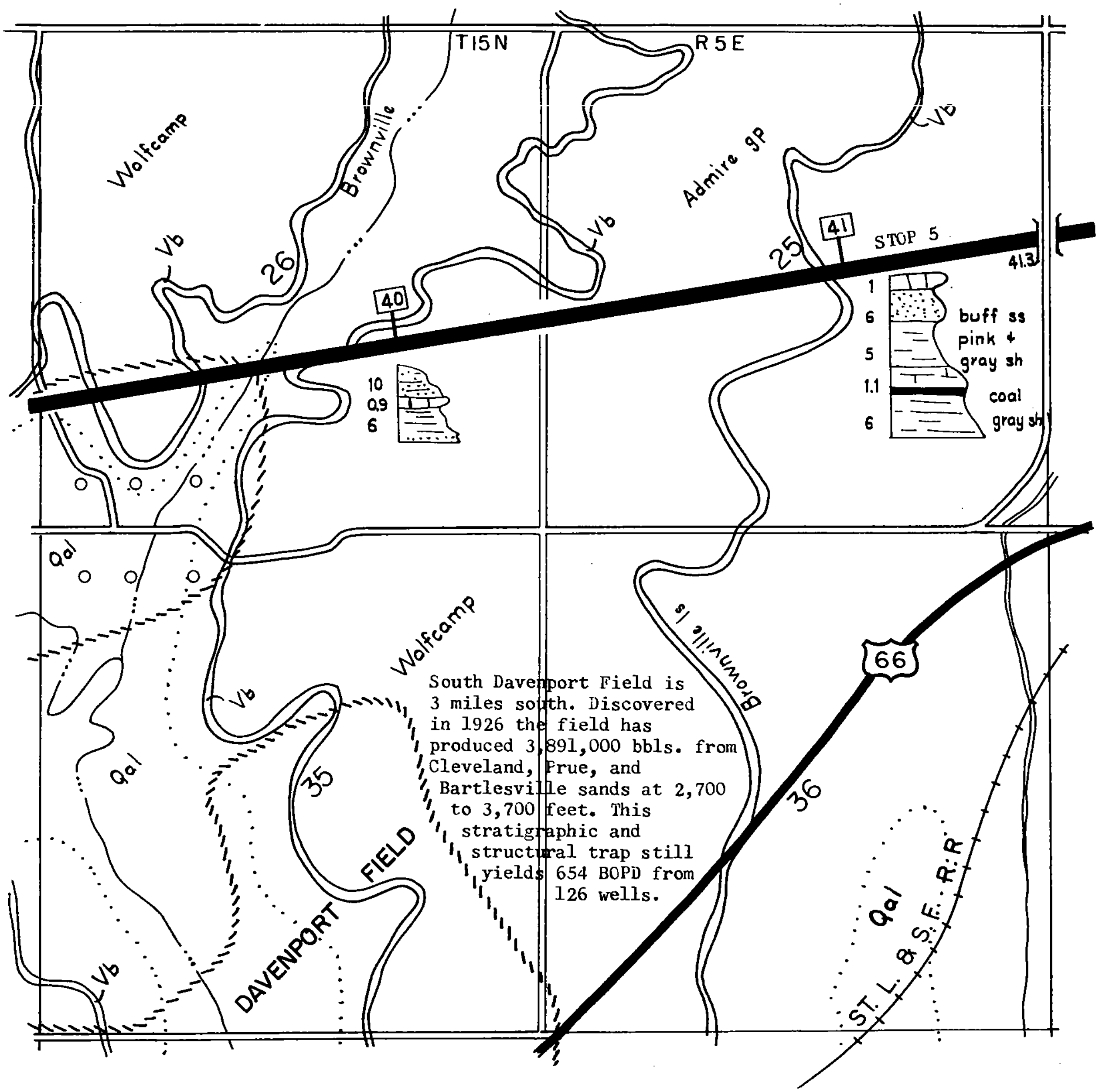
38.2 (48.1)

38.3 (48.0)

38.5 (47.8)

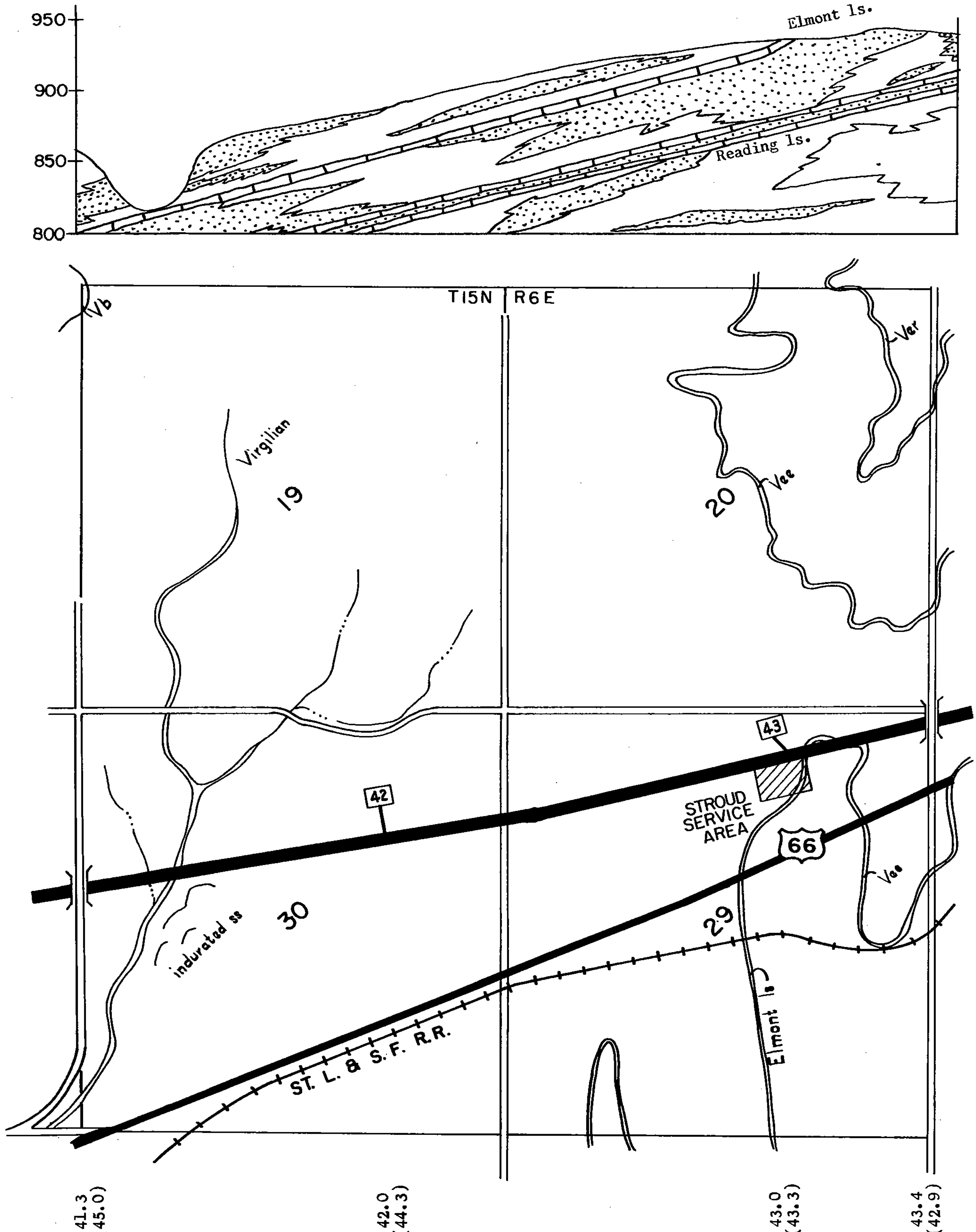
39.0 (47.3)



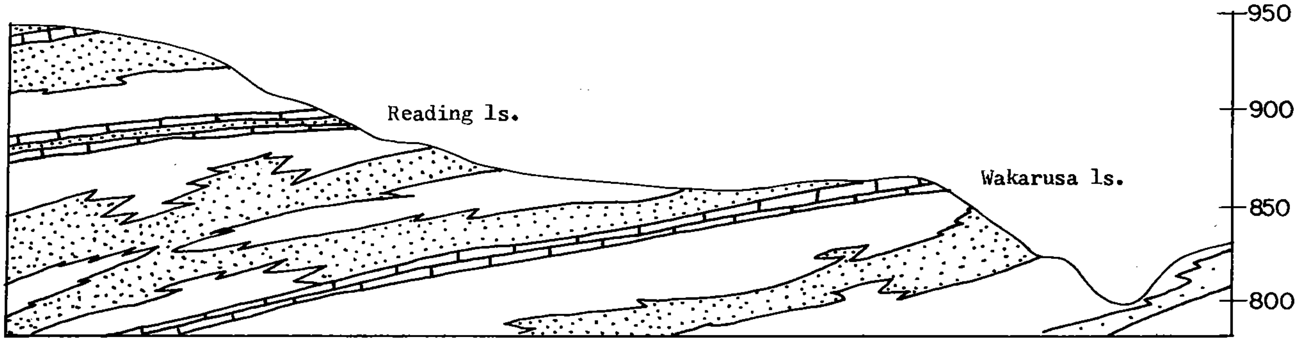


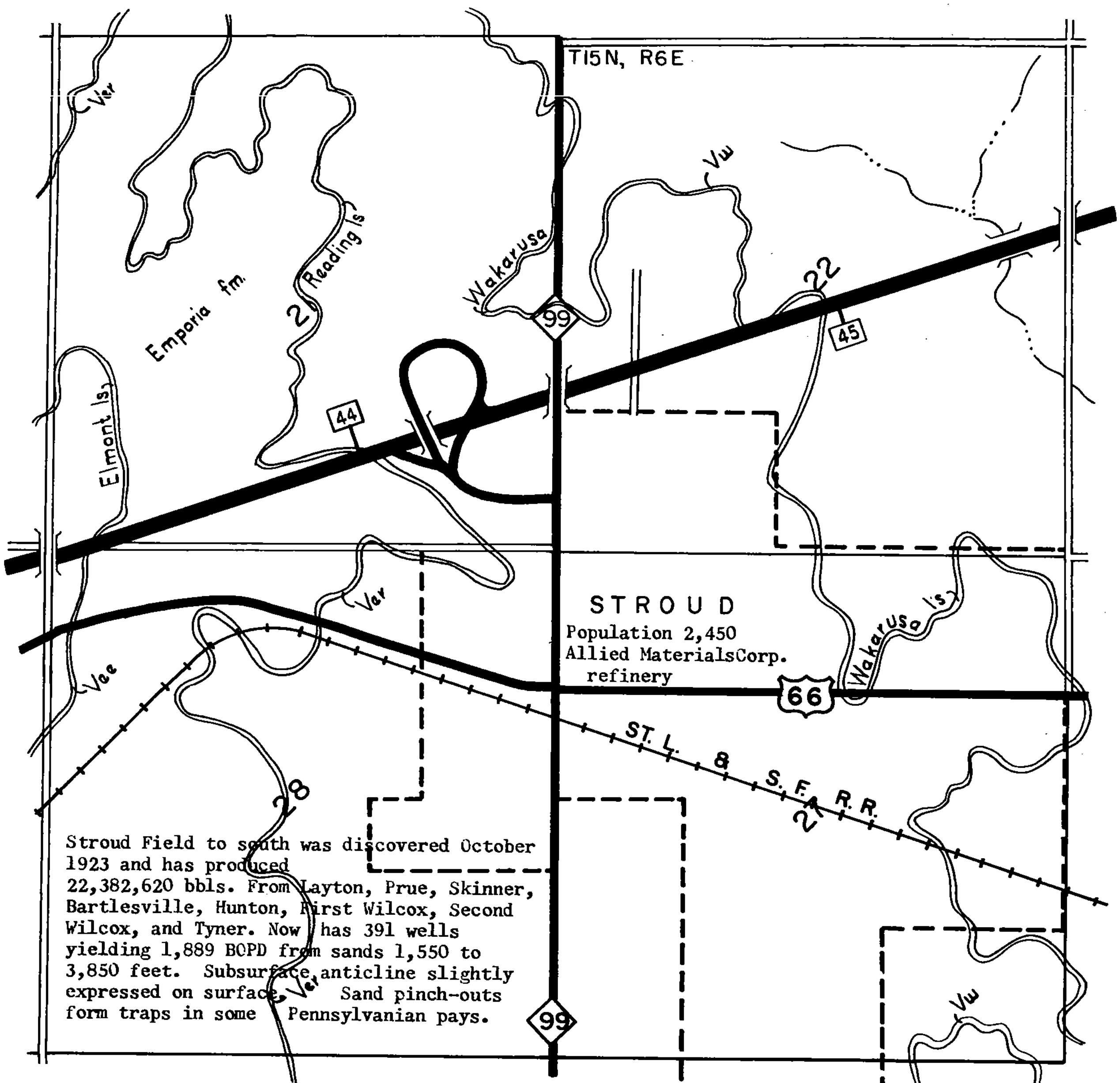
40.0 (46.3)

41.0 (45.3)



950
900
850
800
Elmont ls.
Reading ls.
T15N
R6E
Vb
Ver
Virgilian
19
20
Vee
43
42
STROUD
SERVICE
AREA
66
indurated ss
30
29
Vee
Elmont ls
ST. L. & S. F. R.R.
41.3
(45.0)
42.0
(44.3)
43.0
(43.3)
43.4
(42.9)





43.4 (42.9)

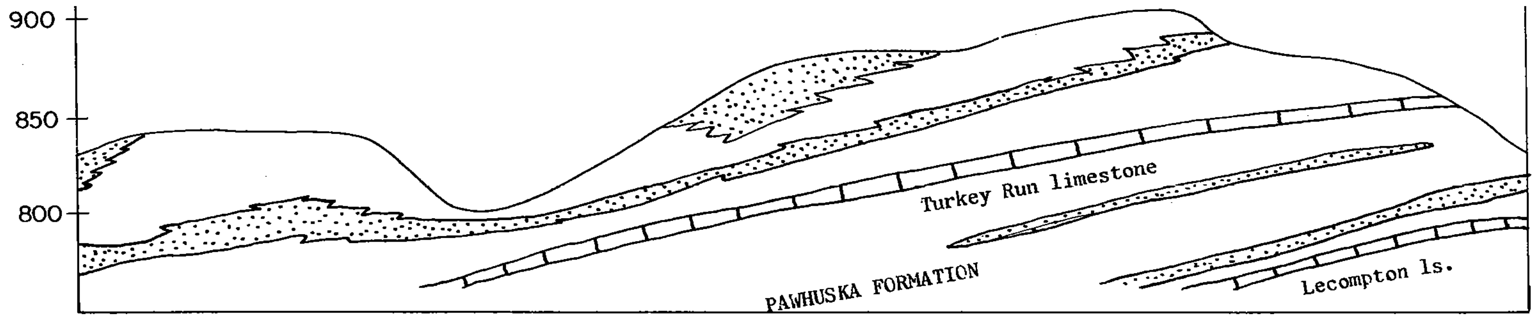
44.0 (42.3)

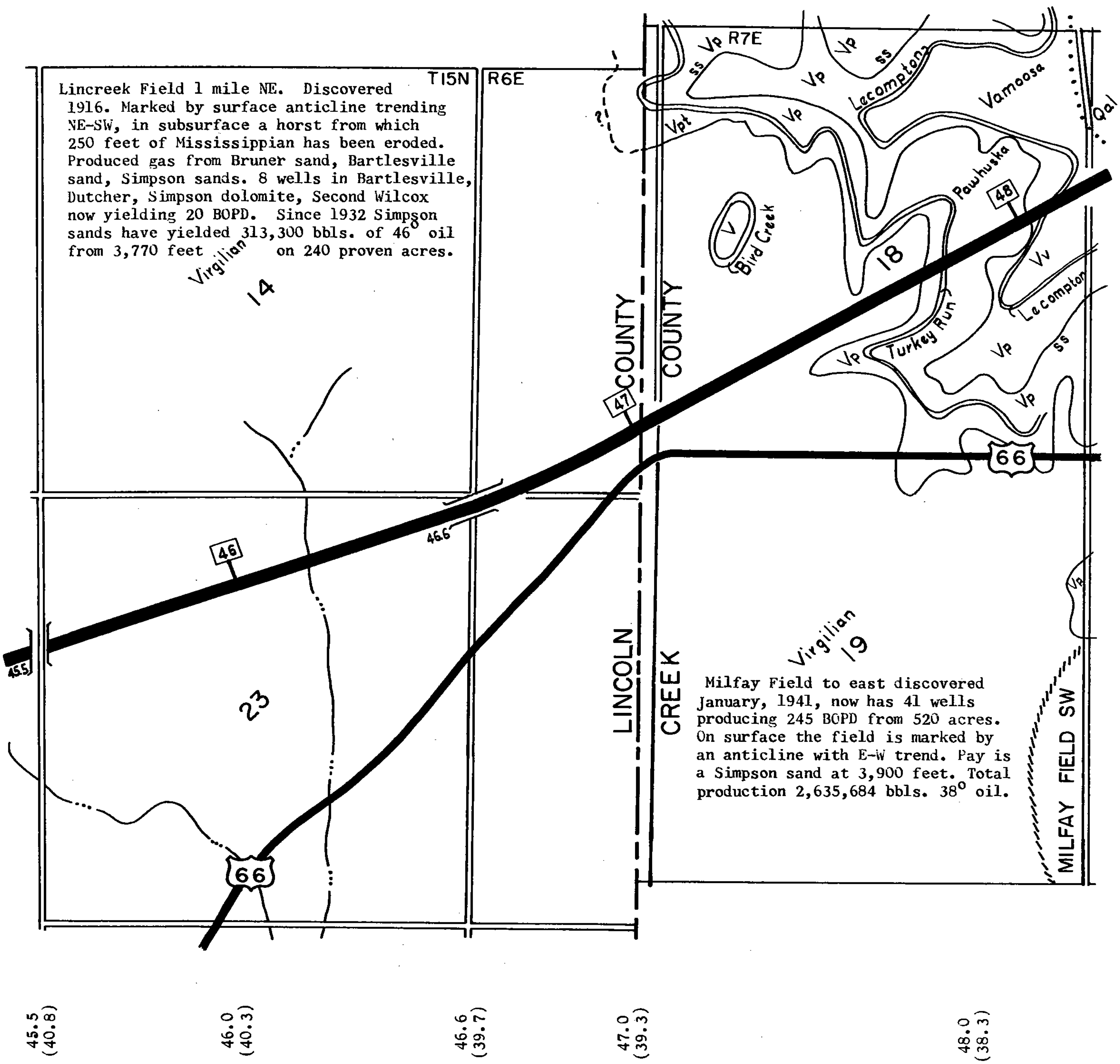
44.5 (41.8)

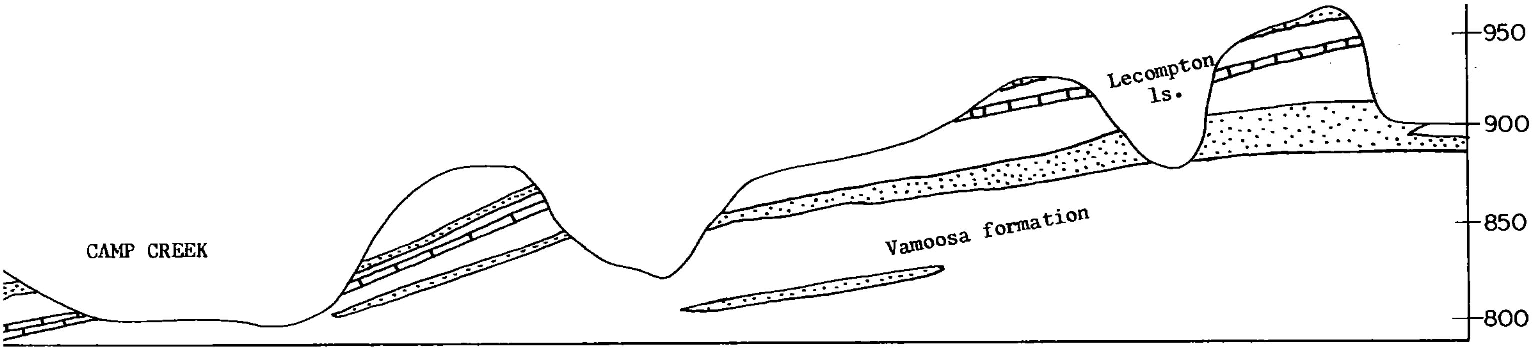
45.0 (41.3)

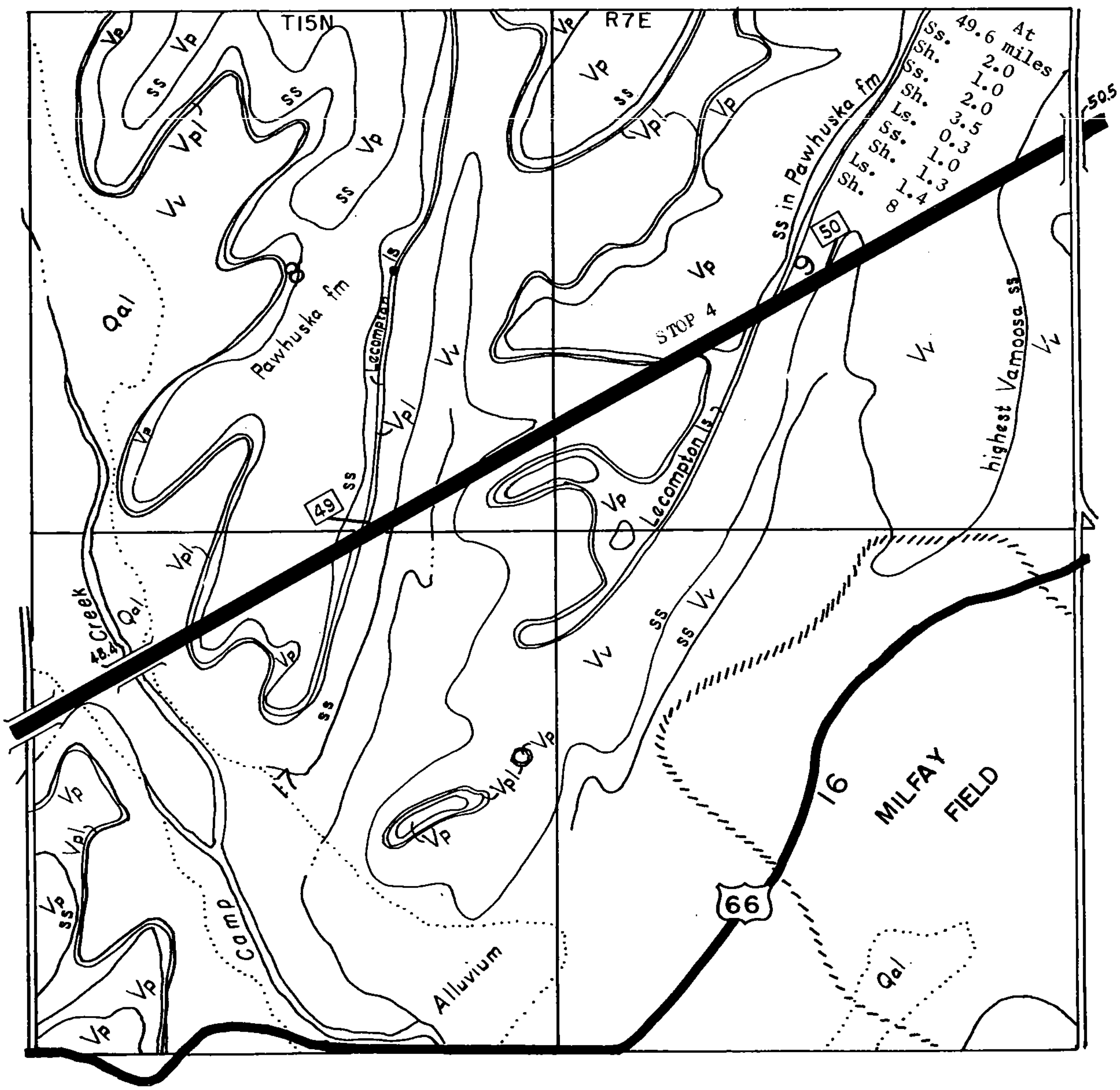
45.4 (40.9)

45.5 (40.8)


900
850
800
Turkey Run limestone
PAWHUSKA FORMATION
Lecompton ls.


Lincreek 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, Dutcher, Simpson dolomite, Second Wilcox now yielding 20 BOPD. Since 1932 Simpson sands have yielded 313,300 bbls. of 46° oil from 3,770 feet on 240 proven acres.
T15N
R6E
R7E
Virgilian
14
Vp
ss
Lecompton
Vamoosa
Qal
Vpt
Pawhuska
Bird Creek
V
18
48
Vv
Turkey Run
47
46
46.6
45.5
66
23
LINCOLN COUNTY
CREEK COUNTY
Virgilian
19
Milfay 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. 38° oil.
MILFAY FIELD SW
45.5 (40.8)
46.0 (40.3)
46.6 (39.7)
47.0 (39.3)
48.0 (38.3)





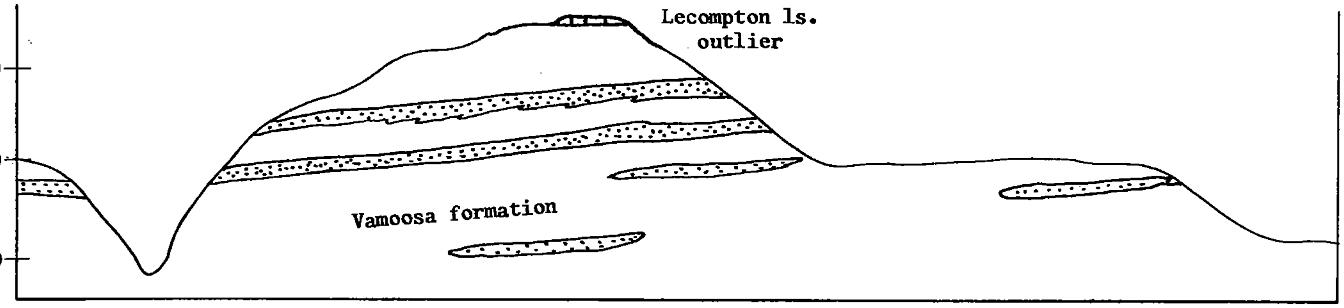
48.4 (37.9)

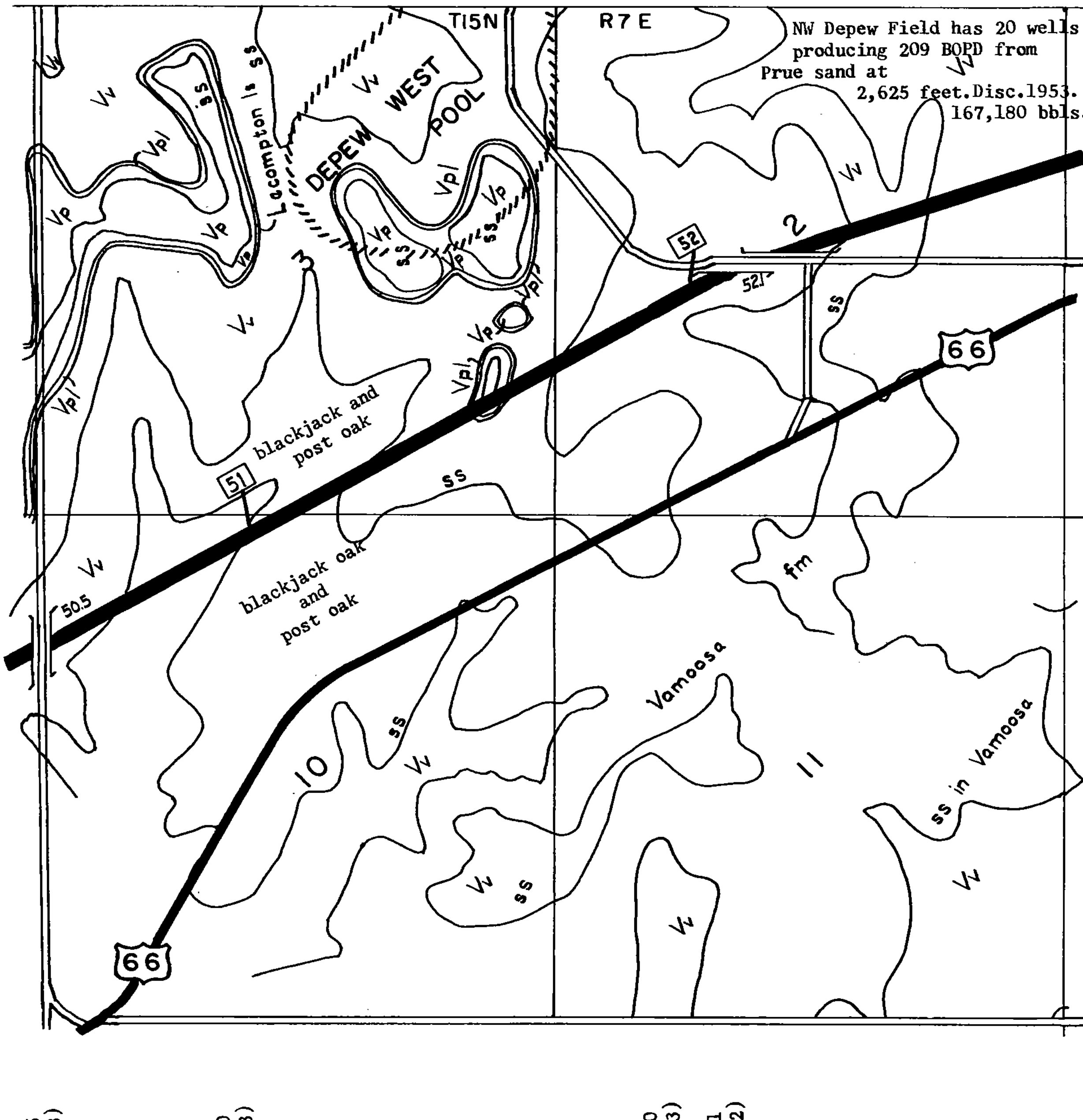
49.0 (37.3)

49.6 (36.7)

50.0 (36.3)

50.5 (35.8)



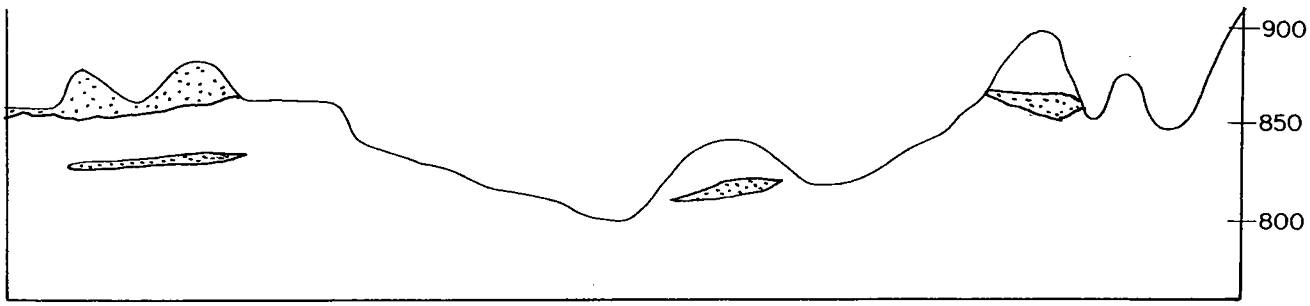


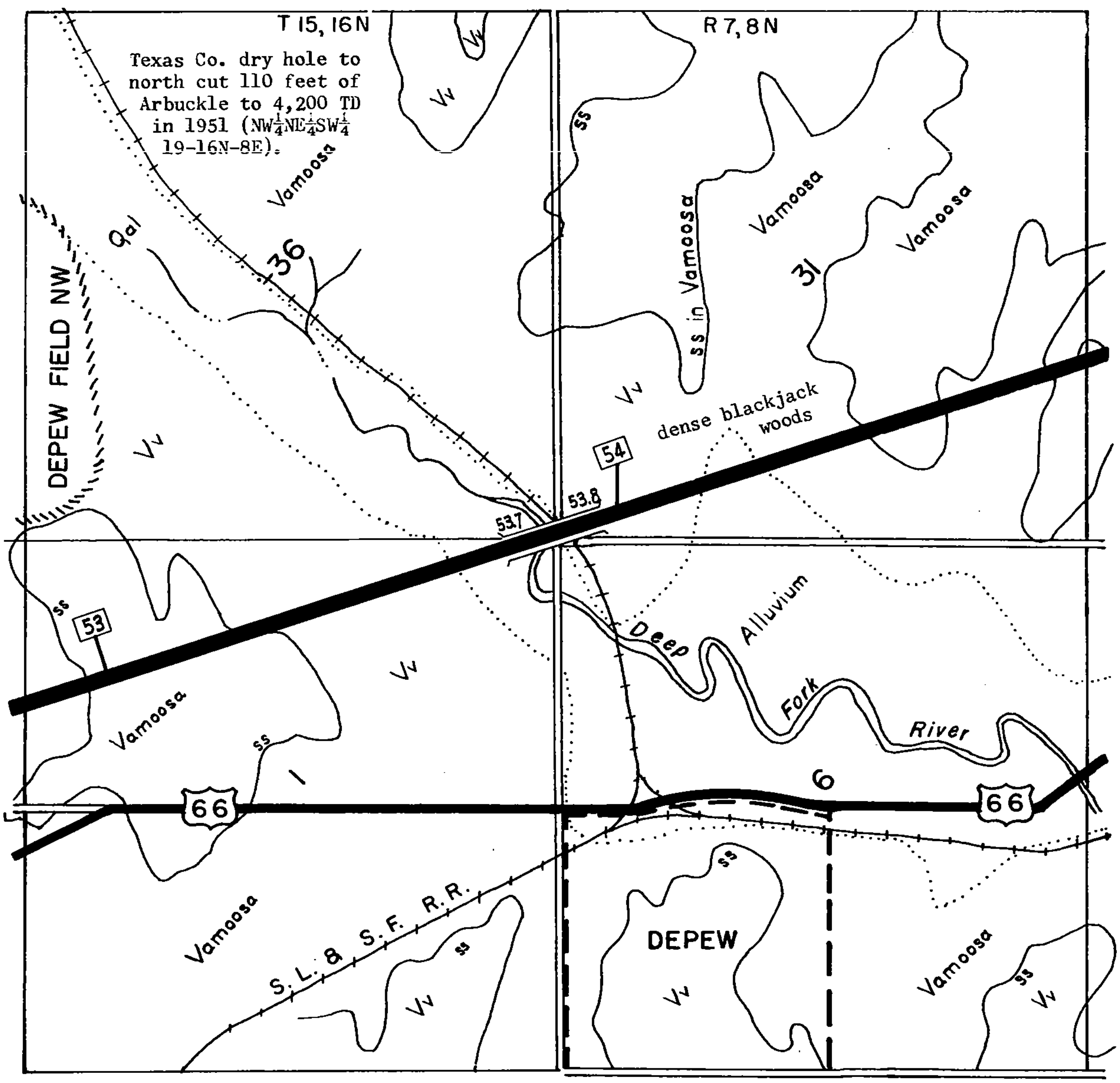
50.5
(35.8)

51.0
(35.3)

52.0
(34.3)

52.1
(34.2)



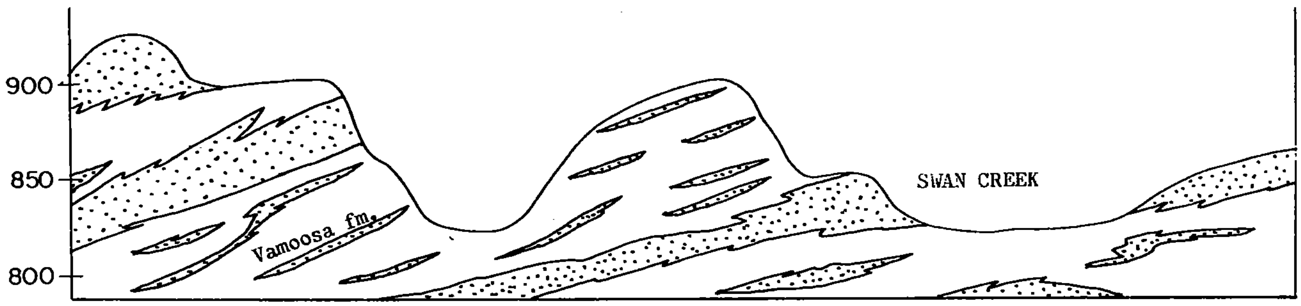


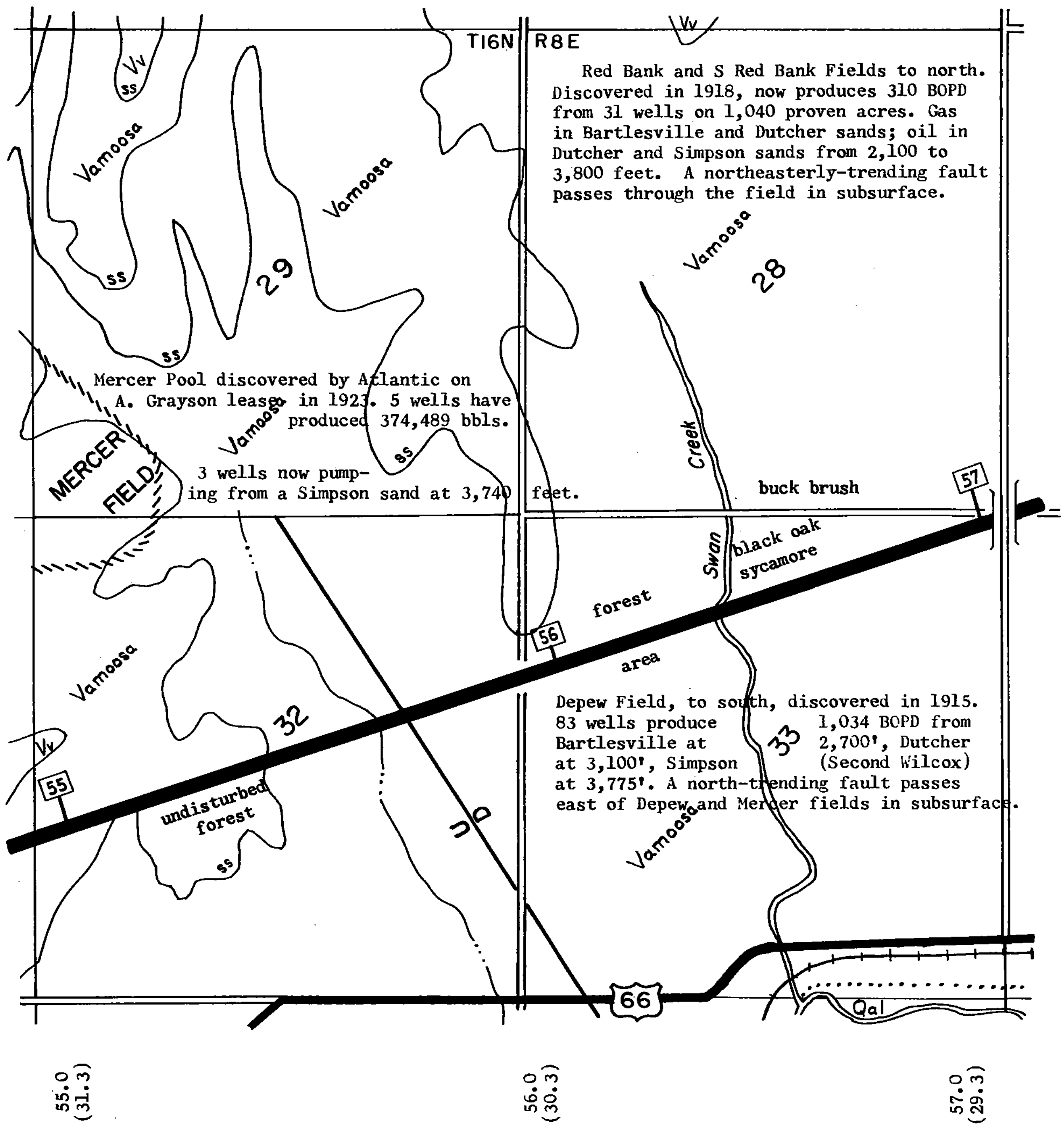
53.0 (33.3)

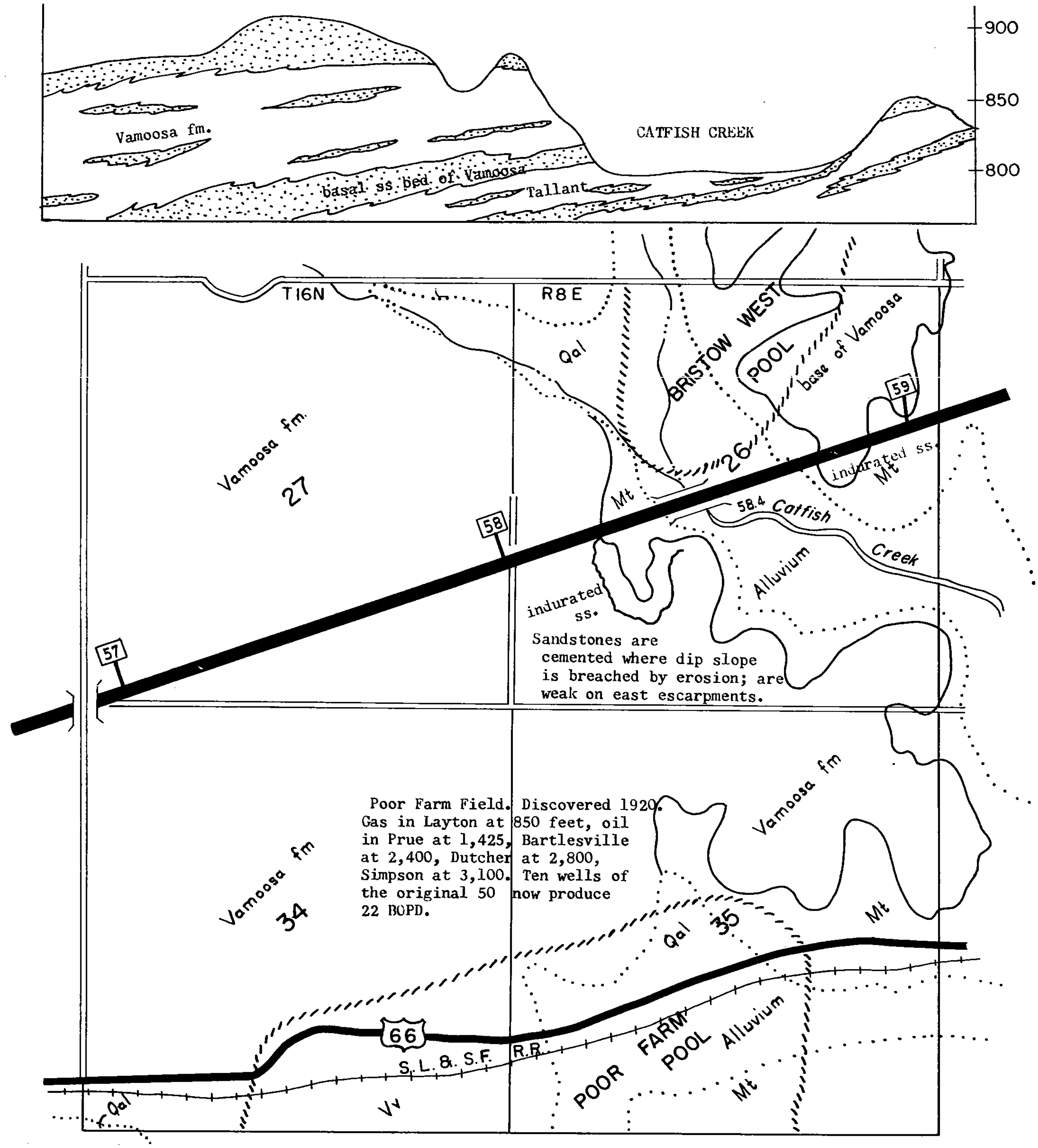
53.7 (32.6)

53.8 (32.5)

54.0 (32.3)


900
850
800
Vamoosa fm.
SWAN CREEK


T16N
R8E
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.
Vamoosa
ss
29
28
Mercer Pool discovered by Atlantic on A. Grayson lease in 1923. 5 wells have produced 374,489 bbls.
3 wells now pumping from a Simpson sand at 3,740 feet.
MERCER FIELD
Swan Creek
buck brush
black oak
sycamore
forest
area
57
56
55
32
33
undisturbed forest
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.
U
D
66
Qal
55.0
(31.3)
56.0
(30.3)
57.0
(29.3)

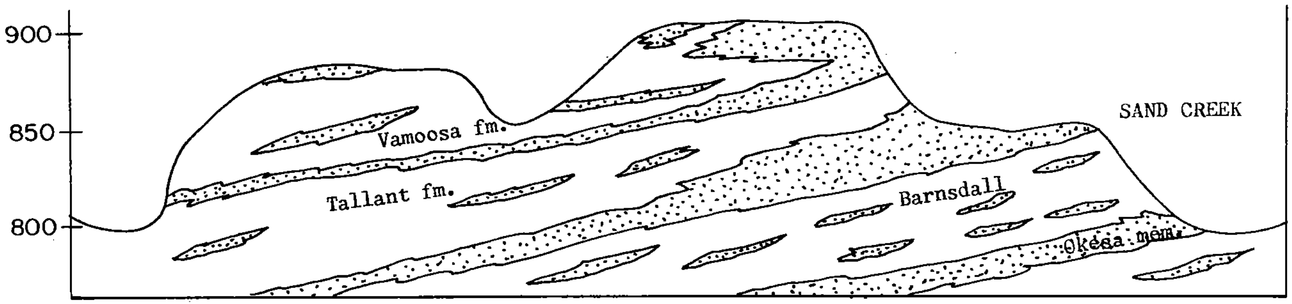


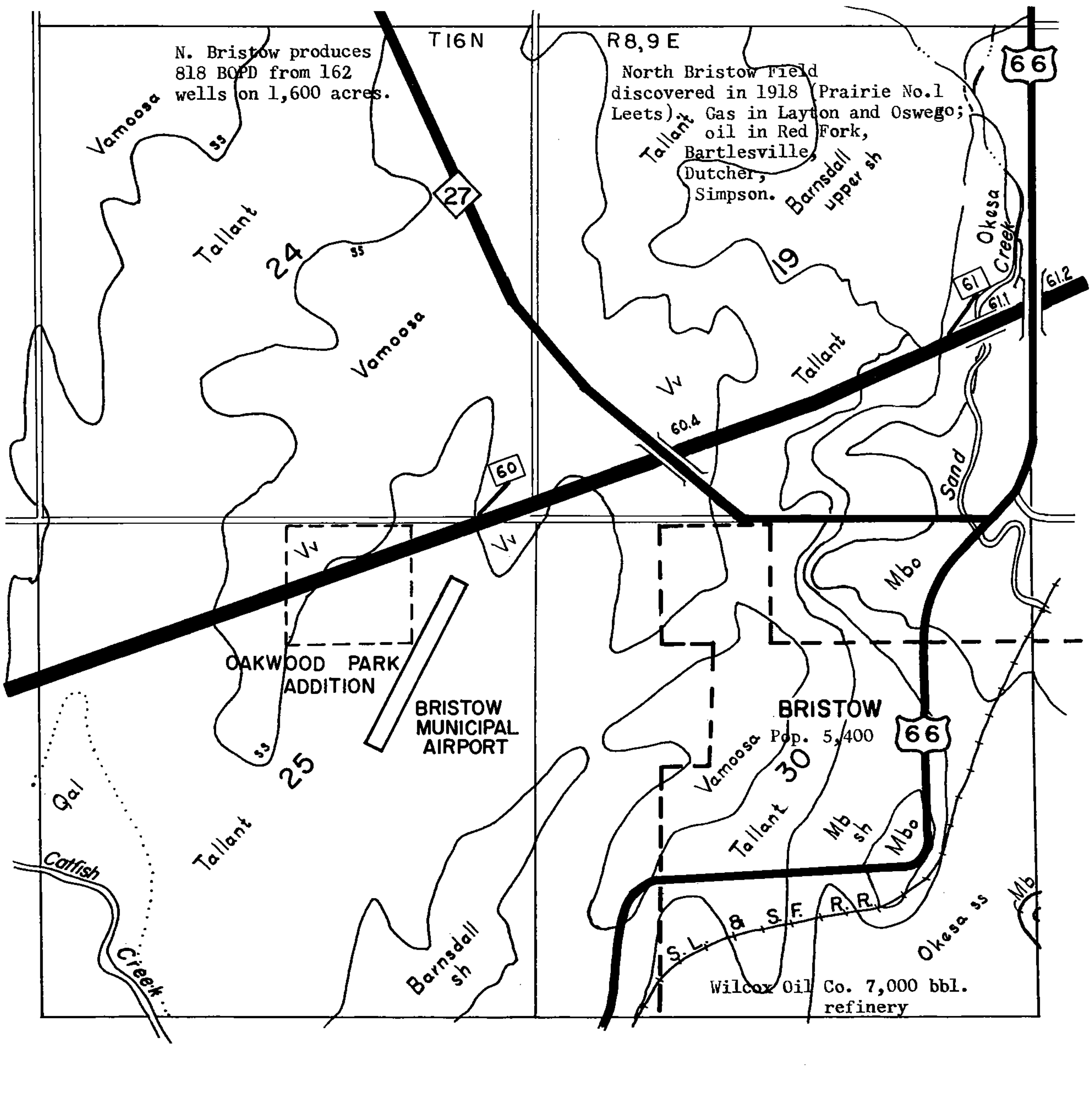
57.0 (29.3)

58.0 (28.3)

58.4 (27.9)

59.0 (27.3)



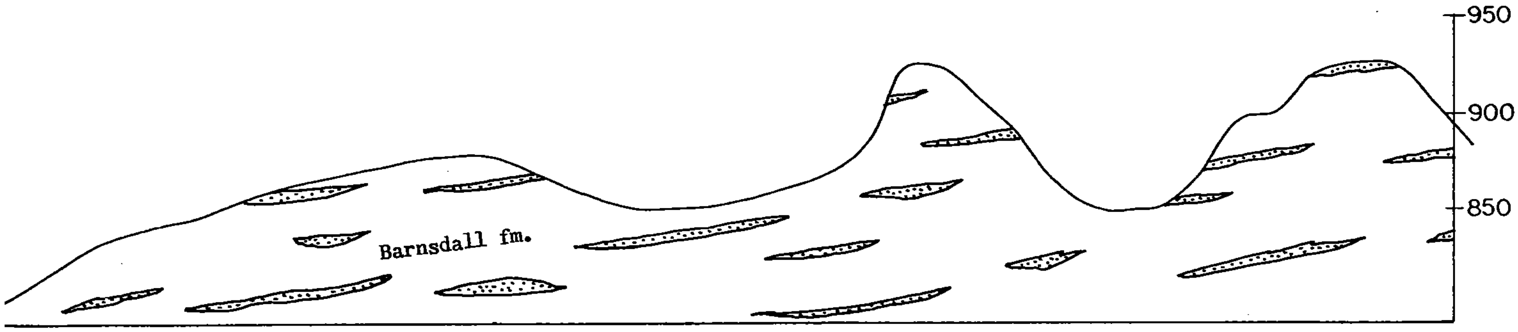


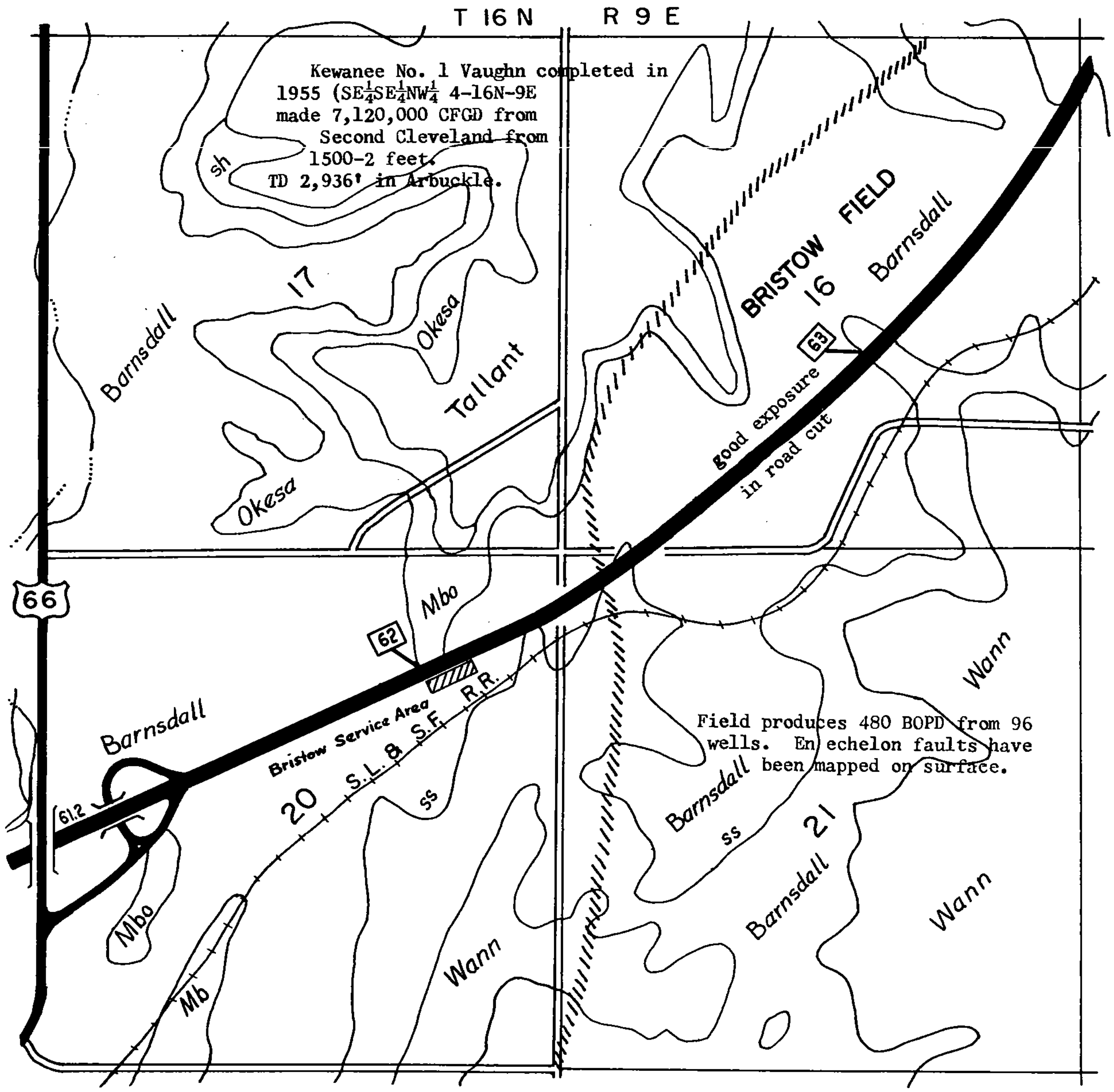
60.0 (26.3)

60.4 (25.9)

61.0 (25.3)
61.1 (25.2)

61.2 (25.1)

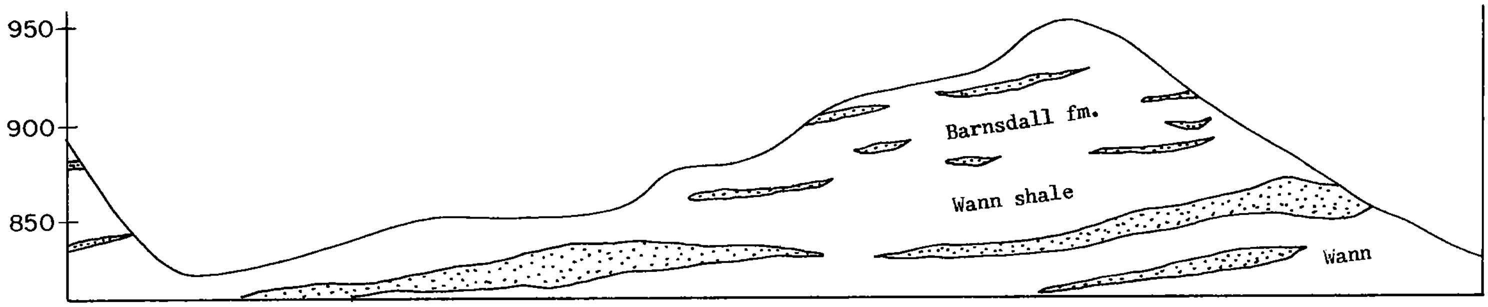


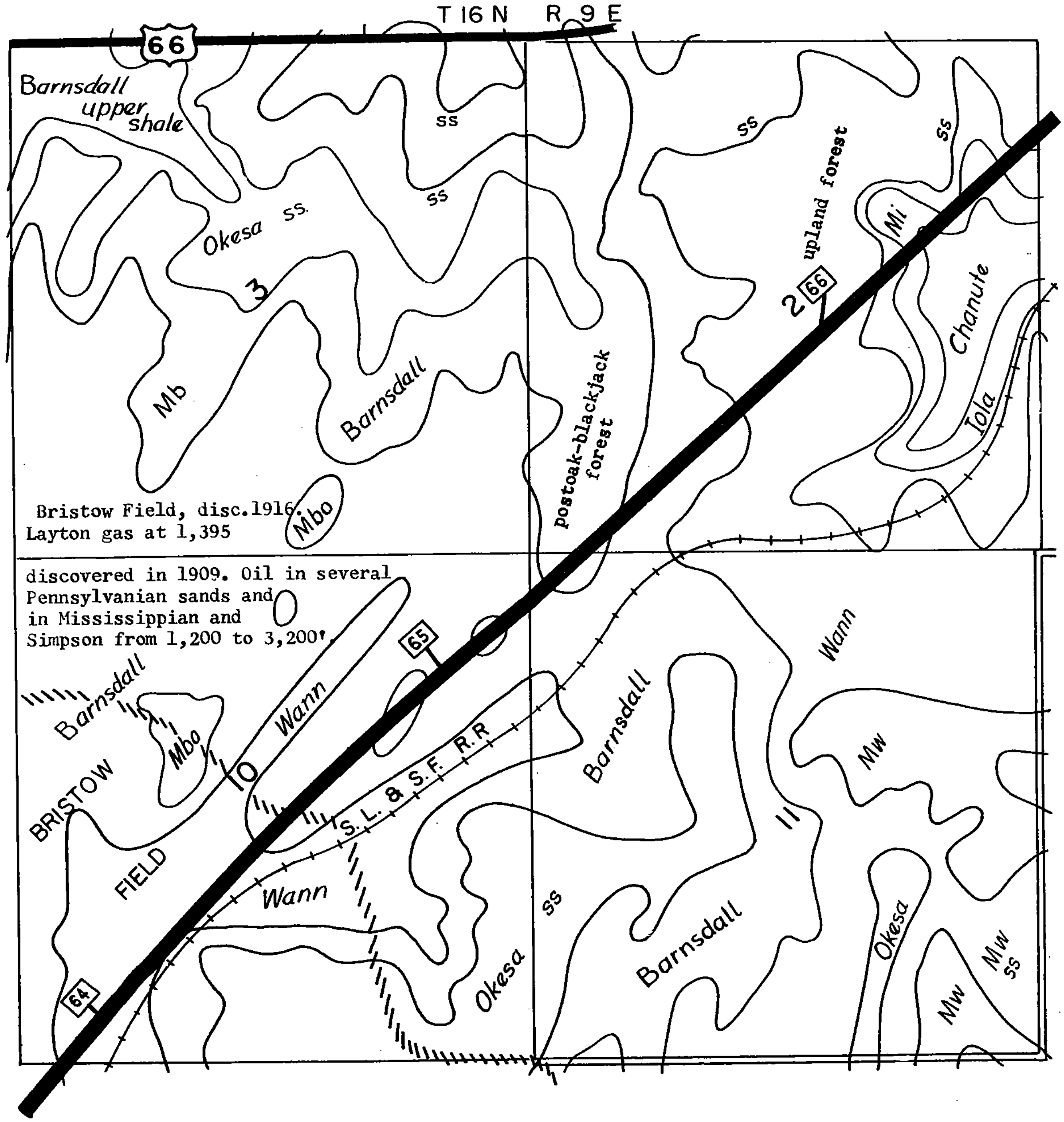


61.2 (25.1)

62.0 (24.3)

63.0 (23.3)

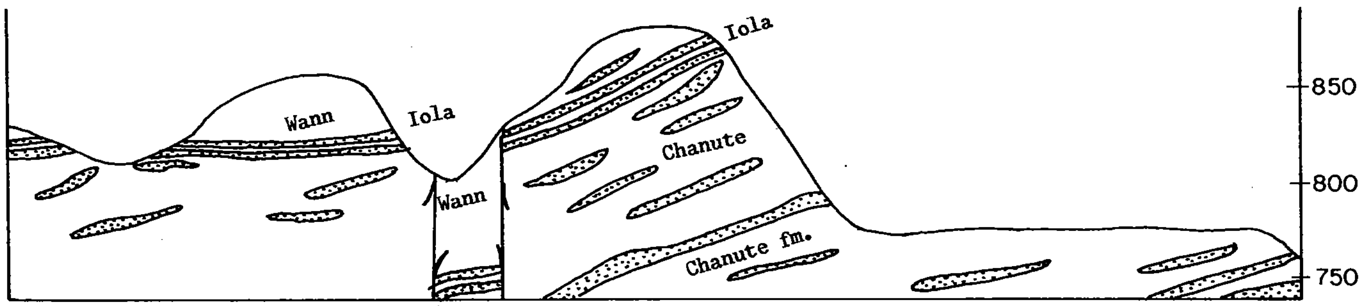


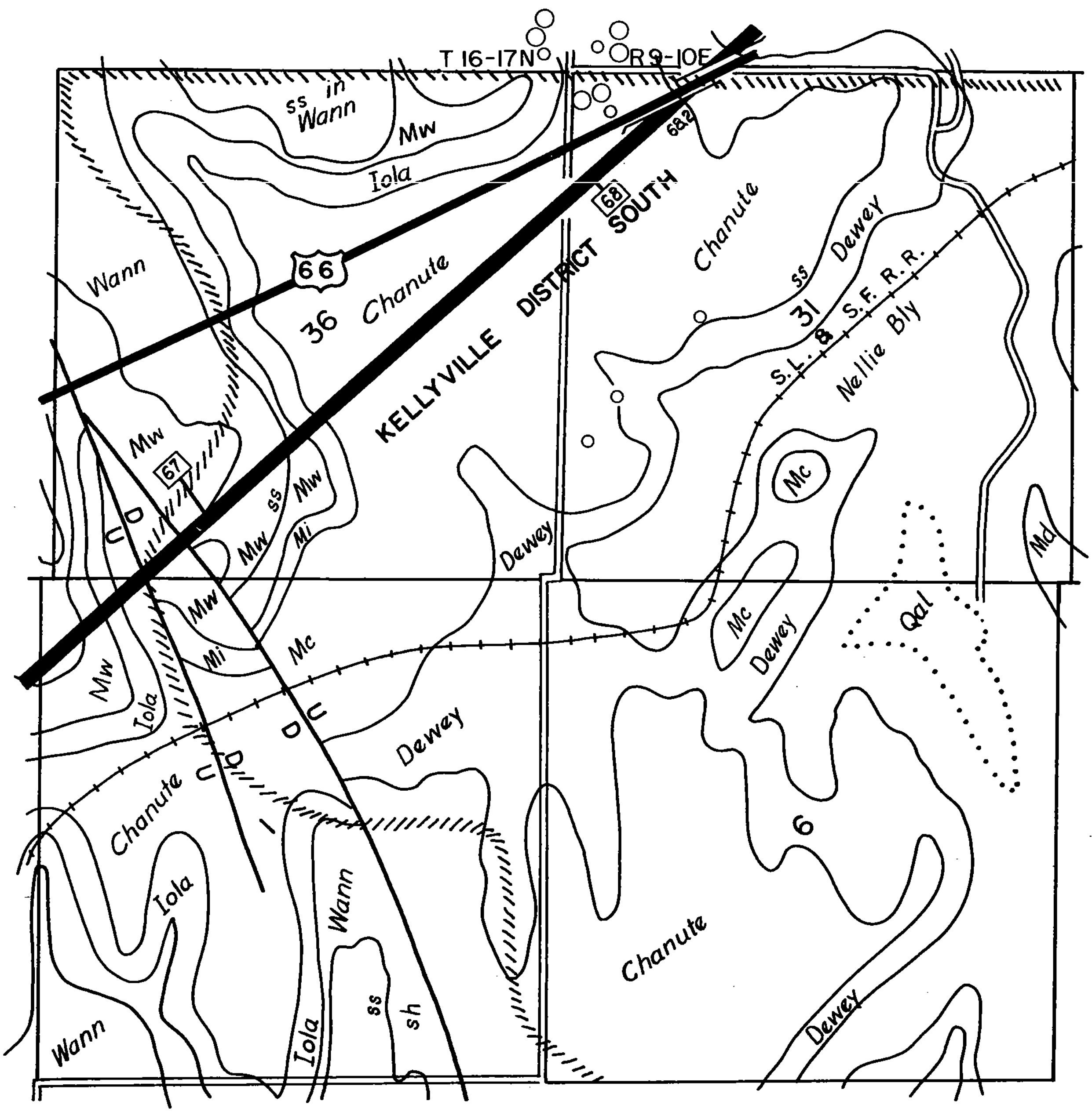


64.0 (22.3)

65.0 (21.3)

66.0 (20.3)

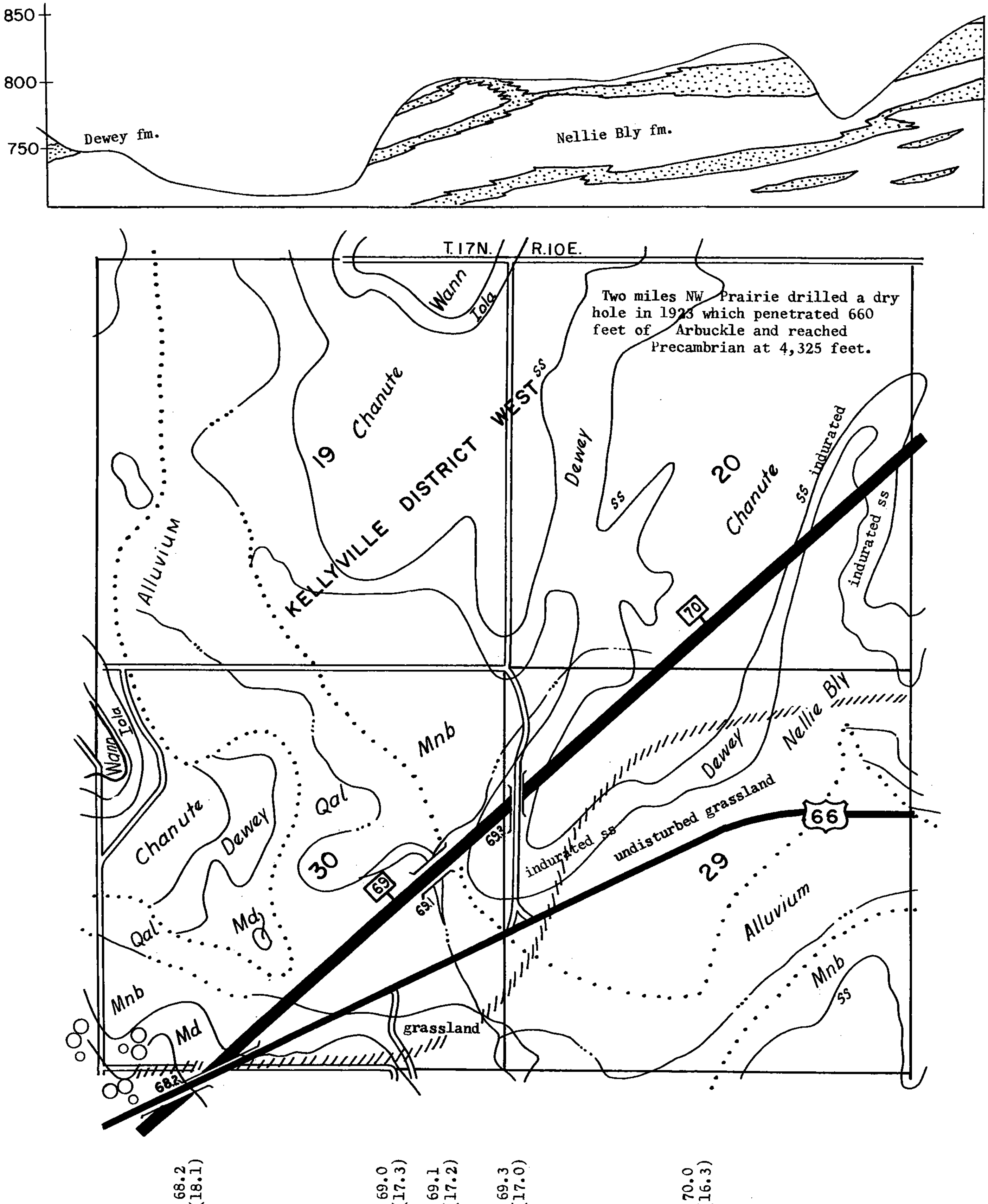


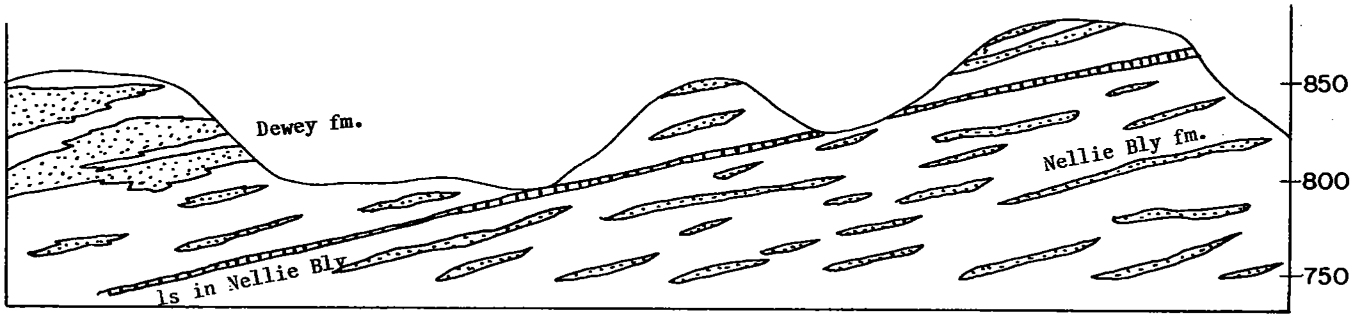


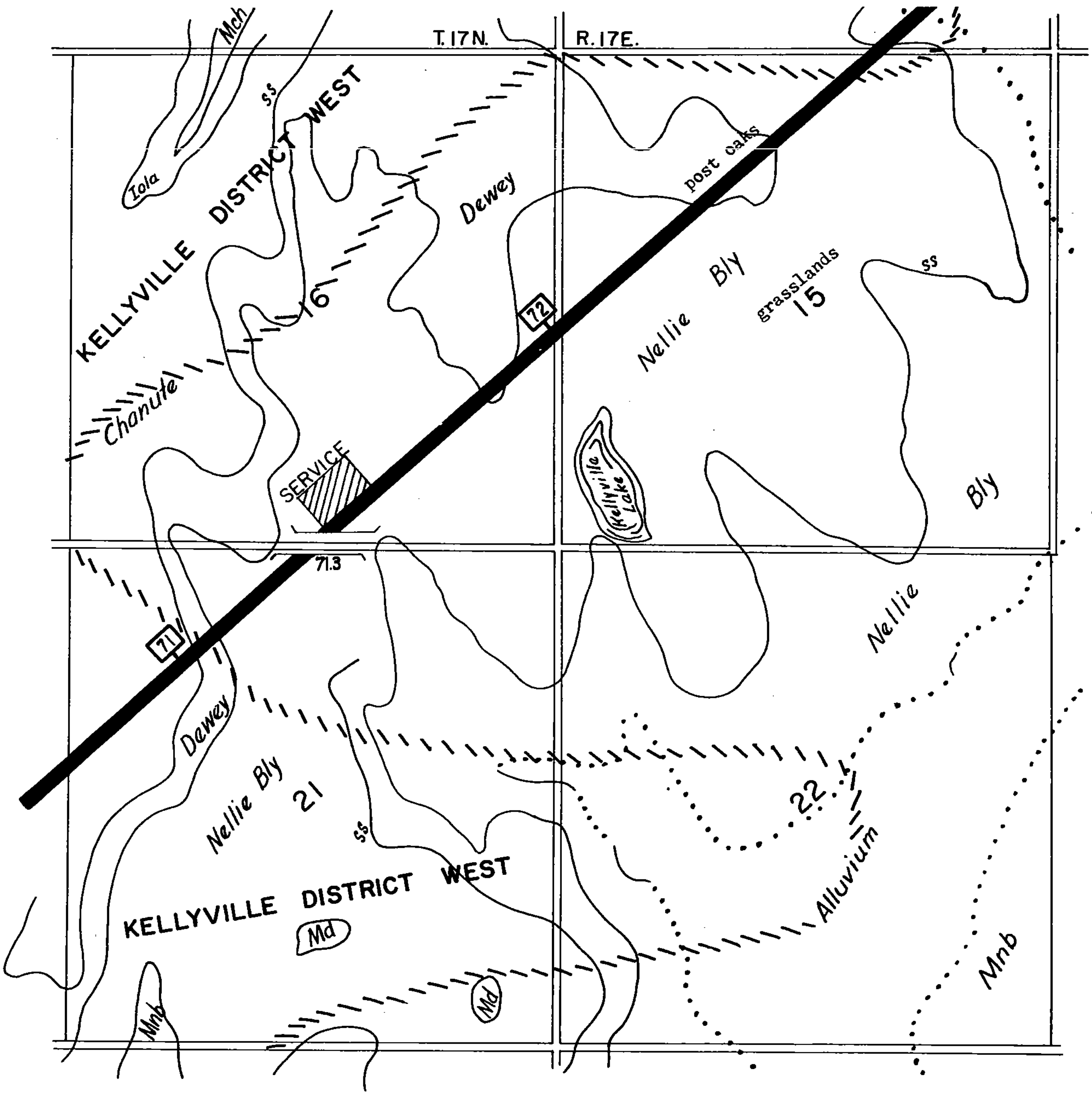
67.0 (19.3)

68.0 (18.3)

68.2 (18.1)


850
800
750
Dewey fm.
Nellie Bly fm.
T.17N.
R.10E.
Two miles NW Prairie drilled a dry hole in 1923 which penetrated 660 feet of Arbuckle and reached Precambrian at 4,325 feet.
KELLYVILLE DISTRICT WEST
19
20
29
30
Chanute
Dewey
Wann
Iola
Alluvium
Mnb
Qal
Md
ss
indurated ss
Nellie Bly
undisturbed grassland
grassland
70
66
69
68.2
69.1
69.3
68.2 (18.1)
69.0 (17.3)
69.1 (17.2)
69.3 (17.0)
70.0 (16.3)

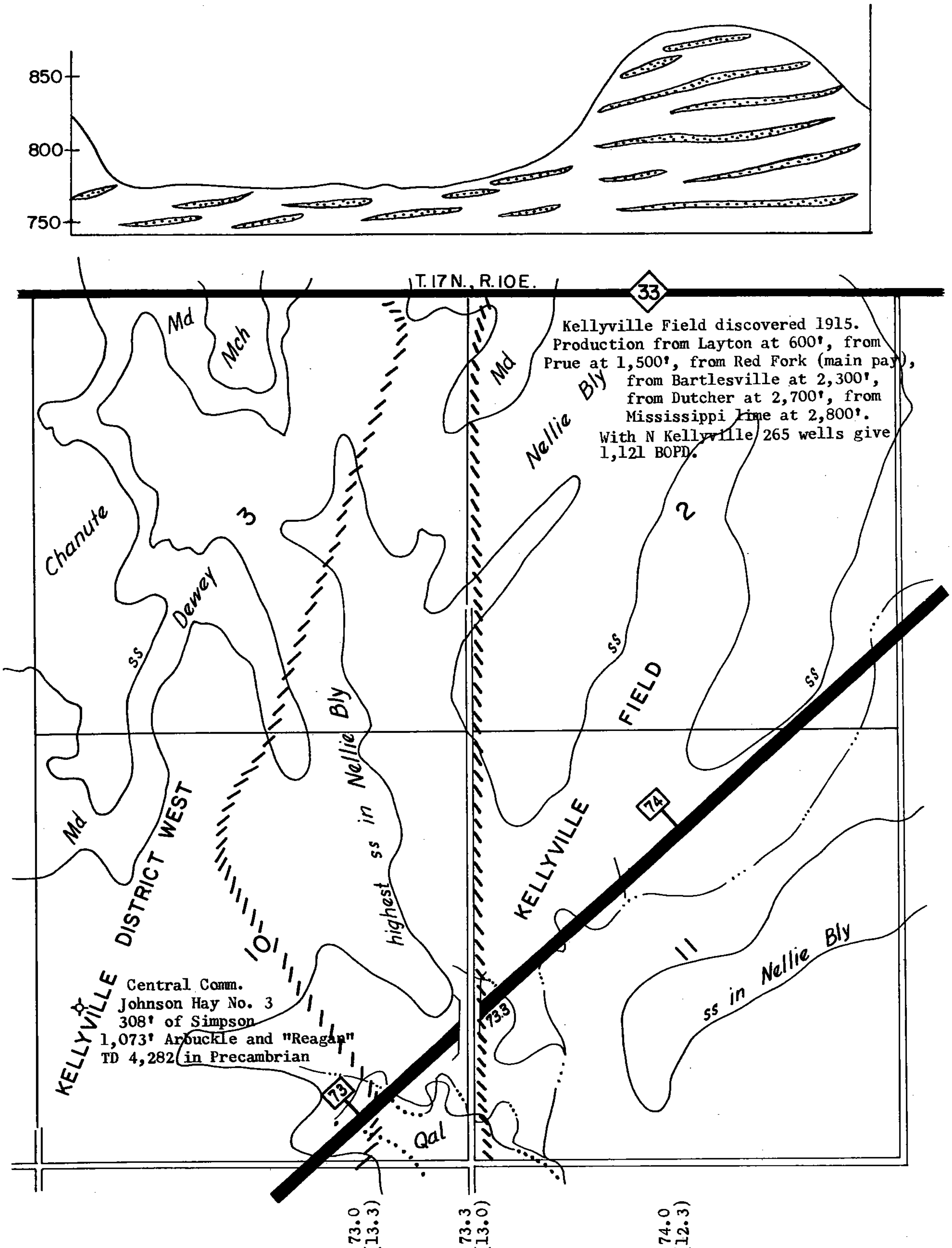


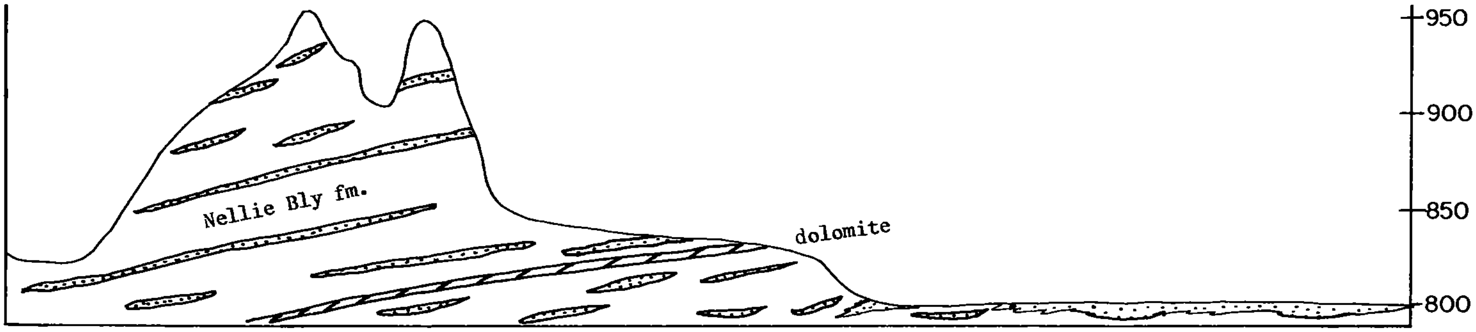


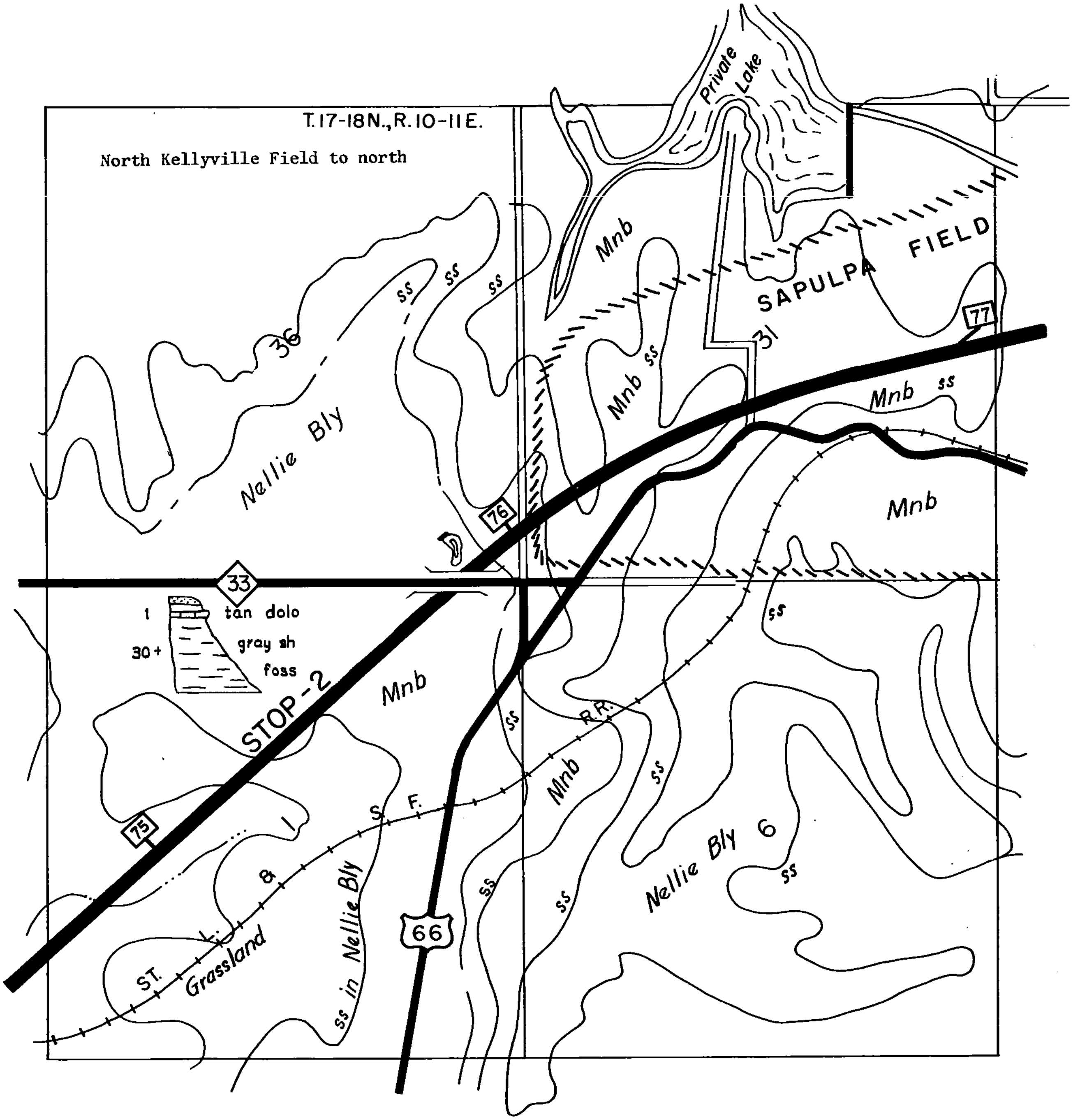
71.0 (15.3)

71.3 (15.0)

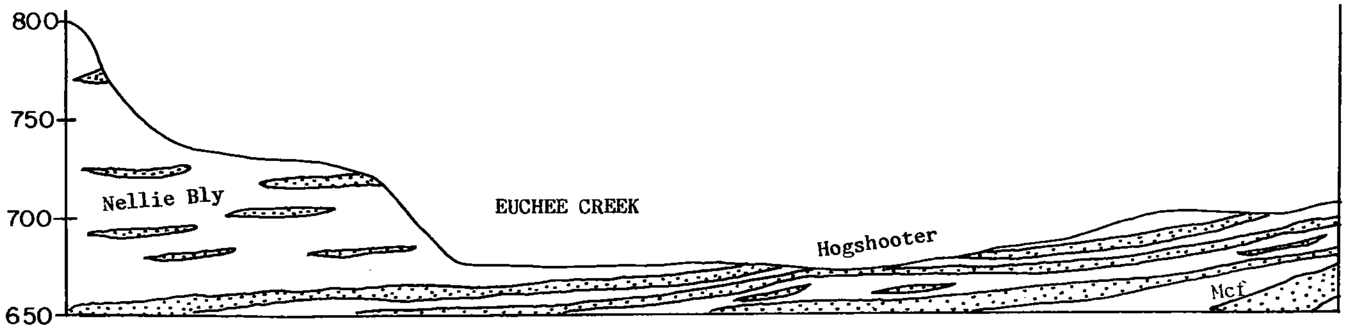
72.0 (14.3)

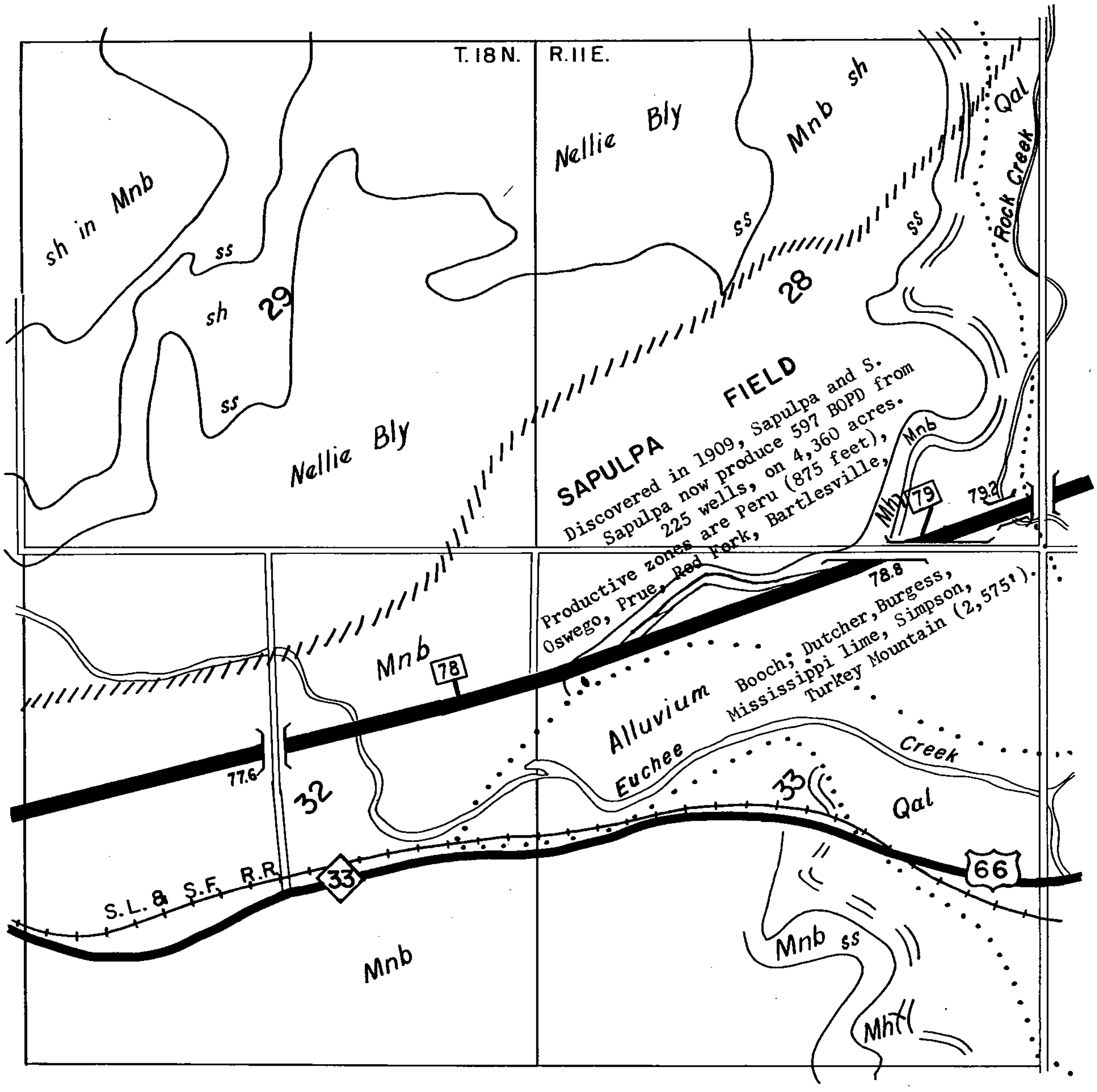

850
800
750
T. 17 N., R. 10 E.
33
Kellyville Field discovered 1915.
Production from Layton at 600', from
Prue at 1,500', from Red Fork (main pay),
from Bartlesville at 2,300',
from Dutcher at 2,700', from
Mississippi lime at 2,800'.
With N Kellyville 265 wells give
1,121 BOPD.
Md
Mch
Md
Nellie Bly
Chanute
3
2
Dewey ss
ss
FIELD
ss
Nellie Bly
highest ss in
KELLYVILLE
Md
DISTRICT WEST
74
10
11
ss in Nellie Bly
KELLYVILLE
Central Comm.
Johnson Hay No. 3
308' of Simpson
1,073' Arbuckle and "Reagan"
TD 4,282 in Precambrian
73.3
73
Qal
73.0
(13.3)
73.3
(13.0)
74.0
(12.3)



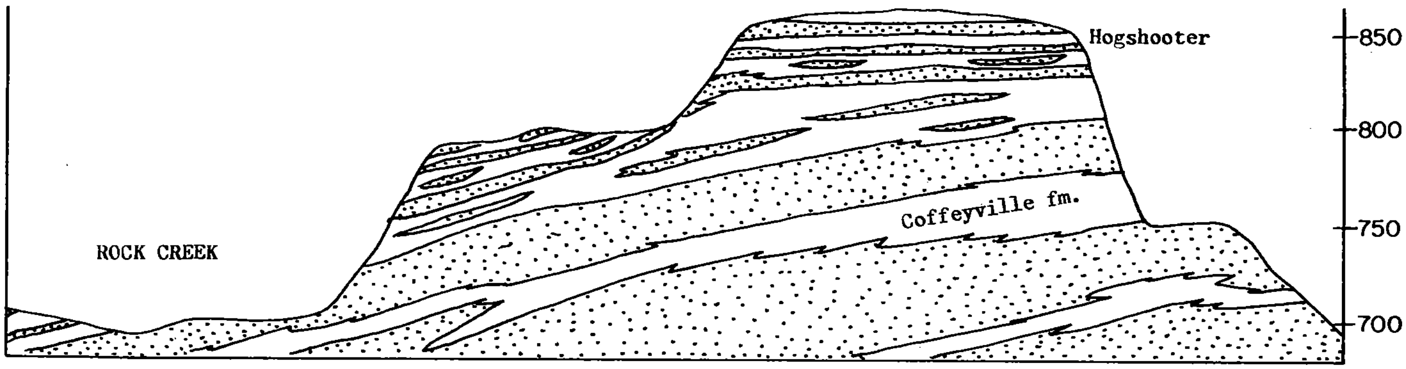


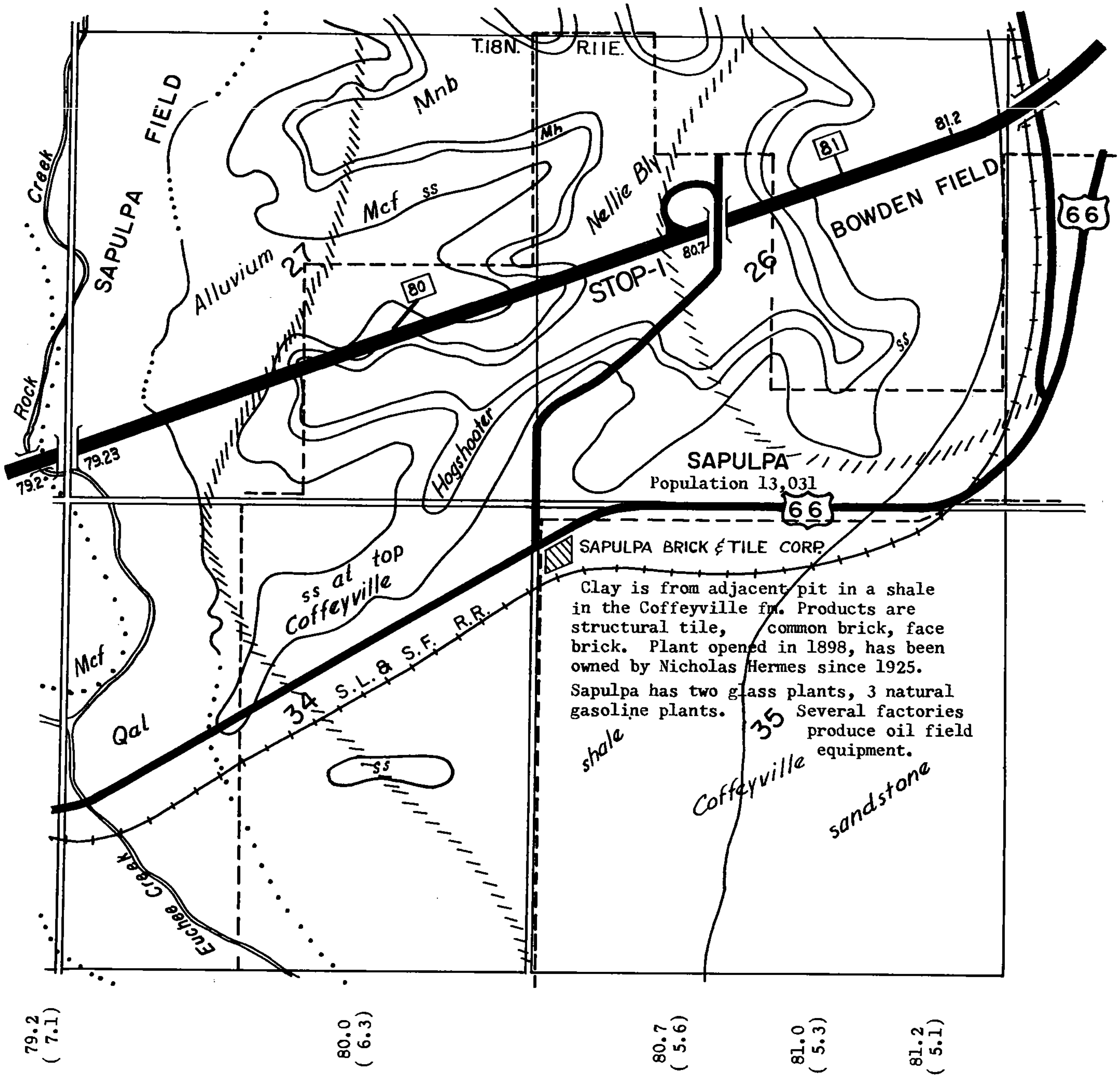
75.0 (11.3)   75.2 (11.1)   76.0 (10.3)   77.0 (9.3)

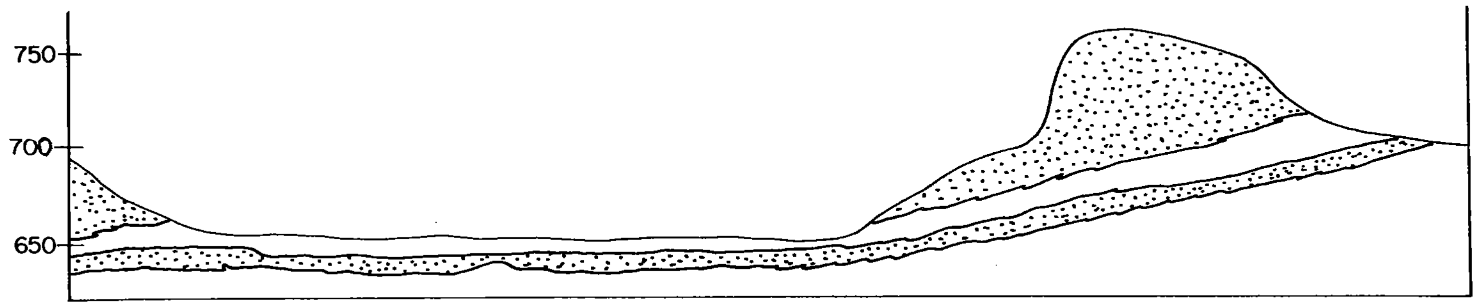


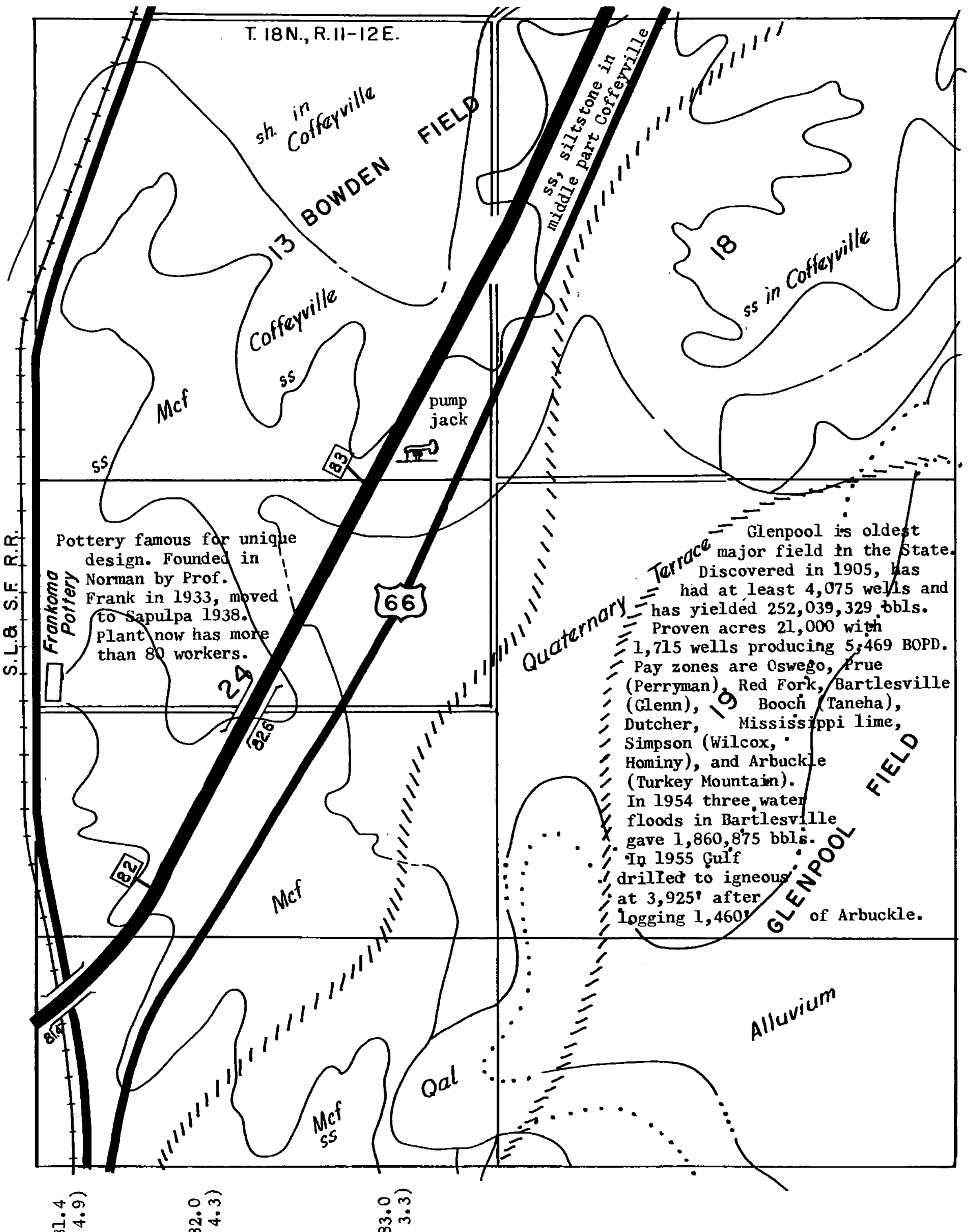


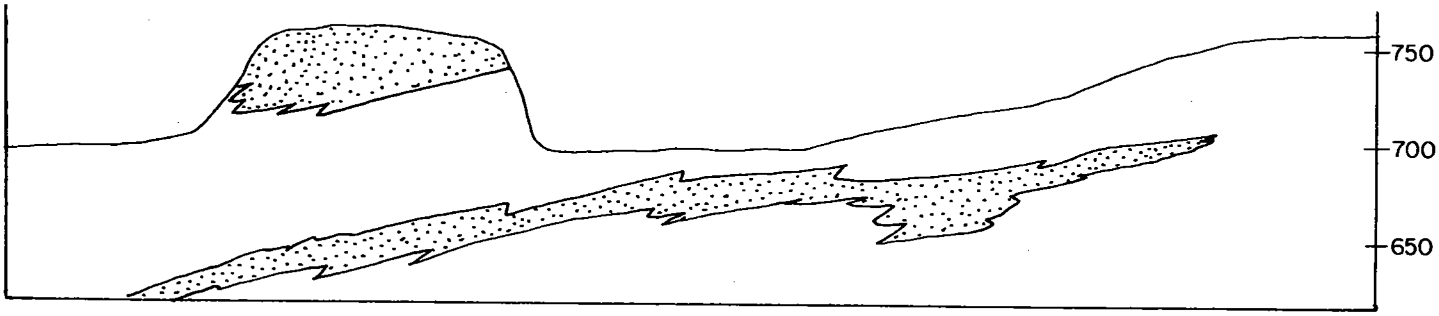
77.6 (8.7)
78.0 (8.3)
78.8 (7.5)
79.0 (7.3)
79.2 (7.1)

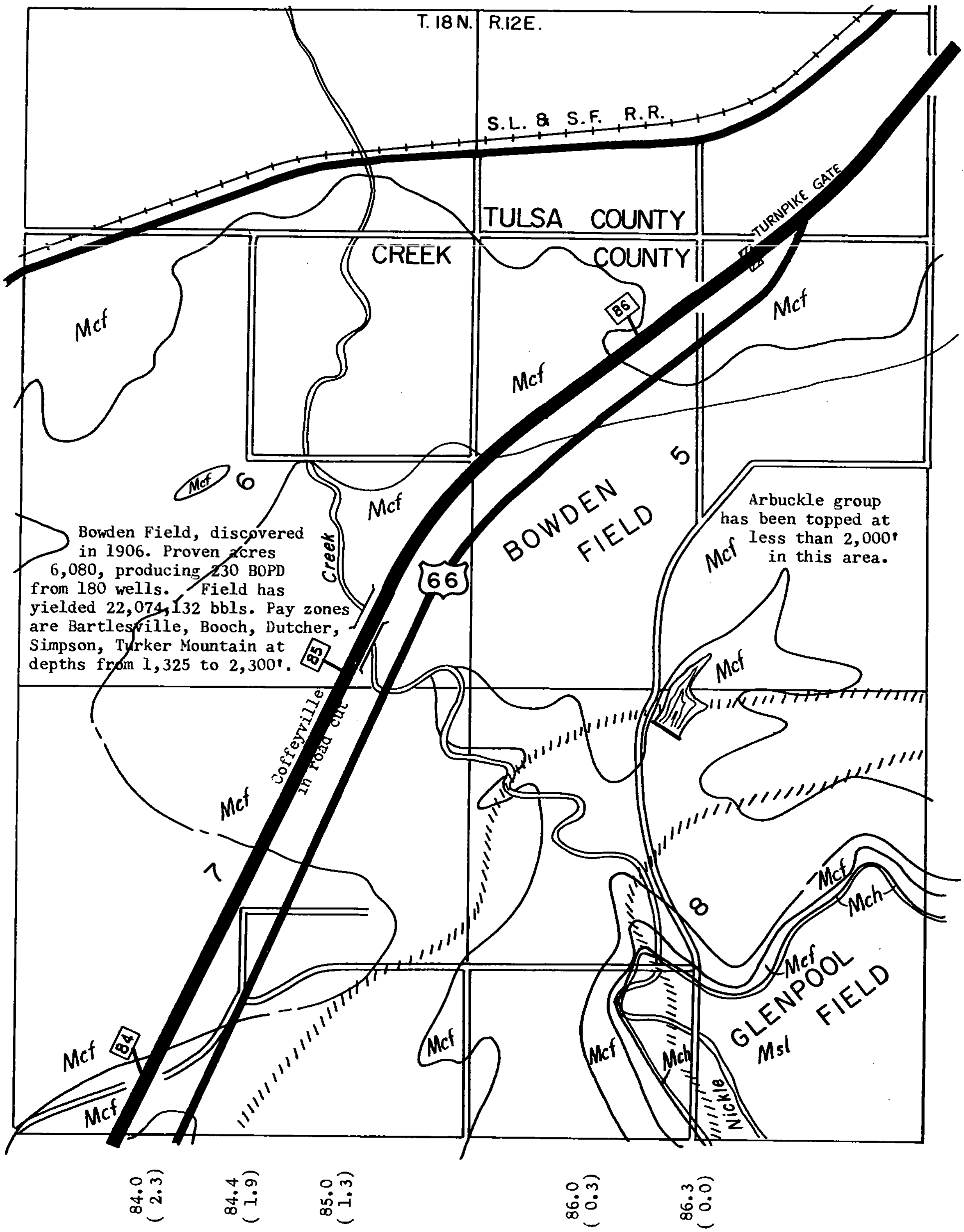

Hogshooter
Coffeyville fm.
ROCK CREEK
850
800
750
700

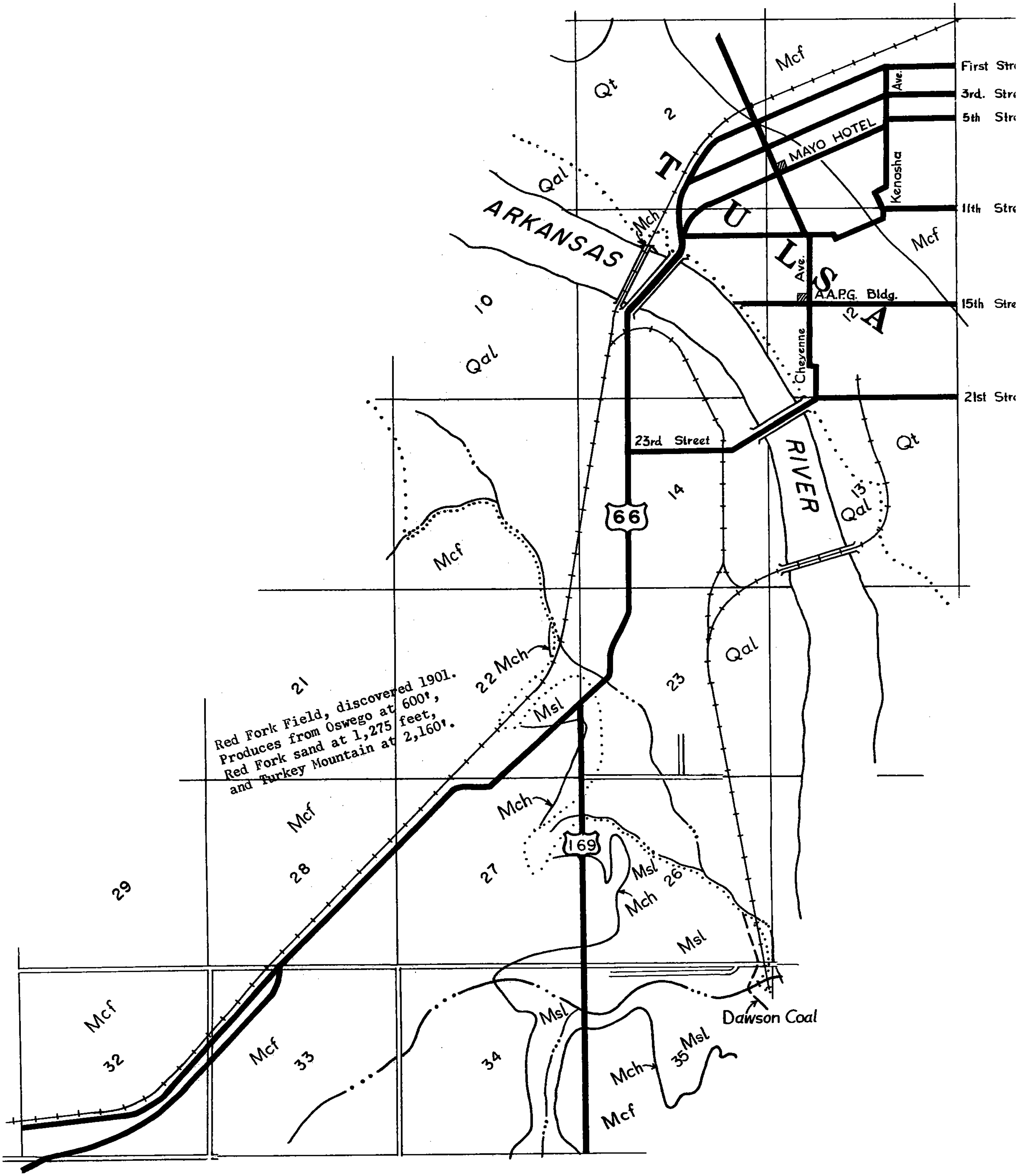

T.18N.
R.11E.
SAPULPA FIELD
Mnb
Mh
Mcf
ss
Nellie Bly
BOWDEN FIELD
81.2
81
66
Rock Creek
Alluvium
27
80
STOP-1
80.7
26
ss
Hogshooter
SAPULPA
Population 13,031
79.23
79.2
66
SAPULPA BRICK & TILE CORP.
Clay is from adjacent pit in a shale in the Coffeyville fm. Products are structural tile, common brick, face brick. Plant opened in 1898, has been owned by Nicholas Hermes since 1925.
Sapulpa has two glass plants, 3 natural gasoline plants. Several factories produce oil field equipment.
ss at top Coffeyville
S.L. & S.F. R.R.
34
35
Mcf
Qal
ss
shale
Coffeyville
sandstone
Euchee Creek
79.2 (7.1)
80.0 (6.3)
80.7 (5.6)
81.0 (5.3)
81.2 (5.1)


750
700
650


T. 18 N., R. 11-12 E.
sh. in Coffeyville
BOWDEN FIELD
13
Coffeyville
ss
Mcf
ss
ss, siltstone in middle part Coffeyville
18
ss in Coffeyville
pump jack
83
Pottery famous for unique design. Founded in Norman by Prof. Frank in 1933, moved to Sapulpa 1938. Plant now has more than 80 workers.
Frankoma Pottery
S.L.& S.F. R.R.
66
24
82.6
Quaternary Terrace
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 Oswego, Prue (Perryman), Red Fork, Bartlesville (Glenn), Booch (Taneha), 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.
19
GLENPOOL FIELD
82
Mcf
81.6
Alluvium
Qal
Mcf ss
81.4 (4.9)
82.0 (4.3)
83.0 (3.3)


750
700
650


T. 18 N. R. 12 E.
S.L. & S.F. R.R.
TULSA COUNTY
CREEK COUNTY
TURNPIKE GATE
Mcf
86
Mcf
Mcf
6
5
Mcf
Mcf
Creek
BOWDEN FIELD
Arbuckle group has been topped at less than 2,000' in this area.
Bowden Field, discovered in 1906. Proven acres 6,080, producing 230 BOPD from 180 wells. Field has yielded 22,074,132 bbls. Pay zones are Bartlesville, Booch, Dutcher, Simpson, Turker Mountain at depths from 1,325 to 2,300'.
66
Mcf
85
Coffeyville in road cut
Mcf
7
8
Mcf
Mch
Mcf
GLENPOOL FIELD
Msl
Mcf
84
Mcf
Mcf
Mcf
Mch
Nickle
84.0 (2.3)
84.4 (1.9)
85.0 (1.3)
86.0 (0.3)
86.3 (0.0)


First Str
3rd. Str
5th Str
11th Str
15th Str
21st Str
23rd Street
TULSA
ARKANSAS
RIVER
MAYO HOTEL
A.A.P.G. Bldg.
Kenosha
Cheyenne
Ave.
66
169
Qt
Qal
Mcf
Mch
Msl
Dawson Coal
Red Fork Field, discovered 1901.
Produces from Oswego at 600',
Red Fork sand at 1,275 feet,
and Turkey Mountain at 2,160'.