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PRELIMINARY REPORT ON THE GROUND-WATER RESOURCES OF LABETTE COUNTY, KANSAS

by

G. C. Prescott

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# PRELIMINARY REPORT ON THE GROUND-WATER RESOURCES OF LABETTE COUNTY, KANSAS

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## INTRODUCTION

An investigation of the ground-water resources of the Pennsylvanian rocks in Labette County, Kansas, was initiated in May 1948, by the Geological Survey, U. S. Department of Interior, and the State Geological Survey of Kansas, in cooperation with the Division of Sanitation of the Kansas State Board of Health, and the Division of Water Resources of the Kansas State Board of Agriculture.

## PURPOSE OF INVESTIGATION

The study was undertaken at the request of Dr. Leon Bauman, Labette County health officer, and Ogden Jones, Division of Sanitation, State Board of Health. Neosho , Crawford, and Cherokee Counties were to be included in the investigation, but owing to the similarity of their ground-water problems to those of Labette County and the limited amount of time, the preliminary work was limited to Labette County. There is a critical water shortage, particularly among dairy farmers, in this county. Many farmers had inadequate water supplies for domestic and stock use. Dr. Bauman reported that 90 percent of the wells were polluted. The city of Altamont, with a population of 600, was without a public water supply. Private domestic wells in Altamont were inadequate, and, according to the County Health Department, many were contaminated by surface runoff or nearby cess pools.

## FIELD WORK

The field work was done during May and June 1948, by C. K. Bayne,

V. C. Fishel, and G. C. Prescott, of the Division of Ground Water. J. M. Jewett, of the State Geological Survey, spent some time in the field advising on various geologic problems that arose. Some previous ground-water work had been done in Labette County by G. E. Abernathy of the State Geological Survey. C. C. Williams investigated the ground-water conditions in the Neosho River Valley in the vicinity of Parsons in 1944. In the course of the present study, 125 wells were visited and pertinent information was obtained from the owners of the wells. Water samples from 53 wells were collected and sent to the Division of Sanitation, State Board of Health, where they were analyzed for chloride and nitrate content by H. A. Stoltenberg, chemist. Almost all the water-well drillers in the area were contacted for information on the wells they had drilled.

## GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

### GENERAL CONSIDERATIONS

Pennsylvanian rocks dipping gently westward crop out in Labette County. The area of each formation outcrop within the county is shown on Figure1. Two generalized cross sections of the outcropping rocks in Labette County are shown in Figures 2 and 3. The cross sections show the general relationship of the formations. The oldest rock formation exposed at the surface in the county is the Cherokee shale which crops out in the eastern part of the county. Formations overlying the Cherokee shale, from the oldest to the youngest in age, are the Fort Scott limestone, Labette shale, Pawnee limestone, Bandera shale, Altamont limestone, Nowata shale, Lenapah limestone, and Memorial shale. These formations constitute the Marmaton group. The Bourbon and Bronson groups of the Missourian series are found in the western third of the county. A small area west of Dennis in the northwest corner

has exposures of rocks of the Kansas City group, the youngest consolidated formations in the county.

The above Pennsylvanian rocks supply most of the water available to wells except the wells in the alluvium of the Neosho River and other valleys. The ultimate source of the water pumped in Labette County is from precipitation on the outcrop area. This water moves slowly westward through the rocks in the direction of regional dip.

Potable ground-water supplies can be obtained from some of the formations at shallow depths. Deep wells in Labette County generally yield mineralized water. The problem is to determine the formations that yield suitable water supplies and the depth at which the supplies can be obtained.

## CHEROKEE SHALE

The oldest rock formation that crops out in the county is the Cherokee shale of the desmoinesian series. This formation is variable as to composition, and through light and dark shale predominates, much sandstone, sandy shale, some important coal beds, and a few thin limestone beds are present. The thickenss at the outcrop ranges from 400 to 600 feet and averages about 450 feet. The Cherokee formation contains much water in its lenticular sands. However, its water may often be salty or taste of sulphur. This is especially true of water obtained from the Mulky coal member which often contains natural gas.

A well on the farm of Fred Hellwig, in the SE 1/4 SE 1/4 sec. 6, T. 34 S., R. 21 E., is 130 feet deep and derives its water from the Cherokee. It yields an ample supply of water which is reported to be rather hard. George Cunningham has a dug well in the Se 1/4 SE 1/4 sec. 4, T. 34 S., R 21 E., which

is 24 feet in depth and produces an adequate amount of palatable water. A drilled well in the S W 1/4 SW 1/4 sec. 14, T. 33 S., R. 20 E., owned by B. W. Pinson, is 350 feet deep and yields a large supply of salty water. J. W. Nickle, who lives in the SE 1/4 SW 1/4 sec. 17, T. 32 S., R. 21 E., has a drilled well 84 feet deep that yields an abundant supply of water which has a strong odor of hydrogen sulphide.

## FORT SCOTT LIMESTONE

The next oldest formation exposed at the surface is the Fort Scott limestone (frequently referred to as Oswego by drillers), the basal formation of the Marmaton group. Two limestone members with an intervening black shale member comprise the Fort Scott limestone. These are, from top to bottom, the Higginsville limestone, the Little Osage shale, and the Blackjack Creek limestone member. The characteristic thickness of the Fort Scott is about 33 feet.

According to well drillers and well records, the Fort Scott is a fairly adequate water-bearing formation and many wells tap its supply. The Little Osage member seems to contain the most water. Shale is not ordinarily a good aquifer, but the Little Osage is platy and contains many cleavage cracks and planes along which water might move. It is possible that a porous zone at the base of the Higginsville may supply the water rather than the shale zone of the Little Osage. The quality of the Fort Scott water is generally good, although it is sometimes salty or sulphury. Some gas may be obtained from the Fort Scott.

One of the best wells recorded in the inventory was a well owned by Leonard Post who lives in the NW 1/4 NW 1/4 sec. 23, T. 34 S., R. 19 E. This well was 175 feet in depth and derived the majority of its water from the Little

Osage member of the Fort Scott. Mr. Post reports that the water has a slight soda taste. A dug well on the Hall farm, in the NE 1/4 SE 1/4 sec. 35, T. 33 S., R. 20 E., is 18 feet deep and 4 feet in diameter. This well is reported never to have gone dry. H . Billington Gets a large supply of salty water from an 80-foot drilled well in the NE 1/4 NE 1/4 sec. 7, T. 34 S., R. 20 E. He reported that salty water was encountered in the Little Osage member of the Fort Scott.

## LABETTE SHALE

The Labette shale consists of from 30 to 100 feet of clay shale, sandy shale, sanstone, and a few thin coal and limestone beds. It also contains the Englevale sandstone member (Peru in the subsurface), a lenticular body lying in the middle and lower parts of the Labette. The Labette furnishes water to a few wells in the area, but is is apparently a rather insignificant aquifer. The extent of the Englevale sandstone is not well known.

J. H. Fowler, who lives in the NE 1/4 NW 1/4 sec. 8, T. 34 S., R. 19 E., had a well drilled 177 feet to the Fort Scott. Water was encountered in the Labette and gas in the Fort Scott. In order to utilize both, a plug was inserted at 133 feet, thus separating water from gas. A pipe penetrating the plug conducts gas to the surface and another pipe carries the abundant supply of good tasting water from the Labette formation. A typical well in the Labette, owned by Floyd Campbell, is in the SE 1/4 SW 1/4 sec. 18, T. 31 S., R. 21 E. This well, which is 22 feet deep, is good in times of normal rainfall, but fails during extensive dry periods.

## PAWNEE LIMESTONE

The upper part of the Pawnee limestone consists of two persistant

limestone members separated by a shale member; whereas the lower part contains shale and a thin basal limestone member. The thickness of this formation is from 15 to 60 feet and the average is 30 feet. The Pawnee, or Pink limestone as it is called by drillers, contains water of good quality. It is probably a more important aquifer than our well inventory indicated and needs further investigation.

A 195-foot well in the Pawnee formation in the NW 1/4 NW 1/4 sec. 20, T. 35 S., R. 19 E., owned by A. E. Krockstrom, yields a large amount of excellent water. This well may indicate that the Pawnee is an important aquifer. Mr. Shaeffer, a driller at Altamont, reported that he had recently drilled a well yielding about 50 gallons a minute on Mr. Carnahan's farm just west of Altamont. He completed another well in June 1948 in the southeast part of town that was reported to yield about 50 gallons a minute.

## BANDERA SHALE

The Bandera shale consists of clay shale, sandy shale, massive to thin bedded sanstone, and the Mulberry coal bed near the base. According to Jewett (1945), the thickness ranges from 35 to 75 feet, but gas well logs indicate a slightly greater thickness. The Bandera furnishes water to numerous wells throughout the county, however they are variable in character. The water is reported to be rather hard and may be high in chlorides. Gas well logs indicate the presence of salt water and gas in the Bandera.

An excellent dug well 14 feet in depth and 10 feet in diameter, owned by Louis Cranor, is in the SE 1/4 NE 1/4 sec. 10, T. 35 S., R. 19 E. Another good well in the SW 1/4 SW 1/4 sec. 29, T. 33 S., R. 19 E. belongs to R. F. Jones. No drilled wells deriving water entirely from the Bandera were found. The

Bandera yields water very slowly and unless a large reservoir is dug, very little water can be obtained. An ordinary 6 or 8 inch drilled well would be pumped dry in a very short time.

ALTAMONT LIMESTONE

The Altamont limestone, which overlies the Bandera, has an average thickness of about 19 feet. It is composed of two limestone members separated by shale. Wells in the Altamont are not common, however, it does supply a fair amount of good quality water in some areas.

Roy Benning, who lives in the NE 1/4 SE 1/4 sec. 6, T. 35 S., R. 18 E., has a dug well, which is 27 feet in depth and 5 feet in diameter. This is a fairly good well, although it went dry in 1947. George W. Young has a good dug well, in the SE 1/4 SW 1/4 sec. 1, T. 35 S., R. 17 E., that is 23 feet in depth and 16 feet in diameter. Altamont yields water very slowly, and, as in the case of the Bandera, a well of large diameter seems desirable for an adequate supply.

NOWATA SHALE

The Nowata shale formation ranges from 3 to 30 feet in thickness and has an average of 18 feet. It consists of clay shale, sandy shale, and sandstone. A thin-bedded to massive sanstone in the lower and middle Nowata has been called the Walter Johnson sandstone. Well logs gave no indication that this sandstone member is extensive in Labette County. A few wells derive water from the Nowata, but in general, this formation furnished only meager supplies.

A dug well on the W. F. Troxon farm, in the NE 1/4 NE 1/4 sec. 9, T. 34 S., R. 18 E., yields a fairly large supply of water, but it is contaminated by a nearby gas well. R. E. Harris has a 12-foot dug well, in the SW 1/4 SE 1/4 sec. 5, T. 34 S., R. 18 E., which penetrates the Nowata, but it has a very poor

yield and the water is hard.

## LENAPAH LIMESTONE

The Lenapah limestone, which overlies the Nowata, includes two limestone members and a shale member. It averages about 12 feet in thickness. The Lenapah is not a good water-bearing formation in Labette County.

## MEMORIAL AND BOURBON SHALES

Because of a lack of information, the Memorial and the Bourbon shales, which are above the Lenapah, are being considered together. The Memorial consists of about 10 feet of shale. The upper part of the Bourbon includes sandstone and interbedded black shale and flaggy limestone. Beneath this layer is 20 to 100 feet of light-colored shale; the Checkerboard limestone, which ranges in thickness from a featheredge to 6 feet; and the Helpler sanstone, which ranges in thickness from 2 to 20 feet and has an average thickness of approximately 10 feet. Drillers' logs indicate that these formations carry water, but the amount and quality are not known. Some gas is found, particularly in the Bourbon.

## BRONSON AND KANSAS CITY GROUPS

Directly above the Bourbon lies the Bronson group, and that in turn is overlain by the Kansas City group. The Bronson group ranges from 85 to 175 feet in thickness and has an average of about 135 feet. Included in the Bronson, listed from the bottom to the top layers, are the Hertha limestone,

Ladone shale, Swope limestone, Galesburg shale, and Dennis limestone. The Kansas City group is not represented in its entirety in Labette County, as the Chanute shale is the highest member present. Included between the Chanute shale and the top of the Bronson are the Drum limestone, Quivira shale, the Westerville limestone, the Wea shale, the Block limestone, and the Fontana shale. No information concerning the ground-water resources of these rocks was gathered.

## QUALITY OF WATER

Samples of water were collected from 55 wells in Labette County and analyzed for chloride and nitrate content. The results of these analyses are given in Table 1.

Water containing less than 150 parts per million of chloride is considered to be of excellent quality, and, if it contains from 150 to 350 parts per million, itis suitable for most purposes. However, more than 350 parts per million is undesirable for most purposes, but water containing as much as 1,500 parts per million can be used for stock. Water high in chloride is corrosive to casing and pipe.

The chloride content of the samples of water collected in Labette County varied from 4.5 to 7, 850 parts per million. About 15 percent of the samples contained more than 1,000 parts per million.

The amount of nitrate in ground waters in Kansas is receiving considerable attention from the State Board of Health owing to the recent occurrence of infant cyanosis caused from high nitrate content in the water used in baby formulas. A nitrate concentration of above 90 parts per million is considered dangerous by the State Board of Health for use in preparing the formula for babies less than three months old.

Table 1. Chloride and nitrate content of sample of water collected from wells in Labette County

| Well Number | Owner | Depth (feet) | Chloride (parts per million) | Nitrate (parts per million) |
|---|---|---|---|---|
| 31-20-26ba | F. W. Closs | 100. | 1380. | 6.6 |
| 31-20-28ba2 | do | 20.6 | 53. | 2.6 |
| 31-20-28bc | Chas. Chenoweth | 47.6 | 179. | 199. |
| 31-21-17cd | Dan Eisenbrandt | 22.5 | 109. | 133. |
| 31-21-17cd2 | do | 22. | 49. | 146. |
| 31-21-18cd | Floyd Campbell | 21.6 | 65. | 40. |
| 31-21-20da | D. N. Parks | 19.7 | 3490. | 8.0 |
| 31-21-29ad | R. L. Cook | 21.6 | 68. | 84. |
| 32-19-13cc | P. W. Johnston | 34. | 142. | 15. |
| 32-19-13da | John Gearhiser | 31.8 | 7.0 | 5.8 |
| 32-19-13dd | do | 27.6 | 107. | 173. |
| 32-20-19aa | Leo Johnson | 17.3 | 323. | 354. |
| 32-20-21aa | Joe Wilson | 240.0 | 3050. | 15. |
| 32-20-21aa2 | do | 70.0 | 54. | 173. |
| 32-20-21ab | do | 250. | 1470. | 30. |
| 32-21-8ad | W. R. Peak | 58.5 | 32. | 2.6 |
| 32-21-17cd | J. W.Nickle | 84. | 265. | 0.88 |
| 32-21-20bb | Mearl Brown | 82.6 | 123. | 1.1 |
| 32-21-29aa | A. L. Harshaw | 25. | 64. | 5.3 |
| 33-19-1cc | Mrs. Dennis | 23.3 | 20. | 24. |
| 33-19-13aa | C. O. Perry | 97.3 | 140. | 115. |
| 33-19-20bb | A. E. Krokstrom | 195. | 71. | 19. |
| 33-20-1dd | Ralph Swanson | 75. | 290. | 0.88 |

Table 1. Chloride and nitrate content of samples of water collected from wells in Labette County--Continued

| | | | | |
|---|---|---|---|---|
| 33-20-4dd | Anna B. Taylor | 17.0 | 38. | 53. |
| 33-20-5dc | J. B. Payne | 39.5 | 153. | 199. |
| 33-20-7aa | | 35.8 | 14. | 6.2 |
| 33-20-11aa | John M. Wiggins | 64. | 0.25 | 1.1 |
| 33-20-11aa2 | do | 28.0 | 8.0 | 35. |
| 33-20-14cc | B. W. Pinson | 350. | 1.3 | 5.8 |
| 33-20-20bb | D. Aylea | 45+ | 3.3 | 15. |
| 33-20-26cc | M. I. Miller | 78. | 0.22 | 0.97 |
| 33-20-27cb | C. V. Ruttgen | 30.6 | 20. | 89. |
| 33-20-29cd | J. R. Winters | 115.5 | 1.2 | 5.3 |
| 33-20-29cd2 | do | 24.8 | 68. | 301. |
| 33-20-36ac | Ralph Hayden | 158.0 | 2.8 | 12. |
| 33-20-36ac2 | do | 19.5 | 25. | 58. |
| 33-21-6dd | Carl Gray | 15.5 | 18. | 12. |
| 33-21-17ba | J. G. Crossland | 58.9 | 46. | 15. |
| 33-21-29cb | Burt Smith | 47.0 | 48. | 3.5 |
| 34-18-26dd | M. J. Neidigh | 70.5 | 15. | 44. |
| 34-19-1dd | M. H. Elliott | 19.0 | 202. | 390. |
| 34-19-8ba | J. H. Fowler | 133.0 | 12. | 5.3 |
| 34-19-20bb | R. M. Roberts | 48.0 | 8.0 | 19. |
| 34-19-32bb | C. B. Henry | 27.0 | 8.0 | 11. |
| 34-19-35ba | Clyde Johnson | 150. | 227. | 62. |
| 34-20-2ad | Fred Miller | 110. | 3730. | 7.1 |
| 34-20-14bb | C. Betson | 28.0 | 67. | 363. |
| 34-21-4bb | C. E. Youse | 50.0 | 64. | 80. |

Table 1. Chloride and nitrate content of samples of water collected from wells in Labette County--Concluded

| | | | | |
|---|---|---|---|---|
| 34-21-6dd | Ferd Hellwig | 130. | 110. | 128. |
| 34-21-15dd | R. C. King | 27.0 | 10. | 19. |
| 34-21-18cb | M. O. Davis | 30. | 70. | 89. |
| 35-18-4cc | Drue Wood | 231. | 1850. | 5.8 |
| 35-18-5dd | School District | 17.1 | 10. | 62. |
| 35-19-10ad | Louis Cranor | 13.8 | 4.5 | 17. |
| 35-19-10da | do | 11.9 | 5.5 | 5.8 |

The nitrates in the 85 samples of water varied from 0.88 to 390 parts per million. A high nitrate concentration may indicate that the well is polluted. Wells having highest concentrations of nitrates were dug wells which had been poorly covered or cased andwere easily accessible to surface pollution.

The occurrence of chlorides and nitrates in the samples of water analyzed are summarized in Table 2.

Table 2. Summary of chloride and nitrate in water samples collected from wells in Labette County. The number of samples collected in each formation are shown for each range in concentration of chloride and nitrate

| Geologic formation | Cherokee | Fort Scott | Labette | Pawnee | Bandera | Altamont | Alluvium | Total |
|---|---|---|---|---|---|---|---|---|
| | Number of samples | | | | | | | |
| Chloride (Parts per million) | | | | | | | | |
| Less than 50 | 5 | 1 | 1 | 1 | 8 | 1 | 1 | 18 |
| 51 to 200 | 5 | 5 | 3 | 3 | 6 | 0 | 0 | 22 |
| 201 to 500 | 3 | 1 | 0 | 0 | 2 | 0 | 0 | 6 |
| 501 to 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,001 to 4,000 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 6 |
| 4,001 to 8,000 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total | 18 | 9 | 4 | 4 | 16 | 1 | 1 | 53 |
| Nitrate (parts per million) | | | | | | | | |
| Less than 10 | 9 | 4 | 1 | 0 | 4 | 0 | 0 | 18 |
| 11 to 30 | 5 | 1 | 0 | 3 | 4 | 0 | 0 | 13 |
| 31 to 50 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 3 |
| 51 to 100 | 3 | 1 | 0 | 1 | 1 | 1 | 0 | 7 |
| 101 to 200 | 1 | 1 | 2 | 0 | 3 | 0 | 1 | 8 |
| 201 to 400 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 4 |
| Total | 18 | 9 | 4 | 5 | 15 | 1 | 1 | 53 |

## CONCLUSIONS

Owing to inadequate information at this time, only tenative conclusions can be made as to the possibilities of increased ground-water production from Pennsylvanian rocks of this county. In some areas attempts to obtain water by drilling have not been made. Many farmers rely entirely upon rain water catchments for their domestic supplies; they may or may not have a shallow dug well from which they obtain water for poultry and stock. Many of the dug wells go dry or nearly dry during period of low precipitation and the farmer is forced to haul water for his stock. In many cases, this condition is being alleviated by the construction of stock ponds.

Unless further study indicates that in some areas potable ground-water supplies are unavailable, it seems that a systematic drilling program is advisable. Wells should be accurately logged and water samples taken from every water-bearing formation. By so doing, any formation carrying undesirable water could be isolated and cased off in order to avoid contamination of the well. If by test drilling, certain areas are found to be devoid of usable ground water, it will be necessary to construct more stock ponds and to continue to use cisterns and dug wells for domestic purposes. Many cisterns and dug wells are polluted and steps should be taken to filter and purify this water. Contamination by surface runoff may be lessened by proper well construction.

During the course of the field work of this investigation 115 wells were visited, of which 65 percent were shallow dug wells. About 65 percent of the wells are less than 40 feet in depth and 23 percent have a depth of less than 20 feet. This preliminary study indicates that there has been too much dependence on shallow dug wells and that the deeper aquifers have not

been thoroughly tested. In parts of Labette County is seems impossible to develop either a shallow or deep well. Three examples will be given of good wells that have been drilled recently. These wells are located in three areas which formerly depended on meager supplies from shallow dug wells.

Two wells were drilled recently near Altamont which were reported by the driller to yield about 50 gallons a minute. These wells are about 120 feet in depth and obtain their water supply from the Pawnee limestone. Almost all the wells in Altamont are less than 40 feet in depth. Two wells in Bartlett have been drilled to a depth of approximately 100 feet. The driller reported these wells furnish good potable water supplies. A well belonging to F. W. Closs was drilled on a farm in sec. 28, T. 31 S., R. 30 E., east of Parsons. This well was reported to yield an adequate supply of water for stock and domestic use. The water has a chloride content of 1,380 parts per million which is fairly high for drinking purposes. The owner considers the water satisfactory, however, and plans to install a water system in his home. This well has a depth of 100 feet and is in an area where water supplies have been generally difficult to obtain. Water containing a fairly high chloride content is satisfactory for stock purposes. In many areas wells probably can be drilled where the water would be too highly mineralized for domestic use but would be satisfactory for stock use.

Adequate domestic and stock supplies are difficult to develop in Labette County, but I would like to emphasize that in many areas the deeper aquifers have not been tested. The program of constructing farm ponds for stock purposes should be encouraged as a supplemental water supply. A thorough study should be made as soon as possible of the ground-water resources of the county.

## REFERENCES

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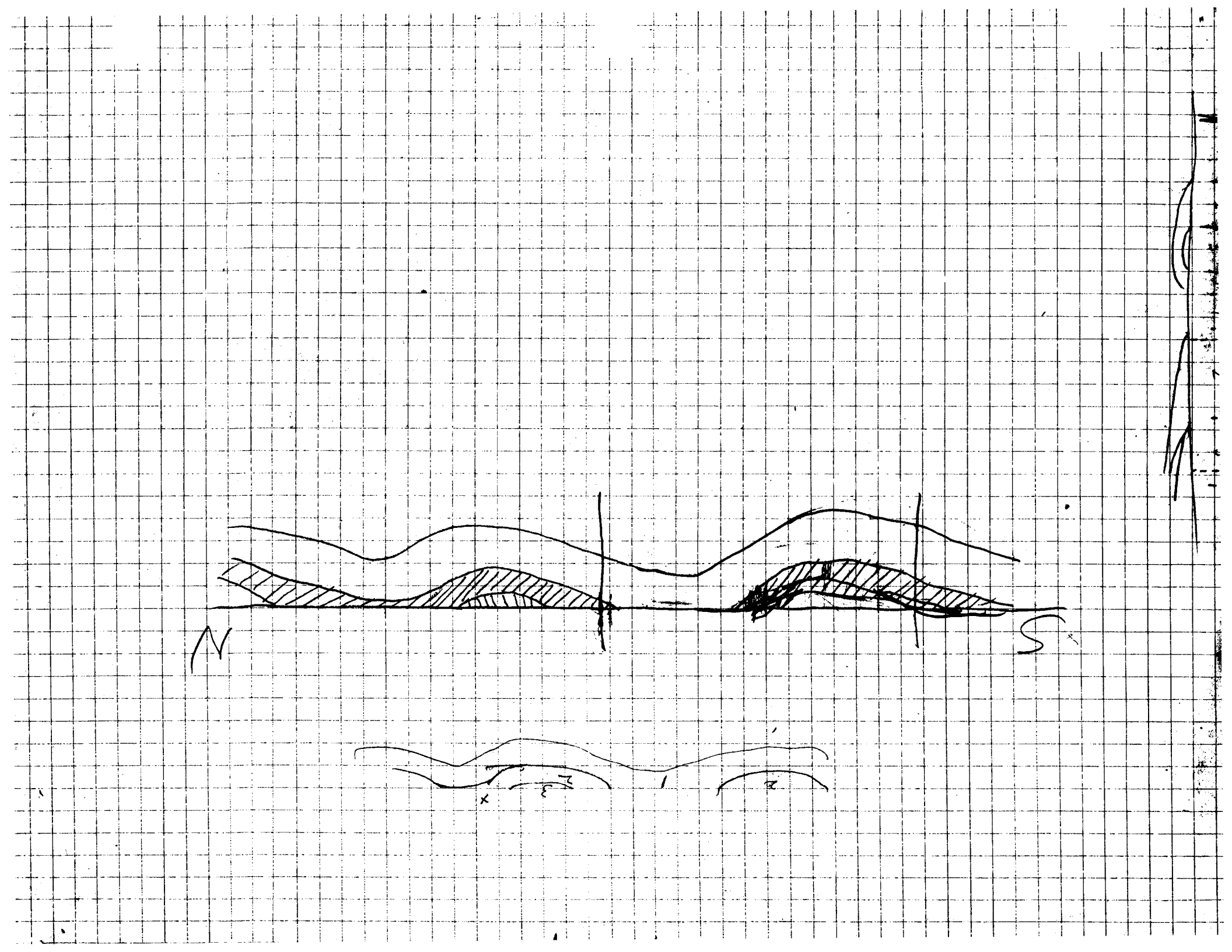
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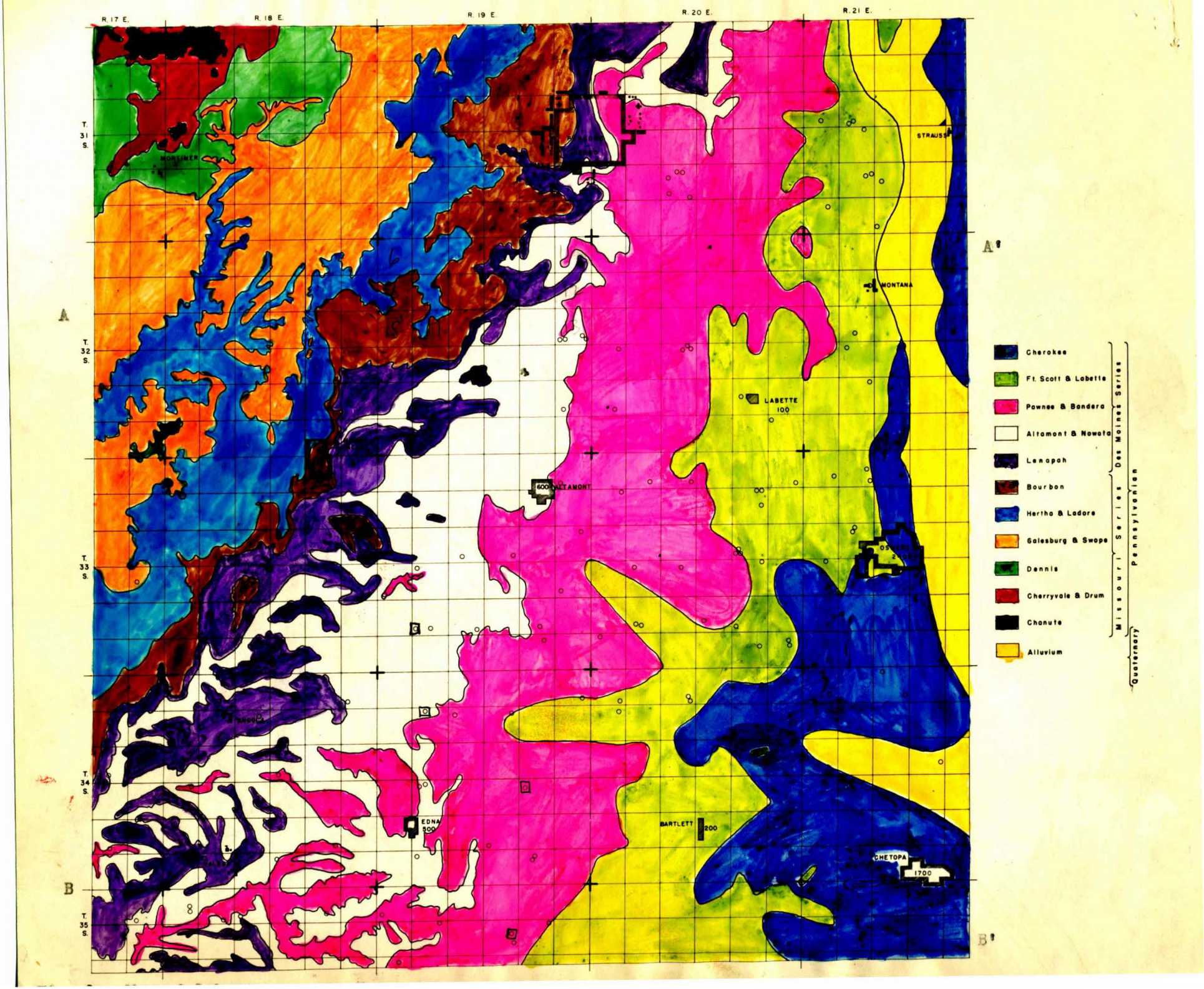
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Pawnee & Bandera
Altamont & Nowata
Lenapah
Bourbon
Hertha & Ladore
Galesburg & Swope
Dennis
Cherryvale & Drum
Chanute
Alluvium
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has exposures of rocks of the Kansas City group, the youngest consolidated formations in the county.

The above Pennsylvanian rocks supply most of the water available to wells except the wells in the alluvium of the Neosho River and other valleys. The ultimate source of the water pumped in Labette County is from precipitation on the outcrop area. This water moves slowly westward through the rocks in the direction of regional dip.

Potable ground-water supplies can be obtained from some of the formations at shallow depths. Deep wells in Labette County generally yield mineralized water. The problem is to determine the formations that yield suitable water supplies and the depth at which the supplies can be obtained.

## CHEROKEE SHALE

The oldest rock formation that crops out in the county is the Cherokee shale of the Desmoinesian series. This formation is variable as to composition, and though light and dark shale predominates, much sandstone, sandy shale, some important coal beds, and a few thin limestone beds are present. The thickness at the outcrop ranges from 400 to 600 feet and averages about 450 feet. The Cherokee formation contains much water in its lenticular sands. However, its water may often be salty or taste of sulphur. This is especially true of water obtained from the Mulky coal member which often contains natural gas.

A well on the farm of Ferd Hellwig, in the SE¼ SE¼ sec. 6, T. 34 S., R. 21 E., is 130 feet deep and derives its water from the Cherokee. It yields an ample supply of water which is reported to be rather hard. George Cunningham has a dug well in the SE¼ SE¼ sec. 4, T. 34 S., R. 21 E., which

is 24 feet in depth and produces an adequate amount of palatable water. A drilled well in the SW¼ SW¼ sec. 14, T. 33 S., R. 20 E., owned by B. W. Pinson, is 350 feet deep and yields a large supply of salty water. J. W. Nickle, who lives in the SE¼ SW¼ sec. 17, T. 32 S., R. 21 E., has a drilled well 84 feet deep that yields an abundant supply of water which has a strong odor of hydrogen sulphide.

## FORT SCOTT LIMESTONE

The next oldest formation exposed at the surface is the Fort Scott limestone (frequently referred to as Oswego by drillers), the basal formation of the Marmaton group. Two limestone members with an intervening black shale member comprise the Fort Scott limestone. These are, from top to bottom, the Higginsville limestone, the Little Osage shale, and the Blackjack Creek limestone member. The characteristic thickness of the Fort Scott is about 33 feet.

According to well drillers and well records, the Fort Scott is a fairly adequate water-bearing formation and many wells tap its supply. The Little Osage member seems to contain the most water. Shale is not ordinarily a good aquifer, but the Little Osage is platy and contains many cleavage cracks and planes along which water might move. It is possible that a porous zone at the base of the Higginsville may supply the water rather than the shale zone of the Little Osage. The quality of the Fort Scott water is generally good, although it is sometimes salty or sulphury. Some gas may be obtained from the Fort Scott.

One of the best wells recorded in the inventory was a well owned by Leonard Post who lives in the NW¼ NW¼ sec. 23, T. 34 S., R. 19 E. This well was 175 feet in depth and derived the majority of its water from the Little

Osage member of the Fort Scott. Mr. Post reports that the water has a slight soda taste. A dug well on the Hall farm, in the NE¼ SE¼ sec. 35, T. 33 S., R. 20 E., is 18 feet deep and 4 feet in diameter. This well is reported never to have gone dry. H. Billington gets a large supply of salty water from an 80-foot drilled well in the NE¼ NE¼ sec. 7, T. 34 S., R. 20 E. He reported that salty water was encountered in the Little Osage member of the Fort Scott.

## LABETTE SHALE

The Labette shale consists of from 30 to 100 feet of clay shale, sandy shale, sandstone, and a few thin coal and limestone beds. It also contains the Englevale sandstone member (Peru in the subsurface), a lenticular body lying in the middle and lower parts of the Labette. The Labette furnishes water to a few wells in the area, but it is apparently a rather insignificant aquifer. The extent of the Englevale sandstone is not well known.

J. H. Fowler, who lives in the NE¼ NW¼ sec. 8, T. 34 S., R. 19 E., had a well drilled 177 feet to the Fort Scott. Water was encountered in the Labette and gas in the Fort Scott. In order to utilize both, a plug was inserted at 133 feet, thus separating water from gas. A pipe penetrating the plug conducts gas to the surface and another pipe carries the abundant supply of good tasting water from the Labette formation. A typical well in the Labette, owned by Floyd Campbell, is in the SE¼ SW¼ sec. 18, T. 31 S., R. 21 E. This well, which is 22 feet deep, is good in times of normal rainfall, but fails during extensive dry periods.

## PAWNEE LIMESTONE

The upper part of the Pawnee limestone consists of two persistent

Cooperating Agencies
Kansas State Board of Agriculture
Division of Water Resources
Kansas State Board of Health
Division of Sanitation

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY
AND
STATE GEOLOGICAL SURVEY OF KANSAS
DIVISION OF GROUND WATER, UNIVERSITY OF KANSAS, LAWRENCE

Address Reply To
Federal and State Geological
Surveys,
University of Kansas
Lawrence



August 13, 1948

Dr. Leon Baumann
County Health Department
Labette County, Kansas
Parson, Kansas

Dear Dr. Baumann:

I am transmitting herewith a copy of a report by G. C. Prescott prepared as a result of his preliminary study of the ground-water resources of Labette County. Early in the course of this investigation we concluded that a satisfactory study of the ground water in Labette County could be made only in cooperation with all the well drillers in the area. I feel that we could come out with some very worthwhile information if we could work with the drillers and collect information on every well as it is being drilled.

In some places in Labette County it is impossible to develope a satisfactory well but in many places the farmers have not made any tests of the deeper supplies. A large percentage of the wells are shallow dug wells which are generally polluted and fail quickly during dry weather. Very frequently a drilled well encounters a satisfactory supply of water in Labette County

Due to the pressure of other work we will not get to devote much time to Labette County for the next few months but I hope that we can begin a more systematic study next summer.

I believe conditions are favorable for the development of a municipal supply at Altamont and they are going ahead with some tests. We are keeping in touch with developments there.

If you have any questions regarding the enclosed memorandum I will be very glad to discuss them with you. I plan to be out of town for about two weeks but as soon as I return I would be glad to come to Parsons.

Very truly yours,

V. C. Fishel
District Engineer

cc: J. M. Jewett
Odgen S. Jones
John C. Fr[illegible]

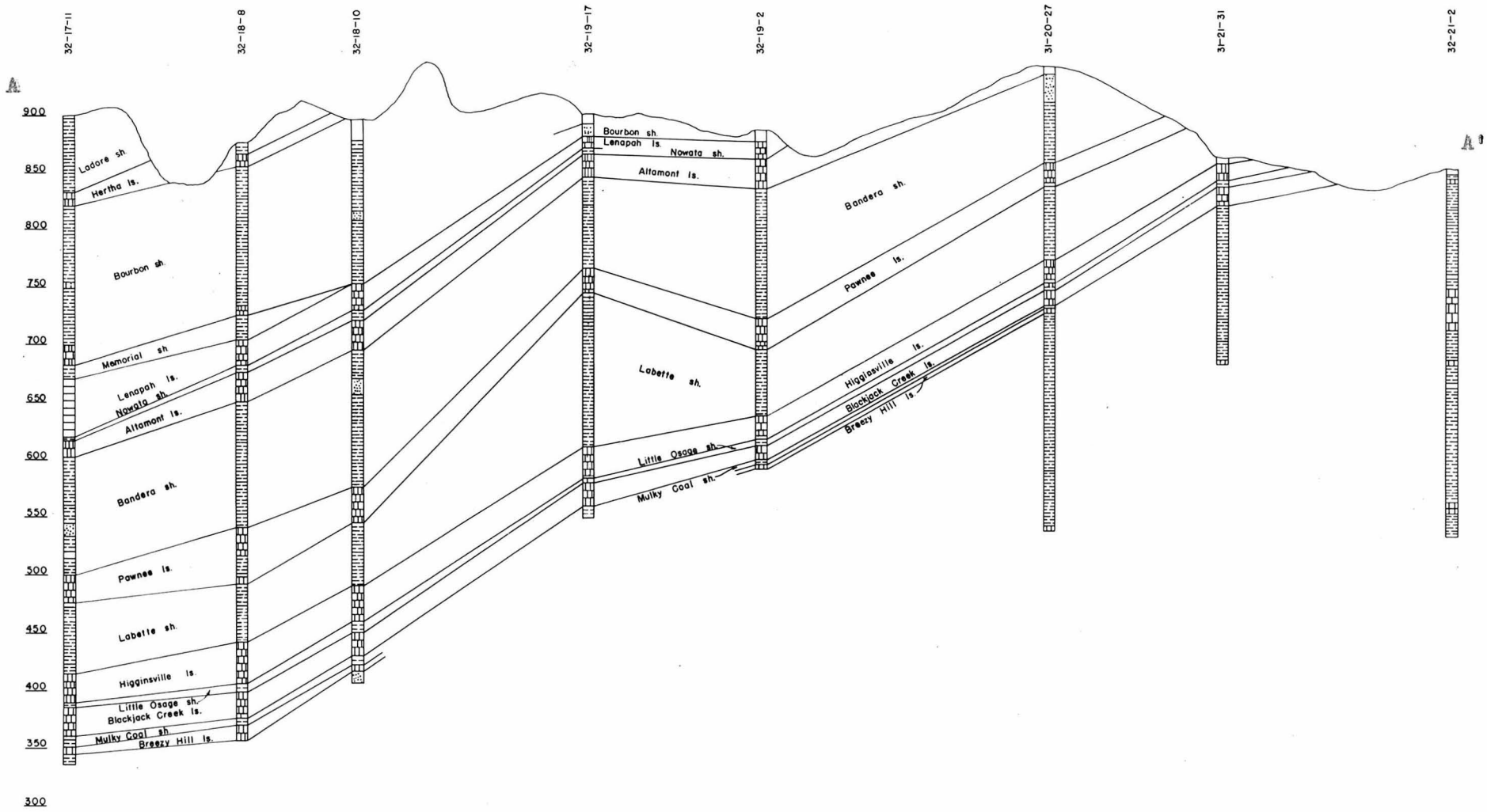



Fig. 2. East-west geologic profile through the northern part of Labette County. Location of profile indicated by A-A' on Figure 1.

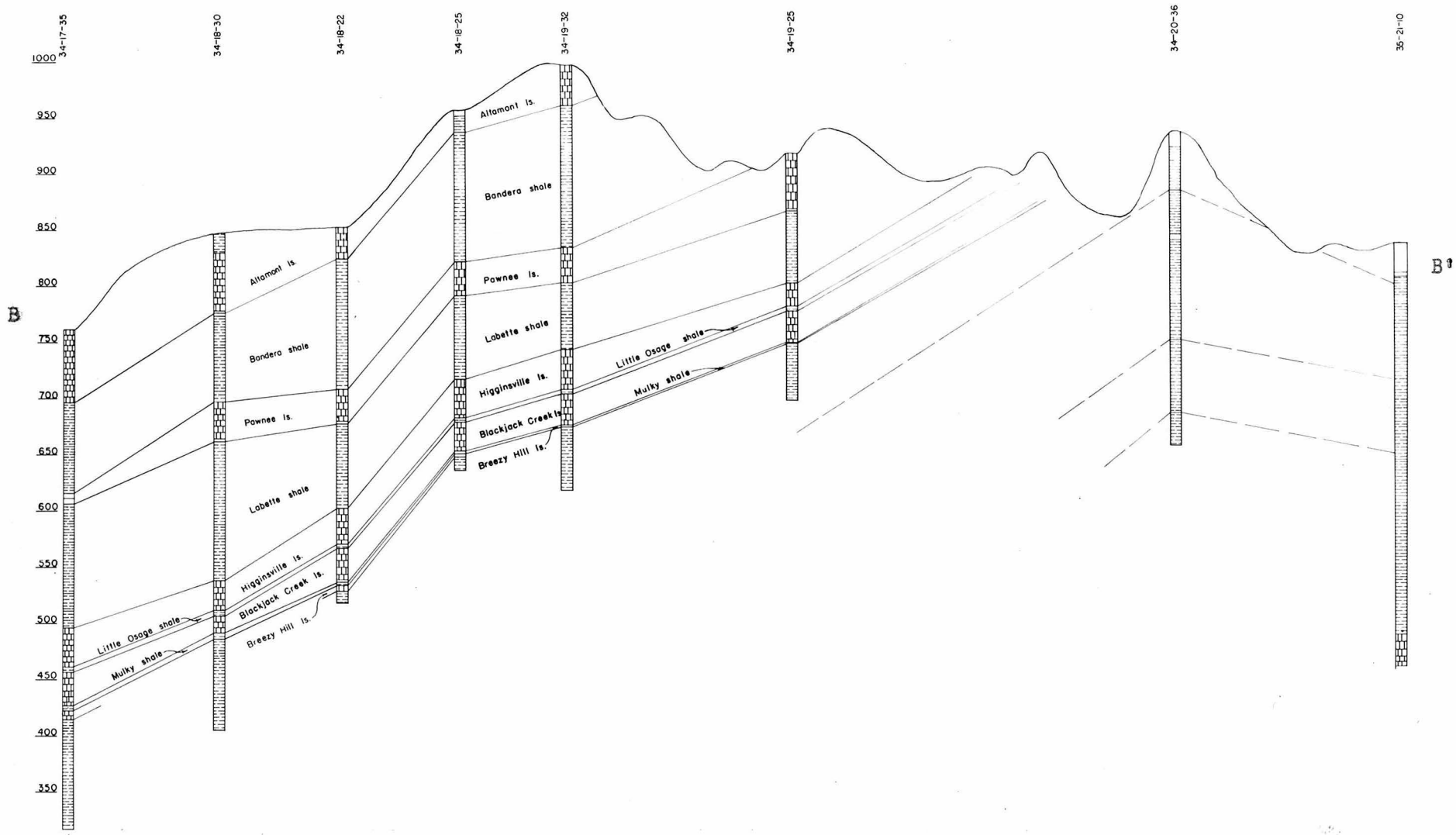
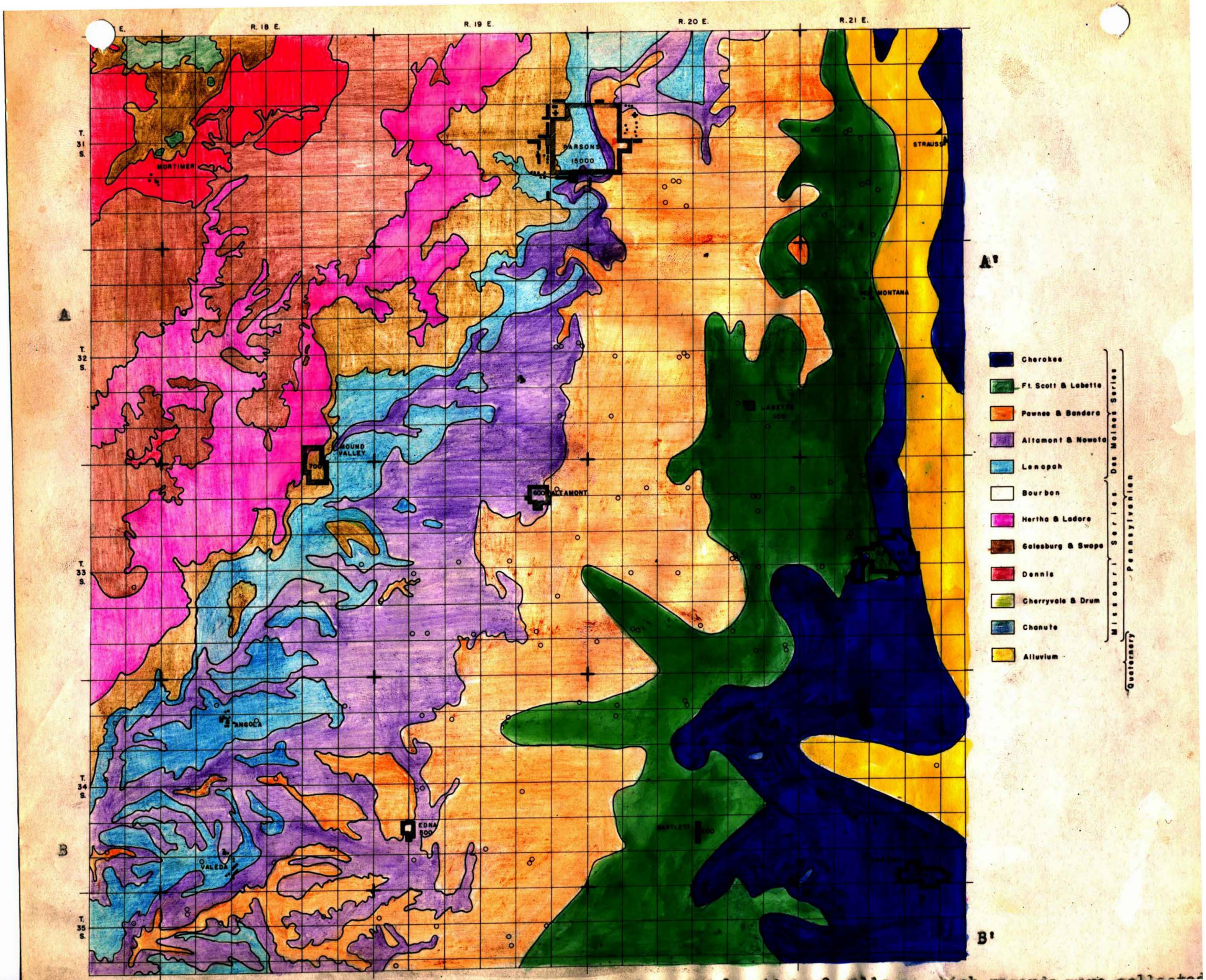
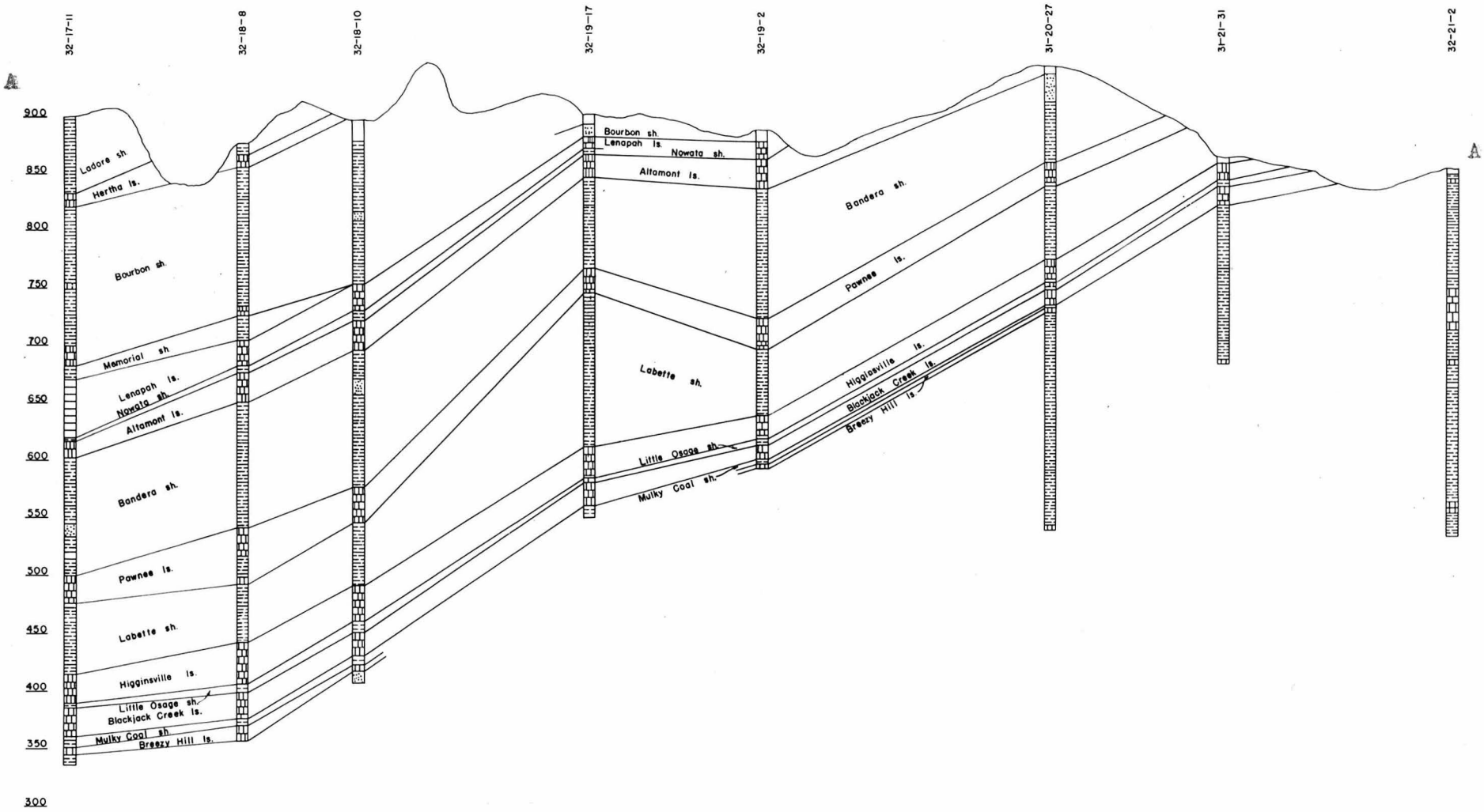



Fig. 3. East-west geologic profile through the southern part of Labette County. Location of profile indicated by B-B' on Figure 1.


R. 18 E.
R. 19 E.
R. 20 E.
R. 21 E.
T. 31 S.
T. 32 S.
T. 33 S.
T. 34 S.
T. 35 S.
A
A'
B
B'
MORTIMER
PARSONS
15000
STRAUSS
MONTANA
LABETTE
MOUND VALLEY
ALTAMONT
ANGOLA
EDNA
BARTLETT
VALEDA
Cherokee
Ft. Scott & Labette
Pawnee & Bandera
Altamont & Nowata
Lenapah
Bourbon
Hertha & Ladore
Galesburg & Swope
Dennis
Cherryvale & Drum
Chanute
Alluvium
Missouri Series
Des Moines Series
Pennsylvanian
Quaternary

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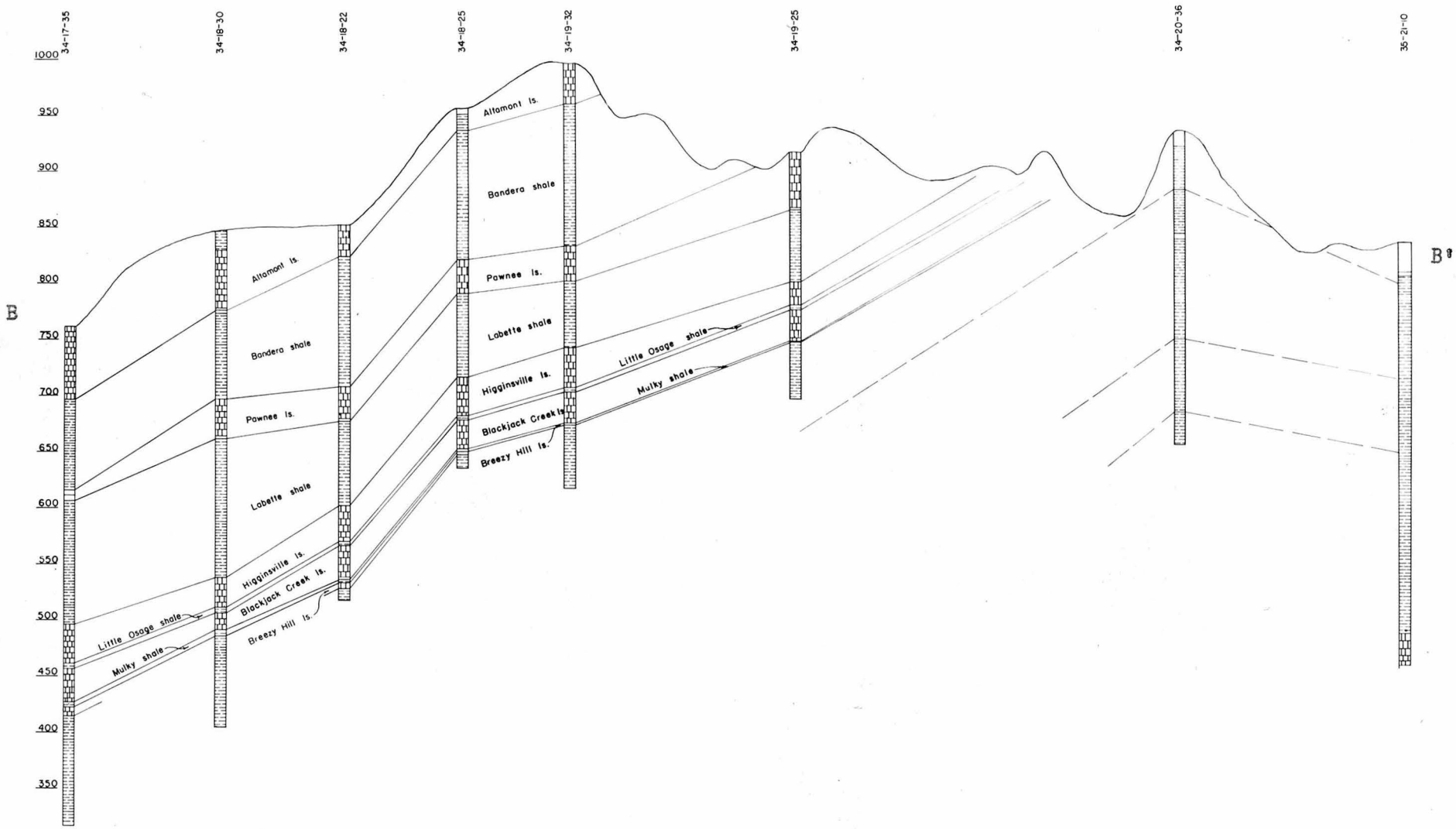


Fig. 3. East-west geologic profile through the southern part of Labette County. Location of profile indicated by B-B' on Figure 1.