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THE MEDIA ANTICLINE, HENDERSON COUNTY, ILLINOIS

By A. H. Bell and L. E. Workman

Introduction

The Media anticline has recently come to the attention of the State Geological Survey through Messrs. C. R. Pendarvis of Media and Fred Gibson of Kirkwood, who have been interested for several years in the oil possibilities of this region. The structure is situated in the southeastern part of Henderson County in T. 9 N., R. 4 W., (Media Township) and extends in a direction west-northwest and east-southeast across the township, through the village of Media. The geographic position of the Media anticline, with its relation to the nearest producing area, the Colmar-Plymouth oil field, is indicated in figure 1.

This paper is published in accordance with the policy of the Survey to provide information on the oil and gas possibilities of territory that extends beyond the leases now held. It gives the results of a study of the structural geology of the area near Media, based partly on data supplied by Mr. Pendarvis and partly on field work by the authors. This report is here made public for the first time.

Oil Showings and Previous Development

Three oil and gas seepages have been brought to the notice of the writers. One is found on the Ericson farm three hundred feet northeast of the center of sec. 24, where the gas and oil come up through the mud and broken chert in the bed of a small stream. The bedrock immediately below is the Burlington limestone, and the contact with the underlying Kinderhook is probably about 30 feet below the surface. Another seepage is found along the bed of a stream 1000 feet east of the west line and 300 feet south of the railroad in sec. 21. It is possible that the oil here has come from a leak in one or more of the several oil pipe lines, of the Prairie and Sinclair Pipe Line companies, along the base of the railroad embankment. However, it is reported by an old resident that oil appeared on the water in the vicinity before the pipe lines were put down. A third seepage was reported on the Dalton estate in the NE. ¼ sec. 13, but this location was not visited.

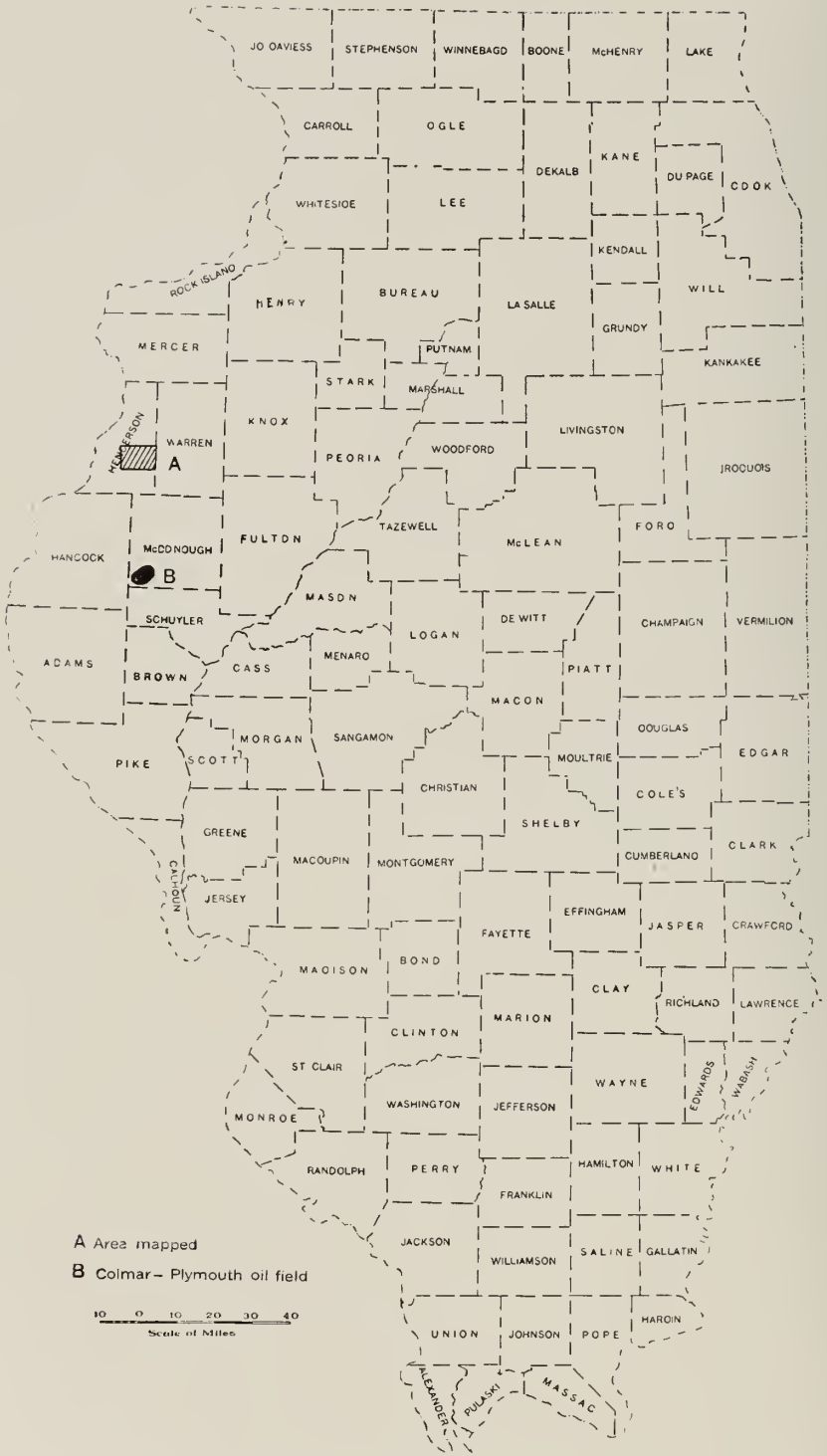


FIG. 1. Index map of the State showing area included in this report.

At some time before 1898 a water well, drilled to a depth of 204 feet on the William Pogue estate in NW. ¼ NE. ¼ sec. 17, T. 9 N., R. 4 W., gave sufficient gas pressure to blow the pump tubes out of the well. The Rankin No. 1 well was then drilled for oil nearby to a depth of 213 feet, and it is reported that sufficient oil was found to fill up the hole and run over the top down the hill. This well, however, did not continue to produce. Rankin well No. 2 was then drilled to a depth of 606 feet. A slight showing of oil was reported at 150 feet, but at 500 feet salt water began to flow over the top of the casing, the stream increasing with the depth drilled. In 1916 the Richey well was drilled to a depth of 504 feet. A little gas and oil was reported at 146 feet. At 424 feet the hole filled up with fresh water which is now believed to have been surface water breaking in around the casing. The Pogue well No. 1 was drilled in 1916 so close to the Rankin No. 1 that it probably penetrated the old well. Some thick, heavy oil or tar was obtained which appeared to be the oil residue after the more volatile parts had escaped through the old well. No drilling has been undertaken recently in this area.

Many data have been collected privately by Mr. Pendarvis on wells and outcrops in the vicinity of Media, and under his direction levels were run to such of these as he considered of value in outlining the structure. In 1916 Mr. William C. Morse was engaged by Mr. Pendarvis to go over these data and make a report on the oil possibilities in the region. The area which he recommended as favorable for testing was much the same as is now inclosed by the 680-foot contour line. (See figure 3.)

The field work for this report undertaken by the authors consisted of traversing most of the creeks in the township for outcrops, and running additional levels, by means of the barometer, to all the exposed points of Burlington-Kinderhook contact, to springs which might indicate such a contact, and to the lowest points to be obtained on Burlington outcrops. The accompanying contour map, figure 3, was prepared from data furnished by Mr. Pendarvis and that collected more recently by the Survey.

General Geology

The graphic log, figure 2, shows the thickness and characteristics of the strata underlying the Media region. Surface deposits consist of glacial drift with a thin covering of loess. Their average combined thickness is about 30 feet, although well records show that the thickness ranges from 20 to 105 feet. The drift lies unconformably on the eroded edges of the Burlington limestone and Kinderhook shale formations. These are exposed in outcrops along Ellison Creek and its tributaries where the streams have cut through the drift.

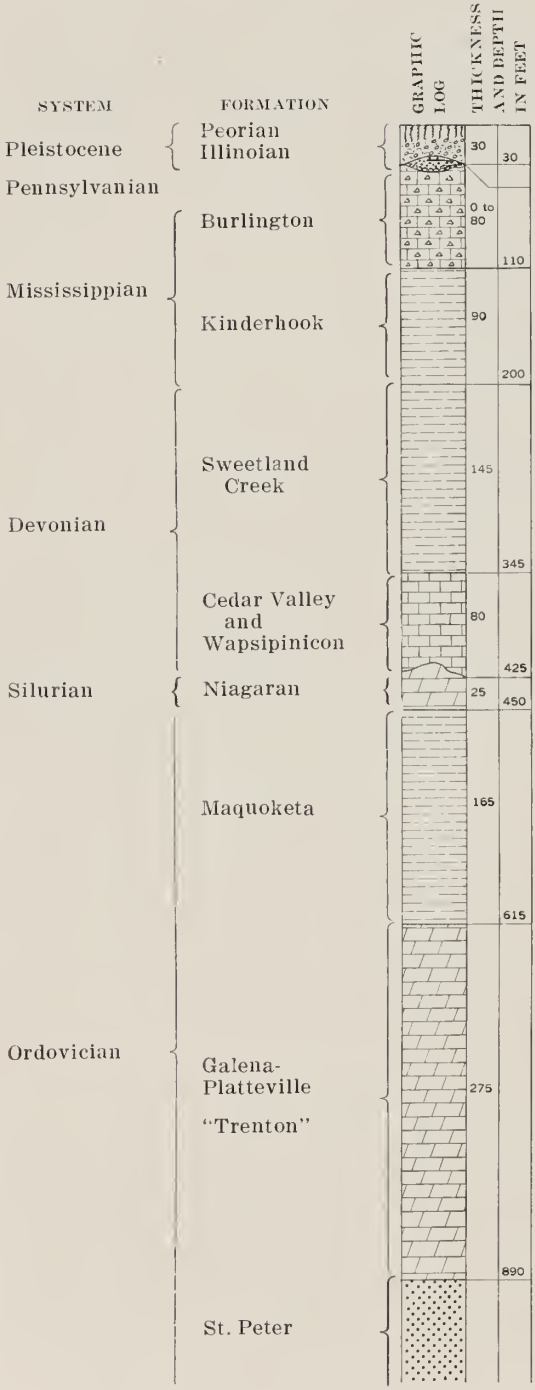


FIG. 2. Generalized geologic section for Media area.

The Burlington is a coarsely granular limestone made up largely of the broken plates and stems of crinoids. In general the upper beds are light gray and fairly pure, whereas the lower are brown, finer grained, and more or less magnesian. Nodules and beds of chert are common throughout the formation. The thickness of the Burlington in this region is about 80 feet. Its outcrops extend roughly along a V-shaped line from sec. 35, T. 10 N., R. 5 W., through sec. 24, T. 9 N., R. 4 W., to sec. 25, T. 9 N., R. 5 W., as shown on the map. Valleys in the Burlington formation are narrow with steep slopes.

The Kinderhook formation is a dolomitic, grayish-blue shale. Where capped by the Burlington it is protected somewhat from erosion and steep faces are commonly developed. Where the Burlington has been removed by erosion, the Kinderhook has weathered considerably so that long slopes and wide flood plains in the valleys have been developed; consequently good outcrops of the Kinderhook are rare under these conditions. Because the shale is impervious, water flowing through the cracks and solution channels of the limestone comes out in the valleys at numerous springs along the contact. The thickness of the Kinderhook is about 90 feet.

Under the Kinderhook are the Devonian shale and limestone, the Niagaran dolomite, the Maquoketa shale, and the Galena-Platteville (Trenton) dolomite, to the St. Peter sandstone. These are found only by drilling. Their thicknesses and general characteristics may be seen in the graphic log (fig. 2).

Structure

The structure of the area is illustrated by a contour map showing the altitude of the base of the Burlington limestone. Some of the datum points are on actual outcrops of the contact; others are on probable positions of the contact inferred from the spring horizon or water zone immediately above the impervious Kinderhook shale. The datum points used in drawing the contours are listed in the table which should be used in conjunction with figure 3. Because the Burlington ilmestone has been removed by erosion from the higher parts of the structure, it was necessary to calculate its probable altitude for three of the datum points. This was done by adding an assumed interval between the Burlington and the base of the "Niagaran" limestone to the altitude of the latter as obtained from the well logs. The value of 340 feet for this assumed interval was taken from the logs of the Stronghurst and Parrish wells in which both formations are recorded.

The most conspicuous structural feature is the Media anticline. Its axis trends approximately west-northwest and east-southeast. Available data indicate a probable closure of 60 feet. Two local structural highs lie along the major anticlinal axis and are separated by a slight saddle. One of them centers around the Richey, Rankin, and Pogue wells in secs. 8 and

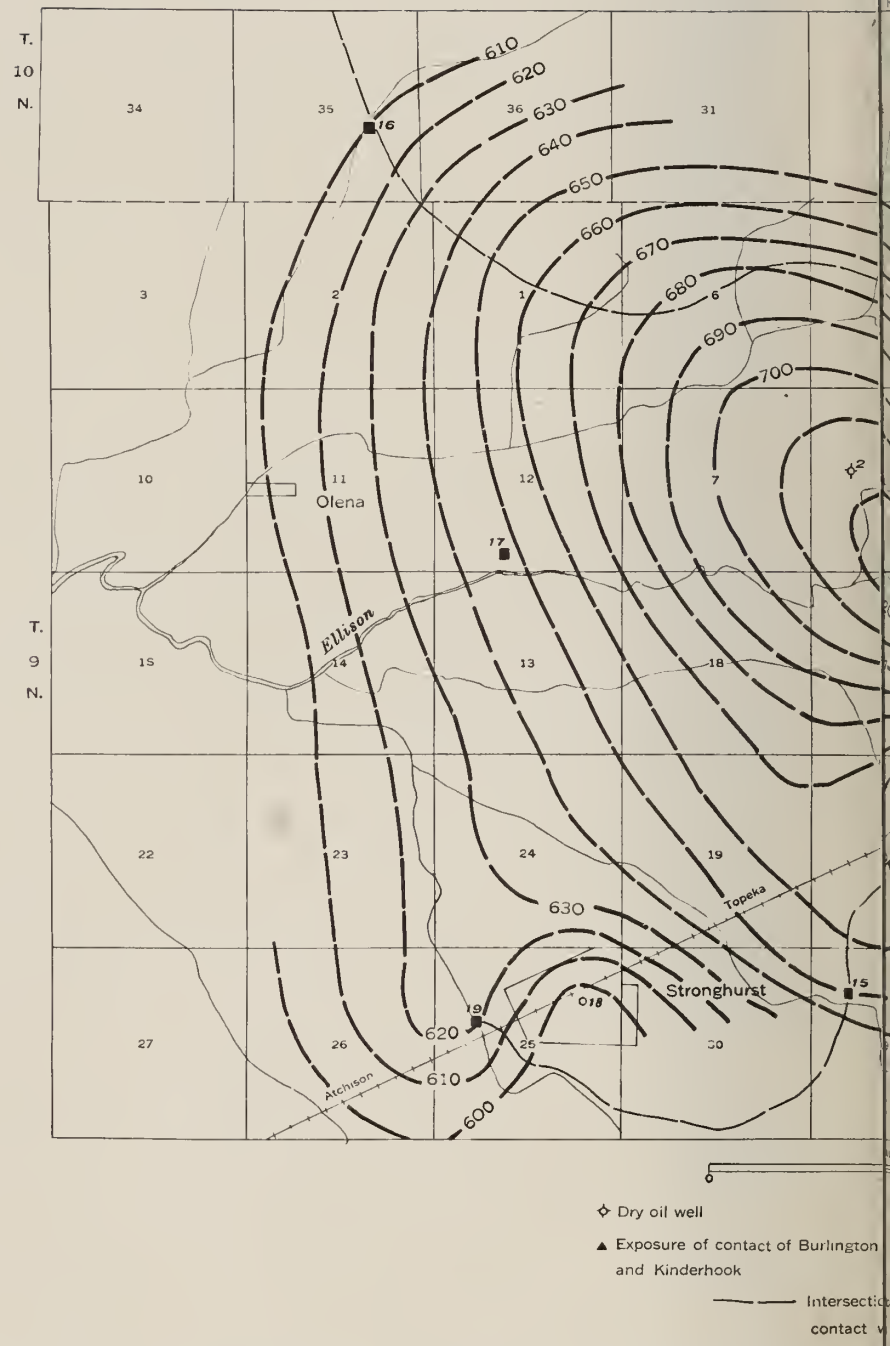
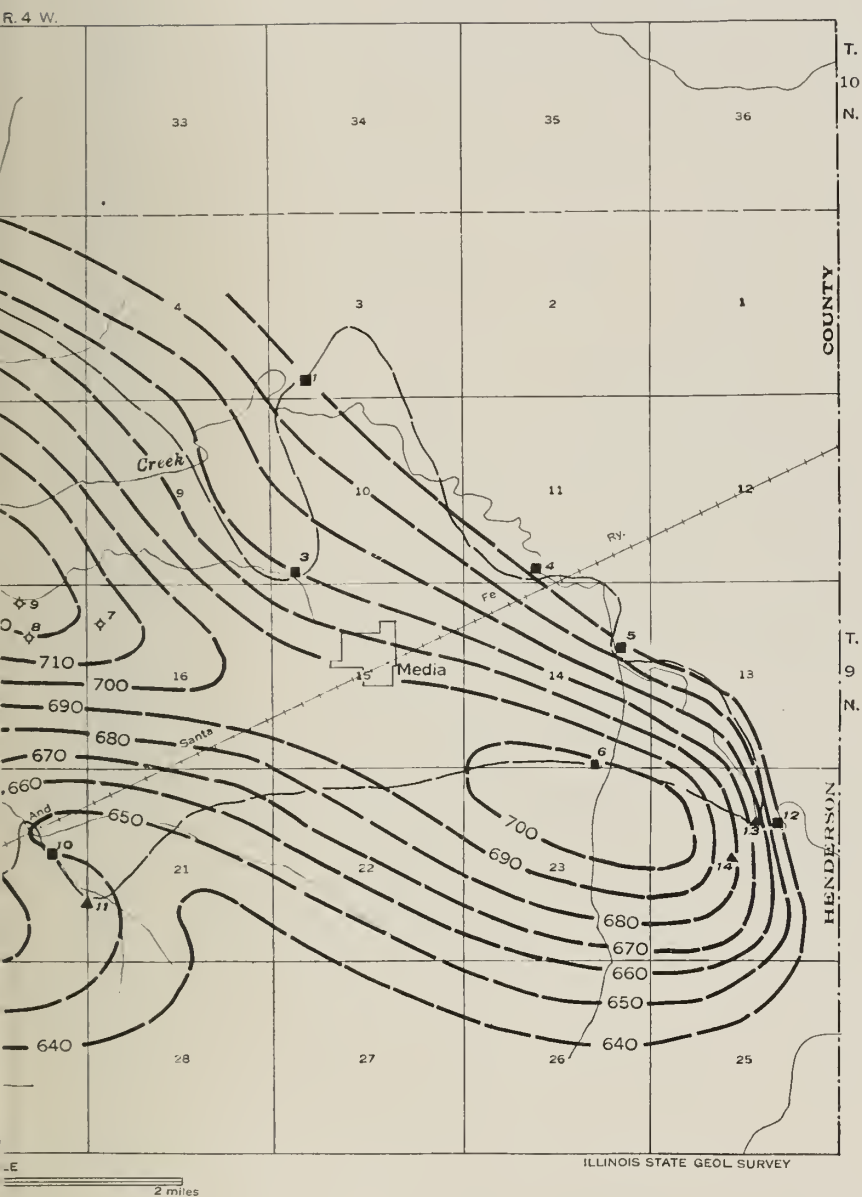


FIG. 3. Structure map of the Media area. Key horizon, base of th



o Water well

■ Probable elevation of Burlington–Kinderhook contact

f Burlington–Kinderhook rock surface

Burlington formation. Contour interval, 10 feet. Datum, sea level.

17, T. 9 N., R. 4 W. The other is about 4 miles farther east and appears to lie mainly in secs. 23 and 24, T. 9 N., R. 4 W. The relatively steep dips to the north, northeast, and east are based on observations of fairly continuous outcrops. Lack of outcrops to the south prevented the determination of dip by direct observation; the south dip shown, therefore, is not proved, but is considered to be a probable eastward continuation of the south dip measured in secs. 17 and 20.

The Media anticline appears to represent the highest up-warping of the Burlington and associated formations within a radius of at least 15 or 20 miles. At Burlington, Iowa, about 12 miles west of the west border of the area mapped, the Burlington-Kinderhook contact lies at an elevation of 520 feet or about 200 feet lower than at the crest of the Media anticline. The same contact in the LaHarpe and Good Hope quadrangles to the south and southeast, and in the Monmouth quadrangle to the east and northeast, has a maximum elevation of 550 feet and a minimum elevation of 250 feet. At Biggsville, about 5 miles north of Media, the *Orthoceras keokuk* bed of the Keokuk limestone outcrops. Its position in the type section, with respect to the base of the Burlington limestone, is known and so the altitude of the base of the Burlington at Biggsville can be calculated. This altitude varies from 458 to 500 feet, more than 200 feet below the altitude of the same horizon at the crest of the Media anticline.

Oil and Gas Possibilities

In areal extent and amount of closure the Media anticline appears adequate to have influenced the accumulation of oil and gas in commercial quantities. Showings of oil and gas in the top of the Devonian limestone were found in the Richey, Rankin and Pogue wells which are all near the crest of its western part. These wells were drilled into the Kimmswick ("Trenton") limestone without finding commercial production and accordingly this part of the structure seems to be condemned. The structural high to the southeast of Media has not yet been tested and the steeper dips on the basinward side of this structure make it appear somewhat more favorable as an oil structure than that part of the Media anticline which has already been tested. For this reason it appears to merit test drilling.

Recommendations

A favorable location for a test of the eastern part of the Media anticline appears to be in the area inclosed by the 700-foot contour in sec. 24 and the adjacent part of sec. 23, T. 9 N., R. 4 W. In view of the oil showings found in the upper part of the Devonian limestone this formation appears to offer the best chance of being productive of oil. The Galena-Platteville also has possibilities of oil production for it is correlated with the

Kimmswick or "Trenton" which produces oil in the Waterloo pool, Monroe County, and the Westfield pool, Clark County, Illinois, and, to a greater extent, in Indiana and Ohio. However, in many places where it has been drilled in this part of Illinois it does not contain porous strata, and for this reason is less favorable as a prospective oil horizon than is the Devonian limestone. There is some suggestion that a porous zone may be looked for near the top of the Galena-Platteville formation, inasmuch as at Bushnell, 25 miles southeast of Media, 11 feet of sand was reported at this horizon. In order to test the whole of the Galena-Platteville it would be necessary to drill through it to the top of the St. Peter sandstone, which may be expected to be at a depth of about 800 feet in the area recommended for testing. The advisability of testing the whole of this formation (275 feet) is, however, open to question, as it is doubtful whether or not the prospects of production warrant the considerable additional expense involved. In view of the possibility of a porous zone in the upper 10 or 15 feet of the Galena-Platteville, as suggested above, it might be worth while to test this much of the formation. The top may be expected at a depth between 500 and 550 feet in the area recommended for testing.

In some of the oil fields of Illinois and other states it has been found that the oil sands lie on the flanks of anticlinal structures without extending over the tops. A dry hole on the top of a structure, therefore, does not necessarily condemn the flanks. Localized lenses of Hoing sand might exist on the sides of the Media anticline. Accordingly the territory included between the 670- and 700-foot contours on the part of the structure to the east of Media is considered to have possibilities of production if Hoing sand is present. As the dips are steeper around this eastern part of the anticline than to the west of Media, it is recommended that the eastern part be tested first. If production should be obtained on either the top or flanks of the eastern part of the Media anticline, testing might be continued on the flanks to the west of Media.

Casing

For the benefit of those who may undertake drilling in the area, the following suggestions concerning casing are included.

To prevent the entrance of surface water and ground water from the glacial drift and Burlington, 10 inch conductor pipe might be used. Probably not more than 40 feet of 10 inch pipe would be needed. With 8¼ inch casing set on top of the Devonian limestone (at a probable depth of about 275 feet) the hole would be dry and in good condition for testing the Devonian limestone. If production is not found here the most advantageous point for setting the 6⅝ inch casing depends on whether or not the Hoing sand is present. If Hoing sand is found and if water is coming in, then the 6⅝ inch casing should be set on top of the Hoing sand. If Hoing sand

is not found the 6⅝ inch casing might be set on top of the Galena-Platteville limestone.

The following table gives the probable maximum casing requirements for a test to the upper Galena-Platteville in the area recommended.

Size casing in inches	Probable maximum amount required in feet
10	40
8¼	275
6⅝	545

Table of well and outcrop data

Map No.	Location			Surface elevation	Elevation Base Burlington	Name of well	Remarks
	Sec.	Twp.	Rge.				
1	3	9N	4W	640(?)	640(?)	. . . . .	Lowest outcrop of Burlington.
2	8	9N	4W	601	716	Richey	Gas and oil show at 146 feet, top of Devonian.
3	10	9N	4W	667	667	. . . . .	Spring in Burlington. Kinderhook exposed downstream.
4	11	9N	4W	638	638	. . . . .	Lowest outcrop of Burlington, Spring.
5	14	9N	4W	643	643	. . . . .	Lowest outcrop of Burlington, Spring.
6	14	9N	4W	700	700	. . . . .	Lowest outcrop of Burlington. Valley widens downstream.
7	16	9N	4W	670	?	Pogue	Total depth 600 feet. No record.
8	17	9N	4W	652	720	Pogue No. 1	Show heavy oil in top of Devonian.
9	17	9N	4W	?	?	Rankin	Oil and gas show in top of Devonian.
10	20	9N	4W	650	650	. . . . .	Outcrop Kinderhook, Burlington blocks above.
11	21	9N	4W	657	657	. . . . .	Contact Kinderhook and Burlington.
12	24	9N	4W	640	640	. . . . .	Outcrop Burlington, dip 3½° E-NE.
13	24	9N	4W	665	665	. . . . .	Contact Kinderhook and Burlington.
14	24	9N	4W	683	683	. . . . .	Contact Kinderhook and Burlington.
15	29	9N	4W	650	650	. . . . .	Lowest outcrop of Burlington, much Kinderhook in drift.
16	35	10N	5W	611	611	. . . . .	Lowest outcrop of Burlington.
17	12	9N	5W	577	643	McGaw	Total depth 284; oil showing.
18	25	9N	5W	675	595	Stronghurst	Total depth 1009, city well, water from St. Peter.
19	25	9N	5W	625	625	. . . . .	Spring below Burlington. Much Kinderhook in drift downstream.
	34	9N	3W	752	430	Parrish	Last three points outside of area shown in fig. 3.
	17	10N	4W	618	457		
	21	10N	4W	657	500		