

Underground Water and Glacial Geology of Scottsburg, Indiana and Vicinity

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Introduction

Early in July 1948 the writer was asked to assist the firm of Poole and West, well drillers, of Scottsburg, Indiana in a search for a larger water supply for the city. The project as proposed by the city required the contractors to provide a well or wells that would furnish 400 gallons per minute of potable water. These wells to be located within five (5) miles of existing water mains.

It is the purpose of this report to record the results of this study including the results of borings made and secondly to describe something of the glacial geology of this part of the Scottsburg Lowland.

Previous Work

In April of 1945, Mr. Fred H. Klaer Jr. of the U.S.G.S. published a "Preliminary Report on Ground-Water Conditions in the Vicinity of Scottsburg, Scott County, Indiana." This report summarizes the "results of several days field investigation" as well as work previously done in an effort to add to the city's inadequate supply of water. The inadequacy of the water supply may be judged from Klaer's statement, "The total quantity of water available was estimated to be 130,000 gallons per day. The average daily consumption in September of 1944 was 172,000 gallons per day with a maximum of 200,000 gallons per day."

The most extensive drilling done in the past was by the Layne-Northern Company of Mishawaka, Indiana. In 1938 this company drilled 41 test wells on which accurate logs were kept and numerous tests were recorded without preserving the logs. Most of the logged wells were put down in the vicinity of Lake Iola at the northern edge of the city but a few were drilled elsewhere which contributed considerably to an understanding of the bedrock topography.

The Present Study

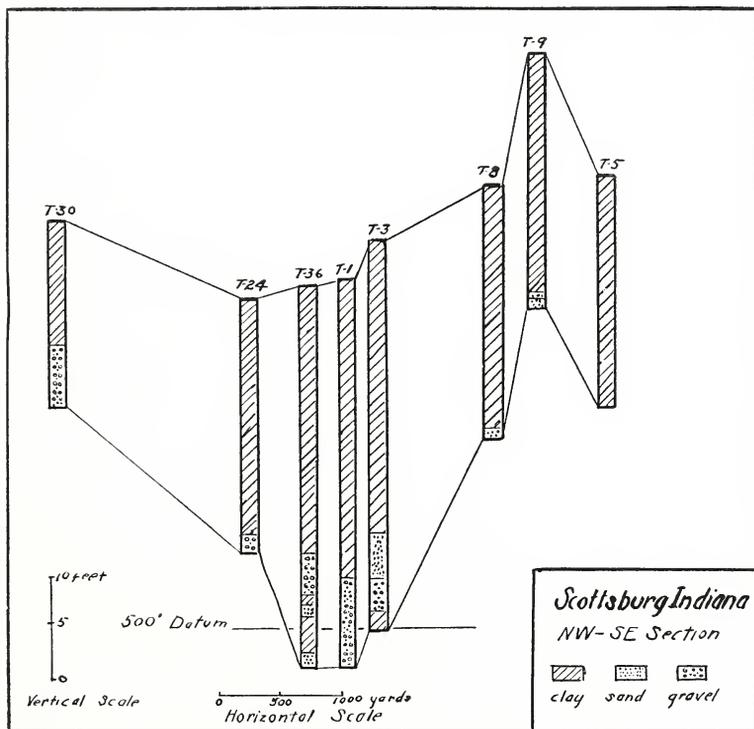
The present study was undertaken with the following assumptions in mind. (1) The Scottsburg Lowland¹ was carved by glaciation. (2) During deglaciation, water from the shrinking ice sheet should have established fairly definite channels in the bedrock, and these channels would have fairly extensive permeable sediments. (3) Since

¹For description of this physiographic division see: "Handbook of Indiana Geology" Pages 80-90. Indiana Department of Conservation 1922. the lowland of the vicinity of Scottsburg is roughly six miles wide, a

major stream could be assumed to have done the carving. Its channel sediments would be permeable, extensive and sufficiently continuous to make an aquifer.

On the other hand, if such permeable, extensive, and continuous sediments did not exist there was no point in looking for lesser sand and gravel bodies since they could not be expected to yield the 400 gallons per minute of water required by the contract.

Thus the problem resolved itself to a matter of making soundings in the glacial drift in a pattern sufficiently close to encounter any extensive gravels filling a bedrock channel².

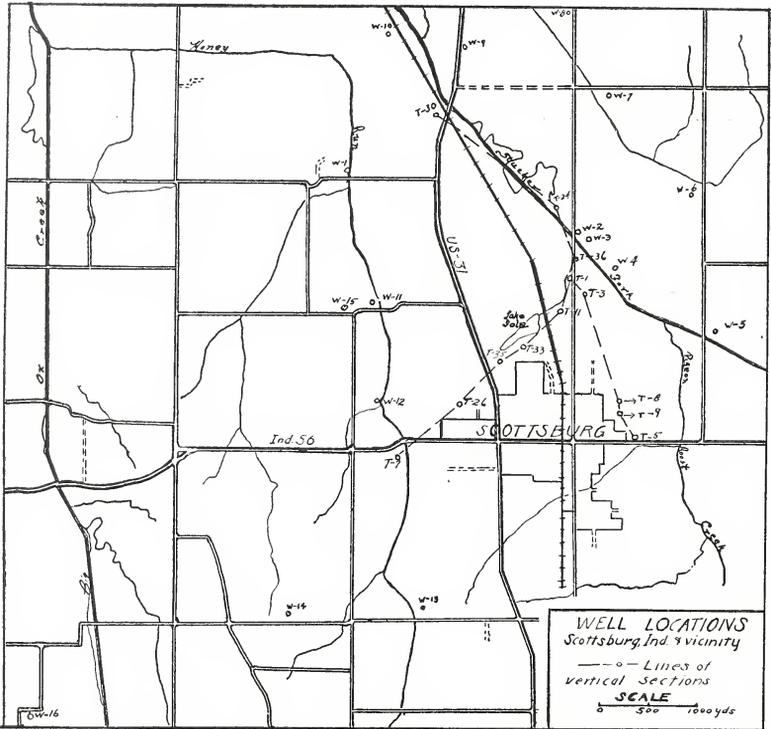


As a preliminary to this search, the logs of the Layne-Northern Company were studied and two sections made. One trending NE-SW and a second NW-SE as shown in figure 1. These revealed a low in the vicinity of Test T-1.

Just prior to the writers employment on this project Poole and West had recognized this low and had sunk three wells at points marked W2, W3, and W4 on the accompanying map (figure 2). These wells

² Deep drilling in bedrock was not considered advisable due to the high mineral content of waters usually encountered.

filled with water but, on pumping well W2, the static head was lowered 23 feet and that of well W4 lowered 4 feet. Both wells required three days to recover a normal static level. This slow recovery discouraged further sounding close to the wells since the sand body encountered, though thick enough, could hardly be extensive in view of this rapid drawdown and slow recovery.



Nevertheless, the valley of Stucker Fork was explored with borings at W-5, 6, 7, 8, 9, 10 (figure 2). These together with Layne-Northern Co. Tests, T-23, 24, 29, 30, 36 proved Stucker Fork did not have an extensive aquifer

Attention was next directed at Honey Run. Beginning in sec. 12, 6E. 3N. tests were made up stream as shown in figure 2. at W-1, 11, 12, 13, 15. None encountered any considerable sand except W-11 which filled with sand and water at 13 feet below surface. This hole was "mudded back" and by keeping a head of water in the hole $3\frac{1}{2}$ feet of water bearing sand was penetrated and $5\frac{1}{2}$ feet deeper bedrock was encountered,—see accompanying logs. Test W-15 sunk 200 yards away penetrated clay and clay only. Other borings in Honey Run yielded similar negative results as did Layne-Northern well T-25.

Thus the stream valleys were eliminated as likely water producers and the uplands were prospected. Borings were made at W-14 sec. 25, 6E. 3N. and at W-16 sec 35, 6E. 3N. neither showed pervious beds. A permanent well of the city T-46 sec. 18 7E. 3N. bottoms on bedrock and yields only a small quantity of water. Tests of Layne-Northern Co. T. 26 (western part of city) and T-40 south of city encountered nothing but clay and were dry.

This evidence was deemed sufficient to eliminate the area beneath the divide as a water bearer and boring was discontinued.

Bedrock Topography

The bedrock in the southwestern part of this area is a gray shale (Borden) the rest is black shale (New Albany). Though both are commonly described as soft shale they are too hard to be cut with an auger. Hence, borings penetrated only to broken rock.

It is possible to contour the bedrock from the 57 borings on which records exist. The Stucker Fork floodplain overlies an elongated bed-rock low with an embayment in the vicinity of Lake Iola. This embayment is the only place where thick sand lenses are encountered.

Glacial History

The region has had two periods of deposition with an interval between during which plant growth flourished,—wood was brought up from test 9,—and others showed a weathered clay with carbonaceous particles at varying depths usually about 6 feet below the surface. The thickness of this weathered peaty zone was usually less than a foot though test W-9 penetrated 3 feet of plant debris and tests W-13 and W-14 had 2 feet of peat and clay. The accompanying logs show the record for all the above.

The hypothesis of a major glacial stream in the Scottsburg Lowland seems untenable for no extensive sand and gravel bars exist. The Lake Iola embayment in the bedrock has a thick sand body (15 feet) but it is not extensive and not continuous.

In view of this lack of evidence of glacial streams it would seem that a glacial rather than a glacio-fluviatile origin of the lowland must be assumed. A possible explanation is found in the adjacent "Knobs" to the west. These "Knobs" (knobstone escarpment) resisted passage of the ice across them and tended to alter the direction of ice movement to parallel their front. Thus the erodable shales adjacent to the "Knobs" were subject to a more severe ice attack than similar shales farther east and hence were more deeply eroded. The bedrock low beneath Stucker Fork may not even be continuous but merely a local variation in rodability of the shale.

The origin of the clay which covers this area and so much of the adjacent Muscatatuck Regional Slope to the east is not clear. Leverett³

³Leverett, Frank. "Pleistocene of Michigan, Indiana and History of the Great Lakes." Monography of U.S.G.S. Vol. LIII, 1915. Plate VI.

maps this area as loess and such may be the best designation for the material. Nevertheless; it should be borne in mind that columnar jointing, and weathering in vertical cliffs is not present. Nor have land fossils been discovered in the clay.

Summary

A study of the results of nearly 60 wells and borings made in a search for water in the vicinity of Scottsburg, Ind. shows clay covering the bedrock with only a few scattered, discontinuous, thin sand lenses. Thickness of the clay varies from 0 to 40 feet.

An elongated depression in the bedrock exists beneath the Stucker Fork floodplain trending NW-WE. With a conspicuous embayment at Lake Iola.

There are a few widely scattered sand lenses but no other evidence of glacio-fluviatile origin. The origin of the lowland itself at this locality is believed to be due to diversion of ice by the adjacent knob-stone escarpment which accelerated glacial action in the soft shales of the lowland. Whether the clay which covers the bedrock is wind or water laid or a weathering product is not determined. That there have been two periods of deposition separated by a period of plant growth and weathering is evident.

Log of Test Wells Drilled and Borings by Poole and West

Scott County, Indiana, July, 1948.

Test: W-1 **boring**

Location: Range 6E. Twp. 3N. Sec. 12; 1750 yds. E. 5 yds. N. of SW corner.

Bed of Honey Run
Surface el. 532 ft.

Formations	Thickness Ft.
Gravel	2½
Blue Clay	8 and more

Test: W-2 **well**

Location: Range 7E. Twp. 3N. Sec. 17; 505 yds. E. 1300 yds. N. of SW corner.

Surface el. 536 ft.

Formations	Thickness Ft.
Clay	13
Sand, Blue Clay	16
Gravel, Sand, Shale	7
Bedrock	—

Total 36

Test W-3 **well**

Location: Range 7E. Twp. 2N. Sec. 17; 645 yds. E. 1285 yds. N. of SW corner.

Surface el 536 ft.

Formations	Thickness Ft.
Clay	13
Clay and Sand	16
Gravel	7
Gravel	3
Clay	—
Bedrock	—

Total 39

Test W-4 **well**

Location: Range 7E. Twp. 3N. Sec. 17; 830 yds. E. 880 yds. N. of SW corner.
Surface el. 536 ft.

Formations	Thickness	Ft.
Clay	13	
Sandy Clay	16	
Gravel	7	
Bedrock	—	
	Total	36

Test W-5 **boring**

Location: Range 7E. Twp. 3N. Sec. 16; 30 yds. E. 240 yds. N. of SW corner.
Bed of Stucker Fork

Formations	Thickness	ft.
Blue Clay	10	
Muddy Sand	3	
Sandy Clay	$\frac{1}{2}$	
Clay and Broken Shale	—	
	Total	18

Test W-6 **boring**

Location: Range 7E. Twp. 3N. Sec. 17; 1720 yds. E. 1580 yds. N. of SW corner.
Surface el. 536 ft.

Formations	Thickness	Ft.
Yellow Clay	$7\frac{1}{2}$	
Blue Clay	2	
Yellow Clay	$\frac{1}{2}$	
Blue Clay	9	
Dark Clay and Shale	$\frac{1}{2}$	
Bedrock	—	
	Total	$19\frac{1}{2}$

Test W-7 **boring**

Location: Range 7E. Twp. 3N. Sec. 8; 850 yds. E. 840 yds. N. of SW corner.
Surface el. 538 ft.

Formations	Thickness	Ft.
Yellow Clay	7	
Peat	$\frac{1}{2}$	
Blue Clay	12	
Dark and Gray Sand	2	
Sand and Broken Shale	$\frac{1}{2}$	
	Total	22

Test W-8 **boring**

Location: Range 7E. Twp. 3N. Sec. 8; 400 yds. E. 1640 yds. N. of SW corner.
Surface el. 538 ft.

Formations	Thickness	Ft.
Clay	19	
Sand	$\frac{1}{2}$	
Broken Shale	—	
	Total	$19\frac{1}{2}$

Test W-9 **boring**

Location: Range 7E. Twp. 3N. Sec. 7; 1130 yds. E. 1300 yds. N. of SW corner.
Surface el. 532 ft.

Formations	Thickness	Ft.
Yellow Clay	4	
Blue Clay	14	
Sand Peat and Wood	3	
Brown Clay	3	
Gravel, Broken Shale	2	
	Total	26

(Limit of Boring)

Test W-10 **boring**

Location: Range 7E. Twp. 3N. Sec. 7; 350 yds. E. 1350 yds. N. of SW corner.

Surface el. 534 ft.

Formations	Thickness	Ft.
Yellow Clay	5	
Blue Clay	21	
	—	
	Total	26 (Limit of Boring)

Test W-11 boring

Location: Range 7E. Twp. 3N. Sec. 18; 230 yds. E. 490 yds. N. of SW corner.

Surface el. 538 ft.

Formations	Thickness	Ft.
Yellow Clay	6	
Peat and Clay	½	
Blue Clay	6	
Coarse Sand with Water	3½	(hole "muddied
Blue Clay	3	back to
Clay and Sand	2½	penetrate)
Bedrock	—	
	Total	21½

Test W-12 boring

Location: Range 7E. Twp. 3N. Sec. 19; 210 yds. E. 1325 yds. N. of SW corner.

Surface el. 548 ft.

Formations	Thickness	Ft.
Clay	18	
Broken Shale	½	
	—	
	Total	18½

Test W-13 boring

Location: Range 7E. Twp. 3N. Sec. 30; 670 yds. E. 930 yds. N. of SW corner.

Surface el. 565 ft.

Formations	Thickness	Ft.
Clay	5	
Clay and Peat	2	
Clay	6½	
Sand	3	
Blue Clay and Shale	½	
	—	
	Total	17

Test W-14 boring

Location: Range 6E. Twp. 3N. Sec. 25; 1405 yds. E. 920 yds. N. of SW corner.

Surface el. 594 ft.

Formations	Thickness	Ft.
Clay	8	
Clay and Peat	2	
Blue Clay	7½	
Clay and Broken Gray Shale	½	
	—	
	Total	18

Test W-15 boring

Location: Range 7E. Twp. 3N. Sec. 18; 360 yds. E. 480 yds. N. of SW corner.

Surface el. 548 ft.

Formations	Thickness	Ft.
Clay	11	
Broken Gray Shale	—	
	Total	11

Test W-16

Location: Range 6E. Twp. 3N. Sec. 35; 315 yds. E. 1755 yds. N. of SW corner.

Surface el. 616 ft.

Formations	Thickness	Ft.
Clay	4	
Clay and Peat	1½	
Blue Clay	5½	
Sand	1	
Clay	15	
Clay and Broken Shale	9	
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Total	36	