





ILLINOIS STATE GEOLOGICAL SURVEY



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State of Illinois
Department of Registration and Education
Division of the
STATE GEOLOGICAL SURVEY
M. M. Leighton, Chief

INFORMATION CIRCULAR NO. 4

Supplement to
Report of Investigations 23

RESULTS OF TEST-DRILLING OF LIMESTONE NEAR MORRIS, ILLINOIS

By J. E. Lamar and H. B. Willman

February, 1933

State of Illinois
Department of Registration and Land Survey
Division of the
STATE GEOLOGICAL SURVEY
M. M. Harbo, Chief

INFORMATION CIRCULAR NO. 2

Subsequent to

Records of Investigations 25

RESULTS OF TEST-DRIING OF LIMESTONE FROM MORGAN, ILL.

By J. K. Harbo and H. W. Williams

February, 1932

Illinois State Geological Survey
Urbana, Illinois

Information Circular No. 4

February, 1933

RESULTS OF TEST-DRILLING OF LIMESTONE NEAR MORRIS, ILLINOIS

By J. E. Lamar and H. B. Willman

SUMMARY

In 1931 the Illinois State Geological Survey published Report of Investigations No. 23, on "High-calcium limestone near Morris, Illinois," based on data obtained from surface outcrops and records of water wells.

The potential commercial importance of the deposit together with requests for further information and the acquisition of information not known to exist at the time of publication, emphasized the desirability of coring the deposit. Through the courtesy of the State Highway Division four borings with a diamond drill were made for the Geological Survey. Each boring passed through the limestone and entered shale.

The results of the borings and the chemical analyses of the cores are shown in Table 1. They indicate that in the tract south of Illinois River the upper few feet, to a maximum thickness of 4 or 5 feet, is usually high-calcium stone, most of it brown in color. This confirms the information obtained from outcrops. Below the high-calcium rock the amount of magnesium carbonate generally increases with depth. All samples of core tested had a high or moderately high total carbonate content.

BORING NO. 1

Boring No. 1 was located 60 feet east of the Elgin, Joliet and Eastern Railroad and 40 feet north of a small abandoned quarry about a quarter of a mile north of the grain elevator at Divine station, sec. 34, T. 34 N., R. 8 E.

Black soil 4 inches thick overlies the limestone. No core was obtained from the upper foot of the stone which was partly disintegrated but otherwise appeared to be similar to that immediately underlying. The two samples of core representing the next 3 feet 9 inches of stone contained respectively 98.1 and 97.0 per cent CaCO_3 and 1.7 and 2.7 per cent MgCO_3 .

To the Honorable
The Board of Trustees

of the University of Illinois

REPORT OF THE ILLINOIS STATE GEOLOGICAL SURVEY
ON THE GEOLOGY OF THE STATE

BY J. S. HARRIS, GEOLOGIST

SUMMARY

In 1891 the Illinois State Geological Survey published a report of investigations by J. S. Harris on "High-Altitude Lakes in Illinois," based on data obtained from various sources and a field of work.

The geological investigation of the district for which this report was prepared was conducted in 1891 and 1892. The results of the investigation are given in this report. The district is situated in the northwestern part of the State, and is bounded by the Mississippi River to the west, the Illinois River to the east, and the Ohio River to the south. The district is a part of the Illinois River drainage basin.

The results of the geological investigation of the district are given in this report. The district is situated in the northwestern part of the State, and is bounded by the Mississippi River to the west, the Illinois River to the east, and the Ohio River to the south. The district is a part of the Illinois River drainage basin. The geological features of the district are described in detail in this report.

PLATE I

Plate I shows a map of the district, and a cross-section of the district. The map shows the location of the district in the northwestern part of the State, and the Illinois River drainage basin. The cross-section shows the geological structure of the district, and the location of the high-altitude lakes. The map and cross-section are both based on the geological investigation of the district.

Below the high-calcium stone, the amount of $MgCO_3$ increases with depth, reaching a maximum of 34.9 per cent in the lower 10 1/2 feet of stone. The average composition of the entire core is 74.6 per cent $CaCO_3$ and 22.8 per cent $MgCO_3$. The total thickness of stone penetrated was 28 feet 11 inches.

BORING NO. 2

Boring No. 2 was located on the north side of the right-of-way of an east-west wagon road and 150 feet east of a lane leading north to a house near Dresden Island locks and dam, sec. 35, T. 34 N., R. 8 E.

The boring penetrated 6 inches of black soil overlying the bedrock limestone. Only 2 feet 3 inches of core was obtained in drilling through the upper 7 feet 11 inches of the deposit. Of this core, the upper 11 inches, representing a thickness of approximately 3 feet of the stone penetrated, was shown by analysis to fall short of the high-calcium limestone class by only 1/2 of 1 per cent. It contained 94.5 per cent of $CaCO_3$ and only 1.3 per cent magnesium carbonate. Below this, the magnesium carbonate content increases rapidly, reaching a maximum of 37.2 per cent in the lower 7 1/2 feet of stone. The average composition of the entire core is 69.5 per cent $CaCO_3$ and 26.3 per cent $MgCO_3$. The total thickness of stone penetrated is 26 feet 4 inches.

BORING NO. 3

Boring No. 3 was located about 150 feet south of an old corn-crib near the center of sec. 2, T. 33 N., R. 8 E.

The boring penetrated 2 feet 3 inches of soil overlying the limestone. The upper 1 foot 2 1/2 inches of core, representing approximately the upper 2 feet of the stone penetrated, is high-calcium stone containing 95.4 per cent of $CaCO_3$ and 2.5 per cent $MgCO_3$. The core representing the next lower 11 feet of stone contained 8 to 16 per cent $MgCO_3$, and the remainder of the core, representing the lower 13 feet, contained from 38 to 39 per cent $MgCO_3$. The average composition of the entire core was 71.6 per cent $CaCO_3$ and 25.0 per cent $MgCO_3$. A total of 26 feet 2 inches of stone was penetrated before blue shale was encountered.

BORING NO. 4

Boring No. 4 was located on the north side of the right-of-way of an east-west road and 90 feet west of the Elgin,

Joliet, and Eastern Railroad in sec. 22, T. 34 N., R. 8 E., on the north side of Illinois River.

At this location the strata penetrated were 13 inches of soil overlying 8 feet 4 inches of limestone below which blue shale was encountered. Analyses of the core indicate the entire thickness of stone to be magnesian. The upper 5 feet 1 inch contained 35.3 per cent $MgCO_3$ and the lower 3 feet 3 inches contained 15.7 per cent $MgCO_3$.

DISCUSSION

The stone encountered in boring No. 1, almost 29 feet thick, was somewhat thicker than anticipated on the basis of previous data. The rock in boring No. 2, 26 feet thick, was somewhat less than was expected on the basis of the reported 32 and 44 feet of stone encountered in water wells drilled respectively west and east of it. Boring No. 3 with 26 feet of stone gives information in an area where no data were previously available. The 8 feet of stone encountered in boring No. 4 on the north side of the river was much less than anticipated, as a well about a third of a mile northeast of the boring reported 36 feet of stone.

The fact that only the upper part of the deposit is high-calcium limestone restricts its use. The deposit would probably make satisfactory agricultural limestone. The stone below the high-calcium portion may be suitable for concrete aggregate, for road material, for certain types of mineral filler, for riprap, rubble, and building stone but further exploration of the deposit on a larger scale and testing of large samples would be necessary to determine its acceptability for these uses.

The commercial feasibility of working the deposit so as to separate the upper high-calcium rock from the underlying magnesian beds is not known. The cores indicate that most of the high-calcium stone is buff or brown. It could probably be employed for those uses, as listed in Report of Investigations No. 23, which are not critical with regard to the color of the stone or its content of iron compounds.

The data afforded by the cores and their analyses indicate the variable nature of the deposit and confirm the recommendation made in the previous publication that it be thoroughly prospected before development is undertaken.

The first section is located in section No. 1, about 2 1/2 miles
west of the mouth of the river, and is about 100 feet thick.
It is composed of a fine sandstone, which is highly fossiliferous.
The fossils are small, and consist of a few species of
trilobites, and a few small brachiopods. The trilobites
are of the species *Trilobites* sp. and *Trilobites* sp.
The brachiopods are of the species *Brachiopods* sp. and
Brachiopods sp.

DESCRIPTION

The first section is located in section No. 1, about 2 1/2 miles
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are of the species *Trilobites* sp. and *Trilobites* sp.
The brachiopods are of the species *Brachiopods* sp. and
Brachiopods sp.

The second section is located in section No. 2, about 1 1/2 miles
west of the mouth of the river, and is about 100 feet thick.
It is composed of a fine sandstone, which is highly fossiliferous.
The fossils are small, and consist of a few species of
trilobites, and a few small brachiopods. The trilobites
are of the species *Trilobites* sp. and *Trilobites* sp.
The brachiopods are of the species *Brachiopods* sp. and
Brachiopods sp.

The third section is located in section No. 3, about 1 1/2 miles
west of the mouth of the river, and is about 100 feet thick.
It is composed of a fine sandstone, which is highly fossiliferous.
The fossils are small, and consist of a few species of
trilobites, and a few small brachiopods. The trilobites
are of the species *Trilobites* sp. and *Trilobites* sp.
The brachiopods are of the species *Brachiopods* sp. and
Brachiopods sp.

The fourth section is located in section No. 4, about 1 1/2 miles
west of the mouth of the river, and is about 100 feet thick.
It is composed of a fine sandstone, which is highly fossiliferous.
The fossils are small, and consist of a few species of
trilobites, and a few small brachiopods. The trilobites
are of the species *Trilobites* sp. and *Trilobites* sp.
The brachiopods are of the species *Brachiopods* sp. and
Brachiopods sp.

TABLE 1 - DATA ON BORINGS IN THE DIVINE AREA

Depth below surface(1)	Character of limestone	Length of core	Thickness represented(1)	Carbonates(2)			
				CaCO ₃	MgCO ₃	Total	
<u>Boring No. 1, NW. corner NE. 1/4 sec. 34, T. 34 N., R. 8 E.</u>							
0'-0'4"	(Soil)	0'0"					
0'4"-1'4"	Brown, coarsely crystalline	0'0"					
1'4"-2'8"	Brown, coarsely crystalline	0'8"	1'4"	98.1	1.7	99.8	
2'8"-5'1"	Brown, coarsely crystalline	1'0"	2'5"	97.0	2.7	99.7	
5'1"-(10'4")	Brown and white, coarsely crystalline	2'5 $\frac{1}{2}$ "	(5'3")	} 7'10"	91.5	8.2	99.7
(10'4")-12'11"	Brown, white and gray	1'3 $\frac{1}{2}$ "	(2'7")		81.0	18.0	99.0
12'11"-18'9"	Gray and brown, porous in part	2'10"	5'10"	69.0	29.3	98.3	
18'9"-(21'0")	Gray and brown, slightly porous	1'7 $\frac{1}{2}$ "	(2'3")	} 10'6"	62.0	34.9	96.9
(21'0")-29'3"	Gray, locally very porous; locally pyritic	4'11"	(8'3")		59.1	34.9	94.0
			Average(3)	74.6	22.8	97.4	

Boring No. 2, Center S. line, SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 35, T. 34 N., R. 8 E.

0'-0'6"	(Soil)	0'0"					
0'6"-(3'8")	Dark brown, ferruginous	0'11"	(3'2")	} 7'11"	94.5	1.3	95.8
(3'8")-8'5"	Dark brown, ferruginous	1'4"	(4'9")		83.5	14.0	97.5
8'5"-(11'8")	Light gray, locally brown	1'2"	(3'3")	} 6'6"	65.4	28.6	94.0
(11'8")-14'11"	Light gray	1'2 $\frac{1}{2}$ "	(3'3")		67.2	30.1	97.3

Depth below surface(1)	Character of limestone	Length of core	Thickness represented(1)	Carbonates(2)		
				CaCO ₃	MgCO ₃	Total

Boring No. 2 (continued)

14'11"-19'4"	Light gray and gray, locally porous	3'11 $\frac{1}{2}$ "	4'5"	59.7	34.3	94.0
19'4"-26'10"	Light gray and gray, largely highly porous, locally pyritic	4'2"	7'6"	58.6	37.2	95.8
Average(3)				69.5	26.3	95.8

Boring No. 3, Center S. line, SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 2, T. 33 N., R. 8 E.

0'-2'3"	(Soil)	0'0"					
2'3"-(4'5")	Brown, crystalline	1'2 $\frac{1}{2}$ "	(2'2")	} 5'1"	95.4	2.5	97.9
(4'5")-7'4"	Brown, crystalline, white at base	1'7 $\frac{1}{2}$ "	(2'11")		80.2	15.9	96.1
7'4"-(11'3")	Brown and light brown	1'4 $\frac{1}{2}$ "	(3'11")	} 8'1"	89.2	8.4	97.6
(11'3")-15'5"	Gray, white and brown	1'6 $\frac{3}{4}$ "	(4'2")		80.6	16.5	97.1
15'5"-19'4"	Gray, upper part porous	1'9 $\frac{1}{2}$ "	3'11"	58.3	38.9	97.2	
19'4"-23'6"	Gray and dark gray, locally porous	2'9"	4'2"	57.7	39.3	97.0	
23'6"-26'2"	Gray and dark gray, locally porous	1'8"	2'8"	56.5	37.6	94.1	
26'2"-28'5"	Gray and dark gray, with white mottlings	1'9"	2'3"	57.0	37.6	94.6	
Average(3)				71.6	25.0	96.6	

Year	Month	Day	Time	Location	Notes
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Approximate 7.000000

1971	08	10	10:00
1971	08	11	10:00
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1971	08	12	10:00

Approximate 7.000000

1971	08	13	10:00
1971	08	14	10:00
1971	08	15	10:00
1971	08	16	10:00	...	...
1971	08	17	10:00	...	...
1971	08	18	10:00	...	...
1971	08	19	10:00	...	...
1971	08	20	10:00	...	...
1971	08	21	10:00	...	...
1971	08	22	10:00	...	...
1971	08	23	10:00	...	...
1971	08	24	10:00	...	...
1971	08	25	10:00	...	...
1971	08	26	10:00	...	...
1971	08	27	10:00
1971	08	28	10:00
1971	08	29	10:00
1971	08	30	10:00
1971	08	31	10:00
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1971	08	31	10:00

Depth below surface(1)	Character of limestone	Length of core	Thickness represented(1)	Carbonates(2)		
				CaCO ₃	MgCO ₃	Total

Boring No. 4, SW. corner, SE. $\frac{1}{4}$ sec. 22, T. 34 N., R. 8 E.

0'-1'1"	(Soil)	0'0"				
1'1"-6'2"	Brown and gray	0'9"	5'1"	58.8	35.3	94.1
6'2"-9'5"	Dark gray	0'7"	3'3"	77.9	15.7	93.6
			Average(3)	66.3	27.7	93.9

Railroad cut north of Divine, NW. cor. NE. $\frac{1}{4}$ sec. 34, T. 34 N., R. 8 E.

6"-4'0"	Coarsely crystalline, brown and pink		3'6"	97.6	2.1	99.7
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(1) The length of the core obtained was usually less than the thickness of the rock penetrated due to the fact that some of the rock was ground up during drilling. In order to secure the maximum information regarding the chemical composition of the rock, it was necessary to divide some of the core at points whose exact depths were not known. In these cases it was assumed that the core was uniformly distributed throughout the interval which it represents and the resulting thicknesses are given in parentheses.

(2) Chemical analyses were made by the Analytical Division, State Geological Survey. In order to expedite preparation of this report a rapid method of analysis having an accuracy of ± 0.5 per cent on the basis of oxides, equivalent to approximately ± 1.0 per cent on the basis of carbonates, was employed. Each analysis is the average of duplicate determinations calculated to the first decimal place. The accuracy of the analytical method is comparable to the probable accuracy of sampling.

(3) Average weighted according to thickness of rock.

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