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STRUCTURE AND OIL POSSIBILITIES IN DOOR COUNTY,
WISCONSIN

by

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STRUCTURE AND OIL POSSIBILITIES

IN DOOR COUNTY, WISCONSIN.

Exploration by F. T. THWAITES and R. C. LENTZ
1922.

Structure and Oil Possibilities in Door County, Wisconsin.

Exploration by F.T. Thwaites and R.C. Lentz, 1922.

Introduction. Door County is situated in the far northeastern part of Wisconsin. It consists of a peninsula whose long axis extends NNE - SSW and divides Green Bay from Lake Michigan. Its area has been estimated at 469 square miles or 300,160 acres (1).

(1) Whitson, A.R., Geib, W. J., Geib, H. V., and Thompson, Carl, Soil Survey of Door County, Wisconsin: Wisconsin Geol. and Nat. Hist. Survey, Bull. 52D, p. 12, 1919.

The length of the peninsula excluding islands at its tip is about 60 miles, the width varying from 18 to 4 miles. At one point, near Sturgeon Bay, the peninsula has been cut in two by a ship canal.

Topography. The Door peninsula is composed of from two to three distinct cuestas whose escarpments face Green Bay. The maximum known elevations do not exceed 210 feet above the lake and the average relief of the interior is less than 100 feet.

General geology. The county is almost entirely underlain by the Niagara group of dolomites of Silurian age. Underlying the Niagara group is a small area of "Clinton" or Neda corallitic hematite which is exposed only on the Green Bay coast near Little Sturgeon Point. Below the Neda formation is the Richmond shale (Cincinnati group, Ordovician) which outcrops along a narrow band on the Green Bay side south of Little Sturgeon Point. The concealed formations include the Galena- "Trenton" dolomite group (Black

River), the St. Peter sandstone, and older Ordovician and Cambrian sediments; all these have been found in deep drill holes. The concealed formations all outcrop west of Green Bay. The entire county has been glaciated. North and west of Sturgeon Bay the drift is for the most part very thin, a thickness of over 15 feet being considered unusual; southeast of Sturgeon Bay the drift is heavy.

General structure. The regional dip is about ESE at the rate of about feet per mile. The dip is not constant but abnormally steep belts (up to 15 degrees) alternate with structural terraces where the beds are practically horizontal. The conditions for finding anticlines are poor. Lack of relief and of good sections handicap the geologist. Although there are many outcrops few afford a view of more than a single stratum. Dips may be readily measured since many flat areas extending over many acres lie upon a single layer. There are only two deep wells of which exact records have been obtained. Three test holes were drilled years ago and poor records preserved.

Anticlinal areas. Anticlinal structure could be demonstrated only in two general districts. The largest known anticline, as far as could be determined, has a length of about 3 miles, a width of about half a mile and a demonstrable height of about 25 feet. As in all observed belts of unusual dip, the anticlines show an abnormal amount of fissuring.

Method of exploration. As only a month's time could be devoted to the exploration of Door County, it is evident that

all details of stratigraphy and structure could not be solved. Work was confined to obtaining a working knowledge of the several key beds and to scouting for westward dips. Localities where such were proved or suspected were worked out in detail with the plane table except in one case where the structure is so clearly displayed that no further work was required than to walk over the anticline. Most contacts were measured with the hand level for the aneroid is of little value near the lake.

STRATIGRAPHY.

General. The stratigraphy was studied from a lithologic standpoint. Fossils were found to be of little value in determining key beds since very extensive search would have been needed to prove the absence of any particular form from other beds. Very little was added to the section as worked out many years ago by Chamberlin(1). In the following

(1) Chamberlin, T.C., Geology of Eastern Wisconsin: Geology of Wisconsin, vol. 2, pp. 257-405, 1877.

discussion principal emphasis is laid on beds useful in determining structure.

Cambrian formations. The Cambrian strata may have been reached in one of the deep drill holes of the Calumet Land and Oil Co. in Sec. 36, T. 27, R. 23 E. north of Brussels.

St. Peter sandstone. The St. Peter sandstone was reached in all five of the known deep drill holes in the county. Samples have been examined from both of the city wells at Sturgeon Bay and from the Tornado Oil and Gas Co. hole

near Brussels. These all show a medium to fine grained gray calcareous quartz sandstone. Little data is available on the thickness. At Sturgeon Bay a very hard shale was found after penetrating about 90 feet of sandstone; the driller reported this rock as "granite". In the Calumet Land and Oil Co. test holes near Brussels 175 feet is reported (1) without the bottom being reached.

(1) Weidman, Samuel and Schultz, A R., The underground and surface water supplies of Wisconsin: Wisconsin Geol. and Nat. Hist. Survey, Bull. 35, pp. 311-312, 1915.

The record of the lower part of the Tornado Oil and Gas Co. hole is too vague to be depended upon.

Galena - "Trenton" dolomites. The Galena - "Trenton" is important because it is the possible oil-bearing horizon. Within Door County it is known only in drill holes. It is not well exposed along most of the west shore of Green Bay but was formerly seen in the quarries near Green Bay. It has been carefully studied in drill samples from Sturgeon Bay, Peshtigo, Green Bay, Greenleaf, Hollandtown, Brillion, and other points. Samples from the Tornado Oil and Gas test were also seen but the writers were not permitted to examine them in detail.

Partial log of well of Pat. Hanoway, NE¹, SE¹, Sec. 17, T.21, R.30 E. near Greenleaf.

	Thickness	Depth
Dolomite, bluish gray	?	313ft.
Dolomite, mixed blue and gray	2	315ft.
Dolomite, gray ✓	60	375ft.
Dolomite, light bluish gray	45	420ft.
Dolomite, dark gray with blue spots	35	455ft.
Dolomite, dark bluish gray	13	468ft.
Dolomite, mixed blue and gray	5	473ft.
Dolomite, light bluish gray	7	480ft.
Dolomite, gray	34	504ft.

504
315
189

The quarry at Duck Creek near Green Bay showed in 1914 about 52 feet of rock. The section is abbreviated from notes of the senior author.

Section of Quarry at Duck Creek, NW¹/₄, NW¹/₄, Sec. 15,

T. 24, R. 20 E.

Feet.

52

Dolomite, gray, even beds 10-15", used dimension stone 12 ✓

Dolomite, bluish gray, layers 6"-18" divided by partings of blue calcareous shale with abundant fossils. The dolomite is marked with bands of gray in some layers; formerly quarried to a greater depth but was found too soft. 40

According to the foreman of the quarry the St. Peter sandstone is only 80 feet below the top of the quarry but this is probably too low a figure, although these beds undoubtedly lie in the lower part of the dolomite formation.

NE NW

Partial log of Tornado Oil and Gas Co. test hole, ¹⁷⁰⁰
~~Sec. 9, T. 26, R. 24 E.~~

SE NW
230

Dolomite, blue at top, passing to gray below	115	820
Dolomite, blue	45	865
No record, apparently dolomite	18	883
Sandstone, medium grained, gray	1	884
Dolomite, gray with some blue layers	56	935

935
820
115
115
230

Partial log of Sturgeon Bay City well.

Dolomite, gray	50	915
Dolomite, light bluish gray and gray	5	920
Dolomite, light gray	45	965
No sample	5	970
Dolomite, blue	5	975
Dolomite, dark gray	5	980
Dolomite, brownish gray and some light gray	45	1025
Dolomite, no samples	56	1081

216

1081
915
166
55
216

Partial log of test hole of Calumet Land and Oil Co.

Limestone and soapstone	120	666
Sandy limestone with water	90	756
Slaty limestone	30	786

140

786
666
120
120
786

The thickness of the Galena - "Ironton" as shown by these records varies from 216 to 240 feet. A general subdivision into upper gray beds and lower blue or brownish

666
120
546

beds may be made. This fact appears to have been recognized long ago by Rominger(1) in upper Michigan.

(1) Rominger, Carl, Paleozoic rocks of the upper peninsula: Michigan Geol. Survey, vol. 1, pp. 56-71, 1873.

Richmond shale. Overlying the Galena-"Trenton" is the Richmond shale. The uppermost layers of this formation outcrop along the Green Bay shore south of Little Sturgeon Point. The following sections indicate the character of the formation.

Lake shore section in Sec. 18, T. 27, R. 24 E.

	Feet
Dolomite, fine grained, gray, very shaley, layers 4"-12", top decomposed	4.1
Dolomite like above, more shaley, thinner beds	3.5
Shale, very calcareous, blue and purple	0.3
Dolomite, gray, shaley, white chert and gypsum nodules in lower part	19.0
Dolomite, coarse grained, greenish gray and purple in spots, splits into thin flags, abundant ripple marks, and chert nodules	12.0
Shale, calcareous, purple and gray, layers 4"-5"	10.0
Unexposed covered by debris from cliff	14.0
Shale, soft, blue	1.0

Lake shore section in Sec. 8, T. 27, R. 24 E.

Shale, purplish red and bluish gray, calcareous	5.0
Shale, more dolomitic than above, firmer than above or below, greenish-blue and red mixed, layers 2"-6" some nodules of gray chert	5.0
Shale, slaty, red and green, ripple marked	8.0
Dolomite, yellowish-green, slabby, layers 2"-6", abundant nodules of gray chert	6.0
Shale, slaty, laminated purple and greenish gray, undulating bedding, ripple marks, layers and nodules of white chert to 2" thick	5.0
Talus	14.0
Clay, blue, very soft owing to lake water	1.0

Records of deep drill holes show that the blue calcareous clay shale found at the bottom of these sections about 40 to 50 feet from the top of the formation extends on downward for about 400 feet. In the Calumet Land and Oil

Co. exploration 540 feet of shale is said to have been penetrated and the hole started in the shale. No samples were seen from either this hole or those drilled by the later Tornado Oil and Gas Co. The deep hole of the latter is said to have found blue shale from 269 to 595, blue slate from there to about 695, then brown shale to 705. The samples from the Sturgeon Bay wells give the best idea of the formation. Those from the hole on the south side at Sawyer were evidently washed giving thus an exaggerated idea of the amount of dolomite.

595
269

326
705
269

436

Partial log of well at Sawyer.

429

	Thickness	Depth
Dolomite, dark gray to blue interbedded with layers of shale, bluish gray, soft, very calcareous	329	790
Like above, more shale	30	820
Shale, blue, calcareous	70	890

790
329

461

Partial log of Sturgeon Bay city well.

405

Dolomite, gray, shaley and shale, blue, calcareous	10	420
Dolomite, gray, very shaley	8	428
Shale, blue, calcareous	42	470
Shale, hard, very dolomitic, blue	5	475
Shale, blue, calcareous	5	480
Shale, hard, very dolomitic, blue and dolomite, gray	10	490
Shale, blue, calcareous	12	502
Dolomite, dark gray, gypsum	3	510
Shale, gray, very calcareous	5	515
Dolomite, gray; shale, hard, blue, calcareous; gypsum	20	535
Shale, gray; dolomite, gray, samples a fine powder	95	630
Shale, blue, calcareous	10	640
Shale, dark brown; dolomite, gray	15	655
Shale, light brownish gray, slightly calcareous	40	695
Shale, blue, very slightly calcareous	65	760
Shale, brown, calcareous	105	865

445

Neda formation. The only known area of Neda formation consists of an outcrop of oolitic hematite near Little Sturgeon Point. It is now being explored and no details can

be given.

Niagara group, Mayville dolomite. The Mayville dolomite is the basal member of the Niagara group. It consists of medium grained gray dolomite which forms rather thick rough weathering layers. In topographic expression it makes a series of minor cuestas, the details of which could not be determined in the district studied. The best marker in the formation is a massively bedded zone 10 feet or more thick which is filled with *Pentamerus* casts; this occurs almost or quite at the top. The thickness was not accurately measured but seems to be about 100 feet; the Sawyer well shows 91 feet.

Byron Dolomite. The Byron dolomite contrasts sharply in character with the Mayville. It consists of very fine grained dolomite except for a zone of about 18 feet not far below the top. The bedding is thin and regular; most layers are less than a foot in thickness. Mud cracks and ripple marks are found in abundance. The top of the Byron is an exceedingly fine grained gray to blue dolomite; this layer is readily distinguished in outcrops by its texture, conoidal fracture and relation to overlying and underlying coarser grained strata. Its upper surface is irregular with many small channels and pits up to nearly two feet in depth. The thickness of the "blue", as this bed was called in the field, varies from 7 to 13 feet. The thickness of the entire Byron formation is from 66 to 100 feet. The Byron forms a marked escarpment which rises from the Mayville lowlands to the west. This feature may be traced from near Brussels to the end of the peninsula. North of

Sturgeon Bay, however, most of the Mayville cuesta is concealed beneath the waters of Green Bay. The following section is typical of the Byron-Coral contact.

Section in Smith quarry, Sec. 13, T. 28, R. 25 E.

	Feet.
Coral dolomite.	
Dolomite, medium grain, gray, laminated, layers 3"-6", corals	7.0
Dolomite, gray, coarse grained, laminated, corals extremely abundant	1.0
Dolomite, coarse grained, gray, bottom part finer than top, layers 15"-18", cavaties, abundant corals.	9.0
Byron dolomite.	
"Blue bed", dolomite, very dense, very fine grained, light bluish gray, weathers white, laminated on weathered surface, layers 2"-4", mud cracks	12.5
Dolomite, gray, medium grained, layers 1"-4", cavaties, undulating beds	10.5
Dolomite, gray, medium grained, solid, laminated	3.0
Dolomite, medium grained, gray with white bands, some white chert, ripple marks, layers 2"-3"	4.0
22 1911. → Dolomite, gray to bluish gray layers 2"-15" mainly fine to very fine grained	34.5
Unexposed to lake level	10.0

Coral dolomite. The Coral dolomite was divided by Chamberlin into two divisions, upper and lower. In the field, however, it was not found practicable to separate these members. The formation consists of rather coarse grained gray dolomite which weathers buff and "sandy". It is in many places full of cavaties, is thin bedded (2"-12") at nearly all horizons, contains abundant silicified corals, and in the middle carries much white chert. At the base alone is the rock firm and regularly bedded enough for building stone. The following section illustrates its character.

Section in abandoned quarry, Peninsula State Park.
Eagle terrace trail, Sec. 14, T. 31, R. 27 E.

Dolomite, medium grained, gray, silicified fossils	5.0
Unexposed slope above bench	10.0
Dolomite, medium grained, some beds fine grained, gray, weathers light gray, many silicified fossils, layers 2"-2', not all well exposed; top makes bench	21.0
Dolomite, fine grained, dense, dark gray, irregular, wavy layers from 1"-2"	5.5
Dolomite, medium grained, gray, weathers light gray, wavy bedding, white chert nodules, many silicified fossils, layers 2"-2'	12.5
Dolomite, coarse grained, beds 4"-2', gray, weathers gray and "sandy", laminated, once used for dimension stone	12.0
Dolomite, medium grain, gray, weathers dark gray and "sandy", layers 2"-4'	4.0
"Fishes Blue" → Dolomite, very fine grain, gray, weathers white, wavy lamination	2.0
Dolomite, coarse grained, gray, weathers dark gray, layers 2"-12", many cavities in some	34.0

The layer 34 feet from the base is one which occurs only sporadically. It might be mistaken for the top of the Byron but it hardly seems likely that any errors have arisen from this source. The detailed stratigraphy of the Coral was not worked out nor was the cause of the series of benches which mark its outcrop area. It is possible that such a study might be an aid in working out structure. The Coral makes up the backbone of the peninsula. Its thickness could not be accurately determined; it is at least 300 feet.

Racine dolomite. The Racine dolomite consists of firm, heavily bedded, medium grained, gray dolomite. The transition from the thinner bedded Coral is rather abrupt and is marked by an escarpment of 20 to 100 feet in height. No good sections of the Racine can be found in Door County. Its outcrop area is generally heavily drift covered or is confined to small peninsulas and islands of the Lake Michigan shore.

Details of structure. The top of the Byron was followed on the west coast from near Brussels to the end of the peninsula. However, it is only at Sturgeon Bay and near Fish Creek that this horizon can be traced inland for any distance. At the former locality there is a slight reversal of the normal dip between Smiths quarry and the Sturgeon Bay Stone Co. quarry of the north shore of the Bay. This amounts to only 10 feet and may be part of an anticline that pitches to the east. At Fish Creek a well defined anticline strikes N-S parallel to the Bay shore. It has a known length of at least 3 miles, as shown on the map. The exact closure on the west and north sides can only be conjectured but a height of not less than 25 feet can be positively demonstrated. This area was surveyed with the plane table. Somewhat similar structure is indicated in the peninsula east of Fish Creek but as this structure lies mainly within the State Park little attention was devoted to its details. The best exposed anticline is situated in Secs. 34 and 35, T. 31, R. 28 E., and Secs. 2 and 3, T. 30, R. 28 E. near North Bay. The surface rock is the basal layer of the Racine, which is in places broken through to the underlying Coral. The anticline is a hill nearly bare of drift whose summit is situated in the NE $\frac{1}{4}$. NE $\frac{1}{4}$, Sec. 3. The closure to the north cannot be much less than 30 feet in the distance that the beds can be followed; on the west it continues to the marsh on the border of Mud Lake. The entire structure is marked by excessive fissuring. Open cracks extend to depths of several feet and in places the roads ring hollow ~~where~~ where bridged over these.

The strike of most of the cracks is N. 70 E. and N. 20 W. Some of the former dip 60° E. The maximum dip of the beds locally exceeds 5 deg. The dome is not simple but has a lobe east of the road in Sec. 2. It was at this point where the greatly fractured dolomite makes up a rock floor to a pasture that the phenomenon was first discovered. No plane table map was made as it seemed unnecessary. Somewhat similar westward dips were noted in Sec. 9, T. 31., R. 28 E. but no definite structure could be made out.

Cause of structure. The question can now be raised as to the origin and possible depth of these structures. Are they due to irregularity of deposits such as coral reefs in the Niagara group, are they due to earth movements or are they due to settling over buried pre-Cambrian Monadnocks? If they are due to coral reefs the indications for oil are very poor. If they are due to earth movements the same is true since the closure is so small that it would hardly be possible that the anticline could extend to the top of the Galena-Trenton. If the structures are due to subsidence over an unconformity either at the base of the Cambrian or of the St. Peter than the chances are very good that the size of the bulge increases with depth.

Structures due to buried hills of pre-Cambrian are positively known at Baraboo where the Cambrian sediments dip away from the quartzite. At Fond du Lac the marked anticline ascribed by Alden to ice pressure (1) has been

(1) Alden, W. C., Quaternary geology of southeastern Wisconsin: U.S. Geol. Survey, Prof. Paper 106, p. 207, 1918

shown by drilling to lie above a quartzite ridge. The dome described by Chamberlain (1) north of Appleton

(1) Chamberlain, T. C., Geology of eastern Wisconsin: Geology of Wisconsin, vol. 2, p. 303, 1877.

very likely has the same origin. It is worthy of note that the two known anticlines in Door County lie in an E-W line; that directly west of this belt at Marinette pre-Cambrian quartzite is known (2); that the pre-Cambrian

(2) Smith, R. A., Deep well borings: Michigan Geol. and Bio. Survey, Pub. 24, pp. 238-239, 1916.

quartzite and other formation northwest of the area have an E-W strike. The excessive fissuring of the North Bay anticline supports the view that it is due to vertical stresses and tends to support this view.

The huge anticline near Two Rivers, Wisconsin, rests upon pre-Cambrian rocks as has been shown by the senior writer's reexamination of the samples from the deep test hole put down by the city in the vain search for artesian water.

The writers therefore conclude that the anticlines of Door County may extend to considerable depth and increase in size in the lower formations.

OIL INDICATIONS.

Observed oil. The senior writer examined a well at Holland town, east of Kaukauna, Wisconsin in 1919. This well was drilled by J.J. Faust and Sons who reported that after standing some time about 10 gallons of a light oil was taken from on top of the water. Oil continued to come up with the water apparently from the lower part of the Galena-"Trenton" for some time. This attracted considerable attention. At the time the well was visited there seemed to be little doubt that the statements about the oil were correct and that it actually came from the rock. No oil could be seen in the old dug well in the bottom of which the deep well was drilled, this apparently eliminates the hypothesis of artificial origin. Furthermore, oil was found in another well which was cased down some distance into the rock. Slight traces of oil were found by testing the brown shales from the Sturgeon Bay well.

Reported indications. Oil showings were reported by J. E. Johnson, Superintendent of Sturgeon Bay water works at from 650 to 800 feet depth in the Sturgeon Bay well. These depths correspond to the brown shales of the Richmond. He stated that the most oil was found at about 800 feet; it was of dark color and very offensive smell. So much was obtained that he said that they feared they would get oil rather than water. Since the fresh water of the St. Peter was let into the hole the oil has disappeared. Smaller showings were reported from the Sawyer well across the bay. J.J. Faust, well driller of Kaukauna, states that he has found small oil showings in deep wells east of that

city for many years. C.L.Green, well driller of Green Bay reports a slight show of oil in the well at the Sisters Laundry, Green Bay. H. C. Sibree of Sturgeon Bay stated to the writers that oil showings were found at depths of 760, 820, 947-950 in the last and deepest hole drilled by the Tornado Oil and Gas Co. From the lower one he stated that the driller claimed to have bailed out several barrels of oil but that it was drowned out by salt water. However, C.L.Green who did most of the drilling stated positively that neither oil nor salt water was found. This was confirmed by the statement of a neighbor who told us that Green was in the habit of making tea with water from this drill hole. No salt water is known in the vicinity at any depth although the waters at Two Rivers and a few other points to the south are somewhat salty (1).

(1) Weidman, Samuel and Schultz, A.R., The underground and surface water supplies of Wisconsin; Wisconsin Geol. and Nat. Hist. Survey, Bull. 35, pp. 250, 434, 1915.

The writers examined a supposed oil seepage at Scarboro, Wisconsin deciding that it is not of natural origin.

R. A. Smith (2) states that the outcrop of the Galena-

(2) Smith, R.A., The occurrence of oil and gas in Michigan: Michigan Geol. and Bio. Survey, Pub. 14, p. 232, 1914.

"Trenton" in northern Michigan is "bituminous and petroliferous and very frequently the cracks and fissures are found to contain dried oil residue or asphaltum 'gum' ".

Some of the same material has been found in Wisconsin. At Greenleaf, Wisconsin the basal Byron contains some asphaltic material in cavities.

The writers conclude that there is valid evidence of the presence of oil in Door County. It does not follow that the oil was necessarily formed in the near vicinity; it may have migrated up the dip from the Michigan basin.

W. I. Robinson of the Michigan Survey stated in a letter dated June 24, 1922 that:

"most of the oil formerly contained in the Basin has migrated toward the outcrop and that any small pools that may be developed may be found much nearer the outcrop than the center of the Basin. If you have a definite structure on the Door Peninsula whose axis is transverse to the dip, it would be my personal opinion that it is worth investigating".

HISTORY OF EXPLORATIONS.

Calumet Land and Oil Company. About 20 years ago the Calumet Land and Oil Co. of Calumet, Michigan became interested in prospecting for coal in Door County. From information given by H.C. Sibree of Sturgeon Bay it appears that the work was started by a man named Burns who had found coal fragments on the beach. Without questioning the inhabitants who could have told him that these were washed up from wrecks in Green Bay, he started upon deep drilling. The records of two test holes are given by Weidman and Schultz (1); their report states that the work was done in Sec. 24, T. 27, R. 23 E. but inquiry

(1) Weidman, Samuel, and Schultz, A. R., The underground and surface water supplies of Wisconsin: Wisconsin Geol. and Nat. Hist. Survey, Bull. 35, pp. 311-312, 1915.

among neighbors and the description by distance from the lake shore convinces the writers that the locality was actually the SE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 36. C.L.Green of Green Bay stated that drilling was done at only one place but that the holes were abandoned because of tools lost in them. He said that, although only a few feet above the lake level, there was no artesian flow.

Tornado Oil and Gas Co. After the failure of the Calumet exploration, Burns is said to have started drilling in the south part of the SW $\frac{1}{4}$, Sec. 3, T. 26, R. 24 E. on a high hill which is capped by an outlier of the Coral. Just what caused this spot to be selected could not be determined; certainly Burns did not believe in geologists or he would not have drilled for coal in the Ordovician! After some unsuccessful drilling he interested H. C. Sibree, a physician of Sturgeon Bay. They organized the Tornado Oil and Gas Co. which was named after the now abandoned post office of Tornado, then located just east of the hill. According to C.L.Green about \$4000 was spent on drilling, although \$18000 worth of stock was sold. Dr. Sibree told us that he alone sank \$7000 in the enterprise. The deepest hole was in SE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 9, T. 26, R. 24 E. by the side of State Trunk Highway 78. Much bad luck was encountered and the tools were lost in all the holes

started. It is said by some person that the last and deepest hole reached a depth of nearly 1400 feet, but this is very doubtful. The deepest samples in Dr. Sibree's possession do not indicate much over 1000 feet and Green is positive that the tools lost at that depth when he quit the job were never recovered. Burns died during the course of the work and on his deathbed persuaded Dr. Sibree to continue. As noted above it seems quite probable that someone deceived the Doctor as to what was found and as to the depth. Dr. Sibree claims that his leases still hold and that he intends to drill again. How large a territory was leased we did not learn, but understood that it was all south of Sturgeon Bay. One of the test holes is now used as a well; the deeper one was filled with loose rocks.

Explorations outside Door County. Explorations along the west shore of Lake Michigan comprise some old work in northern Michigan described by Smith (1), the recent Seul Choix exploration east of Manistique by the Schoolcraft

(1) Smith, R. A., The occurrence of oil and gas in Michigan: Michigan Geol. and Bio. Survey, Pub. 14, pp. 231-246, 1914.

Development Syndicate, the Johnson exploration near Kaukauna, the Scarboro Development Co. near Luxemburg, Wisconsin, and some scattered attempts not followed up by the writers.

Seul Choix Exploration. The exploration on Seul Choix point was done in 1922. Information was secured from W. I. Robinson of the Michigan Survey and from F. A. Edson who visited the locality. Nothing was found but fresh

water and although located on geological advice the holes were carried far deeper than there is any possibility of oil. According to Robinson the fold pitches strongly and shows no closure. (Letter, Aug. 8, 1922).

Johnson exploration. The oil showings discovered at the Hollandtown creamery east of Kaukauna were investigated by the senior writer for the Wisconsin Survey and pronounced probably genuine. Following this H. M. Johnson of Sheboygan formed a company and obtained leases on about 5000 acres. This was done contrary to advice, for examination had definitely shown that there is no structure at that locality. In 1920 a shallow hole was drilled which is believed to have been completely dry. Following the refusal of the State Railroad Commission to permit the sale of stock the project was abandoned. According to letters from J. J. Faust, the promoters had expected to find oil in the pre-Cambrian granite!

Scarboro Development Company. In 1920 a seepage of oil was found at Scarboro, Kewaunee County, east of Luxemburg. This was investigated by E. F. Bean, assistant State Geologist of Wisconsin who pronounced it leakage from a gasoline tank a rod or two away. C. L. Green of Green Bay also reached the same conclusion. A shallow test hole was started by some boys of the neighborhood with a borrowed drill rig; this was abandoned at a depth of about 40 feet. A "geologist" from Texas reported favorably on the project to a company of local farmers who leased about 7000 acres. The area was also investigated for this company by the writers in 1922.

Other explorations. J.J. Faust of Kaukauna reported that south of Kaukauna a well over 1300 feet deep was once drilled in search of gas. Gas does occur here in the drift but is evidently from the "forest bed" under the red clay(1).

(1) Weidman, Samuel, and Schultz, A. R., The underground and surface water supplies of Wisconsin: Wisconsin Geol. and Nat. Hist. Survey, Bull. 35, pp. 264-265, 1915.

Other projects have been reported in the papers from time to time but nothing came of them.

CONCLUSIONS.

Facts favorable to exploration for oil in Door County, Wisconsin, comprise:

(a) The Black River group which contains oil in Ohio, Indiana, and Illinois occurs here.

(b) This rock is under sufficient cover to retain oil in proper structures.

(c) The known structures may be large enough at depth to trap oil.

(d) Oil may have migrated from Michigan up the dip.

(e) Oil residue, slight oil showings, and bituminous shales are known in or near the county.

(f) Exploration would be cheap as the depth is not great and the nature of the formations is well known.

Unfavorable facts are:

(a) No deep hole in Wisconsin has found oil in quantity.

(b) The known structures are small.

(c) The area is near to the outcrop of the covering shale.

(d) Deep wells find fresh water below the oil horizon.

-THIRTY.

LEGEND

SILURIAN

Sr

Racine dolomite

Sc

Coral dolomite

Sb

Byron dolomite

Sm

Mayville dolomite

ORDOVICIAN

Or

Richmond shale

Otg

Galena-Trenton group

Osp

St. Peter sandstone

Olm

Lower Magnesian dolomite

Csh

Elevation base of formation
Shown by initial
formation boundary
(approximate only)

20' contours, base of Coral

100' contours, base of Richmond

(cont)

CAMBRIAN

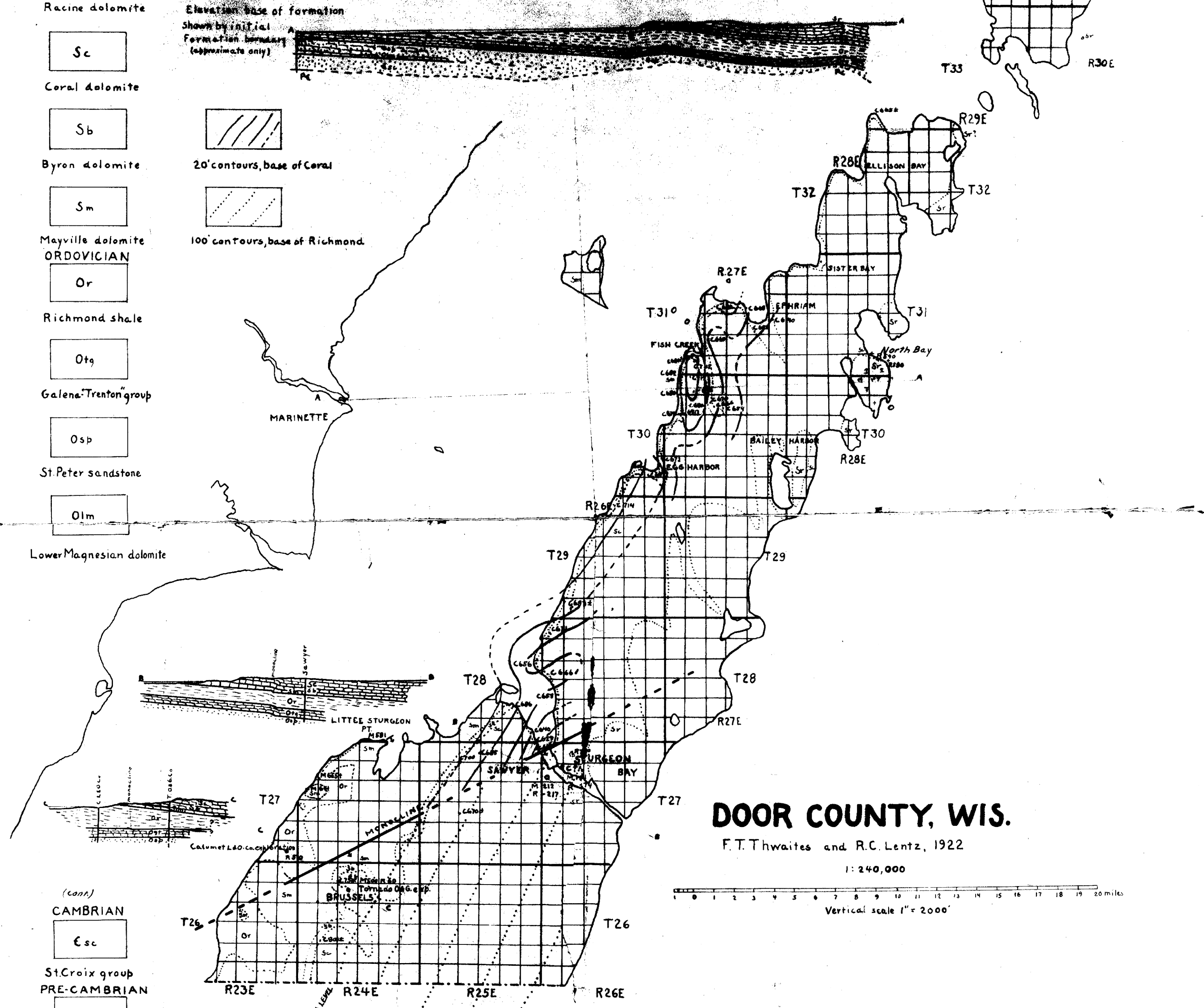
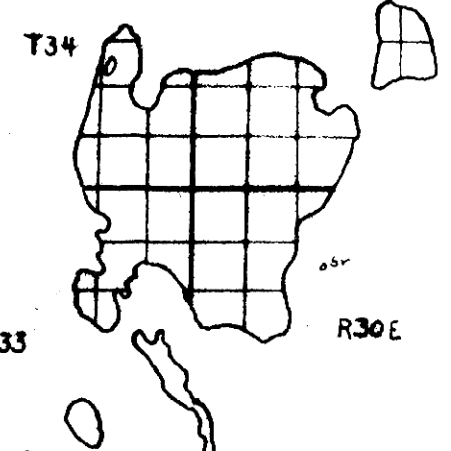
Esc

St. Croix group

PRE-CAMBRIAN

PE

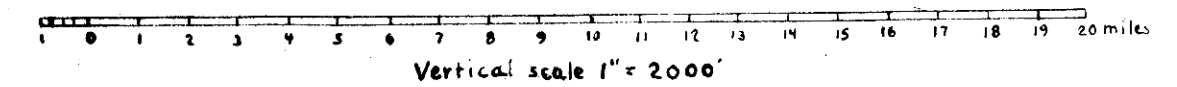
Undifferentiated



DOOR COUNTY, WIS.

F.T. Thwaites and R.C. Lentz, 1922

1:240,000



Vertical scale 1" = 2000'