GM 35738

REPORT ON EXPLORATORY DRILLING, SAINT-MAURICE AND CHAMPLAIN

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Énergie et Ressources naturelles
Québec

REPORT

ON EXPLORATORY DRILLING

BY SEAWAY-ALMOA LIMITED AT

ST. MAURICE

AND

CHAMPLAIN

QUEBEC

T. H. CLARK

GEOLOGIST

NOVEMBER 20, 1957

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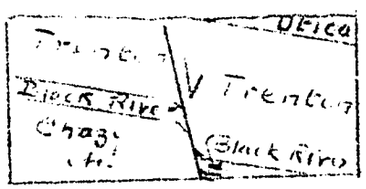
REPORT UPON PRELIMINARY DRILLING FOR ALMEGA - SEAWAY, LTD.

AT ST. MAURICE, CHAMPLAIN COUNTY, QUEBEC

Evidences from two separate sources — first, areal geological mapping and second, a geophysical (gravity) survey, indicate that the geological situation in the vicinity of St. Maurice involves a series of Ordovician strata, listed below:

Lorraine shale	2,000 feet thick	
Utica shale	300 "	
Trenton limestone	700 "	
Black River limestone	50 "	
Chazy limestone, etc.	)	
Beekmantown dolomite	) thickness	
A basal sandstone	) uncertain	

These beds all dip toward the south-southeast with angles, on an average regional basis, of from 2° to 3°. At St. Maurice village they are broken by the St. Prosper fault, trending northeast-southwest, the rocks on the southeast side having dropped down. Gas or oil rising up the dip in a northwesterly direction would, with no complications, reach the air and dissipate. The St. Prosper fault, it is thought, would pose a barrier to this migration, and it is expected that gas or oil would be trapped as shown in the cut above, most likely in the Trenton limestone where it is covered by the impervious Utica shale. The evidences mentioned above involve a possible error of from half a mile to a mile in determining the geologic boundaries and the position of the fault. In



order to determine the distribution and attitudes of the rock formations with greater exactness, and to locate as precisely as possible the position of the St. Prosper fault, four holes were spotted upon the gravity map, two northwest of St.Maurice village, and two southeast of that place, thus straddling the supposed trace of the fault. The results of the drilling, which penetrated no more than 50 feet into the rock at any place, are shown on the accompanying chart.

Comments upon the Chart. Holes 4 and 8 show Lower Trenton limestone at about the same depth. Hole 7, which was not recommended in the original plan, adds nothing to our information and should not have been drilled. Because there is no impervious cover over this Lower Trenton limestone, and because it lies up-dip from the fault, search for oil or gas there is not likely to be rewarded with success.

Hole 1 begins in the Upper Trenton, at a lower elevation than the Lower Trenton of Hole 8. This anomalous condition can be resolved by introducing a fault between the two holes. Nevertheless, although Hole 1 is backed toward the northwest (i.e., up-dip) by this fault, the absence of an impervious cover reduces the chances of finding oil or gas remaining in the limestone here.

Hole 6A begins in the Utica shale, and a fault must therefore intervene between it and Hole 1. Similarly, a fault is called for between Hole 6A and Hole 5, which latter begins in the Lower Lorraine at the same elevation as the Utica of Hole 6A. Hence the presence of both an impervious shale cover above the Trenton limestone in the vicinities of Holes 6A and 5, together with the certainty that in each case a fault lies up-dip from these two holes, makes drilling a deep exploratory hole on the site of either, or both, of them a highly desirable undertaking.

Recommendations In view of the above analysis, I recommend that both hole 6A and Hole 5 be deepened by diamond drilling as far as the base of the Trenton limestone. Hole 6A should, accordingly, go down not more than another 1,000 feet. Hole 5 might have to be deepened anywhere between 1,200 and 1,500 feet, depending upon the amount of displacement along the fault between the two holes. Though there is a distinct possibility of finding gas or oil at still deeper horizons, the Trenton limestone has proved to be the greatest producer to date in the Lowland, and deserves to be thouroughly explored before the deeper formations.

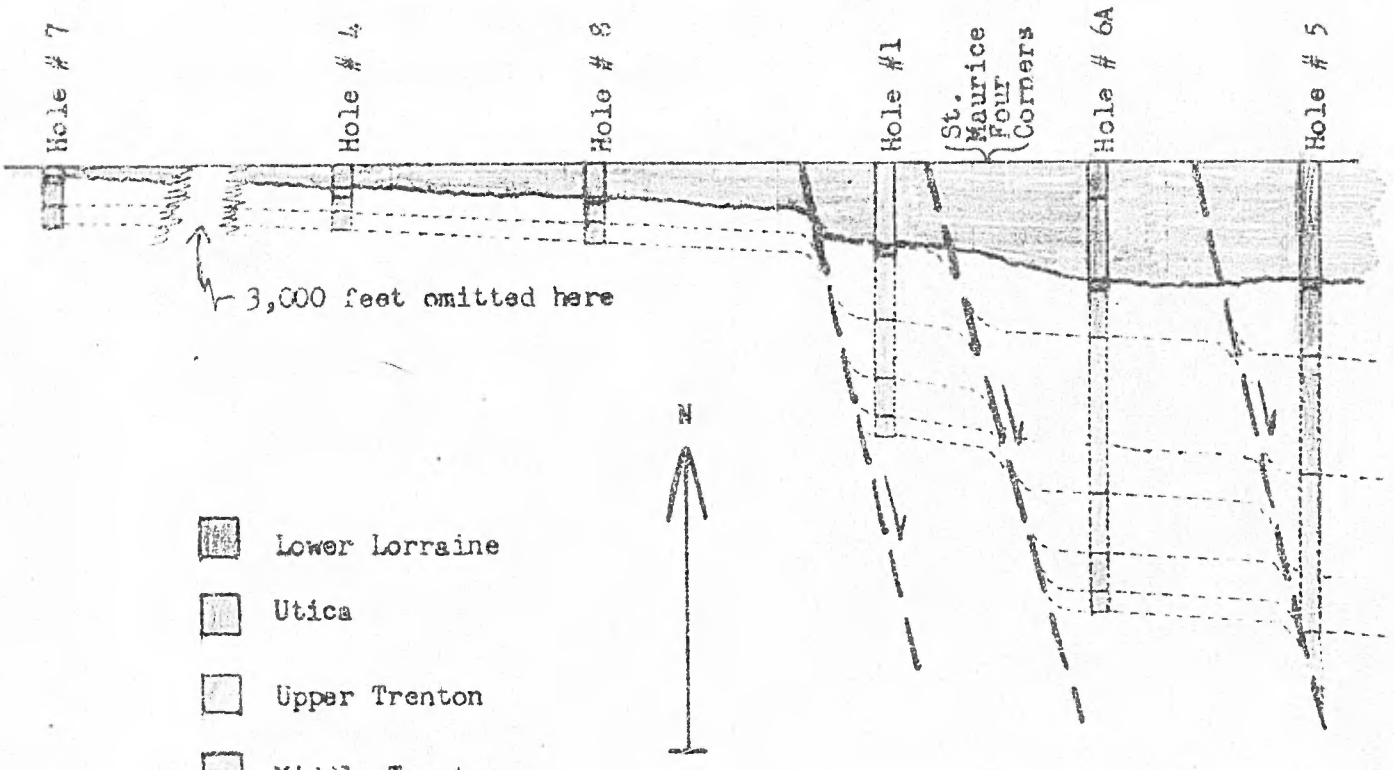
T. H. Clark

T. H. Clark, Geologist
November 10, 1957

CORRELATION CHART OF SEAWAY - ALMEGA ST. MAURICE HOLES

TO SHOW EXPECTED SUB-SURFACE STRUCTURE & DISTRIBUTION

SECTION DRAWN ALONG NW — SE ROAD THROUGH ST. MAURICE



Lower Lorraine

Utica

Upper Trenton

Middle Trenton

Lower Trenton

Black River, etc,

Overburden

Top of rock
Base of overburden

Fault

Formation boundary

Drill holes are projected down beyond their actual depth as far as the Black River formation

500'
SCALE
0'
500'

J. W. Clark
Nov. 10, 1957

G.S. 5201

LOG OF SEAWAY - ALMEGA ST. MAURICE HOLE NO. 1

Depth in feet		Description
0 - 90	OVERBURDEN	No samples
90		Coarse sand
100		ditto, a few shell fragments
110		ditto, a few fragments of dense brown limestone
120		ditto, ditto
130		ditto, ditto, up to 5% of sample
140		ditto, ditto
150		ditto, ditto
160		ditto, ditto
170		ditto, ditto
180		ditto, ditto
190		ditto, ditto
200	UPPER TRENTON	ditto, 40%; dense brown limestone 60%

D.W. Clark
Sept 6 1957

Log of Seaway - Almega St. Maurice Hole no. 1

(continued)

GM 5576

Depth in feet		Description				
200 - 214		No samples received				
						Diamond Drill Samples — Core
214 - 220	UPPER TRENTON TETREAUVILLE FORM.	Dark dense limestone, interbedded with black fissile shale Contacts cloudy, Limestone shows no bedding; shale faint color bands. Bedding dips up to 10° Maximum thickness of limestone beds: of shale: % of shale				
			10°	8"	17"	61%
220 - 225		Rocks as above	10°	8"	30"	70%
225 - 230		Rocks as above	15°	7"	12"	60%
230 - 235		Rocks as above	15°	4"	13"	78%
235 - 237½		Rocks as above	20°	6"	6"	43%
		A few thin calcite veins (.1") at 75°				

J. W. Clark
Nov. 10, 1947

LOG OF SEAWAY - ALMEGA HOLE NO. 4 ST. MAURICE

Depth in feet		Description
40	OVERBURDEN	Light gray clay
50		ditto, with very fine-grained sandy patches
60		ditto, ditto
70		ditto, with a few small pebbles
		Diamond Drill Cores
69 - 79	LOWER TRENTON	Lower Trenton (Deschambault) limestone. Fine-, medium-, and a few coarse-grained beds, mostly light to medium gray. A few bryozoa-rich beds (characteristic of the lower part of the Deschambault formation).

GA 5303

St Lawrence
Sept 3/57

Log of [illegible] - AMOCO ST. PATRICK HOLE NO. 5

Depth in feet		Description				
0- 10	OVERBURDEN	Gray clay				
10-20		"				
20- 30		" , faintly sad finely micaceous				
30- 40		" "				
40- 50		" shell fragments				
50- 60		" , dark " "				
60- 70		" " " "				
70- 80		" " "				
80- 90		" " "				
90-100		" " "				
100-110		" " "				
110-120		90% fragments of biotite gneiss; 10% clay. Probably one gneiss boulder, for the fragments are all alike. Shell fragments				
120-130		90% as above; 10% other Precambrian types; 10% clay. ditto				
130-135		75% as above; 10% ditto; 5% brown limestone; 10% clay. Ditto				
135-140		60	30	5	5	"
140-145		65	20	5	10	"
145-150		40	45	5	10	
150-155		25	60	5	10	
155-160		20	70	5	10	
160-165		20	70	5	10	"
165-170		30	55	5	10	"
170-175		30	55	5	10	"

Cm5431

Log of Seaway-Alcan St.Maurice Hole No. 5 — continued

Depth in feet		Description		
175-180	OVERBURDEN	Gray clay		
180-185		80% Precambrian; 10% brown limestone; 10% clay; shell fragments		
185-190		85	5	10
190-195		Clay		
195-200		ditto		
200-205		85% Precambrian	5	10
205-210		85	5	10
210-215		85	5	10
215-220		85	5	10
220-225		Clay		
225-230		ditto		
230-235		85% Precambrian	5	10
235-240		85	5	10
240-245		85	5	10
245-250		85	5	10
250-255		85	5	10
255-260		Clay		
260-265		ditto		
265-270		ditto		
270-275		ditto		
275-280		85% Precambrian	5	10
280-285		80	10, in part shaly	10

GM 5451

Log of Seaway-Almega St Maurice Hole no. 5 - continued

CM 5497

Depth in feet		Description
285 - 290		80% Precambrian; 10% shaly ls. 10% clay
290 - 295		80 10 10
295 - 300		50 40 10
300 - 301		No record
		CORE SAMPLES BELOW THIS DEPTH
301 - 302'3"	ORDOVICIAN	Lower Trenton limestone. Probably a block in the overburden, because ~~underlain~~ under by Precambrian
302'3"-302'5"		Precambrian gneiss. Certainly a block in overburden
302' 5" - 311	L. LORRAINE	Dark gray shale with thin sandy beds
311 - 320'5"		Dark gray shale with thin sandy beds. 6" sandstone bed from 311 to 311'6". Climacograptus pygmaeus a Lower Lorraine index fossil Strong odor of petroleum

Recd Dept 3 1957

LOC OF SEAWAY - ALMEGA ST. MAURICE NO. 6A

Lot 11, St. Jean Rang, S.E.
Parish of St.Maurice, County Champlain
Becancour topographic map-area

Depth in feet		Description
10	OVERBURDEN	Light gray clay
20		ditto
30		ditto
40		Light gray silty clay
50		ditto
60		ditto
70		ditto
80		ditto
90		ditto
100		ditto, with small pebbles
110		ditto, ditto
120		ditto
130		ditto
140		ditto
150		ditto
160		ditto, shell fragments
170		ditto, with sand grains
180		ditto, ditto
190		Medium-coarse grained sand grains, some silt
200		Coarse sand
210		ditto, and fine gravel

GM 5648

Log of Seaway - Almega St. Maurice no. 6A

(continued)

Depth in feet		Description
220	OVERBURDEN	Coarse sand
230		ditto
240		ditto
250		ditto
260		Fine sand
270		Very fine sand
280		ditto
290		Clay and black shale, brown streak, faint effervescence, a little pyrite in shale
300		Clay and black shale, brown streak, weak effervescence,
		Diamond drill core
300 - 304	UTICA	No samples
304 - 310		Dark gray to black shale with very thin sandy beds, less than 1mm. Bedding more or less horizontal.
310 - 315		ditto
315 - 320		ditto
320 - 325		ditto
325 - 326		ditto, but sandy bands prominent, up to 1/8" thick

J. W. Clark
Nov. 10. 1957

LOG OF SEAWAY-ALMEGA ST.MAURICE HOLE NO. M 7

GM 5493

Depth in feet		Description
		Diamond Drill Core
0-39		**Overburden**
39-49	LOWER TRENTON	**Medium to light gray, fine- to medium grained limestone, crystalline throughout. Bryozoan beds common. Deschambault formation**

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Sept 3 1957

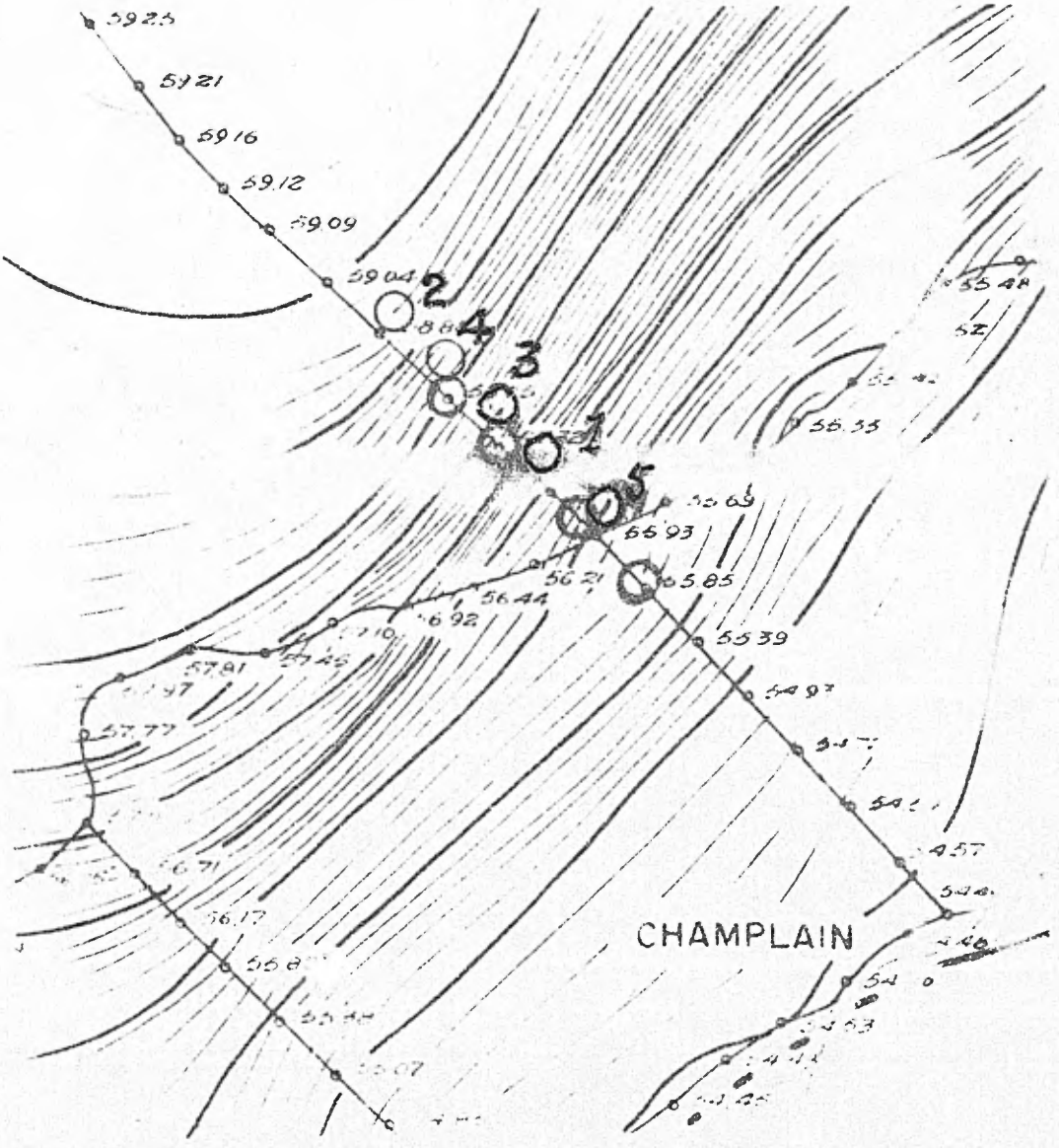
COMMENTS AND RECOMMENDATIONS CONCERNING CHAMPLAIN HOLES

1, 2, 3, 4, & 5, CHAMPLAIN, QUEBEC

PURPOSE OF DRILLING

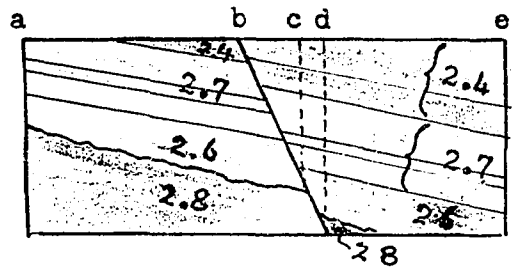
The purpose of the drilling program carried out in the last two months by Seaway - Almega (Quebec) Company at Champlain was to determine the characteristics of a supposed fault indicated by crowded isogals on the gravity survey map. The trend of this crowded zone is north-northeast, identical to that of known faults in this part of the Lowland. Moreover, the lower readings lie to the southeast side of the supposed fault, indicating a downdrop on the southeast side, a situation in harmony with known conditions elsewhere. These two corroborative facts, together with the Gravity Survey map anomaly, are sufficiently compelling evidences of the existence here of a fault. Hereafter it will be referred to as the Champlain Fault.

REPRODUCTION OF PART OF THE GRAVITY MAP SHOWING THE RELATIONSHIP BETWEEN THE GRAVITY ISOGALS AND LOCATIONS OF THE FIVE HOLES DRILLED TO DATE.



EXPLANATION OF GRAVITY ANOMALY

Diagrammatically, a simplified exposition of the theory underlying the present interpretation of the gravity anomaly is as follows. If we start with a fault whose characteristics are similar to those of known faults in the Lowland (e.g., Charette, Prosper, Neuville faults) the cross-section would be more or less like this, disregarding overburden.



Readings taken on the gravity meter record the gravitational pull of the underlying rocks, which is a function of their specific gravities. These specific gravities (average, not determined, values) are inserted in the diagram. It follows then, that in passing from a) to b) there will be a progressively weaker gravitational attraction due to the greater depth at which the heavier rock occurs, assuming a regional dip of the strata of 2° towards the southeast. From c) to d) there will be a considerably lessened pull due to the much greater distance below the surface of the heavier rocks, and the greater thickness of the lighter rocks. This results in a larger number of isogals per horizontal unit distance, and hence their crowding. From d) to e), due to the normal regional dip, fairly regularly spaced isogals should, and do, show up on the map, comparable to those for the a) to b) interval.

FACTORS TO BE INVESTIGATED

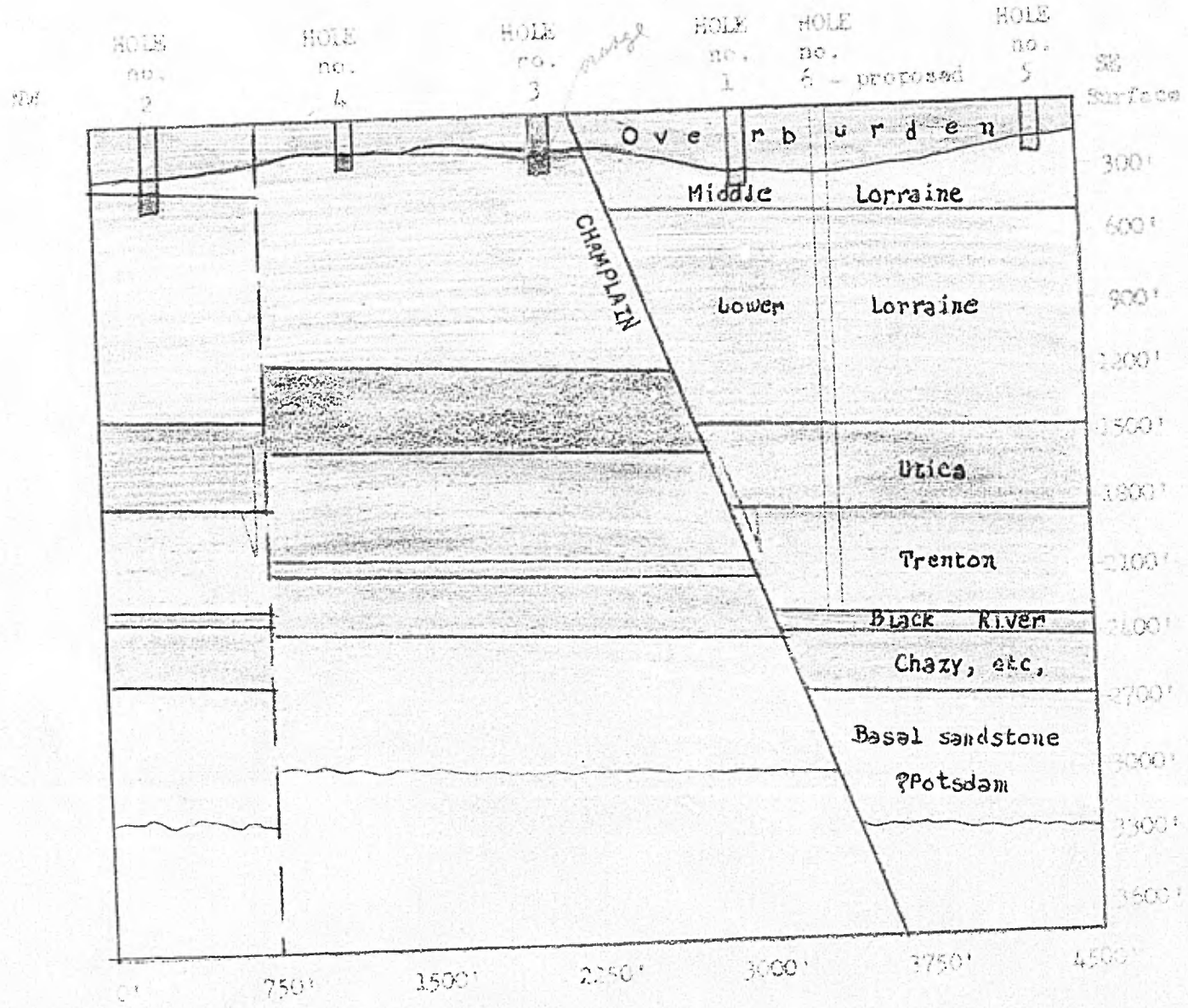
There are several important features regarding this Champlain fault which we should know about before intelligent drilling can be undertaken.

1. Location, as precise as possible,
2. Inclination.
3. Amount and direction of displacement.
4. Closed or open.

Location. The group of Holes 2, 4, 3, 1, and 5 straddle the structure as it is shown on the gravity map. Lithologic differences in the cores should tell between which pair of holes the break occurs. Because the isogals are fairly well crowded over a width of half a mile, Holes no. 2 and no. 5 were chosen to be well beyond the crowded zone to the northwest and the southeast respectively. The numbers record the order of drilling. 50-foot cores were taken from each hole. As expected, there is a decided discontinuity in the stratigraphic sequence between the logs of Holes 3 and 1 (see charts, pp. 7a and 7b) so that, even in the absence of other evidence, the presence of a fault here would be definitely proved. There also is a second fault between Holes no. 2 and no. 4, but because it lies up-dip from the Champlain fault the chances of its having been able to accumulate much, if any, oil or gas is of a low order.

The fact that the core of Hole no. 3 is cut by 45° joints and slickensides indicates that this core was sufficiently close to the fault to have been so affected, and hence it is here located closer to Hole no. 3 than to Hole no. 1 whose core shows neither joints nor slickensides.

CORRELATION CHART OF HOLES DRILLED AT CHAMPLAIN, QUEBEC



Horizontal and vertical scale: 750 feet to one inch

Elevation of surface approximately 100 feet above sea level

Inclination. Where similar faults are known they are inclined at angles of from 65° to75° to the southeast, and this inclination, therefore, should be assumed for the Champlain fault. Partial corroboration may be had by reference to the diagram on page 2 shows that the outcrop of the fault at the surface b) would only lie directly above the belt of crowded isogals c) to d) if the fault surface were vertical. The more the fault departs from the vertical the greater will be the distance between b) and c) on the surface. Hence there is here direct evidence of an inclination of the fault plane down toward the southeast, but at what angle is is not possible to say with assurance.

Amount and Direction of Movement. Without the logs of a well which actually cuts through the fault, or logs of two holes, one on each side of it, no precise figure of the displacement can be given. Reference to Chart · dndicates a difference of at least the length of No. 1 core, which must be taken as the minimum displacement. It might well be a few hundred feet more. As for the direction of movement the chart on page 7b shows clearly that the entire succession in Hole no. 1 lies stratigraphically above that of Hole no. 3 and could only have reached that relative position by slipping down the Champlain fault plane.

Open or Closed. This important feature cannot be determined until the fault is actually cut. In the most favorable circumstances the fault would be found clogged with gouge, and, thus closed, would act as a dam to oil or gas migrating up the dip toward the northwest. If open, it might act as a channel for the escape of these fluids. Because no marked incidence of gas occurrences has been noted along its tracem, it is probable that it is largely, if not completely, closed.

CONCLUSIONS

The above analysis provides sufficient data to allow the drawing of conclusions concerning the position underground of the preferred stratigraphic horizon, and concerning the most favorable location for a deeper test hole.

Preferred Stratigraphic Horizon. To date, in the majority of cases where the horizon of gas production is known, it is the Trenton limestone which is the producer. Below this come the Black River and other limestones, and a basal sandstone often called the Potsdam. Of the formations below the Trenton only the basal part of the 'Potsdam' sandstone, supposedly similar to the 'granite wash' of Kansas and Saskatchewan, holds promise of production. Because the expense of drilling the 1,000 feet between the Trenton limestone and the base of the 'Potsdam' is not economically defensible, I recommend, in order to reach the formation holding maximum promise, drilling through the Trenton limestone (here about 450 feet thick) and stopping at its base, or just within the Black River limestone (here about 50 feet thick). If this procedure is followed, then the underlying hard and tough sandy limestones and dolomites and the pure quartz sandstones will be avoided, at least until conditions warrant basement exploration.

On Figure x-section p 3a. I have indicated the most favored location for Champlain Hole no. 6. Because there is some uncertainty concerning the elevation of the Middle - Lower Lorraine contact in Holes nos. 3 and 5, the depths at which the various horizons will be met may be as much as 200 feet higher or lower than shown on the chart. Hence, the

Trenton limestone should be encountered at about 1800 (± 200) feet below ground, and should continue to about 2250 (± 200) feet. The maximum depth to which this hole is expected to go is the latter figure, and it might very well be the lesser figure given.

Location. I have located Hole no. 6 some 350 feet southeast of Hole no. 1. Thus the hole should penetrate the Trenton limestone reasonably close to the fault plane and on its southeast side. By so doing it will take full advantage of the possible entrapment of any oil or gas which may have risen up the dip and be held against the fault plane. In making this selection the unknowns, including the inclination of the fault plane, its position at the surface between Holes nos. 3 and 1, and the exact thickness of strata below ground have been allowed for.

RECOMMENDATIONS

I recommend that a hole be put down on the site of the suggested Champlain Hole no. 6. This hole should penetrate the Trenton limestone formation completely, and should be terminated at the base of the Trenton, or, if there be any doubt about that horizon, anywhere within the underlying Black River limestone. No gas or oil of importance should be expected until the impervious Utica shale shall have been penetrated. Thereafter the chances of finding considerable gas, if not oil, are good.

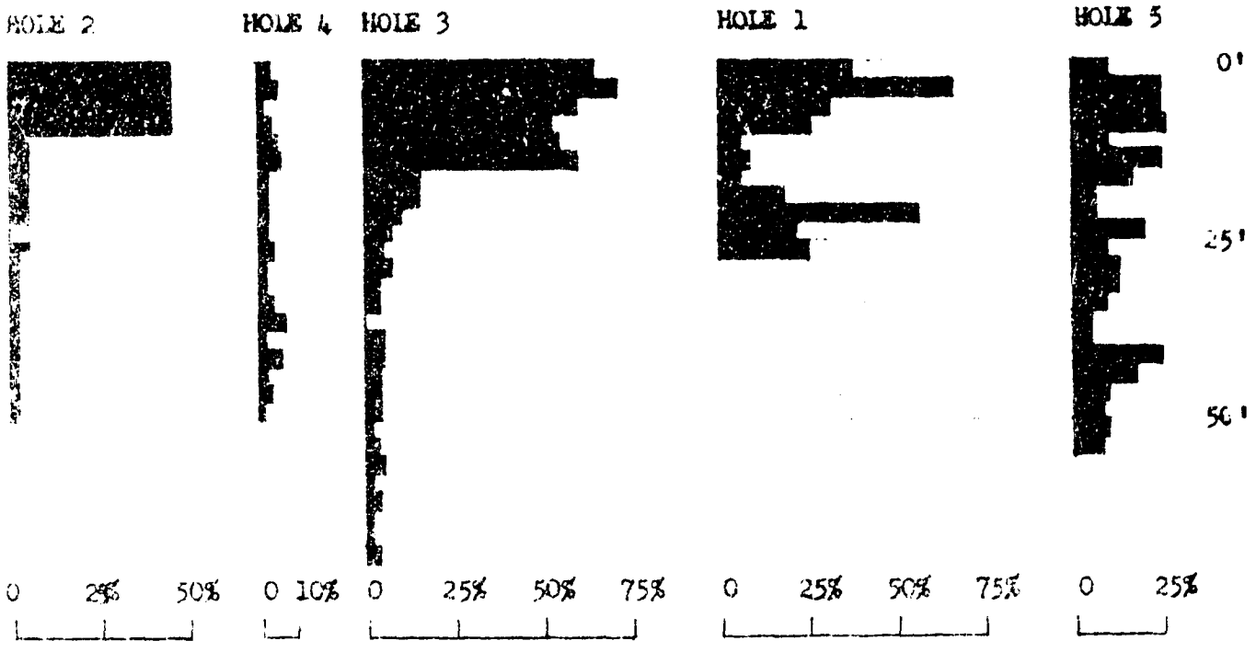
Although expert engineering advice should be sought to determine the most efficient and the most economical method of drilling, I favor, in the absence of other controlling factors, diamond drilling. It must be realized that this hole will still be an exploratory hole (there can be no production hole until the existence of a pool of gas or oil has been located). The chief function of an exploratory hole is to provide information, and there is no better method of providing geological information than by studying a diamond drill core.

T. H. Clark

T. H. Clark - Geologist

December 18, 1957.

PLOT OF SANDSTONE PERCENTAGES IN CHAMPLAIN CORES



Horizontal scale: one small square side -- 5% sandstone

Vertical scale: one small square side -- 2½ feet

The Middle Lorraine shale rarely has less than 10% sandstone, and usually has more than 20%.

The Lower Lorraine shale rarely has as much as 10% sandstone, and usually less than 5%

The boundary between the Middle Lorraine above and the Lower Lorraine below is clearly shown in the logs of Holes 2 and 3.

Hole 4 is entirely in Lower Lorraine.

Holes 1 and 5 are clearly in Middle Lorraine.

See next figure

D. V. Clark
Dec. 19, 1957

ORDER OF SUPERPOSITION OF CORES FROM HOLES 1, 2, 3, 4, & 5

DETERMINED IN PART FROM PATTERNS OF SANDSTONE PERCENTAGES IN SHALE



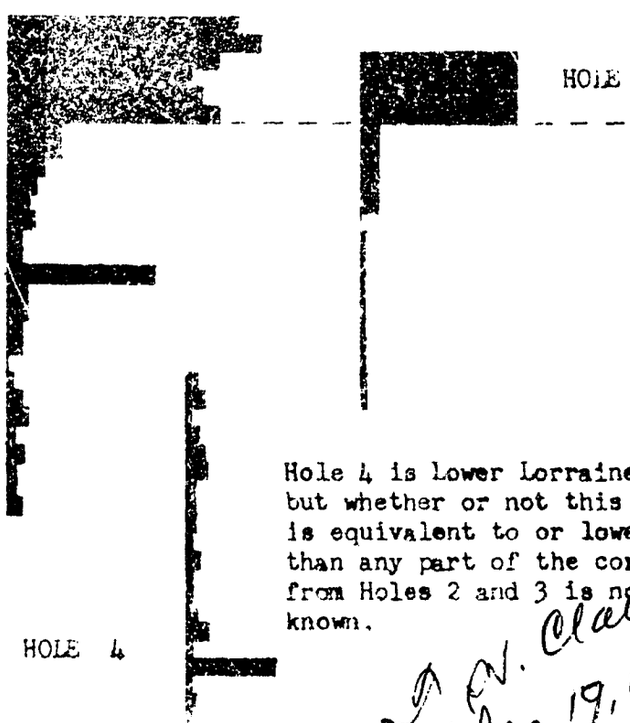
HOLE 5

Holes 5 and 1 are both in the Middle Lorraine. The Correlation Chart shows clearly that the core of Hole 5 lies stratigraphically above that of Hole 1, with about 100 feet between them



HOLE 1

Hole 1 must lie above any part of holes 2 and 3, for there is no correspondence in sandstone percentage pattern. How much of a gap intervenes can only be estimated.
Maximum 500 feet
Minimum 100 feet



HOLE 3

Middle Lorraine
Lower Lorraine

HOLE 2

Holes 3 and 2 both show the Middle—Lower Lorraine boundary and are therefore at the same stratigraphic horizons.

Vertical and horizontal scales the same as on previous chart.

HOLE 4

Hole 4 is Lower Lorraine, but whether or not this core is equivalent to or lower than any part of the cores from Holes 2 and 3 is not known.

D. P. V. Clark
Dec. 19, 1957

LOG OF SEAWAY - ALMEGA CHAMPLAIN NO. 1 HOLE

Depth in feet		Description
10		Fine to medium-grained sand
20		ditto
25		Silt
30		Fine-grained silty sand
35		ditto
40		Light gray clay
50		ditto
55		ditto
60		ditto
65		ditto
70		ditto
75		Silty clay
80		Light gray clay
85		ditto, silty
90		Light gray clay
95		Fine-grained sand and silt
100		ditto
110		ditto
120		Silty clay, with a few sand grains
130		ditto
140		Silty clay
150		ditto, with shell fragments
160		Silty sand, with small pebbles
170		Medium-grained sand

OVERBURDEN

Lo G of Seaway - Almega Champlain no. 1 Hole

Continued

Depth in feet		Description					
					Cable Rig Cuttings		
		Very fine-grained micaceous sandstone, medium to light gray					
		Medium grained shaly siltstone					
		Fine-grained gray-brown shale				Reaction to weak acid	Streak
180	MIDDLE ORRAINE	90	5	5		Weak	White
185		100	—	pr		"	"
190		80	20	pr		"	"
195		85	10	5		"	"
200		90	5	5		"	"
205		90	5	5		"	"
215		95	5	pr		"	"
220		90	5	5		"	"
225		85	5	10		"	"
230		80	10	10		"	"
235		90	5	5		"	"
240		75	10	15		"	"
					Diamond Drill Core		
240 - 245		Medium dark gray shale, with abundant sandstone beds up to 2" thick, cross-bedded, non-absorbent. Sandstone makes up 32% of core					
245 - 250		Ditto, ss. beds up to 1½", 38% of core					
250 - 255		Ditto, 6", 66%					
255 - 260		Ditto, 2", 32%					
260 - 265		Ditto, 2", 26%					

Log of Seaway - Almega Champlain no. 1 Hole

Continued

Depth in feet		Description			
265 - 270	MIDDLE LORRAINE	Dark shale, with thin sandstone beds, irregular, cross-bedded, up to ¼" thick, ss. 7% of core			
270 - 275		Ditto	½"	9%	
275 - 280		Ditto	1"	6%	6%
280 - 285		Ditto	2"	18%	
285 - 290		Ditto	6"	56%	
290 - 295		Ditto	3"	22%	
295 - 296		Ditto	1"	25%	(Flat branching algae at 295½)
		Bottom of hole			

D. M. Clark
Nov. 6, 1957

LOG OF SEAWAY - ALMEGA CHAMPLAIN NO. 2 HOLE

Depth in feet		Description
10	OVERBURDEN	Sand, medium to coarse grained, a little clayey matrix
20		ditto
30		Light gray clay, sand grains rare
40		ditto sand grains common
50		ditto ditto
60		ditto ditto
70		ditto ditto
80		ditto ditto
90		ditto sand grains abundant
100		ditto ditto
110		ditto ditto
120		ditto ditto
130		ditto ditto
140		Light gray silty clay, sand grains and small pebbles present
150		ditto ditto
160		ditto ditto
170		ditto ditto
180		ditto ditto
190		ditto ditto, marine algae present
200		ditto ditto, rock fragments present, dark to medium gray very fine-grained sandstone and siltstone -- Lower Lorraine

Log of Seaway - Almega Champlain no. 2 Hole

(continued)

Depth in feet		Description
210	OVERBURDEN	Gray clay, with fragments of shale
220		ditto more abundant
230		ditto ditto
240	MIDDLE ORDOVICIAN	Light gray shale 50%; Medium dark gray shale 20%; light gray siltston 30%
250		ditto 25% ditto 30% ditto 45%
260		ditto 25% ditto 30% ditto 45%
		CABLE RIG CORE
261 - 274		Dark gray micaceous shale, finely banded, and ¼" or less beds of medium gray silty sandstone. Acid test: shale, none - sandstone slight. Streak: white to light brown.
274 - 286		Dark gray shale with thin (max. ¼") sandy beds. Latter irregular in detail, and cross-bedded. Sandstone probably less than 5%. Oily smell in a few places.
286 - 291		No samples.
		DIAMOND DRILL CORE
291 - 300	LOWER Lorraine	Dark gray shale with a few thin sandy bands Almost no effervescence. Streak white to light brown
300 - 305		Ditto, sandstone about 2% of core
305 - 310		Ditto. 45° slickensides throughout
310 - 315		Ditto, sandstone beds 1 - 2%. 45° slickensides from 310 to 311½ and 313 to 314½
315 - 320		Ditto. 30° slickensides at 317. 45° slickensides at 320.
320 - 325		Ditto. 45° slickensides at 324.
325 - 330		Ditto. 45° slickensides from 325 to 326
330 - 335		Ditto.
335 - 340		Ditto, sandstone beds about 1% of core. 45° slickensides at 339-340
340 - 342		Ditto. 40°-45° slickensides throughout. Bottom of hole.

A. W. Clark Nov. 6

LOG OF SEAWAY - ALMEGA CHAMPLAIN HOLE NO. 3

Lot 436, Parish of Champlain, County of Champlain
Quebec

Depth in feet/inches		Description	
0 - 162		Overburden	
162 - 162/9	MIDDLE LORRAINE	Light gray fine-grained sandstone, faintly cross-bedded	SS. 65%
162/9 - 165		Ditto, with interbedded shale	
165 - 165/9		Solid medium gray, fine-grained micaceous sandstone	ss. 72%
165/9 - 166/4		Similar sandstone with interbedded shale	
166/4 - 167/6		Interbedded ss. and shale, medium to dark gray, micaceous.	ss. 60%
167/6 - 170		Ditto	
170 - 170/6		Core broken up	
170/6 - 172/6		Rock as 167/6 - 170	ss. 50%
172/6 - 173/6		Ditto	
173/6 - 174		Nearly pure fine-grained ss.	ss. 56%
174 - 174/6		Sandstone and shale interbedded as above	
174/6 - 175		Shale, and thin ½" ss. beds	
175 - 175/9		Solid cross-bedded, fine-grained sandstone	
175/9 - 177/6		Sandstone and shale interbedded as above	ss. 60%
177/6 - 180	LOWER LORRAINE	Ditto, cross-bedded	ss. 13%
180 - 182/6		Ditto. Vertical fractures at 181/6	ss. 13%
182/6 - 185		Ditto	ss. 8%
185 - 187/6		Ditto, ss. cross-bedded. Vertical and inclined fractures at 185/6	ss. 7%
187/6 - 190		Ditto	ss. 5%
190 - 192/6		Ditto	ss. 7%

Log of Seaway - Almega Hole no. 3 — continued

Depth in feet		Description	
192/6 - 195		Medium to dark gray shale and light gray, fine-grained sandstone interbedded	ss. 3%
195 - 197/6		Ditto	ss. 3%
197/6 - 198/6		Solid fine-grained light gray sandstone	
198/6 - 200		Sandstone and shale interbedded as above 45° joint at 198/6	ss. 42%
200 - 202/6		Nearly pure shale, with a few thin ss. beds 45° joint at 202 45° joint at 202/6	ss 5%
202/6 - 205	LOWER LANE	Ditto Vertical joint at 205	ss. 5%
205 - 207/6		Ditto. Shale as above, sandstone inconspicuous Vertical fracture at 205/6 45° fracture at 207	ss. 3%
207/6 - 210		Ditto. Ss as above. Vertical veins, 1mm thick, at 209	ss. 3%
210 - 212/6		Nearly pure shale.	ss. 0%
212/6 - 215		Ditto. Many minor sandstone beds	ss. 1%
215 - 217/6		Ditto. Sandstone beds more numerous, up to ¼"	ss. 3%
217/6 - 220		Ditto, ss still more numerous. 45° fracture at 219	ss. 5%
220 - 222		Ditto. Sandstone beds inconspicuous	ss. 1%
222 - 224/6		Ditto, Sandstone beds mostly about ¼"	ss. 3%
224/6 - 227		Ditto.	ss. 2%
227 - 229/6		Ditto	ss. 2%
229/6 - 231		Ditto	ss. 3%
		Bottom of hole.	

J. W. Abel
Dec. 19, 1957

LOG OF SEAWAY - AIMEGA CHAMPLAIN HOLE NO. 4

Depth in feet		Description	
0 - 155		Overburden	
155 - 157½		Dark gray, very finely micaceous shale with thin, 1mm, beds of light gray sandstone singly or in groups up to about 1"; cross-bedded. Inclination up to 5°. No acid reaction. Streak very pale brown	Sandstone - 4%
157½ - 160		Ditto	Sandstone - 5%
160 - 162½		Ditto	Sandstone - 1.5%
162½ - 165		Ditto	Sandstone - 3.5%
165 - 167½		Ditto	Sandstone - 5%
167½ - 170		Ditto	Sandstone - 6%
170 - 172½		Ditto	Sandstone 2.5%
172½ - 175		Ditto	Sandstone - 2.5%
175 - 177½		Ditto	Sandstone - 2.5%
177½ - 180		Ditto	Sandstone - 2.5%
180 - 182½		Ditto, somewhat darker.	Sandstone - 3%
182½ - 185		Ditto, ditto	Sandstone - 1.5%
185 - 187½		Ditto, ditto	Sandstone - 1.5%
187½ - 190		Ditto, ditto	Sandstone - 2.5%
190 - 192½		Ditto, ditto. 1½" solid, unbedded sandstone.	Sandstone - 6.5%
192½ - 195		Ditto, ditto	Sandstone - 1%
195 - 197½		Ditto, ditto. 6¼" and 1½" solid sandstone	Sandstone - 26%
197½ - 200		Ditto, ditto	Sandstone 1%
200 - 202½		Ditto, ditto	Sandstone - 2.5%
2 2½ - 203½		Ditto, ditto	Sandstone - 1%
203½ - 205		No core. Bottom of hole	

LOWER AINE

J. W. Clark
Dec. 19, 1957

SEAWAY - ALMEGA CHAMPLAIN HOLE NO. 5

Lot 436, Parish of Champlain

Champlain County, Quebec

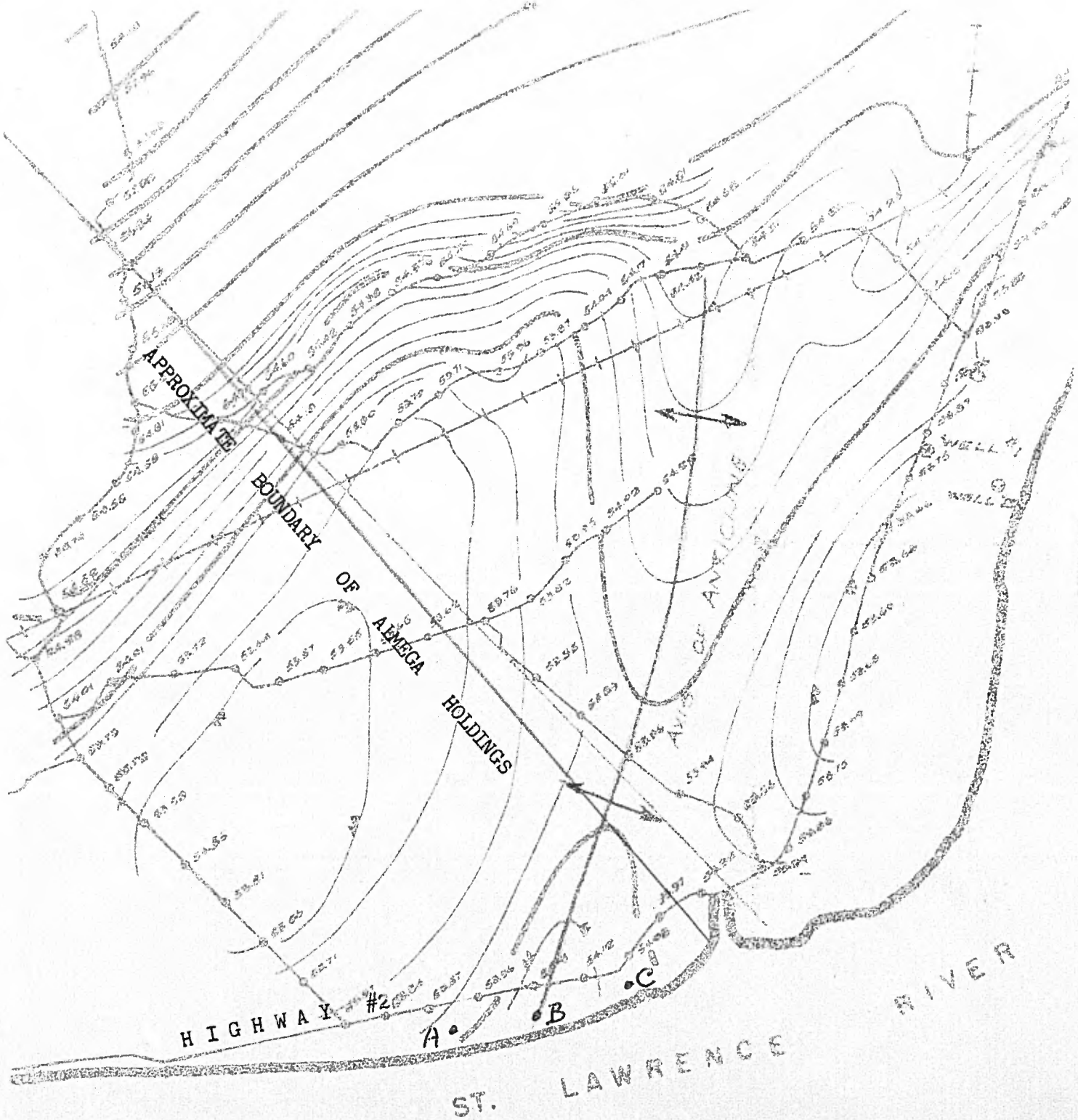
Depth in feet		Description		
0 - 167		Overburden		
167 - 169½	MIDDLE ORAIN E	Dark gray shale and light gray, very fine-grained sandstone. The latter in lmm beds, either singly or in groups up to 1". Cross-bedded. Some sandstone in solid beds, no bedding.		Sandstone - 10%
169½ - 172		ditto.	Solid ss. 1½", 4"	Sandstone - 25%
172 - 174½		ditto.	Solid ss. 1", 1", 2", 1".	Sandstone - 25%
174½ - 177		ditto.	Solid ss. 3", 3".	Sandstone - 26%
177 - 179½		ditto.		Sandstone - 10%
179½ - 182		ditto.	Solid ss. 3", 2",	Sandstone - 25%
182 - 184½		ditto.	Solid ss. 2", 2".	Sandstone - 16%
184½ - 187		ditto.		Sandstone - 6%
187 - 189½		ditto.		Sandstone - 6%
189½ - 192		ditto.		Sandstone - 20%
192 - 194½		ditto		Sandstone - 8%
194½ - 197		ditto	Solid ss. 1".	Sandstone - 12%
197 - 199½		ditto.		Sandstone - 12%
199½ - 202		ditto.		Sandstone - 9%
202 - 204½		ditto		Sandstone - 5%
204½ - 207		ditto		Sandstone - 5%
207 - 209½		ditto.	Solid ss. 4".	Sandstone - 25%
209½ - 212		ditto.		Sandstone - 17%
212 - 214½		ditto.		Sandstone - 10%
214½ - 217		ditto		Sandstone - 8%
217 - 219½		ditto		Sandstone - 10%
219½ - 221		ditto. Bottom of hole.		Sandstone - 8%

D.F.W. Caul
Dec 19, 95

GRAVITY ANOMALY EAST OF CHAMPLAIN

On a Total Gravity Survey Map of Batiscan Area constructed by Radar Exploration earlier this year a marked 'high', interpreted by Radar as an anticline, cuts across the extreme southeastern corner of Almega holdings, as shown on the accompanying map. This 'high' is bordered on the east by a 'low', on the northwestern flank of which Bald Mountain Batiscan Holes 1, 2, 3, 4, and 5 have been drilled — a not very promising structural situation. To the west there is another 'low'. Although there is still some doubt as to the correct interpretation of these gravity 'highs' and 'lows', their association here strongly suggests that they reflect an anticlinal structure and two flanking synclines. I recommend that this possibility be tested.

The presumed anticline is itself warped into a low saddle where it crosses the NW-SE road near the word'AXIS'. Thence, in both directions, the axis (crest of the fold) rises. The road intersection with the axis is, therefore, the least promising spot along the axis for the accumulation of oil or gas. Such volatiles would have migrated up the axis southwesterly toward the St.lawrence river, or northerly beyond Almega holdings. The further from the saddle along the anticlinal axis, the greater the chances of success.


APPROXIMATE
BOUNDARY
OF
ALMECA
HOLDINGS
WELL #1
WELL #2
HIGHWAY #2
A
B
C
ST. LAWRENCE
RIVER

The first, and least expensive, step to be taken is to determine whether or not the gravity 'high' really does reflect an anticlinal structure. To do this, three holes should be put down at points A, B, and C, on the south side of Highway #2, and a quarter of a mile or so apart, the middle one to be as nearly as possible squarely on the axis as mapped. From each of these holes 100-foot cores should be taken. On the basis of the sandstone percentage pattern (see above, Chapllain section, pp. 7a, 7b) it is expected that the relationship between these three cores will determine the underground structure.

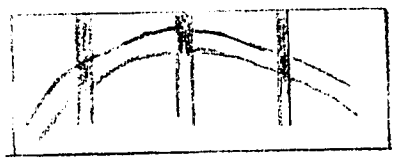
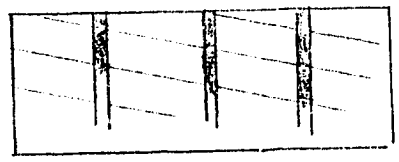


Figure 1

Figure 2



If the relationship is as indicated in figure 1, the structure is favorable, and deep drilling should be undertaken. If, on the other hand, an orderly sequence of beds be encountered, as in figure 2, the project should be abandined

T. H. Clark

T. H. Clark, Geologist
December 19, 1957