(History of the Goudreau Lake Property)

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REPORT ON THE CLAIMS

of the

ALGOMA COMMERCIAL COMPANY

near

Gondreau Lake, Township 27, Range 26 District of Algoma.

Location: These claims numbering twenty-eight in all are situated in Township 27 Range XXVI in the District of Algoma, and they receive their name from Gondreau Lake which lies about half a mile east of the most easterly claim.

They may be reached from Missinaibi Station on the main line of the C. P. R., from which point they are about 21 miles distant. This route lies across Dog Lake for 7 miles to the Emily Mine and thence overland to Jackfish Lake from which a canoe route leads to Gondreau Lake. Overland they may be reached from Otter Station on the C. P. R. by a walk southwards of possibly ten miles : and also by a road leaving the Ryerson Tote Road near the Half-way House.

History: In the fall of 1899 twenty-two claims were staked in this locality because of there being a "fair showing of bog ore" on them. As these claims lay within the area reserved by Order-in-Council of April 29th, 1901, to the Algoma Central and Hudson's Bay Railroad on account of the Land Grant, they were allowed to lapse to save expense.

In 1902 while this section was still reserved on account of the Land Grant Mr. W. R. Askwith was sent in to do some development work on the areas previously located with the

idea of learning if they would be valuable as a source of pyrite, it having been reported by Mr. Willmott in 1900 that they were worthless as iron properties. Stripping, trenching and test-pitting were carried on for about two months. In the fall camps and other necessary buildings were erected and early in 1903 a diamond drill was brought in and drilling was continued till the drill shed and drill frame were destroyed by fire in April of that year.

During 1904 the land which had been reserved to the A. C. Ry. was thrown open : so in the fall of that year Mr. R. H. Paterson was sent in to re-stake the claims and 25 in all were staked. These on being recorded were numbered from 1595 to 1619, and it is by these numbers the claims are still known.

By the fall of 1905 the necessary assessment work had not been done to hold these so a special arrangement was made whereby the work done in 1902 and 1903 was applied as assessment work on the group. This arrangement acknowledged the assessment work done on Claims Nos. 1595, 1596, 1598, 1601, 1602, 1604, 1605, 1606, 1607, 1610, 1614, 1615, 1617, 1618, and 1619 up to Nov. 30th 1906; and on Claims Nos. 1597, 1599, 1600, 1603, 1608, 1609, 1611, 1612, 1613 and 1616 up to Nov. 30th 1907. This left assessment work to the value of $300.00 on each one of the first group, and to the value of $150.00 on each one of the second group to be done before title could be secured to them.

Apparently no attempt was made to comply with the above-mentioned conditions in 1906 : nor was anything done in 1907 till the month of October when it was decided to finish the

assessment work and Mr. Hasselbring was put in charge of the property.

In January 1907 three more claims were staked in the vicinity of the others : these were numbered S. S. M. 513, S. S. M. 514, S. S. M. 515 : so the group now comprises 28 claims.

Development: Mr. Askwith's instructions, when he was sent to the Gondreau Lake Claims in 1902, were that he should "estimate the amount of bog ore, and the possible amount of pyrite."

Mr. Askwith went in from Missanaibi by way of the Emily Mine. From the Emily a trail some 7 miles long was cut to Jackfish Lake and from the latter lake a canoe route was opened up to the claims. Camp was finally pitched on a small lake about one and three-quarters miles west of Gondreau Lake.

Operations commenced on the "Bear" Claim, which is the most easterly and which now lies in Claim 1619. Of this deposit Askwith says in his summary report for June 1902:-

"Here for 800 feet in length were evidences of iron pyrite, as seen from the bog ore, a few exposures, and from depressions where the pyrite had weathered away.

During the month we have dug on the "Bear" Claim 10 trenches averaging 50 feet in length and sunk 10 pits to bed-rock from 4 to 12 feet deep. Our work has proved the existence of a large body of low grade iron pyrites. The strike of the deposit is about East and West. (Correct directions cannot be ascertained in this locality with the compass because of the presence of magnetite or possibly pyrrhotite).

The deposit consists of two bands of pyrites of varying

width with a band of greenstone between. At the point best exposed by the work the south band is about 100 feet in width. North of this is the greenstone schist 120 feet wide and then 50 feet of iron pyrites. We put in shots at a number of the most promising-looking places but we could find nothing but ore full of silica and too low grade to be of any use.

There may be some good ore in the depressions which run east and west but on account of the depth of gravel and water it was impossible to get down and these could best be proved by a diamond drill."

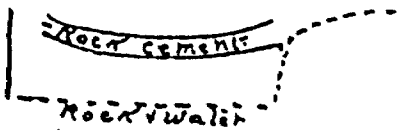
Following this, work was performed on a deposit known thereafter as "A". This was a little less than half a mile north of the camp and is now on Claim 1603. Here is a mound 185 feet long and averaging 50 feet in width, surrounded on the North, West, and South by swampy ground, which is "made up of a deposit of pyrites of a siliceous nature, and greenstone schist. The mound is being undermined on all sides by the decomposition of the iron pyrites, and on the top of the mound are depressions formed by the same cause. The general strike seems a little North of West. The mound terminates abruptly on the east by perpendicular walls from 10 to 15 feet high of solid pyrites - better than that seen anywhere else.

The work we have done consists of 11 trenches and pits, and I shall now give in detail what was found in each.

#1. Trench 20 feet long and average 3½ feet deep shows a poor grade of iron pyrite entire length mixed with a sugary siliceous rock.

#2. Trench 45 feet long, 1 foot deep, with a deep pit on the edge of hill at south end. At the north end is a long depression 7 feet wide at this point. A blast was put in at north end which showed poor pyrites. In the centre of trench is greenstone schist 10 feet wide. The rest of trench uncovered siliceous pyrites.

#3. From point #3 where a pit was dug one can see under the covering at #4 for the top of the ground is formed as an arch bridge made up of rock cemented together by bog iron and under this is filled up with water and more cemented material.



#4. is a depression 30 feet wide caused by the weathering away of the pyrites.

#5. is a trench 54 feet long and 2 feet deep, which shows up poor pyrites and greenstone schist.

#6. is a trench 50 feet long, 6 inches deep, shows poor pyrites and greenstone schist. We put in shot at wall of depression which showed low grade pyrites. At south end on edge of hill is a pit which showed decomposed pyrites. This pit is deep.

#7. is a trench 20 feet long,- shows siliceous pyrites,

#8. showed the usual low grade pyrites and the band of greenstone.

#9. is a depression formed by the weathering away of the pyrites : it is 30 feet long, 15 feet wide, and is deep.

#10. Lean pyrites found for entire length.

#11. Is a wall of pyrites 12 feet high.

#12. Shows same ore as at #11. We put a pit down here until we came to water. It seems to be undermining the mound. The cliff is 15 feet high.

#13. Is a narrow ridge not more than 10 feet wide.

#14. We did not get to bed rock.

#15. Is same in appearance as #11 and #12.

#16. Is a mound made up of cemented boulders in bog iron. It is hollow underneath.

#17. Is same as #16.

The cliff along at #18, #11, and #15 is 75 feet long. The depression east of the cliff has undoubtedly been formed by the weathering of iron pyrites and underneath this may be found good ore : it is impossible to get down in this owing to the water.

It is slow work drilling in the pyrite and where bog ore has been deposited it is very slow work getting through it. Between the lake and #1 trench is a quantity of bog ore : it cannot be estimated at present.

I think this property might be showed up to advantage by a few diamond drill holes, and while it has not turned out as promising as anticipated from the few exposures seen, and from the long wall of pyrites exposed, still to my mind it has possibilities."

It will be interesting here to refer to the results of

diamond drilling done on this deposit - see ahead p. 11.

Work was next performed on Deposit "B", which at present lies in Claims 1602 and S.S.M.513. The following notes are copied from the report by Mr. Askwith, and are intelligible by referring to sketch attached.

No.1	Trench	20' x 3' x 1'	-	Poor pyrites.
" 2	"	85' x 4' x 1'	-	Poor pyrites - blasted.
" 3	"	75' x 3' x 1'	-	Some good pyrites but not in quantity - blasted.
" 4	"	12' x 3' x 1'	-	South of No. 4 are two pits. The contact between the pyrites and greenstone is between the two.
" 5	"	60' x 5' x 1'	-	Situated on steep side hill - blasted.
" 6	"		-	Pit on side of depression shows up poor grade pyrites -blasted.
" 7	"	90' x 4' x 1½'	-	Poor grade pyrites all the way - blasted.
" 8	"	45' x 4' x 1½'	-	Poor grade pyrites all the way. At south end greenstone shows.
" 9	"		-	Pit full of rust and cement boulders.
" 10	"	12' x 3' x 2'	-	Rust.
" 11	"	4' x 3' x 3'	-	Very little fair quality pyrites.

300 feet to the West of No. 1 is a trench 15'x3'x1' which showed up a little low grade pyrites.

There is a little bog ore in lake bottom between Nos. 3 and 5.

The pyrites as a whole in this deposit is very low grade but it undoubtedly extends under the lake, and may be better there. The width of the deposit on land is nearly 100 feet."

Deposit "C" was also prospected. This appears to be now located on Claim 1596. It is described in the following notes from Mr. Askwith's report.

No. 1.	Trench	25' x 3' x 1'	-	Cemented boulders.
" 2.	"	10' x 5' x 5'	-	Gravel, rust and boulders.
" 3.	"	10' x 5' x 2' and) 6' x 8' x 5')		Shows some good looking ore.
" 4.	"	4' x 5' x 2'	-	Rusted gravel.
" 5	"	8' x 5' x 5'	-	" "
" 6	"	15' x 6' x 3½'	-	Outcrop of fairly good-looking ore.
" 7	"	10' x 3' x 2'	-	Gravel.
" 8	"	4' x 6' x 4'	-	Siliceous pyrites.
" 9	"	36' x 4' x 1½'	-	" "
" 10	"	8' x 4' x 3'	-	Gravel.
" 11.	"	20' x 5' x 1'	-	Pyrites all the way but not very good.
" 12.	"	30' x 3' x 2'	-	Pyrites a little siliceous-looking.
" 13.	"	6' x 10' x 4'	-	Some fairly good looking pyrites. There is a cave here and from this it looks as though the deposit were dipping south.
" 14.	"	25' x 4' x 2½'	-	Some siliceous but not too bad-looking pyrites.
" 15.	"	12' x 6' x 1'	-	Siliceous pyrites.
" 16.	"	20' x 4' x ½'	-	" "

A depression runs along from east to west as though pyrites had weathered away, and the farther away from the edge of this depression one goes northward the poorer he finds the pyrites in character. I therefore expect to find the best pyrites underneath this depression.

South of where pits Nos. 1 to 16 were dug, and distant

180 feet from No. 13 is a deposit of pyrites 300' by 250 feet. It is slightly higher than the surrounding land and a depression runs through it from east to west.

No.	17.	Trench	15' x 5' x 1'
"	18	"	20' x 5' x 3/4'
"	19	"	100' x 3' x 1'
"	20	"	15' x 3' x 1'

The above trenches and other exposures show up an immense deposit of poor grade pyrites : a few blasts were put in.

Trenching was next done west of the lake on the south shore of which Deposit B is located. This deposit was called "D"; it is now on Claim 1600. An account of the work done on it is given in the following notes from report of W. R. Askwith.

"There appear to be two ore-bodies, one directly north of the other. The exposures are on the sides of rounded hills which for the most part are covered with gravel and boulders.

No.	1	Trench	-	-	Rust and decayed pyrites and a band of limestone.
"	2	"	14' x 4' x 2'	-	Siliceous pyrites.
"	3	"	8' x 3' x 1'	-	" "
"	4	"	12' x 5' x 2'	-	Lean ore.
"	5	"	42' x 8' x 1'		
"	6	"	45' x 5' x 1'	-	Pyrites much the same as in #5 - some good, some bad.
"	7	"	35' x 4' x 1'	-	Some good ore, and some of poor quality mixed.
"	8	"	-	-	Boulders of ore.

On the northern body is a depression situated on the top of the hill evidently formed by the weathering away of pyrites.

The last place work was performed by Askwith was about a

quarter of a mile northwest of "D". This was called Deposit "E" : it seems to be now located on four claims Nos. 1608, 1600, 1611, and S.S.M. 515. It is briefly described in the following notes.

"No. 1. 6 feet of ore of good quality showing out of side of bluff and apparently dipping southward.

No.	2.	Pit	12' x 10' x 3'	- Cut in face of bluff and showing pyrrhotite altogether.
"	3.	Trench	60' x 5' x 2'	- South end shows pyrrhotite while north shows pyrites.
"	4	"	20' x 8'' x 1'	- Mixture of rock and pyrites.
"	5	Pit		- South of this pit which shows pyrites is a band of quartz banded in structure.
"	6	Trench	24' x 4' x 3'	- Mixture of pyrrhotite & pyrites.
"	7	"	12' x 4' x 3'	- " " " " .

Prospecting was discontinued about Aug. 1st and during the next two months the only work done in the locality consisted of reconnaissances for wagon and sleigh roads to the Gondreau Lake Claims.

It having been decided to explore the property by diamond drilling the erection of camps and other necessary buildings was commenced in October under the direction of Mr. E. H. Dodd who had succeeded Mr. Ashwith in September. Two camps 16' x 18' inside were constructed early in November ; also a stable 12' x 16'. Shortly afterwards a sleigh road was cut out from the claims to reach the Ryerson tote road. After this more buildings were constructed, so that by Jan. 1st the following buildings in addition to the camps and stable had been erected - blacksmith shop 12' x 16', hay shed 12' x 14', and store house 12' x 16'. An office was finished during January, and a shed for the Diamond Drill which

had been brought in was also erected. According to report of Mr. R. H. Paterson dated Nov. 1st 1904 the buildings are located as follows:- camps on Claim 1596, stables, and oil-house on 1595, and blacksmith shop and powder house on 1599.

During January 1903 a start was made at sinking a shaft on Deposit E. When a depth of 18 feet had been reached (more than 12 feet of which was sunk before rock was reached) a drift was driven eastward 40 feet, at which point a cross-cut was pushed to the south for a distance of 26 feet. This is said by Mr. E. H. Dodd to have "passed through a point immediately under Star Pit E (which is apparently Pit No. 1). Taking into account the lengths and directions of drift and crosscut we may conclude the shaft was sunk at or near Pit No. 2 on Deposit E. The drift was continued eastward beyond the crosscut for a short distance.

Apparently but little ore was encountered in the drift and crosscut, but Dodd says he is "of the opinion that both drift and crosscut have passed over ore which has been oxidized down to the water-level."

Besides this drifting, some stripping was done around Star Pit E, and a hole was sunk in the centre of depression on A. About the time this work was completed Dodd remarks that "on all the properties now discovered with the exception of the Bear Claim we can only do satisfactory exploration with a diamond drill."

About the middle of January 1903 diamond drilling commenced on Deposit A, and was continued till April 18th '03 when a fire destroyed the drill shed and the frame of the drill.

During this time four holes were put down. Their locations may be seen by referring to plan of Deposit A. Hole No.1

was sunk at an angle of 42° and is 235 feet deep ; hole No. 2 was vertical and is 230 feet deep ; hole No. 3 was vertical and is 98 feet deep ; and hole No. 4 was at an angle of 60° and is 148 ft. deep.

The following are the results of analyses of the core from the drill holes put down :-

Hole No. 1	Thickness of Pyrites	Per cent. Sulphur
16' - 19'	3'	35.02
43' - 46'	3'	38.03
54' - 67'	13'	34.80
111' - 137'	26'	29.25
137' - 167'	30'	34.84
167' - 207	40'	29.22
	115'	Av. 31.54%

Hole No. 2	Thickness Pyrites	Per cent. Sulphur
8' - 12'	4'	42.18
12' - 29'	17'	29.35
43' - 48'	5'	37.83
54' - 57'	3'	37.10
60' - 92'	32'	36.69
97' - 125'	28'	35.36
127' - 129'	2'	about 38.00) not
135' - 169'	34'	" 38.00) analyzed
	125 feet	

Hole No. 3 In this hole pyrites (estimated to run about 32% Sulphur) was encountered from 4' 6" to 7' 6". All below this was green schist.

Hole No. 4 This was 148 feet deep and showed 143.5 feet of pyrite which it was estimated would run from 32% to 40% in sulphur. This hole was still in ore when drilling was discontinued.

The deepest point at which ore was struck in these holes is 169 feet from the surface.

From the time drilling stopped in April 1903,

nothing more was done till October 1907 when Mr. Hasselbring was sent in to complete the assessment work. Concerning his work Mr. Hasselbring reports under date of Dec. 14th 1907 that

"Most of our work so far has been confined to the deposit known as "C". This deposit is in the shape of a hog's- back ridge extending northwest and southeast. Starting with the northwest end we stripped across the deposit to a width of 125 feet where the over-burden became too deep to work to advantage. Four trenches have been stripped over the formation exposing a length of 700 ft., but no trench shows a width of formation of over 125 feet as the hog's-back falls off rapidly on either side and is overrun with large boulders. The grade of pyrites so far as exposed seems to be quite uniform for 600 feet but southeast of this we encountered a lower grade of ore.

The sample taken from 18 pop-holes put in at random over the surface of the entire strippings shows 32.07% sulphur. This would probably have gone up to 35% if the last 100 feet had been omitted.

We think the surface showings on deposit "C" will warrant diamond drilling this deposit, and we could probably arrange with the Mining Recorder to have the work done on C distributed over all the claims. As the ground is very hard and "short" it is impossible to determine the depth of the deposit by sinking without great expense, while if we diamond drill this property we can reduce our present working force and obtain more definite results.

In regard to the other deposits would say that we do not think much of those to the West from the surface showings as they are either small or low grade. Deposit A and the Bear claim however look pretty good. We have not done much work on this.

deposit but considerable stripping was done in 1902 and 1903, and some diamond drilling was done on A. We think that if you could arrange to diamond drill C and the deposits East of this it would be the cheapest and most satisfactory method to obtain definite results."

Possible Quantity of Ore Available: When we turn to consider the possible quantity of ore available it seems probable that no inconsiderable tonnage may be extracted. After the trenching, test-pitting, and drilling done in 1902 and 1903 Prof. Willmott makes the following rough estimate of the tonnage to be obtained on the supposition that the deposits will reach only 100 feet in depth. ("In the case of deposit A it is evident the quantity is underestimated as pyrite was found there at a depth of 169 feet.")

		Tons	Quality
Deposit A	350' x 50'	175,000	Fair
" B	900' x 50'	450,000	Poor
" C	550' x 50'	275,000	Fair
" C	250' x 300'	750,000	Poor
" D	100' x 30'	30,000	Poor
" D	200' x 80'	160,000	Fair
" E	200' x 30'	60,000	Fair
" E	100' x 30'	30,000	Fair
" F	100' x 10'	10,000	Fair
"Bear"	700' x 100'	700,000	Poor
		2,640,000	

Deposit "F" is one of which there is apparently no mention in the correspondence but a tracing shows it to lie along a road crossing claims Nos. 1609 and 1610.

Mr. Hasselbring, at present in charge of the property, has confined his work, as will have been previously noted, to deposit C, and as a result of his work there he estimates the quantity of ore there at 750,000 tons - this on the supposition that the deposit extends to a depth of 100 feet.

Of the deposits to the West, it will be remembered

that Mr. Hasselbring says he does not think much of them as they are either small or low grade.

"The deposits on which work has been done are all separate and distinct prospects and any one of them might possibly develop into a producing property." Besides the places where prospecting has been done there are others on which the surface indications are quite as promising. These are depressions which may quite possibly have been caused by the more rapid weathering away of a purer grade of pyrite than is seen in the siliceous outcrops, or possibly by the weathering of bands of limestone; or of a combination of the two. And these depressions are the most difficult to prospect by trenching because owing to the presence of water it is almost always impossible to get down in the centre of such places.

Mr. Froleck in his Report on Iron Pyrites in Ontario (Report of the Ontario Bureau of Mines, Vol. XVI) remarks after describing the deposits in detail:-

"The above descriptions show very considerable pyrite-bearing area, and indicate the meagre amount of exploratory work in proportion to that necessary for arriving at any adequate estimate of the quantity and grade of available ore. A large extent of gossan - and bog-ore - covered depression has not as yet been prospected. It is not unreasonable to expect that in some of these, deposits of pyrite higher in grade than those on the hilly outcrops may be found."

Quality of the Ore:- With regard to quality of the ore there is scarcely the same note of hopefulness as there is in regard to quantity. It appears that the larger part of the large quantity of ore likely available is too low grade to be marketable without

concentration. The grade of pyrite marketed in North America seems to run mostly from 42% to 44% in sulphur, although some running as low as 38% is marketable. Prof. Willmott, speaking of his estimate of 2,640,000 tons says that "probably half will run 30% in sulphur and over, but this is largely a guess."

The results of analyses of drill cores have been previously given. We will now consider some of the analyses of samples from the surface.

Deposit	Remarks	Per cent. Sulphur
A	(1) Average sample exposed wall eastern end	43.50
	(2) Average of 25 feet across face of bluff #12	40.21
B	Average ore - sample by Rowland F.Hill	35.07
C	(1) Average sample from 6 feet exposed in Trench #15 or #13	33.00
	(2) Average sample from pit #6	39.18
	(3) Pit #14 - Represents a large body of lean ore	32.25
	(4) Average sample by R.F.Hill Believed to be not representative too much rock	23.10
	(5) Average of area 125' x 700', from 18 pop-holes in trenches	32.07
D	(1) Average of surface over an area 4' x 20' Pit #5	36.77
	(2) Average of good ore:- SiO_2 = 6.00%, Fe = 44.36%, CaO = 0.25%, MgO = 0.53%, Cu-trace, As-trace, Pb-nil, Zu-nil	40.28
E	(1) Star Pit No.1	42.42
	(2) Average of pits #3 and #4	28.52
	(3) Sample by R.F.Hill:- Fe = 45.48%, SiO_2=5.98%, Mn_3O_4=1.8%, MgO = 2.14%, CaO-trace, As,Zu,Co,Ni,trace, Pb-none	35.27
	(4) Pyrite & pyrrhotite pit #2 - Ni = .15%	34.21
F	(1) Picked sample - Cu,Au,Mn, traces	48.71
	(2) Picked sample - Insoluble 3.81%,Au = 20	45.69
Bear	Large bodies low grade ore	
	(1) Loose brown hematite - near pyrite on "Bear" - Metallic Iron 58.02%, P = .071	1.25
	(2) Loose brown hematite - Creek Valley below Bear Claim - Iron = 47.17%, P = .014	2.60

Qualitative tests have been made at the Laboratory of the Lake Superior Power Co. for Chlorine and Fluorine and the reports said "No trace" of these elements.

Although the ore as it occurs naturally is too low grade to be marketable it seems to be agreed by all who have seen the deposits that it should be amenable to concentration whereby a marketable product would be obtained. Willmott remarks that "it is customary at the mines in Virginia, which are the largest on this Continent, to concentrate by crushing and jigging ores between 25% and 40% in sulphur. This I was told was accomplished at a cost of 30 cents a ton. They are hoisting ores from a depth of 600 feet to be treated in this way. It seems a safe conclusion that these ores can be mixed and prepared for the market as cheaply as those in Virginia, and there is no doubt they exist in much larger quantities in Michipicoten than in Virginia.

Fraleck in his report referred to above remarks that "Deposits B and C are higher in grade than the others, and with very little culling their product should run approximately 40% in sulphur. In the other bodies workable lenses of 40% ore doubtless occur. The remaining material running between 25% and 35% in sulphur could readily be concentrated to a 48% or 50% product. The plant is quite simple and the operating cost in a country replete with water power should not exceed 60 cents per ton. The overburden of limonite is by no means insignificant economically, and will repay removal especially if taken away before it becomes contaminated during the mining of the pyrite."

It might be here remarked that analyses of bog ore from the Bear Claim and vicinity have shown metallic iron to vary from 47% to 58%, and sulphur from 0.09% to 2.60%.

Mr. Hasselbring in reporting on his work says of the ore in

deposit C, "this ore is of such a grade that it can be easily concentrated either wet or with magnetic concentrators."

Roads:- The question of roads to the Gondreau Lake claims seems to have been enquired into pretty fully in the summer and fall of 1902, under the direction of Messrs. Askwith and Dodd.

The first route examined was one to connect with the C. P. R. In a straight line the C. P. R. is not more than eight miles distant from the claims, but such a route is impossible for a road bocause of high hills and swamps. The engineers locating for the Algoma Central Ry. worked all through this locality and finally located a route leading to Loch Alsh Station. This is the route followed in the main by Askwith's men in 1902. There was great difficulty in locating a suitable route between stations 1238 and 1289 on True's location; but this was finally over come though it would be "the most expensive section of a wagon or sleigh road." To sum up Askwith says:-

"The whole distance from the claims to Loch Alsh will be 14 miles of which half a mile is completed, and four miles will not require much attention. In the whole distance it will require one and a half miles of cross-laying over swamps. I estimate that the cost of such a road completed in rough style but good enough to tote over will be between $1500.00 and $1800.00. A sleigh road over the same route as above will cost in the neighborhood of $500.00"

With reference to roads from the Gondreau claims to the Emily Mine, situated on Dog Lake, and distant 7 miles from Missanaibi, Askwith says:-

"A wagon road from the Emily to the Gondreau Lake claims would cost more than one to Loch Alsh and would then have the

disadvantage of being seven miles by water from the nearest railway siding.

A sleigh road will follow the canoe route and will be about 14 miles in length ; it will cost less than $500.00."

At the request of Prof. Willmott a reconnaissance was made for a road westward from the claims to McVeigh's Creek, and thence along the creek to the A. C. R. near Hawk Lake. Johnston and Massie reported a wagon road impossible : but they succeeded in locating a sleigh road as may be seen on map accompanying their report. They estimated the cost of this road at $460.00 of which $45.00 would cover the cost from the claims to McVeigh's Creek.

Johnston and Massie also made a survey for a road continuing westward across McVeigh's Creek to intersect the Ryerson tote road. This they estimated would cost $255.00 including the cost of a bridge over the Magpie River : it would have a grade each way but so gradual as to give no trouble.

Finally in November and December 1902 a sleigh road was made along the last-mentioned route. At the easterly end numerous branches were laid out to the various deposits so that in all 14 miles of sleigh road were constructed. The distance from the camps to the Ryerson tote road is about 9 miles.

In March 1903 E. H. Dodd made a reconnaissance of the ground between the Gondreau Lake claims and Otter Station on the C. P. R. He reported favorably on this route saying in part "the difficulties would consist of a few hills and some small boulders, but the hills would not be worse than those on the road between the mine and the Magpie River, while the distance would be at the most 12 miles to a station where there is a good siding.

<u>Cost of Gondreau Lake Operations</u>:- From "Ledger No.1, Mines Depart-

ment" we see that the cost of Gondreau Lake operations up to July 3rd, 1903 amounted to $741.21. However according to statement of Prof. Willmott in letter of Oct. 5th, 1905, and from copies of affidavits made on Oct. 16th, 1905 by Prof. Willmott re work done on the Gondreau Lake claims, it appears that, previous to April 1st, 1903, the sum of $9000.00 had been spent in actual mining operations, exclusive of all houses, roads, and other like improvements.

In the fall of 1904 certain expense was incurred in the re-staking of these claims by Mr. R. H. Paterson, but no record of it could be found on the files. Nor does there appear to be any record of the cost of the staking of claims S.S.M.513, 514, and 515 by J. A. Wilde in January, 1907.

The following items re cost of constructing buildings at Gondreau Lake are available viz two camps $260.00, and stable $59.10.

Geology of the Gondreau Lake Claims:- Concerning the geology of the Gondreau Lake Claims and the surrounding locality there is not very much information in the files : so at the risk of repeating some information already given we will quote from Dr. Coleman in his Report on the Iron Ranges of Eastern Michipicoten which appears in the Fifteenth Report of the Ontario Bureau of Mines (see p.183). The report of E. L. Fraleck in the Sixteenth Report may also be consulted.

Gondreau Lake Pyrites Deposits.

Dr. A. P. Coleman.

"Much the most interesting and, from the economic standpoint, by no means the least important, of the mining claims visited

during the summer was the series of pyrites deposits near Gondreau Lake. At first it seemed doubtful if they should be included in the Iron Formation since crystalline limestone and iron pyrites are their two prominent features. However there are also suggestions such as a considerable amount of banded silica and black slate, making it certain that these deposits are simply an extremely sulphurous variety of the Iron Formation. It is known that the Iron Formation at the Helen Mine originally contained its iron largely in the form of pyrites, and there are still thick bands, very rich in pyrites just south of Sayers Lake, the best body of water to the west of Helen Mine.

Banded schist with rusty streaks suggests the deposits as one turns east over the hills from McVeigh's Creek, but characteristic material is not seen until a succession of ponds is reached running east and west through the property.

The first outcrop towards the west, named "E" by the prospectors who explored it, runs east and west for about 100 feet and in cross-section shows from south to north:

Pyrite with some green schist	8	paces.
Limestone, mostly hidden by debris	6	"
Pyrite	4	"
Green schist (strike 100°, dip 60°S)	33	"
Pyrite with some cellular silica	29	"
Very rusty banded silica (dip 25°S)	19	"
Width of section	98	paces

Just to the west of the hill top on which the section was measured the limestone and much of the pyrites have been dissolved out as a narrow ravine, and here a shaft 25 feet deep has been sunk. The materials on the dump are mainly limestone, but with some bands and knots of green schist and many masses of pyrite, sometimes interbanded with the limestone. The limestone is exactly like that of the Grenville series, but the silica at the north end of the

section is unmistakeably Iron formation, though with little interbanded magnetite. The pyrites often has a porphyritic look, large crystals being embedded in a finer groundmass.

A quarter of a mile to the east another hill contains a large amount of pyrites at deposit D, shown massively by the stripping but mainly covered with a thin sheet of gossan, the largest outcrop being about 90 feet by 25 feet in dimensions. Just to the west between the two hills lies a muskeg with a pool having yellow ochre at its bottom. No limestone was seen on this hill.

Still farther to the east there are small outcrops of pyrites for more than 100 feet, when the hill sinks away toward bouldery ground followed by a small lake. Along the south side of this pond gossan shows at many points on the steep bank and stripping discloses more or less pyrite with a little pyrrhotite. The bottom along the south shore is often covered with gossan, and the lake basin may represent pyrites and limestone now dissolved away.

Near the east end of the small lake, on the edge of the hill there are interesting sink holes representing the solution of sulphides.

A short distance to the north of this lake along the path from outcrop "E" a nearly straight band of crystalline limestone was followed for 410 paces. In some places it is 30 feet wide, though generally less than that, and parallel to it on the north runs a long depression, sometimes showing gossan on its north side, and perhaps representing a band of pyrites. The limestone is white or gray, and dips about 80° to the south, with a strike nearly east and west. After the 410 paces diorite seems to

cut off the limestone, but 160 paces to the east there are two sink holes running east and west as narrow trenches. The largest is 15 feet long and 8 or 10 feet deep with 6 feet of partly decomposed pyrite at the bottom.

Somewhat to the east of these sink holes and a little north of the second small lake, there is a low hill of gossan 200 paces long from east to west, and about 120 paces broad. Most of the hill is covered with small pines but where these have been overturned rusty banded silica may be seen, containing some pyrites. The dip and strike were not clearly determined, the dip seeming to be very flat in some places but as high as 60°N. in others.

Still to the north along a road are found deposits "C", some of which contain fairly pure pyrites, as shown by several strippings one extending for 50 feet. In places the pyrite is interbanded with granular silica, or has a band of chert to the north, and in one stripping a little impure siderite was found with the silica.

Deposit "A" to the northeast of C is very interesting owing to the sink holes and small caverns resulting from the weathering of pyrites. Towards the east end there are two depressions, one 120 feet long, the other 80 feet, with their longest diameters nearly east and west. They are about 10 feet deep and are floored mainly with peat. Along the northwest wall of the more westerly depression there are pits and small caves of natural origin but suggesting mining operations. The longest cave runs in about 10 feet, and has about the same depth , the roof being of rusty pyrite and the floor of gossan. One natural open pit is about 10 feet by 25 feet in dimensions. There is a larger flat depression to the southeast of the two just mentioned, but

with no evidence of pyrites.

To the northwest and west of the depressions just described, a gossan-covered hill runs westerly with green schist on the north and more or less pyrites on top and along the south side, where a band of crystalline limestone 10 or 15 feet wide stretches for about 150 feet. At one place a cave opens into the limestone, roofed with limestone and gossan, the bottom being largely covered with blocks of limestone. Here the limestone seems to arch over the pyrites.

A section across the low hill near its west end shows green schist to the south, then limestone with some pyritous schist, 30 feet of pyrite, 12 feet of green schist, 9 feet of pyrite, and green schist to the north. There seems to be little continuity in the structure however, and sections at different points vary greatly among themselves. Pyrites or gossan extends for about 400 feet from east to west, with a width of 150 feet, but it is greatly mixed with other materials, especially schist and limestone. It is stated that a diamond drill hole on A claim showed pyrite to a depth of 169 feet averaging about 35% in sulphur.

The Bear Claim.

The most easterly deposit called the Bear Claim displays many interesting features, and has the largest extent of all the outcrops seen, with a length from east to west of 1200 feet and a width of nearly 300. To the west there is low peaty ground with small pools containing a foot or more of ochreor bog ore, probably leached from the deposit : and much of the deposit itself is gossan-covered or hidden beneath drift. A stripping near the middle shows gossan or pyrite at several points across the strike

over a width of 150 feet, but no stripping crosses the full width. Towards the east walls of green schist or schistone hornblende porphyrite rise on both sides, and at the east end of the deposit the appearance is that of an amphitheatre leaving the schist projecting over it like an eave. Whether the valley was formed by the destruction of pyrites is uncertain, but the arrangement suggests this. The pyrites of the Bear Claim seems more mixed with rock matter than in most of the deposits, but it covers a far larger area than any of the others.

The length of the series of outcrops from east to west is 2 1/2 miles and at the end of the first little lake there are outcrops over a width of half a mile : so that a considerable territory is more or less covered with pyrites or gossan formed from it. The total amount must go into the millions of tons : but undoubtedly much of it is too low grade to be profitably used. With selection there should be a large amount available reaching a percentage of 35 or 40 in sulphur, and a considerable amount still higher in grade.

There is very little magnetic disturbance near some of the deposits, but at others the compass is untrustworthy, probably, however, from the presence of pyrrhotite rather than of magnetite. The iron of the Gondreau Lake range must be looked upon as almost entirely combined with sulphur rather than with oxygen, as in almost all other ranges.

The large amount of crystalline limestone is most striking in a region so devoid of limestone as that north of Lake Superior. One band near the west end of the series of deposits runs nearly a quarter of a mile without a break, and limestone is found from point to point for about a mile and a half, though

none was observed at the Bear claim. The limestone varies a good deal in appearance some being yellowish, and other parts gray, very little being white. It is generally somewhat streaked or banded and portions would make a good ornamental stone. Some parts are somewhat coarsely crystalline like much of the limestone of the Grenville series in the east, but others are rather fine-grained, though none of it has the bluish gray of the Huronian limestone near Garden River or Echo Bay. If met with in the Parry Sound region or the Ottawa Valley the rock would certainly be considered to belong to the Grenville series, or possibly where somewhat fine-grained and gray, to the Hastings series.

The considerable amount of banded silica associated with the deposits leaves no doubt of the age relationships. The series belongs to the Iron formation and so occupies the upper part of the Keewatin. The associated rocks are largely green schist and porphyrite, but along the northern side of the range surface volcanics are found in the shape of a band of greenstone showing pillow structure. The schistose rocks generally have a strike of from 80° to 100°, and a steep dip, from 60° to 90°. It is probable that with more time than we could afford a series of anticlines and synclines could be worked out, disentangling the somewhat complex relationships between limestone, iron formation, and accompanying schists sketched in the foregoing pages. The rather widespread drift deposits hamper field work for the prospectors, and the geologist, in this part of the district.

Dikes of rather fresh diabase and of older basic rock were found north of the range, but time was not available to follow them up. The Gondreau Lake Iron formation is of special interest as containing probably the largest known pyrites deposits of

Ontario, and also the only extensive and fairly pure limestone known to exist for hundreds of miles along the north shore of Lake Superior.

R E P O R T

-on the-

GOUDREAU LAKE PYRITE PROPERTY

-of the-

ALGOMA COMMERCIAL COMPANY,

LAKE SUPERIOR CORPORATION.

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INTRODUCTION:

The Goudreau property consists of a number of claims in the Province of Ontario, Canada, about 120 miles North of Sault Ste. Marie, between Lake Superior and the C.P. R., on which exist large exposures of iron pyrites. This occurrence of iron pyrites has been known for years. The property was first taken up in 1899, on account of the bog ore showings on it. In 1900 the lands were reported by Mr. A. B. Wilmott, after an examination, as worthless as iron properties, and since then the pyrite has been considered the more valuable ore, and the exploration done on the property has been done with a view to proving the value of the pyrite deposits. Up to the present time practically nothing, with the exception of a few diamond drill holes and one drift from a shallow shaft, has been done, except surface work, such

as digging trenches, digging a few shallow test pits through the glacial drift to the bed rock, and stripping of moss from the exposures.

On December 5th, I reached Missinabie, the nearest outfitting station on the Canadian Pacific Railroad from which to start to the mines. I was accompanied by Mr. Hasselbring, who was in charge of the exploration on the properties during the past year. The day of my arrival the thermometer showed 20 degrees below zero, and the country was covered by snow about 5 inches deep. Dog Lake, which during the summer is a part of the canoe route to the property, and over which the trail in winter goes when the lake is frozen, had just been frozen the night before my arrival. The Indians reported that the ice was not safe to travel upon; there was not enough snow for the dog teams, even had the trail across the lake been safe. I found that it would be necessary to wait several days for the ice to thicken, even in order to go in on foot. This meant a two days' trip to get in, sleeping out one night. All my supplies would have to be carried in, as the supplies had been removed from the camp on the property at the end of the season's work, and the camp closed.

A close study of the surface conditions on the property is the only means at present, in view of the slight amount of exploration work which has been done, of reaching

a conclusion as to the possibilities of the property. As this close geological study was not possible, in view of the covering of snow, I abandoned, much to my regret, a trip to the properties. Such detailed study of these properties as is necessary can only be done during the open season, when there is no snow.

On my way to Missinabie, I stopped over at the "Soo", and while there secured from Mr. R. W. Seelye and Mr. Hasselbring all the valuable information concerning the claims which was on record in the company's office, and known personally to these men, with maps of the property. In addition to this information, I had with me reports made by two of the Canadian officials, Dr. A. P. Coleman and E.L.Fraleck, published in the 15th and 16th Annual Reports of the Bureau of Mines, Ontario, for 1906 and 1907 respectively.

From a study of the data supplied by the gentlemen mentioned, and the official government records, the accompanying report is written. I am alone responsible for the conclusions.

Not having been informed as to the exact intentions in case the property is taken over, or as to the purchase price of the property, I am unable to do more than render estimates in certain parts of my report.

PROPERTY:

The property consists of 26 claims, having a total acreage of 952.75 acres. The following is a list of the claims, using the government departmental claim numbers, with the acreage of each claim placed opposite:--

Departmental Number.	Acreage.
1595	30.38
1596	33.58
1597	33.73
1598	30.71
1599	30.49
1600	41.51
1601	34.72
1602	37.15
1603	42.30
1604	37.97
1605	32.75
1606	36.91
1607	36.72
1608	41.86
1609	45.57
1610	30.83
1611	35.57
1612	38.14
1613	36.31
1614	38.77
1615	42.41
1616	42.17
1617	28.14
1618	38.93
3619	34.13
S. S. M. 513	41.00
	952.75

TITLE:

These claims are now held by the company under possessory title from the Government only; the full amount of

assessment work necessary to hold these claims having been done by the company and accepted by the proper department.

The claims have been surveyed for patent by a government mineral surveyor and all plats prepared and submitted to the proper official. In order to secure patent, there now only remains for the company to pay the amount per acre required by the government, and to have the papers approved and passed through the regular official routine.

LOCATION AND ACCESSIBILITY:

The property is situated in Township 27, Range XXVI, in the District of Algoma, Province of Ontario, Canada. The claims lie about 27 miles from the Port of Michipicoten, on Lake Superior, and 21 miles from Missinabie Station, on the Canadian Pacific Railroad. The nearest point on the railroad, Otter Station, is only about 10 miles distant. Missinabie Station, on the C.P.R. is the easiest way from which to get in to the property. The general location is shown on the accompanying blue print, Map. 1. The route in summer is a canoe route, with one long and difficult portage, but otherwise relatively easy. In winter the trail follows the portage route over the ice on the lakes. In summer the trip can be made in one day; in winter it will require two days on foot; or one short day with dog teams, in case the trails are in good condition.

TRANSPORTATION:

It is somewhat difficult to get supplies into the camp. The best time is during the winter, when the snow is on the ground and supplies can be taken in by dog teams. Otherwise, in summer everything must be packed on the backs of Indians and in canoes. In case energetic development work should be started on the property, and an attempt made to ship ore in quantity, it would be necessary to construct a railroad in order to get in heavy materials and ship out the ore.

The most feasible railroad route from the Goudreau property to the C.P.R. at Lochalsh Station, is 14.2 miles long. A road over this route should not, however, be constructed, for the reason that it means a long rail haul after the main line of the C.P.R. is reached, in order to get the ore to any point where it can be utilized.

The line of road, the construction of which should be considered, is the stretch of 15 miles from the end of the Algoma Central & Hudson Bay Railroad, at the Helen mine, which would then connect the Goudreau properties with the Port of Michipicoten. This would give a total railroad haul from the Goudreau to Lake Superior of about 27 miles.

It would be expensive to construct the 15 miles of this road, on account of the fact that the topography is rough in detail, and there will be a large amount of rock work.

The cost of this line would range from $20,000 to $30,000 per mile, or, if we take the figure of $30,000 per mile, a total of $450,000.

At the present time, the Helen mine produces some pyrite which is transported from the mine to the harbor, a distance of 12 miles, for 45 cents per ton. It must be borne in mind in this connection that this rate can be considered as a rate made on the shipment of, in round numbers, 150,000 tons a year of iron ore and pyrites. If an additional 15 miles of road is constructed to the Goudreau, it would be for the transportation of supplies to the camp, and of the product from the mine alone. There is no freight produced at any point intermediate between the Helen mine and the Goudreau at present, though some may be developed in the future. It is reasonable to assume that in expending $450,000 for construction, the railroad will demand from the company operating the Goudreau property a freight rate which will recompense them for this outlay. I estimate that the probable charge will be in the neighborhood of $1.00 per ton on the ore from the Goudreau to the Lake during the first years of construction, with a possible reduction to 75 cents for subsequent years, if other freight is developed along the route. In my later estimates these figures for transportation are used.

From Michipicoten there is then an all water route

to any of the lake ports. The cost of transportation by water freight to any of the lake ports, based on the present charges will be 70 cents per ton. It is not probable that this rate will be materially changed in the future.

TOPOGRAPHY:

A reference to the accompanying map (No. 2) of the Goudreau property, on which the outline of the hills is indicated by hachures, will give a fairly correct idea of the general character of the topography of that section of Canada. The hills are either rounded knobs, or hog backs with the long direction approximately East and West, or Northeast and Southwest. The maximum elevation above sea level is approximately 1500 feet, I am informed. The maximum elevation on the Goudreau property of the hills above the intervening swamps is about 500 feet. The valleys between the hills are occupied by muskeg swamp or by lakes. This entire section of country is one in which there are great numbers of lakes connected together into chains by small streams. These small streams frequently have a considerable fall, so that there exist extremely good possibilities for the development of cheap water power.

GEOLOGY:

My statements concerning the geology of this section are based upon the statements of Dr. A. P. Coleman and

Mr. E. L. Fraleck, appearing in the 15th and 16th Annual Reports of the Bureau of Mines, of Ontario, for 1906 and 1907. The Goudreau property lies in an area in which the Iron formation (known at the Helen mine as containing that iron deposit) occurs, The iron bearing rocks belong in the so-called Keewatin formation of Canada, a formation which is widely distributed in Canada. On the property the pyrite is associated with green schist, some limestone and the silicious iron formation.

OCCURRENCE OF THE PYRITE:

The pyrite occurs in masses, of various sizes, more or less intimately associated with the green schist, limestone and silicious iron formation mentioned above, and is frequently most intimately mixed with the silicious material. (1)

The following section, taken from Mr.Coleman's report illustrates this. The various outcrops are indicated by the letters "A", "B", "C",etc., with the exception of one deposit known as the"Bear Claim"deposit.

(Deposit E).	"Pyrite with some green schist,	8	paces
	Limestone (mostly hidden by debris),	6	"
	Pyrite,	4	"
	Green schist (strike 100°,dip 60° South),	33	"
	Pyrite with some cellular silica,	29	"
	Very rusty banded silica (dip 25° South),	19	"
	Width of section,	98	" "

(1) Goudreau Lake Pyrites Deposits, A.P.Coleman, 15th Annual Report of the Bureau of Mines, Ontario, 1906,Part I,p.184).

(Deposit A.)[1]

> "A section across the low hill near its west end shows green schist to the south, then limestone with some pyritous schist, 30 feet of pyrite, 12 feet of green schist, 9 feet of pyrite, and green schist to the north. There seems to be little continuity in the structure, however, and sections at different points vary greatly among themselves. Pyrites or gossan extends about 400 feet from east to west, with a width of about 150 feet, but it is greatly mixed with other materials, especially schist and limestone."

Sufficient work has not been done to enable one to determine whether or not the pyrite occurs in well defined lenses in the rocks with which it is associated. From the descriptions given and others in the report referred to, which I will not quote here, I am led to believe that while these deposits may have in general a lenticular character, that these lenses of pyrite will nevertheless have running through them a large percentage of waste material.

It is most important that a careful examination of these deposits be made under favorable conditions, in order to determine, if possible, the mode of occurrence of the ore, and in order to enable one to draw conclusions as to the possible continuation in depth of these deposits.

While a few drill holes (4) have been put down, one of which gave a core of pyrite at a maximum vertical depth below surface of 169 feet, nevertheless these drill holes are

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(1) Op. Cit., p. 186.

so few that one cannot feel satisfied as to the occurrence of the ore to any definite depth below that point on the surface at which it can be actually seen to exist. The reasonableness of this doubt as to the continuation in depth of this pyrite below where it may be seen, is shown by the fact that at one place a shaft 30 feet deep was sunk in Deposit E; a 60' drift was driven from the bottom of this shaft, and at this shallow depth it appears to have passed under the pyrite, none being shown in the drift. Also a drill hole 98' deep, passed through the pyrite at 7' below surface and for the remaining distance, was in green schist.

GENERAL CHARACTER OF THE ORE DEPOSITS:

Coleman in his report,[1] says:

> "The Goudreau lake Iron formation is of special interest as containing probably the largest known pyrites deposits of Ontario, x x x ".

The following quotations from the Coleman and Fraleck reports will give definite statements concerning the size of the exposures. Coleman speaks of Deposit "A" having a length 400 ft. east and west, by 150 ft. north and south.[2] He says of the Bear Claim deposit, that it has a "length from east to west of 1200 feet, and a width of nearly 300 ft.".[3]

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(1) Op. Cit., p. 187
(2) " " p. 186
(3) " " p. 186

Fraleck says, "The total length of Deposit "C" as disclosed by 16 pits, is about 600 ft."[1] Of Deposit "B" he says: "Along the side hill trenches reveal a length "of 900 feet of either pyrite or gossan, and the lake bottom "on that side appears to consist of limonite."[2]

Both writers emphasize the meagre amount of exploratory work which has been done on these properties, in comparison with the extent of the outcrops, and that it is necessary to do a great deal more work in order to secure sufficient data to enable one to arrive at any adequate estimate of the quantity and grade of the available ore.

The work done by the company owning the Goudreau Lake property has consisted chiefly in digging trenches, sinking occasional pits through the drift to bedrock, and stripping. As the result of the exploratory work, the lengths of outcrops have been determined and are indicated approximately on the map accompanying, Map II, made by the company, on which the locations of the exposures are shown.

Mr. Hasselbring,[3] in a report to his superior, after the 1907-8 work was done, says that Deposit "C" is 700' long by at least 125' wide, and 600' of this is quite uniform in character.

The following size of the outcrops have been determined by the trenching.

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(1) Annual Report Bureau of Mines, Vol. 16, 1907, p. 178
(2) Ibid, p. 178
(3) MS. Report.

A.....	275' x 85'
B.....	550' long,
C (1) hill,	700' x 125'
" (2) "	300' x 150'
" (3) "	275' x 125'
D.....	50' x 100'

These measurements are doubtless only approximate, but they indicate clearly the large size of the exposures of pyrite.

Quality: The information contained in the government reports, and also in the data secured by the company's representatives from the work done by the company on the properties, are too imperfect to enable one to make a definite statement as to the average quality of the pyrite. My intention in going to the property was to sample the property as well as it could be sampled, in order to secure this information. When I found, however, the conditions which existed there, I found that I could not sample the property in such a way, in view of the limited character of the exploration work which has been done, so that I could secure a correct idea of the actual value. I have been able, however, to secure information which will enable me to make a very close estimate as to the possibilities of the property.

In general the ore seems to consist of pyrite and silica as an impurity. In some cases a little magnetic pyrite

pyrrhotite, is known to occur. The pyrite of Deposit "B" is said to carry a little copper and nickel, but no assays have been made to determine how much, as it seemed clear that the amount was extremely small. Assays of this ore should be made in order to determine the possible copper and nickel content.

Coleman, in his report, says of the pyrite on the Bear Claim: "The pyrites of the Bear Claim seems more "mixed with rock matter than in most of the deposits, but it "covers a far larger area than any of the others."(1) He makes the following general statement concerning the Goudreau property:(2)

> "The length of the series of outcrops from east to west is 2 1/2 miles, and at the end of the first little lake there are outcrops over a width of half a mile; so that a considerable territory is more or less covered with pyrites or gossan formed from it. The total amount must go into the millions of tons; but undoubtedly much of it is too low grade to be profitably used. With selection there should be a large amount available, reaching a percentage of 35 or 40 per cent sulphur, and a considerable amount still higher in grade."

Fraleck says of Deposit "C":(3) "A surface cross-"cut here discloses a width of fifty feet of fairly high grade "pyrite, except for some bands of green schist, which could be "easily culled out, and fine intermixed silica."

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(1) Op. Cit., p186
(2) Ibid " p.186
(3) Ibid " p.178

Fraleck also says:[1] "Deposits B and C are "higher in grade than the others, and, with very little cull- "ing, their product should run approximately 40 per cent. "in sulphur. In the other ore bodies, workable lenses of "40 per cent ore, doubtless occur. The remaining material "running between 25 and 35 per cent in sulphur, could readily "be concentrated to a 48 or 50 per cent product."

It is generally admitted by the men associated with the company, who have information concerning these deposits, that only Deposits "A", "C" and the Bear Claim deposit, and possibly the deposits on Claims 1613 and 1605, can be considered as having a possible commercail value. Those to the west, Deposits "B", "D", "E" and "F", are recognized as being of such low grade that they are not worthy of consideration. These statements as to the workable and unworkable deposits, as said above, are based upon what I consider to be insufficient knowledge, judging from the amount of exploratory work which has been done.

The company has supplied me two analyses from Deposit "A", and five from Deposit "C", as follows:

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(1) Op. Cit., p. 180

			Per cent Sulphur.
"A",	(1),	Average sample exposed wall eastern end,	43.50
"	(2),	Average of 25 ft. across face of bluff #12,	40.21
"C"	(1),	Average sample from 6 ft. exposed in trench #15 or #13,	38.00
"	(2)	Average sample from pit #6,	39.18
"	(3)	Pit #14-Represents a large body of lean ore,	32.25
"	(4)	Average sample by R.F.Hill, Believed to be not representative, too much rock,	~~23.10~~
"	(5)	Average of area, 125 x 700 ft., from 18 pop holes in trenches,	32.07

I have no assay returns from the Bear Claim, but the statement is made that there exists there large deposits of low grade ore.

The above samples are too few in number, if they represent all of the samples which have been taken, as to the best of my information they do, in order to give one a correct idea of the average value of these large ore occurrences. I would consider that No. 5 of Deposit "C", which represents an average of an area 125 x 700, and made up of the product from 18 pop holes in trenches which cross-cut the formation,

to be the most representative sample presented. This ran 32.07% sulphur.

I have assumed 32% as the possible average of the ore on the Goudreau property in "A", "C" and the Bear Claim deposits, giving as I believe the best value which reasonably can be given. to the ore in these deposits, after an analysis of the work done and of the returns from the samples taken. In my further estimates I have therefore used 32% Sulphur as representing the general character of the ore, allowing, however, for the possibility of obtaining by hand sorting ten per cent of the total ore mined of a grade of 40% Sulphur, in the case of extensive mining operations.

DEVELOPMENTS:

As stated above, there are practically no developments whatever upon the property. The company confined its work largely to digging trenches, stripping, and sinking some test pits to bedrock. Four diamond drill holes were also put down; these were drilled on Deposit "A" in 1903. Maximum depth below surface was 169' and showed pyrite.

The test pits did not penetrate the bedrock to any depth, and showed only the presence of the pyrite. The following statement shows the trenching done under Mr. Askwith, and its distribution:

Deposit "A",	11	Trenches,	with	total	length	of	185'
" "B",	12	"	"	"	"	"	418'
" "C",	20	"	"	"	"	"	397'
" "D",	8	"	"	"	"	"	166'
" "E",	7	"	"	"	"	"	128'
Bear Claim,	10	"	"	"	"	"	500'
							1794'

The work of 1907-8 was confined to Deposit "C", and many more feet of trenches must have been added to the above record. The trenches will be serviceable in enabling a correct estimate of the area of the ore occurrence to be made, but a great deal more trenching and pitting must be done before any definite knowledge can be said to have been secured of the areal extent of the exposures, and this must be supplemented by underground work from shafts and by diamond drill work before one can get any definite knowledge of the continuation of the pyrite in depth. This exploratory work must be supplemented by careful and extensive sampling before the quality can be determined. Both of these things should be done before any large investment is made in a mining and milling plant, and especially in the construction of a costly railroad.

QUANTITY OF AVAILABLE ORE:

From the above statements as to the lack of sufficient developments, it will readily be seen that no reliable estimate can be made as to the quantity of available ore in these deposits. Various estimates have been made in the

government reports which estimates, however, I consider of no value, as they are mere guesses.

Estimates were made by A. B. Willmott after the trenching, test pitting and drilling was done in 1902 and 1903. In his estimates it was assumed that the deposits would continue to a depth of 100 feet. I consider that these estimates are of no value, however, as they merely represent estimates of the amount of material within a given area, since there was at that time absolutely no reliable information as to the quality of this material. In 1907 and 1908, work on the property was confined to Deposit "C". This work was in charge of Mr. Hasselbring. As the result of his work, he concludes that the deposit has been opened up east to west to a length of 600', and north and south to a width of 125', and he assumes that the Deposit extends to a depth of 100'. According to his estimate, there are in this deposit 750,000 tons of ore. As a matter of fact, the average heighth of this deposit is not to exceed 50 feet above the level of the surrounding marsh. Whether or not the deposit extends for an additional 50 or 500 feet in depth is a question. The doubt as to this extent in depth has already been indicated by the instance referred to above, where a shaft was sunk to a depth of 30 feet on Deposit "E" and a 60' drift driven from it showed no pyrite apparently having passed under the pyrite deposit.

Although in the case of the Deposit "C" this condition may by no means exist, and the deposit may reach down to a very considerable depth, nevertheless, in view of the lack of absolute knowledge as to its continuing in depth, I would not feel like admitting 50 feet below that which is actually known.

Assuming a length of 600', width of 125' and a vertical extent of 50', I estimate the large exposure of Deposit "C" should contain the following tonnage, in round numbers, based on 9 cu. ft. per ton, in place:

Gross tonnage 417,000 of average tenor of 32% S.

This amount will be doubled by every fifty feet in depth to which this ore body is found to continue, provided the length and width remain the same.

As a matter of fact, there can be no question in the mind of anyone but that in the case of these large deposits having the extent which they are said to have by a number of reliable men who have seen them, and whose testimony is corroborative, but that there are many hundreds of thousands of tons of material available on the Goudreau property.

The whole question resolves itself in my mind into the query as to the quality of this material. If it is too low grade to be handled economically, then the quantity is of absolutely no interest, and this question as to the average

quality it is impossible to answer at the present time, on account of the lack of developments and assays as mentioned above.

VALUE OF PYRITE ORE:

In the following paragraphs I shall give some statistics of the production of pyrite ore in the United States in recent years, and the average value, in order to indicate the approximate value of the pyrite ores on the Goudreau property:

UNITED STATES PRODUCTION IN LONG TONS - 2240 lbs.

Year	Quantity	Average price per ton
1904	207,081	$3.93
1905	253,000	3.71
1906	261,422	3.56
1907	247,387	3.21

1907 (Imports foreign Pyrite), 656,477 long tons, 4.01

Two things will be noted from the above; the steady reduction in the price offered for domestic pyrite, that is, for that produced in the United States, and the fact that the higher price is paid for the foreign pyrite. This difference in price between the foreign and the domestic is due largely to the fact that the foreign pyrite is of higher grade and necessarily must be in order to avoid payment of import duty and in order to stand the shipping rates, and also carries a low percentage of copper, which gives an increased value to the

cinder produced from the roasting of the pyrite, thus enabling the purchaser of foreign pyrite to secure a profit from the sale of said cupriferous cinder.

I went over the actual sales statements of pyrite sold from the Helen mine. This product is very high grade. Three shipments amounting to about 5500 tons, ranged in sulphur content from 47.50 to 48.68. In other words, the pyrite was of very high grade. This product brought at the southern lake port where it was sold, 12 cents a unit, or in round numbers, $5.64 a ton. This will be recognized as an exceptionally good price for pyrite.

The current prices for imported pyrite are as follows:

46

Spain

Atlantic ports, 42 to 56%
sulphur:
Lump, unit, ... 12-3/4 to 14 1/2 cts.
Fines, ... 08-1/4 to 10-3/4 "
Spanish f.o.b. Cartegena ton, $2.86

7 1/4 c in W. Y. dist

FUEL:

There is an abundance of timber in this section which can be used for ordinary domestic fuel purposes. For the production of power, however, it will be necessary to bring coal to the camp. At the present time a satisfactory quality of steam coal costs at the Helen mine $4.13 per ton. To this would have to be added 50 cents for rail transportation from the Helen to the Goudreau, bringing the total cost of fuel in

the chutes at Goudreau property at $4.63 per ton.

POWER:

The above fuel used in the production of power will bring the cost of steam power on the Goudreau to between $55.00 and $60.00 per H.P. per annum. At the present time I am reliably informed that electric power generated by water on the Michipicoten River can be contracted for at the Helen mine to the amount of 750 H.P. at the rate of $32.00 per electric H.P. per year. The probability is that this same power plant would deliver power to the Goudreau property at a cost somewhere in this neighborhood, Even should that not be, there is no question but what power for use on the Goudreau property could be developed in that immediate vicinity, at a cost not to exceed $32.00 per H.P. per annum, providing a plant to develop in the neighborhood of 1,000 or 1,500 H.P. is installed.

TIMBER:

Small timber for mining operations can be secured in the vicinity of the property. Square timber brought into the property will average in the neighborhood of $26.00 per thousand.

WATER:

There is an abundance of water for all domestic and milling purposes.

LABOR:

In view of the fact that the Goudreau property is not in the vicinity of any towns of large size, which would supply the mines with the labor needed, it is probable that the labor there will be somewhat higher than in the developed mining camps. This will be true also, because of the climatic conditions.

My information is to the effect that the mine labor at the Helen mine, the nearest mine to the Goudreau property, will average about $3.00 per day. The work there is done on contract, and the men are encouraged to do good work and earn good wages.

DATA FOR ESTIMATES: I have assembled here the data scattered through the body of my report, upon which data the estimates which follow are based.

Quality of Ore: Assumed to carry 32% Sulphur.

Virginia and N. Y. pyrite ores run from 20% to 30% sulphur. Possibly 10% of raw material mined which will carry 40% Sulphur can be selected and shipped as lump ore.

Concentration usually results in a saving of from 70 - 80% of desirable part of a milled ore. I am assuming an average saving in my estimates of 75%.
On this basis a 75% saving of .32% silver ore will give theoretically a concentrate carrying 48% sulphur. Such concentrates usually range in actual practice from 40 - 48%. I have taken 45% S. as the average content of the concentrates which will be produced.

Weight per Cubic Foot. Theoretically calculated, 8.98 cubic feet to the ton on ore carrying 32% S.

I have assumed 9 cubic feet or 1 cubic yard per ton.

Mining Cost:	1st year	2nd year, if conditions are favorable and subsequent years.
Stoping, timbering, traming, etc.,	1.00	.60
Development,	25	10
Exploration,	25	25
Milling, ore-dressing, per ton, on basis of 70 - 80% recovery or average 75% recovery and concentration of 2 into 1:	50	40
Stockpiling and rehandling charges on 1/2 gross output, Navigation being closed for 1/2 year necessary to stockpile and rehandle 1/2 gross output.	05	05
General Expenses, Superintendence, etc.,	20	20
Fixed Charges: Not estimated, since cost of property and extent of plants to be constructed unknown.		
Railroad Transportation: Mine to Michipicoten Harbor:	1.00	75
Water Transportation: Michipicoten Harbor to Import Port on lakes,	.70	70
Unloading charges at Port:	.20	.20

One-half Assay Charges, borne by seller:	.015	.015

United States Import Duty:

Pyrite in the natural state, or concentrated, is imported free if it comes 40% of Sulphur, or over.

Pyrite with less than 40% Sulphur is classed as iron ore and pays 40 cents per ton import duty.

ESTIMATES:

Based upon the above data, I have made the following estimates of the probable costs and profits, assuming that the Goudreau deposits have been proven to contain workable deposits of pyrite of an average grade of 32% sulphur:

First Estimate:

			Cost per ton 1st year.		Cost per ton 2nd year, (if conditions are favorable) and subsequent years.
Mining Gen	Mining	1.00		.60	
	Development	.25		.10	
	Exploration	.25	1.50	.25	.95
	Milling, per ton, raw ore,		.50		.40
	1/2 gross tonnage - winter output to be stockpiled and re-handled during shipping season, a 10c		.05		.05
	General expense ,		.20		.20
	Fixed charges,		-----		-----
Total per ton, raw ore,			2.20		1.60

Double above cost for Concentrates, on basis of concentration two into one,	4.50	3.20
Note that Spanish pyrite at current quotations sells f.o.b. Cartageno, per ton		2.86

Cost per ton of concentrate carrying 45% sulphur,	4.50	3.20
Railroad transportation mine to harbor,	1.00	.75
Water transportation to delivery port,	.70	.70
Unloading charges,	.20	.20
One-half assay charges,	.015	.015
Total cost at selling port, per ton of 45% sulphur concentrate	$6.415	$4 865.
Selling price per ton of 45% sulphur concentrate, at 12 ¢ per unit,	5.40	
Loss 1st year	1.015	
Profit 2nd and subsequent years,		.535

On basis of 45% sulphur and 10c per unit selling price,-$4.50

Loss 1st year,	1.915	
Loss 2nd and subsequent years,		.365

Second Estimate:

In this case I have taken, for the sake of arriving more accurately at the possible costs and profits,

a special case of a plant prepared to mine 250 tons per day of raw ore, averaging 32% sulphur. In mining this ore by hand picking, 10% of the gross output, or 25 tons per day of product carrying 40% sulphur can be secured, which may be sold less milling charges; 225 tons of raw ore will then be concentrated on the basis of two into one, giving 112 tons of concentrates running from 40% to 48% sulphur, say with an average of 45% sulphur. In this estimate it is assumed that the first period of development has been passed, and that the mine and mill have reached their normal condition, and are running at their highest efficiency.

25 tons per day natural ore, 40% sulphur:

Mining Gen:	Mining	$ .60	
	Development	.10	
	Exploration	.25	$ .95
	Stockpiling and rehandling,		.05
	General expenses,		.20
	Fixed charges (unknown)		
Total Mining Cost,			$1.20
Railroad Transportation		$ .75	
Water Transportation,		.70	
Unloading charges,		.20	
One-half assay charges,		.015	1.665
Total cost,			$2,865

Profit from Raw Ore

	12 cts.per unit:	10 cts.per unit:
Selling price of raw ore carrying 40% sulphur,	$ 4.80	$ 4.00
Total cost as above,	2.865	2.865
Net profit per ton,	$ 1.935	$ 1.135
Net profit per day on 25 tons,	$48.375	$28.375
Net annual profit on 9000 tons, assuming 360 working days	$17,415.00	$ 9,215.00

Profit from Concentrated Ore:

112 tons per day, Milled ore, giving product carrying 45% sulphur, on the basis of the estimate given above, p.27 $4,865

	12 cts.per unit:	10 cts.per unit:
Selling price of concentrate carrying 45% Sulphur,	$5.40	$ 4.50
Cost per ton of concentrate,	4.865	4.865
Net profit per ton	.535 Loss,	.365
Net profit per day, on 112 tons of product,	59.92 "	40.88
Net annual profit on 40,320 tons of concentrates in 360 working days,	21,571.20 "	14,716.80

	S.at 12 cts per unit.		S.at 10 cts. per unit.
Net annual profit from 9000 tons of raw ore,	$17,415.00		$ 9,215.00
Net annual profit from 40,320 tons of concentrates,	21,571.20	Loss	14,716.80
Net profit from sale of total product, 49,320 tons,	38,986.20	"	5,501.80

Total ore mined, 90,000 tons

Total product sold, 49,320 "

Average profit per ton of product sold, $ .79

Average profit per ton of ore mined, .43

Above shows clearly how easily a substantial profit may by small fluctuations in market price of product be changed to a loss.

Total estimated tonnage of raw ore at present shown on deposit "C".

Dimensions of exposed ore 600' x 125' x 50' ÷ 9 cubic feet per ton equals in round numbers 417,000 tons.

10% or 41,700 tons of 40% Sulphur may be mined and marketed at a profit per ton of $1.935 at 12 cts. per unit or $1.135 at 10 cts. per unit.

	at 12 cts.	at 10 cts.
Total profit on raw ore,	$80,689.50	$47,329.50

Total concentrates produced,
187,700 tons carrying 45%
Sulphur.

		at 12 cts.	At 10 cts.
Profit per ton on concentrates,		$ .535	Loss $ .365
Total profit oh concentrates,		$100,419.50	$68,510.50
Net profit from 41,700 tons raw ore,		80,689.50	47,329.50
Net profit from 187,000 tons concentrates,		100,419.50	" 68,510.50
Total profit or loss on 5 years' operation,	Profit,	$181,109.00	" 21,181.00

To handle the above tonnage on the basis of mining 250 tons per day or 90,000 tons per annum the operation would be extended through a period of approximately 5 years.

I am not informed as to the initial outlay which it is intended to be expended for thoroughly prospecting the properties, and then if this proves satisfactory in a mining plant and milling plant. A reasonable assumption for the total of these expenditures would be, basing my estimate on the cost of prospecting and of the mining and milling plant alone, $300.000 In other words, the possible net profit per annum, under the most favorable conditions, would represent approximately 10% upon the capital invested.

All of the above estimates of cost are, if anything, low, below the best which is at present done, and are submitted in

order to show the maximum possibilities of a plant operated to its highest efficiency, and when the sales of the product are made at the best prices. The only figures in the above estimates which are liable to remain fixed are those which do not come under the head of the general mining cost, such as transportation, unloading, etc. The estimates for the total cost of mining are under, rather than over, the actual cost for which the specified work can be done, and will in each case probably have to be raised a few cents. It will be noted also that I have not included an estimate of the fixed charges, because these will depend upon the amount of capital invested and in regard to this I have no information as to the intention of the investor. Furthermore, in the above estimates I have assumed that the product was sold on the basis of 12 cents per unit. Your own experience in this matter will show that this is better than it can be asumed that all of the product will bring. A slight change in the figures in the above estimate, increasing the cost of mining and reducing the average price per unit of sulphur for which you will sell your product, will rapidly cut down the estimated profit per ton, and necessarily will greatly reduce the probable net returns which can be secured from the outlined operations.

Based on the above estimates, it will be seen that the highest possible profit which can be expected to be derived from the operation of the Goudreau Lake property will approximate 10% return upon the capital invested in the plant alone, no estimate including the cost of the property.

In the above statement it will be seen that there is also no allowance made for amortization and this should be considered in any legitimate mining venture.

I do not consider the above possible return indicated by the estimates to be high enough for money invested in such a mining property, in view of the hazard of this mining operation and particularly in view of the doubtful commercial possibilities. These commercial possibilities I shall consider in a short appendix to this report.

CRITICISM AND SUGGESTIONS:

Upon reading the above report carefully, so far as regards the description of the exploration work which has been done on the property, it will be appreciated that the work done has not been of such a character as to enable a definite conclusion to be reached concerning the areal distribution of the exposures of pyrite or of a possible extension of these pyrite deposits in depth. In no case can I find from the descriptions an instance where a number of trenches were carried

all the way across the entire deposit at intervals throughout the entire length of the deposit so that one could say positively we have here anarea so and so long and so and so wide in which the pyrites occur. Moreover, the very shallow exploratory work done does not enable a conclusion to be made as to the possible depth or even the probable depth to which this deposit may continue. It is very essential to determine these two points in regard to these deposits before any plans should be made or any large amount of money expended in preparing for mining or milling operations.

In view of the relatively extensive amount of surface work which has been done it is remarkable that so few assays of the pyrite ore have been returned. It is only upon careful sampling and assaying of these samples that any idea can be secured as to the probable quality of the pyrite in the Goudreau deposits. Before any work toward actual mining is done the quality of these deposits should by all means be determined.

My criticisms of the work which so far has been done is that it is insufficient to give any reasonable idea of the available quantity of ore on the Goudreau property, and furthermore, it fails to give any definite idea of the probable quality of the ore which may be mined from these deposits.

CONCLUSIONS:

Having analysed the above reported information which we have concerning the Goudreau pyrite deposits, I have assumed in my estimated, costs and possible profits to be derived from the operations on these deposits, that the ore may carry 32% Sulphur, which is a better average than in reality may be expected that these deposits will carry. I have taken this figure,, however, in order to find out from my estimates what may be done with ore of the best grade which may reasonably be expected.

In my further estimates, especially in those cases where the costs were known, such as the cost of lake transportation, unloading charges, etc., I have assumed costs which on the average are rather lower than is the costsunder average conditions in New York and Virginia at the pyrite mines in these States. I have made these estimates low, for the same reason that I have assumed a rather high content of sulphur in the ore, in order to find out the highest profits that could be made under the most favorable conditions. Bearing in mind these assumptions, a reference to the estimates will show that under the most favorable conditions an annual profit can be made which is so small that it will allow only for a payment of approximately ten per cent upon a total investment of $300,000. It should be borne in mind further in my estimates, that I have not allowed for the fixed

charges representing interest on money invested, amortization, taxes, insurance, etc., which would necessarily reduce the profits, and consequently it would seem that under the most favorable conditions this property cannot pay even ten per cent upon an investment of $300,000.

Not knowing the price for which the property can be purchased, or the intentions of the investor, should the property be purchased, I have assumed a figure of $300,000 as representing approximately the cost of the mining and milling plant, but not including purchase price of the property. My general conclusion is, that you are not warranted under the present circumstances in operating the Goudreau properties, as in my opinion a return of even ten per cent upon the money invested in a mining property is too low a return for the investor, in view of the ordinary hazards of mining, and particularly not sufficient in this case where the ore obtained has a low value per ton, a small profit per ton at best, and where the commercial possibilities are such that a profit today may be changed to a loss tomorrow, as the result of fluctuations in freight rates or selling prices.

RECOMMENDATIONS:

In spite of my statements above, in which I conclude that you are not warranted in mining the Goudreau

pyrite at the present time, I feel that these properties may have in the future, as Canada develops, a value; therefore, I recommend that if you can secure these properties at a low cost, and I mean by this a practically nominal cost, that you are warranted in doing so, and in holding them for the future.

Should it not be possible for you to obtain the properties at a low price, or not desirable that you should so obtain them, and hold them for a period of years, then I recommend that you do not take them up with a view to entering actively into mining and milling operations now. Should this recommendation be disregarded and it be your intention to further consider these properties, I would recommend that you by all means have the property examined during the season when the surface can be carefully studied, and in connection with this examination, which has for its purpose the determination of the probable surface extent of the deposit, and the possible extension in depth, have the ore carefully sampled and assayed with a view to determining the quality. With the two points of available ore and grade of ore definitely settled within reasonable limits, you would then be prepared to base your estimates of future profits upon more definite data than those with which I have, under the circumstances, had to deal in the above report.

Respectfully submitted,

J. Morgan Clements.

New York,
Dec. 2, 1908.

900-15 William Street

[illegible]

[illegible]

[illegible]

[illegible] Township 47, Range [illegible]

District of [illegible]

The following report is compiled from other reports and data on file in this department.

This property consists of [illegible] patented mining claims (with an area of [illegible].75 acres) in Township 47, Range [illegible], in the District of [illegible]. It is registered in the [illegible] Mining Office at [illegible] as Parcel [illegible], [illegible], [illegible] section.

The group of claims, which is about three-quarters of a mile wide by two and a half miles long, includes several detached deposits of iron pyrites.

Exploratory work on the property has been carried on at three different times. The first attempt at exploration [illegible] in 1[illegible] and [illegible] one. In 1907 [illegible] the stripping work on the group of claims was completed under the supervision of Mr. [illegible]. In 1909 one of the pyrites deposits on the property was explored by diamond drill under the direction of Mr. [illegible].

The stripping, trenching and test pitting done in the number of [illegible] showed up seven pyrites deposits, now located as follows: "[illegible]" deposit on claim 1019, "[illegible]" on [illegible], "[illegible]" on [illegible] and [illegible] [illegible], "[illegible]" on 1[illegible]5, 1[illegible] and 1009.

"E" on 1000, "L" on 1000, 1008, and 1011 and "F" on 1009 and 1010.

On the completion of the surface work, it was decided to drill deposit "A" and with this end in view a set of camps was erected, and a road was cut out westerly to intersect the tote road from Helen Mine to Brunsett Station on the C.P.R.

Drilling commenced in January 1903 and was discontinued on April 10th of the same year, when a fire destroyed the drill shed and the frame of the drill.

While drilling was in progress four holes were put down. The deepest point at which ore was encountered was 109' from the surface. The pyrites seemed to lie in bands and much rock was encountered at various depths.

On the completion of this exploratory work, Prof. Gillmott made the following rough estimate of the tonnage of ore available, assuming a depth of 100' for the deposits.

Deposit	Dimensions	Tons	Quality
A	500' X 50'	175,000	Fair
B	900' X 50'	410,000	Poor
C	500' X 50' 300' X 250'	175,000 750,000	Fair Poor
D	100' X 30' 100' X 80'	30,000 100,000	Poor Fair
E	200' X 20' 100' X 30'	60,000 70,000	Fair Fair
F	100' X 10'	10,000	Fair
Rear	700' X 100'	700,000	Poor
		2,040,000	

One-half of this amount is estimated to run 30% or

better in sulphur.

The work done in the winter of 1907 and 190[illegible] consisted of trenching and test-pitting.

Not much work was done on deposit ' '.

Work on deposit'[illegible]' showed the pyrite deposit to extend west and east for 550' and north and south uphill from a lake for 100', where it appears to dip under the greenstone. The ore is banded and differs from the other deposits in that it is composed of a mixture of sulphides - pyrite, pyrrhotite, chalcopyrite and bornite. The entire deposit is covered with from [illegible]' to [illegible]' of gossan. Two drifts were put into the hill for a distance of about 10', but they exposed only lean pyrites averaging 16.95 in sulphur. The better grade of sulphides seems to form a layer next the surface.

The stripping on deposit 'C' was confined to that part standing as a hog's-back ridge. At the North-west end of the ridge, which has a length of 800', a width of 1[illegible]' was shown without either contact being reached; the width at the south-east end is [illegible]'. The last southeasterly 100' is composed of very low grade pyrites, the pyrites blending into quartz-diorite, carrying only a small proportion of pyrites.

Trenching on two hills lying about 150' southwest of the ridge showed bodies of pyrites measuring 150' X 300' and 125' X 275'.

"The pyrites in this deposit is not banded, but appears to be simply a constituent of the quartz-diorite, the prevailing country rock and is much more highly concentrated in some places than others."

Work on deposit 'A' seemed to indicate that this is a flat lying deposit of pyrites with a capping of greenstone.

Trenching done around 'A' failed to show any pyrite.

On the "Bear" deposit trenching on two hills running at right angles showed bands of pyrites with widths respectively of 50,100 and 150 feet, separated by bands of greenstone. In the angle between the two hills a mound of pyrites 50' X 120' was trenched. This may connect with the deposits on the larger hills.

Assuming a depth of 100' for these deposits, it was estimated after the close of the work just described, that deposit 'C' would yield 1,000,000 tons of 45% sulphur concentrates, the 'Bear' deposit the same and 'A' and 'B' together 500,000 tons.

During the summer of 1909 diamond drilling was done with the object of proving the extent of deposit 'A'. While this work was in progress a wagon-road about 9½ miles in length was opened up from the property to Dick Fleing on the C.P.R. a few miles west of Lardeau.

The drilling showed deposit 'C' to have probably a larger area than previously supposed, but a lesser depth. The greatest depth from the surface at which ore was ~~found~~ encountered was 70' and the average considerably less than this. Mr. Hardcolbring estimates that 450,000 tons of 30% ore was actually blocked out by this drilling and that a much larger tonnage is likely available.

From analyses of samples taken over the surface of the

various deposits the percentage of sulphur is seen to run usually between 26 and 32. Drill holes [illegible] and [illegible] have furnished the best samples, these running from 32% to 40% sulphur. Drill core samples from deposit 'C' show only low percentages of copper and nickel, copper .02% and lower, and nickel 1% and lower. Never more than a trace of arsenic is present. Qualitative tests made in 1902 for chlorine and fluorine, showed no trace of these elements.

The pyrite found in the various deposits has usually a silicious gangue and with the pyrite are associated other sulphides in subordinate amounts; pyrrhotite being the most common of these.

It is probable that by working only the most best portions of the deposits the percentage of ore recovered would doubtless be of a much higher grade than that indicated above. However, it appears that the Goudreau property holds a concentrating proposition - as a whole. The concentrating of this ore could be done very cheaply owing to the marked difference between the specific gravity of the pyrites, and the gangue, the gangue being nearly all silica.

After the suspension of drilling in 1909 Mr. Hoelye makes the following estimates as to tonnage of ore available; Deposit 'C' 1,000,000 tons, 'Bear' deposit 1,000,000 tons, Deposits 'A' and 'L' together 1,500,000 tons and deposit 'B' about 500,000 tons. "Probably a safe estimate of the entire property would be 3,000,000 tons. This estimate is based on pyrites running from 30% to 35% sulphur and the ore would of course concentrate two into one to produce a 45%

sulphur ore. In fact there is a considerable amount that would not have to be concentrated. This amount might possibly reach 250,000 tons. In order to be on the safe side and have a little margin, we will assume that all the ore will have to be concentrated and we will assume that the 3,000,000 tons will yield 1,500,000 tons of 45% ore. Based on this tonnage we have the following proposition;

Cost of plant & equipment, exclusive of tracks	$ 250,000.00
Tracks and trestles	50,000.00
Cost of mining - 80¢ per ton	2,400,000.00
Cost of treatment - 30¢ per ton	900,000.00
Freight to Michipicoten Hbr.-75¢ per ton.	1,125,000.00
Duty into States 1½ million tons, 15¢ per ton	225,000.00
This would give us 1,500,000 tons concentrates fob Michipicoten at cost of.	4,950,000.00
1½ million tons 45% concentrates at average market value at Michipi. 11¢ per point per ton, or $4.95 per ton	7,425,000.00
Thus showing, without deducting interest on investment, a profit of	2,475,000.00

So that the plant would have to have a capacity of between 600 and 700 tons daily output. The winter operations would consist of stripping, breaking and sorting ore. There is no doubt but what considerable tonnage could be picked up that would not have to pass through the concentrating plant. Where pyrites is not concentrated and there is no work done other than crushing, then there is no duty to be paid when shipping it into the United States. This class of material would be mined in the winter time and stored for early shipment.

This method would tend to make the operations uniform throughout the season, with the exception of the operation of the concentrating plant.

The total cost of the Coudrens property to date totals $38,609.20.

The operations in 190. and 190[illegible] represented an outlay of $ 8,741.21

Surveys and incidental expenses from June 30th 1906 to Sept.30th,1907, totalled $1,796.04. The assessment work done between October 1907 and July 1908 together with incidental expenses in June and September 1908, cost $8,722.19. In December 1908 there was a payment of 7[illegible].96 for surveys for patents and during January,February and March 1909, payments for patents and incidental expenses in connection therewith amounted to $2,[illegible]07.08. This made a total to March 31st,1909 of $22,[illegible]87.09. The expense since then in connection with drilling operations April 1st to Dec.31st,1909 - amounted to $15,972.12.

Details of costs:

April 1902 to July 1903 Trenching,test-pitting,drilling	$ 8,741.21
June 1906 to Dec.31st,1908 Survey & assessment work	11,308.19
Jan.1st to Mar.31st,1909 Patents & incidentals	2,587.08
March 31st to Dec.31st,1909 Diamond drilling	15,972.12
Total	$38,609.20

This property lies [illegible]unorganized territory, so the only tax to be paid on it is the acreage tax of two cents per acre due yearly without notice or demand on October 1st,

and payable to the Minister of Lands, Forests and Mines, Toronto, Ont.

Sault Ste Marie, Ont.,

Jan. 28th, 1910.

McPhail - pyrite deposit

Note: Report does not refer to a specific deposit making correlation difficult. Claim map would help.

ALGOMA PYRITES COMPANY LIMITED

POILLON & POIRIER'S REPORT

2-5

Claims. 102 - 94 (West of "H" orebody)

Algoma Pyrites

Ont. Pyrites

McPhail.

POILLON & POIRIER
Mining Engineers
63 Wall Street..... New York

Howard Poillon..... C.H.Poirier

R E S U M E
of Report on the Property of
ALGOMA PYRITES COMPANY
Goudreau, Ontario, Canada

NAME: Algoma Pyrites Company

AREA: 310 acres, more or less.

LOCATION: 2½ miles from Goudreau on Algoma & Hudson Bay Railway, 178 miles north from Sault Ste.Marie, and 18 miles from Franz

TITLES: Patents to be granted by Algoma Central & Hudson Bay Railway; now held by location.

ACCESSIBILTY: Spur from Goudreau to Nichols Chemical Company's mine-1 3/4 miles, and 3/4 mile over hilly wagon road. Two spur routes on 6000 feet and one on 9000 feet.

ECONOMIC CONDITIONS: Timber for domestic and some mining purposes. Ample water within one mile, raise 25 feet. Labor; common,average, supply fair; no miners in immediate district. Fuel; coal; chance of electricity being brought in. Supplies, normal. Winters,cold.

SHIPPING:	9000 foot spur to be constructed to main line, thence 38 miles over Algoma Central & Hudson Bay Ry. to Michipicoten Harbor. Eight months season. Tributary to all lake ports. Docks at Harbor but no bunkers. Railroad short of ore cars; mine should own a portion of its car requirements. Freight rates, $1.00 to harbor, and $1.00 to Lake ports; should not exceed $1.50 from mine to lake ports in normal times.
TOPOGRAPHY:	Series of east and west ridges, 100 to 200 feet above general. Intervening area covered with drift, swamps and lakes.
GEOLOGY :	Pre-Cambrian. Greenstones, limestones, and porphyry intrusions tilted 50o to 60°north; all cut by diabase dikes N 20 W.
ORE OCCURRENCE:	Iron pyrite, iron carbonate, pyrrhotite, and some zinc sulphide; iron pyrite and siderite with some quartz replaces limestone along margin at greenstone contact.
VALUES:	Silicious ore next to greenstone, 22% to 25% sulphur and 40% iron, underlain by ore 30% to 32% sulphur and 40% to 44% iron.
DEVELOPMENT:	Pits and open cuts. Outcrop exposed over 2200 feet on two claims. Indicated width of zone, 20 to 50 feet, probably average 30 feet or more. No reason why good depth should not be reached.
CINDER TESTS :	Heads: 30.9% sulphur, 44.3% iron, loss roasting 21.8%. Cinder: 55.7% iron, 2.97% sulphur, .008% phosphorus.
COSTS:	Normal times pre-war, $1.75 to $2.00, f.o.b. cars siding. No depreciation or depletion.
PLANT REQUIREMENTS:	$250,000 to produce 100,000 tons per year.
MARKETS:	All lower lake ports.
CONCLUSION	Low sulphur and iron cinder probably not economic today.

Recommend drilling property; 3000 to 4000 feet of holes cost $15,000 to $18,000.

If tonnage and 30% to 35% sulphur values exist, property can be idle at slight yearly costs until conditions make it economic, which conditions will exist in time, in my estimation.

"Howard Poil..on"

Dec.17,1919

In-House Property
Ontario Pyrites

POILLON & POIRIER
Mining Engineers
63 Wall Street, New York

Howard Poillon C.H.Poirier

REPORT
on property of Algoma Pyrites Company, Goudreau ,Ontario Canada.

NAME — Algoma Pyrites Company; owning the following claims; Darling 102, McGuire No.94, McPhail Nos.91,92,93, Teare Nos.86,87,88 and S.S.M.2113.

AREA — 310 acres, more or less.

LOCATION — The holdings of the company are located near Goudreau, a station on the Algoma Central & Hudson Bay railroad 178 miles north of Sault Ste.Marie, Ontario, and 18 miles south of Franz, the junction point of that railroad and the main line of the Canadian Pacific Railroad running to the west.

The property is more particularly described as lying in Township 27, Range 26.(See Dobie's map of claims attached hereto).

TITLES — The above described claims are being held by location. Sufficient work is reported as having been done to permit the issuance of patents, and the claims were surveyed so that these titles might be obtained.

The property is located on the ground granted by the Government to the Algoma Central & Hudson Bay Railroad, from whom title will be obtained, subject,however, to a royalty of $.10 per ton of pyrites shipped. A copy of these regulations issued by the Algoma Central & Hudson Bay Railroad Company regarding locating and operating mining properties on their lands is attached hereto.(Except ClaimS.S.M.2113).

ACCESSIBILITY — Goudreau may be reached either from Sault Ste.Marie or Franz by Algoma Central & Hudson Bay Railroad.

From Goudreau, a branch line, operated by the Nichols Chemical Company, runs for about a mile and three quarters to Nichols crushing plant at Goudreau Post Office.From this point, a wagon road has been constructed over the Nichols property to the Algoma Pyrites Company's holdings, entering the latter close to the north and south line between Claims No.102 and No.94.

This road is some three quarters of a mile in length and has some steep grades. After entering the property, it branches, one branch running to the outcrop on the west end of No.102 ,and the other to the camp buildings situated in the east central area of No.102.

There are two feasible routes for spurs from the present existing railroad lines; one from the spur from Goudreau to the Nichols mine, and the other from the main line of the Algoma Central & Hudson Bay Railroad at a point about midway between mileage 178 and 179.

The first route would involve the construction of a spur some 4500 feet in length from a point on the Goudreau-Nichols line, situated a short distance east of the present Nichols stock pile, over a country requiring little grading or rock work.

The second route involves the construction of some 9000 foot spur over what appeared to be, from a rough inspection, country lending itself readily to an inexpensive installation.

The comparative merits of these routes will be discussed later under the heading of Plant Requirements.

ECONOMIC
CONDITIONS

The western portion of the company's holdings has been burnt over and contains no timber of importance. Certain sections of the western holdings, however, will probably contain sufficient wood for domestic fuel for some years and round mine timbers for the first two or three years' operations.

Sufficient water probably exists in the lakes and ponds on the property for present purposes, and an ample and permanent supply of good water for camp and boiler use can be obtained from Spring Creek, the outlet of Spring Lake, which passes within less than a mile of the present camp site, and at approximately twenty-five foot lower elevation, thereby necessitating a pumping plant.

Labor;- In the past, the wages paid in this section have benn lower than in the mining camps in either the west or east of Canada, and the supply has been normal. Up to the present time the Nichols Company have used but few miners, as their operations have been on the surface. They are now contemplating underground operations and it will, therefore, be necessary to employ more miners. It is highly probable that this will necessitate increasing the price paid their common labor over what they would have paid, were they to continue to only employ common laborers. It is impossible to indicate, with any assurance of correctness, what the different classes of labor will demand during and after the transition period, but I feel, from what has gone before, that the labor in this section will be considered comparatively cheap.

For operations of any magnitude, coal will have to be used to generate the necessary power.

The willingness of the owners of a small power plant on the Michipicoten River to bring power into Goudreau has been signified several times, if there existed an ample market for it. This still remains a possibility but cannot be regarded as more, with safety, at the present time.

Ordinary foodstuff and mining supplies are normal.

SHIPPING

The present and only economic route for the low-grade ores of this area is to Michipicoten Harbor and via the Lakes to lake ports.

The distance from Goudreau to Michipicoten is 38 miles, with practically all grades favoring the loaded haul.

The equipment at the harbor consists of ore docks, but no bunkers, the steamers being loaded directly from the cars.

Over these docks at present, there are handled the iron ores from the Algoma Steel Company's Magpie- Helen Mines and the iron pyrite ores from the Nichols Chemical Company's Mine. With another property shipping, there would probably be a shortage of cars, as, while neither the Algoma Steel Company nor Nichols Chemical Company is supposed to use cars as storage, it is probable that at times both resort to this practice, as neither has, to my knowledge, any considerable bin storage. The Nichols Chemical Company have some 35 cars of their own, and it would be necessary for any other company entering the field, to either have an equal number or bin storage equal to that now existing on the Nichols property, in order to stand on equal basis with them as far as shipping is concerned.

The present freight rate, I believe, is $1.00 per ton from the mine, delivered on board the steamer at Michipicoten and $1.00 from there to lower Lake ports. This is considerably in excess to normal rates and the business should be handled from the mine to lower Lake ports for a maximum of $1.50 per gross ton.

TOPOGRAPHY

The general area in which the company's property is located is composed of a series of more or less isolated ridges striking in a general east and west direction. The maximum elevation attained by these ridges is about 150 feet above the general plain level, and the surface of the country between the ridges is occupied by swamps or lakes. The ridges are either covered with shallow soil or expose the bare rock, while the plain areas, where not covered by water, are occupied by muskeg or glacial drift.

The immediate area occupied by the company's claims, and along the line of outcrop from west to east, is, briefly, as follows;- From the west line of No.102 for about 300 to 400 feet, the country is generally level and lies above the swamp level 20 or more feet. At 400 feet, the area to the north is occupied by a small lake and swampy ground; and that to the south, by rising ground, formed by the toe of a ridge rising farther to the south. This condition continues for about 500 feet, where the low lake country to the north cuts across the claim almost to the south boundary, forming a swamp for about 150 feet in width. From this point, the swamp bears to the north and the country rises to the east boundary of No.102 north from the point of intersection of the east boundary of No.102 and the vein, the country rises slightly for 200 feet and then falls at an angle of 69 To the south along this line, the country is generally level.

Along the line of the outcrop across Claim No.94, the rise is gradual, the country to the south falling gently, while that to the north, for 200 feet, is occupied by swampy ground and a small pond. Beyond this point north, the country rises rapidly to the crest of the main ridge, which reaches a maximum elevation of some 100 feet above the line of the outcrop.

At about 850 feet east from the east and west boundaries of No.102 and No.94, the swamp on the north of the line of outcrop is terminated by a low, broad hogback extending to the south from the main ridge, and the country slopes gently to the south. The hogback runs to the east for a distance of about 220 feet and divides the drainage of the area north of the outcrop to the east and west. At its eastern limit, the ground north of the outcrop is again occupied by a swamp draining east and continuing to the east limit of No.94. The area south of the outcrop is also occupied by a swamp which heads in the rising ground on the east limit of No.94, south of outcrop, and drains to the west.

To the east of the west limit of Claim No.94, the country falls gently on Nichols Claim No.16 for some 200 feet. At this point it falls rapidly in the form of a series of small cliffs and steep slopes for 100 feet in elevation to a small pond, beyond which lies the Nichols A deposit, and the country is generally swampy.

Claims Nos.86,87,89,91,92 and 93 and 2113 lying to the north and running farther to the east, are located along the strike of a low ridge exhibiting no marked topographic al features, and in no place, probably, will show a difference in elevation to exceed 50 feet. They are for the most part covered with bush making an inspection extremely difficult.

OLOGY

The principal series of rocks underlying the area in which the company's property is located belong to that age of the Pre-Cambrian era, known in Canada as the Keewatin. This series has been folded, and in places schisted, and strikes generally east and west, dipping 45o to 60o to the north. Subsequent to the folding, this formation wascut by a series of vertical diabase dikes that strike in a general N 30oW direction. These intrusions were proceeded or accompanied by faults of various magnitudes causing displacements in the vein along lines parallel with the dikes.

From conditions that presented themselves to me at the time of my inspection, I am inclined to the belief that the faulting action took place before the instrusion of the dikes, and that the dikes found channels along the fault planes.

There are three distinct rock systems of the Keewatin age exposed on the surface of Claims No.102 and No.94. In their order of occurrence, from north to south, first, an ellipsoidal green stone varying from massive to schistose in structure. This overlies, and forms the hanging wall of the pyrite system composed of bands of silicious pyrite and siderite, pyrite and siderite with less silica, limestone with small percentages of pyrite, pure limestone, and limestone and siderite. This in turn overlies a massive gray porphyry locally called hornblende porphyry.

Claims Nos. 93,92,91,88,87 and 86 and 2113 principally disclose greenstones and a minor amount of porphyry on the eastern limit. The pyrite formation does not appear in any extent on the surface, although it outcrops to the south on the Nichols and Morrisonlots, and probably underlies theseclaims at depths varying from 600 to 1000 feet.

ORE OCCURRENCES

The economic mineralization consists of iron pyrite and siderite; this is accompanied by some pyrrhotite and minor amounts of zinc sulphide. It occurs in the upper portion of the pyrite series, against, or in close proximity with the greenstone which forms the hanging wall of the ore body. From surface indications, the mineralization immediately adjoining the greenstone will carry a high percentage of silica, so high, probably, as to make this upper section of the areatoo low in sulphur and iron to permit its being worked at a profit. The thickness of this silicious rib will probably average from 3 to 8 feet. Immediately underlying this rib occurs the principal area of mineralization. Just what the thickness of this is, cannot be more than estimated from the present development on the property. However, from the exposures opened up in conjunction with other surface indications, it is entirely reasonable to expect the existence of an ore body, varying from 10 to 50 feet in thickness, over a distance of 2200 feet on Claims Nos.102 and 94.

Underlying the iron pyrite zone lies a zone of crystalline limestone containing more or less siderite, but nowhere of sufficient iron content to be of economic importance, to my knowledge, This limestone-pyrite series varies in thickness from 150 to 200 feet, except on the west end of No.102 east of the dike. Here the pyrite apparently lies on the porphyry, there being no limestone visible along the vein outcrop, west of the swamp. (See map).

The disturbances in the vein are limited to the dike areas. On Claim No.102, near its west limit, a diabase dike 100 feet in width cuts the ore body, and the accompanying fault has so displaced the westward continuation of the vein that it could not be located by me. From this point east, the vein runs along its true course until some point on Claim No.94 between points of Samples No.12 and No.11, where a dike has again probably cut the vein, slightly faulting it. From this point eastward, the vein again runs on its true course until a short distance west of Sample No.8, where the vein is again slightly faulted by a diabase dike. East of this dike the vein takes a course slightly south of east and so continues over the Nichols J.L.No.16 adjoining, where it is intersected by another dike and again faulted. From this point, on the edge of the cliff, it is lost until it crops to the east at the Nichols A deposit on Claim J.L. No.21.

DESCRIPTION OF OUTCROP AND DEVELOPMENT

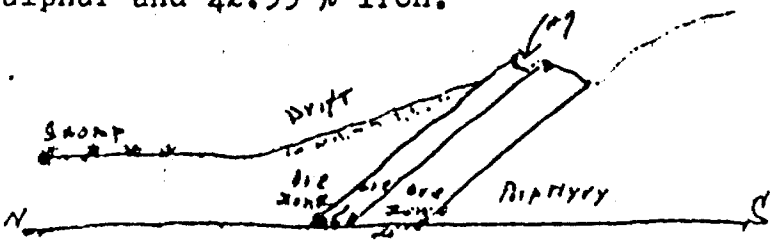
From the west limit of Claim No.102 eastward, no marked outcrop or indications of the vein can be noticed. The S.W. corner stake is set in a small marsh draining the lakes to the east, and the country rises to both north and south, exposing alternating bands of greenstone and porphyry.

Westward, along the projected line of the outcrop this condition continues until at about 500 feet a diabase dike is encountered. This dike is from 80 to 150 feet in width, strikes N 30W and terminates the pyrite zone on its east boundary. From general appearances of the area west of the dike, there has been a considerable displacement parallel with the strike of the dike and the total throw, while not determined, will be over several hundred feet, laterly in extent.

The dike is plainly traceable over the high ground to the northeast and southwest, but has been eroded at its intersection with the dike resulting in a gap forming outlet through which the hightaters of the lake and swamp areas to the north-east pass. The actual contact of the dike and the pyrite zone, therefore, lies buried under the muck and drift. Along the strike of the pyrite zone from its assumed intersection with the dike, the country slowly rises and a trough can be noticed to the south, marking the contact between the pyrite zone and the porphyry.

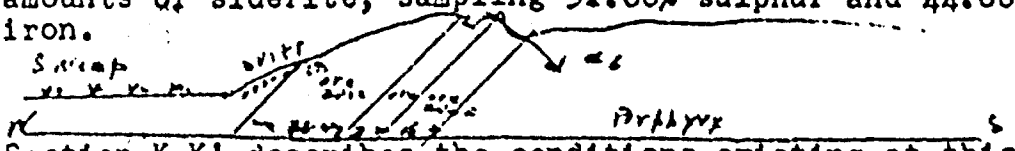
At 94 feet easterly from the pyrite zone's assumed contact

with the east limit of the dike, Section M-M' shows approximately the conditions existing. From this point to a point 66 feet easterly, the trough indicates the existence of the zone, and at the easterly point, the first gossan is encountered. There are, from this point easterly for 66 feet, increasing widths of gossan occupying the crest and portions of the north slope of the hill north of the trough, dividing the pyrite zone from the porphyry, and at the 66 foot point, a trench was shot in the outcrop and Sample No.7 was taken. This trench was 4 feet in depth, 6 feet in length and 4 feet in width, exposing a body of pyrite of fairly even grade, accompanied by intermixed silica and siderite, sampling 30,50% sulphur and 42.55 % iron.



Section L-L' describes the conditions existing at about this point.

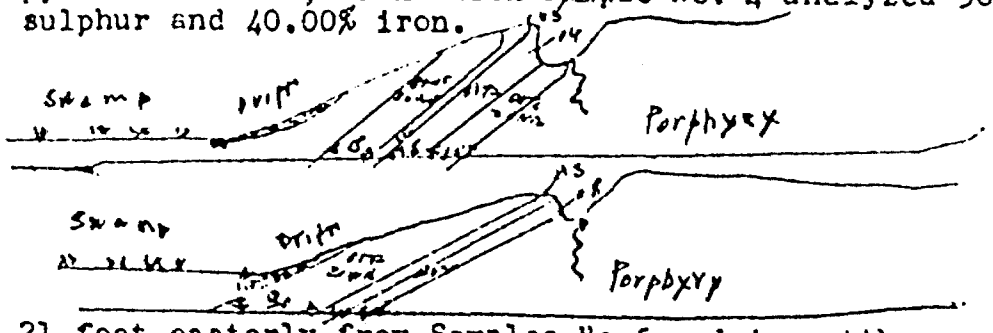
45 feet easterly over rising country, exposing a greater width of gossan, with the power portion of the slope covered with soil and drift to the swamp and lake to the north, and the trough marking the contact between the pyrite area and the porphyry to the south, another trench was cut and Sample No. 6 was taken. This trench was 4 feet in depth, 7 feet in length and 4 feet in width, exposing a body of pyrite of even grade, accompanied by silica and considerable amounts of siderite, sampling 31.66% sulphur and 44.00 % iron.



Section K-K' describes the conditions existing at this point.

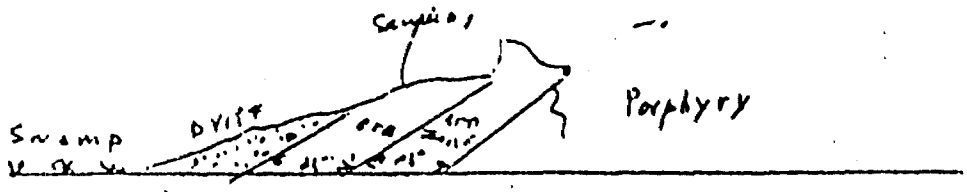
20 feet easterly and 10 feet southerly across the southern edge of the inclined pyrite zone, a cut was shot vertically across the exposure in the trough in order to cross-section the various layers of material in the pyrite zone. This cut reached a depth of about 12 feet, was 5 feet in length and 4 feet in width. The material thus exposed was divided into two classes; the top 4 feet and the lower 8 feet. The top 4 feet showed the existence of a banded structure of alternating layers of silica and siderite and pyrite and siderite so intermixed as to prevent sorting, but quite distinguishable from the underlying material. Sample No.5 of the upper material analyzed 25.00% sulphur and 39.90% iron. The

underlying 8 feet exposed a moreeven and better grade pyrite material, from which Sample No. 4 analyzed 30,35% sulphur and 40.00% iron.



21 feet easterly from Samples No.5 and 4, another cut was shot vertically across the southerly edge of the pyrite exposure, and samples No.3 and 2 were taken. This cut reached a depth of about 3 feet and exposed the same iron-silica and low-sulphur band, 4 feet in thickness, overlying the ore containing higher-sulphur content. From the upper zone, Sample No.3 was taken, analyzing 22.75% sulphur and 20.70% iron. From the lower zone, Sample No.2 was taken, analyzing 30.85% sulphur and 42.50% iron.

22 feet easterly from Samples No.3 and No.2, a cut 15 feet wide, 8 feet deep and 20 feet long, had been excavated. This cut was driven from the northern slope of the gossan outcrop southerly and cut the bands in the formation in such a manner that slight actual depth was gained, considering the flat dip of formation. This resulted in a larger proportion of the lower-grade cap being exposed and less of the better grade zone underlying it. Sample No. 1 taken from this cut, including some of the cap, analyzed 27.94% sulphur and 42.10% iron.



Section J-J' describes the conditions existing at this point.

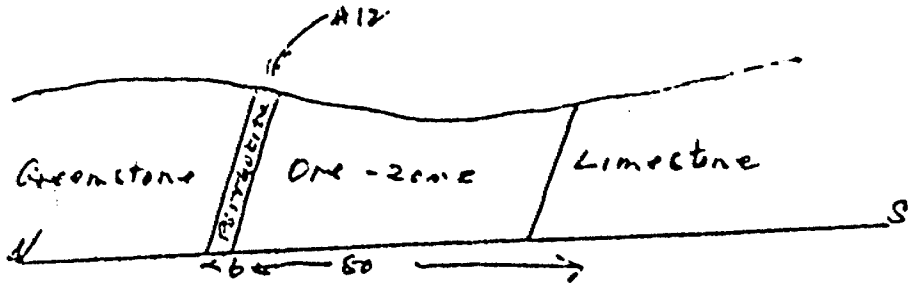
From Sample Cut No.1, the hill slopes to the east and the gossan exposure occupies a low ridge bounded on the north by a trough in the drift, and on the south by a trough marking its contact with theporphyry. This condition exists for some 93 feet, where the gossan disappears and the slope is covered by drift and soil.

Section 1-1' describes the conditions existing at this point.

From the last gossan exposure, the hill slopes gently to the east, and at about 100 feet, terminates in the swamp. From the

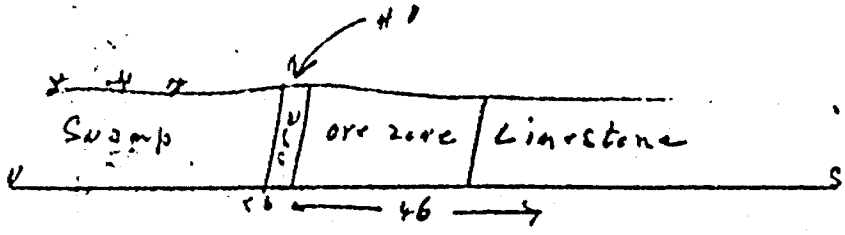
west limit of the swamp, some 200 feet easterly, rising ground is again encountered, and the presence of the zone is indicated by a broad trough, some 90 feet wide, running easterly up the hill. This trough, however, has for its south boundary limestone, the porphyry lying some 200 feet to the south. Its north boundary is greenstone. No pyrite gossans can be noticed in place, and Sections H-H' and G-G' describe the conditions existing at these points.

At Section G-G, the boundary between Claims No.102 and No.94, on the north limit of the trough, a gossan condition was noticed and, on being opened up, disclosed an area containing practically no pyrite, but a considerable amount of pyrrhotite. The material accompanying the pyrrhotite was of igneous origin, and the occurrence has probably no connection with the ore body under consideration, and, further, is of no economic importance. Sample No.12, taken from this exposure, analyzed 20.92% sulphur.



From Section G-G' some 350 feet easterly, the trough marks the course of the pyrite zone. The country rises gently and the north limit exposes greenstone, while the limestones occur to the south, containing some scattered bands of siderite.

At 350 feet, an outcrop of the zone is again encountered in the form of a low lenticular knoll, some 6 feet in width and 17 feet in length. To the east occurs a swamp and small pond, while the limestones run generally level to the south. Sample No.11 was taken from a cut made in this exposure and analyzed 31.93 % sulphur and 51.45 % iron. The material composing the outcrop appeared, to the eye, to contain less silica and a higher iron and sulphur content than any other material opened up on the property.

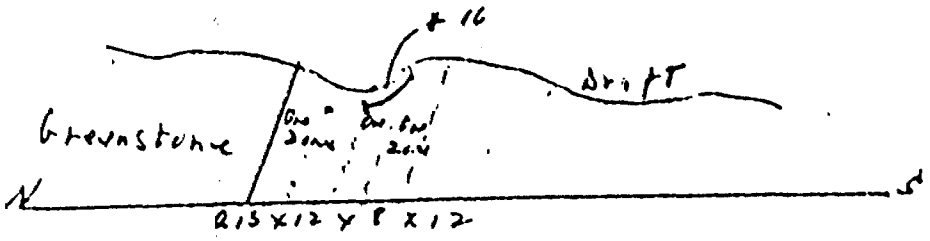


Section F-F' describes the conditions existing a short distance west of this point.

Between the point of outcrop and the next exposure eastward some 110 feet, some disturbance has thrown the outcrop in a southerly direction, and,possibly, the area has been cut by a dike. At this point a trench has been dug showing greenstone for 37 feet, then decomposed greenstone and quartz, apparently the hanging wall for seven feet. At this point a low area was encountered for 52 feet and the trench was filled with water. The material piled on the sides was soft gossan and bog iron, indicating the expentation of encountering the main pyrite area beneath it in depth. To the south of the low area, the trench cut iron-stained limestone and passed to pure limestone at its southern extremity.There being no solid exposures, no samples were taken.

Section E-E' described the conditions existing at this point.

Some 130 feet to the east, over low ground, on the west limit of a small knoll, the solid gossan is again encountered to the north of which lies a trough. A cut in this outcrop to a depth of 4 1-2 feet exposed material containing sulphur, silica and a lower percentage of siderite. Sample No.10 anlyzed 31.62 sulphur and 43.00% iron.



Section D-D' describes conditions existing at this point.

This outcrop can be followed to the east across the knoll and again is exposed at a point 50 feet eastward, and from there 75 feet farther east.

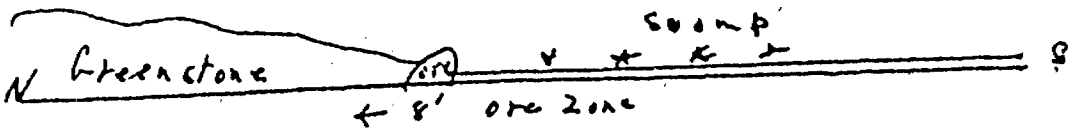
At this point a trench has been cut, exposing at its northern limit 6 feet of greenstone; then 13 feet of decomposed hanging wall; then 12 feet of hard gossan; then passing through a low area for 30 feet, exposing soft gossan and bog iron; then 15 feet of red, fairly hard gossan, the probable continuation of the two outcrops above noted; then 51 feet in iron-stained to pure limestone. Owing to the lack of any other than surface work done, no samples were taken at this point.

Section C/C describes conditions existing at this point.

From this point east, the surface of the pyrite zone is

covered by ground for some 200 feet, where an outcrop is again encountered. The zone here outcrops in the form of lenticular knoll, some 33 feet in length and 6 feet in height, above the swamp. It is bounded on the north with the silicious hanging wall, and is covered on the south by the swamp, exposing some 6 feet of gossan.

Sample No.9 taken from a cut made in this outcrop analyzed 31.09% sulphur and 43.20% iron.



No other outcrop is encountered until at a point 160 feet to the east, where a low, lenticular knoll rises out of the low ground and the zone outcrops on its south slope for a width of some 4 feet.

To the south lies a trough that probably contains the zone proper, and no material was available at this point for samples.

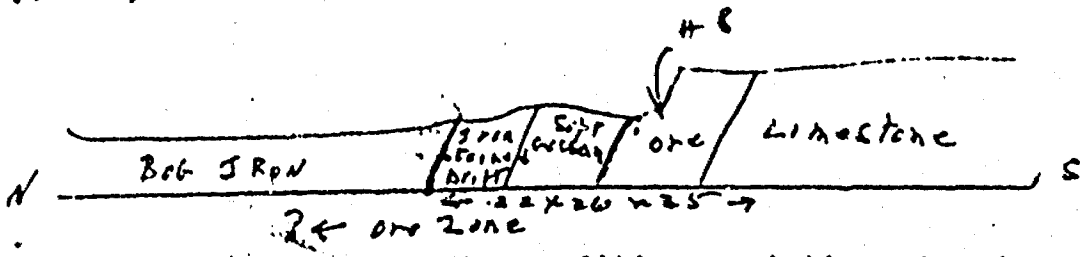
Section B-B' describes the conditions existing at this point.

The zone crops indistinctly for a distance of 33 feet along the knoll, at which point it is cut by a diabase dike which displaces its eastern continuation, probably throwing it in the swamp covered area to the north.

At 66 feet east, the outcrop, striking N.W. and S.E., is again encountered, and a trench dug exposes the following conditions from south to north; limestone, 69 feet; hard gossan, 25 feet; soft-gossany material, 26 feet; iron-stained drift, 22 feet; muck and bog iron, 72 feet; to greenstone rising out of swamp.

Sample No.8, taken from the contact of the hard gossan with the soft-gossany material, analyzed 22.59% sulphur and 40.90% iron.

The material exposed in this pit was an intimate mixture of pyrite, siderite and silica.



Section A-A' describes the conditions existing at this point.

39 feet east, the gossan outcrop crosses the north and south limit of Claim No.94 and passes in the Nichols Chemical Company's Claim No.16. It is exposed in a pit on this claim 182 feet eastward, 20 feet in width, and 70 feet beyond is cut by a diabase dike, reappearing on their Claim No.21, locally known as the A Deposit. It again sinks in the swamp east of the A deposit and reappears on Claim No.38, continuing over Nos.39, 40 and 41, now under option to the Nichols Chemical Company, and on which, I am informed, two shafts are about to be sunk.

Claims Nos.93,92,91,88,87 and 86 lie to the north and east of those just described, and no work had been done to expose any outcrops of importance. In my estimation, their chief value exists in the possibility of their being underlain by the pyrite zone cropping on the claims south and dipping north.

The Nichols Chemical Company have optioned, drilled and are about to sink two shafts on the area covered by Claims A.C.38, 39,40,41,42 and 43.

The zone cropping on your Claims No.102 and No.94 after appearing on Nichols J.L.No.21, reappears at about the center of Claim 38 and crops continuously on Claims 39,40 and half of 41, at which point it sinks into the swamp to the west. See Map No.2, title,Algoma Central and Hudson Bay Railway Company's Mining Claims at Goudreau.

The drilling done by the Nichols Chemical Company on these properties is confined to Claims 40 and 41,with satisfactory results that are now to be further checked by sinking two shafts.

The location of the outcrop and holes drilled are shown on the above maps. While the exact dip of the vein and the results of the drilling could not be found out, on the assumption that the dip is from 45° to 60°,this vein would underlie the Teare No.86 Claim at the most easterly limit of its southern boundary, at from 600 to 1000 feet in depth. The dip and width of this vein, now being prospected by the Nichols Company, can be determined after the shafts now contemplated have been sunk, when this information will be common property and, therefore, available.

ANALYSES OF RESULTS OF SAMPLING IN RELATION TO ORE BODIES

The results of the various samples, in conjunction with the inspection of the ore exposures, leads to the expectation of the existence of two grades of material in the zone of pyrite enrichment. The first,lying directly under the greenstone and represented by Samples No.8,5 and 3. These all run comparatively low in sulphur and iron,due to their admixture with a visibly larger percentage of silica. This zone will probably extend continuously along the strike of the vein and run from 3 to 8feet in thickness.

Directly underlying this leaner band or rib will be found the material higher in both iron and sulphur, as is evidenced by Samples Nos.2,4,6,7,9 and 10. The thickness of the formation carrying these or similar values cannot be definitely stated from the present exposures or the development work thus far done, but from surface indications, might reasonably be expected to vary between 20 and 50 feet, with a general average of not less than 30 feet in width.

Considering the fact that we have only been able to sample the ore under the surface exposures-- and these have in no place been penetrated to the underlying material-- and realizing that the present exposures have probably resisted erosion on account of the relative hardness, which is due to excess silica, we would naturally look for higher grade sulphur bodies under such swamps, as may intersect the line of the outcrop and lie to the north and in the troughs mentioned as occurring along the zone.

While we have no concrete justification for the belief, it is wholly reasonable to anticipate the occurrence of 33% to 35% sulphur ore at points along the strike of the vein where these depressions indicate favorable conditions.

TESTS

In order to determine what results might be reasonable expected from burning the ore, both in regards the available sulphur and composition of the resulting iron cinder, two composito samples were made up and the following results were obtained by Ledoux & Company:

	Composite of Nos.1,2,4,6,and 11	Composite of Nos.7,9 and 10
Sulphur.....	30.62%	31.18%
Iron.....	44.50%	44.05%
Loss on roasting.....	20.44%	23.19%
In the dry cinders:		
Insoluble Matter.....	4.07%	4.09%
Iron.....	55.05%	56.00%
Lime.....	4.77%	3.96%
Sulphur.....	3.11%	2.83%
Phosphorus.....	0.007%	0.009%

COSTS

Considering the period we are now passing through, any figures given would be almost subject to daily change, I will state that the ore body, if living up to the present indications, is one that lends itself to cheap mining; and that in ordinary times the ore could be put on board the cars at from $1.75 to $2.00 per ton, plus depreciation and depletion. Further, that should occasion arise, we will hold ourselves in readiness to furnish detailed costs as and when desired.

PLANT REQUIREMENTS

For the efficient operation of the property, it would be necessary to provide rail connection. Two routes were mentioned under the head of "Economic Conditions". The Goudreau mine route has the disadvantage of, first, operating over the Nichols Chemical Company's line a portion of the way, and, second, lack of side tracks at Goudreau, which, due to the topography of the country there would be expensive to construct.

The spur from Mile 178½ has the disadvantage of being longer, and the feasibility of the route must be determined by survey. There is ample room at Mile 178½ for all the necessary side tracks and switches, and I should be inclined to favor the latter route, unless too costly to construct.

Owing to the proximity of the property to the Nichols Chemical Company's plant, it would be necessary to offer housing and boarding facilities equal ~~to~~ at least to theirs, which are excellent.

Power would have to be generated from coal, and a crusher erected.

The costs of constructionand equipment at the present time are of such a nature that no figures can be compiled that would be of but immediate value. I should estimate that, in normal times in order to equip the property to produce 100,000 tons of ore per annum, it would require an expenditure of $250,000. We also hold ourselves in readiness to furnish you with estimates of costs of this work when and as needed.

MARKETS

The proximity of your property to the Great Lakes puts it in an excellent economic condition, as water deliveries can be made to all lake ports.

There also exists the possibility of delivering your ores via the Erie Canal to new York points, which adds greatly to its attractiveness.

CONCLUSION

It is my opinion that your property contains a large deposit of 30% to possibly 35% sulphur ore, running from 40% to 46% iron, the burnt cinder from which will average 78% of the weight of the original ore, and contain an average of 55% iron per ton.

The cinder in the accompanying tests shows a lime content of 4.77% to 3.96%, which, due to its action in the furnace, probably accounts for their sulphur content of from 3.11% to 2.83%.

The sulphur in the cinder, resolved back in terms of original ore, represents 2.4% unavailable for acid, and reduces your available sulphur on an average of, say, 2.2%

so an ore running 30% sulphur would have only 27.8% available for acid, and an ore running 35% would have only 32.8% available. This loss, in as low a grade of ore as we are treating with, is not inconsequential, and you must enter the market with a low-grade sulphur ore.

The composition of the cinder, as far as it affects its desirability for nodulizing and sale to iron furnaces, has the advantage of an extremely low phosphorus content and the disadvantage of a relatively low iron content that cannot be raised to over 60% iron in a nodulizing kiln.

During the period just past, the low phosphorus ores were in such demand that $.18 and $.20 per unit of iron was freely offered for nodulized ores. Now that the extraordinary demand has ceased, the market is in an unsettled condition and no one can predict with anyassurance of correctness what the demand or price will be. Under prewar conditions, the acid plants, operating in the territory that your property would serve, built up large dumps of iron cinder running low in phosphorus and 62% and over in iron, with only occasional sales made at from $.50 to $1.00 per ton of cinder.

One reason for the lack of market is due to the absence of nodulizing plants, as this cinder must be put in compact form before it is saleable to the various iron furnaces.

It would therefore appear that the ores so far indicated to exist on your property have two prime disadvantages, low sulphur and low iron content in the cinder. To approach a present-day manufacturer of acid with an ore of this nature, unless a considerable reduction in price per unit of sulphur were offered, would be of no avail, and it is highly probable that under the economic conditions that will exist for some time to come, no reduction in price that you could afford to make would induce him to substitute these ores, as their use would result in a considerable reduction in the output of his plant. There is, furthermore, no, way, to my knowledge, of economically concentrating these ores and turning out high-grade sulphur.

I am, however, a firm believer that at dome time in the future, this deposit will prove of economic value, even thought the ores have apparently no market at the present time. I understand that this property can be held indefinitely at a small yearlycost, and, if I am correctly advised in this, I would recommend as follows:

That the property be further prospected by diamond drilling to a sufficient extent to determine what average grade of ore may be reasonably expected to exist and in about what

quantitites above, say, the 300 foot level on Claims 94 and 102. It would probably be necessary to do about 3000 to 4000 feet of drilling to get the information necessary, and probably cost from $15,000 to $18,000. With satisfactory information in hand, if, when the markets settle, the grade of ore proves uneconomic, allow the property to lie idle until such time as the exhaustion of the higher-grade deposits of pyrite tributary to your market, or other economical conditions, make the price and demand such that you can operate on a sufficient scale to afford a commendurate profit.

Respectfully submitted,

"Howard Poillon"

Poillon & Poirier
New York City
December 16,1918.

REPORT ON

MacALPINE PYRITE DEPOSITS

GOUDREAU

1. GENERAL REPORT
2. MORRISON NO. 3 PROPERTY
3. RAND NO. 1 PROPERTY (Also Rand No. 4)
4. RAND NO. 2 PROPERTY
5. ANJIGAMI PROPERTY
6. ALDEN PROPERTY

MAPS

NO.1. KEY MAP OF AREA

NO.2. CLAIM MAP (MORRISON NO.3
(RAND NO.1
(RAND NO.2

No.2A Plan and Section of Diamond Drilling Rand No.2.

NO.3. TONNAGE PLAN MORRISON NO.3

NO.4. CLAIM MAP ANJIGAMI PROPERTY

NO.5. PLAN ANJIGAMI PROPERTY SHOWING TRENCHES

Original Rewritten

Dated 1938

GOUDREAU PYRITE

HISTORY

Pyrite was first discovered in Goudreau in 1907, but no active work was carried on until the last war broke out. ~~when~~ the Continent was scoured by the large American chemical companies for a source of supply of this mineral, due to the fact that their foreign sources were cut off.

One of the largest ~~companies at that time~~ users, the Nichols Chemical Company, after reviewing the whole field, decided that the best place to establish a pyrite industry was at Goudreau, due to the amount of pyrite that appeared to be available, and the geographical situation of the deposit to a harbour on the Great Lakes. They commenced operations in 1914 and spent in the vicinity of two million dollars in opening up various deposits. They did not get into full production until the close of the war when the demand for pyrite dropped appreciably, partially due to the demand for war materials falling off and, partially due to the fact that sulphur from the Gulf States was starting to come on the market. They suspended all operations in 1919 after shipping between three and four hundred thousand tons of pyrite, largely from one deposit. They had also prepared other deposits for mining, but ~~had not got into~~ actual production on ~~these~~ had not

Practically all of the production came from an open pit operation, on what is known as the "O" deposit. This deposit was relatively lowgrade averaging less than 30% sulphur.

In view of this lowgrade operation they optioned the Morrison No.3 deposit, which ~~they~~ was thoroughly diamond drilled and found to average in the vicinity of 33% sulphur. They then prepared to open up this deposit and spent about one hundred and fifty thousand dollars on shaft and under-ground work. This property was practically ready to mine when all operations were suspended in 1919.

A considerable amount of exploration work was done on other deposits notably the Rand No.1 and No.2 properties, but work was also suspended on these when the urgency for war supplies ceased.

These properties are individually described later in this report.

GEOLOGY

The pyrite deposits all occur as a member of Iron Formation. In the Goudreau area the Iron Formation consists of

three members - Silica, Pyrite and Siderite. These members originally were deposited while the formation lay flat. The Siderite being the lowest member, Pyrite in the middle, and Silica on top. The formation is now tilted at all angles from almost horizontal to practically vertical, but the same sequence holds throughout the area.

A knowledge of this sequence is very essential in carrying out exploration work. It is always easy to tell the top of the formations by observing where the Silica member lies, and if in diamond drilling or trenching, after going through the Silica, Siderite is encountered, it can be established with a fairly definite degree of accuracy that no Pyrite exists at that given point.

It has been found by experience that if it is at all possible drilling should be done from the Siderite side of the deposit. The Siderite being easy to drill whereas the banded Silica on the top side is very difficult and sometimes almost impossible to drill. If the formation lies fairly flat this system of drilling, of course, would be out of the question, but if the ore body is anywhere near vertical this information should be kept in mind.

While the Iron Formation usually consists of the three members mentioned above, one and sometimes two of the members may be missing entirely.

There are two classes of Pyrite, one known as Range Pyrite in which the Pyrite bodies are primary and have not been subjected to subsequent enrichment. The other, where the Pyrite has been dissolved from the original body and redeposited as a highgrade almost pure Pyrite. The latter deposits are rare and usually not very extensive. A small deposit of this type was found on the Rand No.1 in the form of a Pyrite sand which averaged 45% sulphur, whereas the main part of the deposit on this same property averages 38% sulphur.

The Gangue in the Pyrite deposits is largely Siderite, but tests on concentration have shown that practically all the Gangue material can be eliminated by simple flotation without extremely fine grinding. The grinding itself is not difficult as the ores are relatively soft.

In prospecting the ranges where they are covered with overburden, a dip needle can be used to advantage, the Iron Formations giving from five degrees to sixty degrees more inclination than the enclosing Keewatin schists. It should be noted, however, that this system of prospecting simply locates Iron Formation and not a Pyrite deposit itself. The Silica member generally will give the greatest reading due to the fact that some

Magnetite is present. Pyrite will also give a reading, but weaker than the Silica, due to a little Pyrrhotite being present.

When Iron Formation is located, exploration for Pyrite need not be a haphazard affair, due to the sequence of the various members which has already been described.

Another feature which simplifies prospecting to a certain extent when faults are encountered, is the fact that the general rule of faulting in this area is in one main direction, that is, in travelling an ore zone and coming to a fault, the faulted extension will usually be found to the left.

Another feature which has been worked out in connection with Pyrite deposits is the fact that the highest grade Pyrite is nearly always found immediately under the Silica member, which would be valuable information in event of having to resort to selective mining.

Secondary or enriched Pyrite gives no informative reaction to a dip needle due to the fact that Magnetite and Pyrrhotite are absent.

MUCALPINE DEPOSITS

There are five deposits in this group, known as the Morrison No.3, Rand Nos. 1 and 2, Anjigami Property and the Alden Property. These deposits are all described in detail later in this report.

The map which accompanies this report shows the relation of these various deposits to one another as well as their situation with regard to transportation and Michipicoten Harbour. It will also be noted that they are advantageously situated with regard to electric power.

TONNAGE

In relation to tonnage, the main ~~question~~ has been to concentrate in an area where a possibility exists of sufficient tonnage to maintain a large scale operation for a considerable number of years. It is, therefore, obvious from the description of the various properties that a large amount of exploration work will have to be carried on in order to prove that sufficient tonnage is available. It must be recognised, however, from the description of these properties, that the possibility of large tonnage does exist.

In the case of the No.2 Rand I have outlined in the report my reasons for believing a large tonnage might be made available. This also applies to the Morrison No.3 Property.

In the case of the Rand No.1 there is not sufficient information available to give any definite figures, but there certainly seems to be reasonable chance of a considerable tonnage being put in sight by exploration work.

The Anjigami Property is a newly discovered prospect, and surface indications from the small amount of trenching done show that there is a possibility of an ore body of considerable size.

The Alden Property is purely a prospect which has considerable promise.

Taking ~~all~~ the properties as a whole I believe there is a possibility of being able to place in sight from twenty-five to thirty million tons of Pyrite.

The ranges are quite extensive, and it has been found, by diamond drilling neighbouring ranges such as the Helen, that ore deposits extend to depths somewhat commensurate with their lengths. No deep drilling has been done on any Pyrite deposit, but the deepest hole put down shows the ore body continuing as strong, or if anything, stronger than on surface.

SOURCES OF INFORMATION

The writer was only present while part of the Pyrite operations were being carried on in the Goudreau area. I did, however, have the opportunity to be with the late Dr. W. H. Collins, Director of the Geological Survey of Canada, while he spent three years in making an exhaustive study of these iron ranges. He had the opportunity to examine all the work done as well as all diamond drilling records and surface work. He also had access to the reports of the various operating companies. Most of these records are not now available, but Dr. Collins' report gives much of the essential information which he acquired at that time. This is particularly true of the Rand No.1 and No.2 deposits and the Morrison No.3.

In the case of the Morrison No.3 I visited the property several times while it was being operated, and had a chance to talk with the various engineers in charge of this work for the Nichols Chemical Company. They were quite enthusiastic about their results, and were opening up this property in order to raise the grade of their operations on other deposits. They made substantial payments on this property after complete information was available from twenty-two diamond drill holes and a considerable amount of underground work, and only dropped their options when they decided, at the close of the war, to abandon their Pyrite operations altogether, not only at this point but in other parts of the Continent where they were also working. I did obtain from one of the Nichols' engineers

the latest copy of their tonnage estimate on the Morrison No.3, which was made for their own use and I believe to be accurate. A copy of this plan is attached to this report. Therefore, while I have not been able to personally check all the information given in this report, I have used only sources which I believe to be both unbiased and reliable.

Sault Ste. Marie, Ontario,
December 9th, 1938.

GOUDREAU PYRITE PROPERTY

The Goudreau Pyrite Property consists of a group of twenty-eight patented mining claims numbers J.L. 1 to J.L. 28, registered as Parcel 412 Algoma West Section. Mining Claims J.L. 3 and 16 are registered as Parcel No. 911. The total acreage is 1032.19 acres.

This property is located in the northwesterly part of Township 27, Range 26, and lies immediately east of the main line of the Algoma Central Railway at Goudreau, 178 miles north of Sault Ste. Marie. A standard gauge railway spur was constructed from Goudreau across the westerly half of the property, and a series of narrow gauge railway lines connected this spur with more remote parts of the property. The rails on these lines have now been taken up, but the right-of-way remains, and these lines could quickly be put back into service again. The distance from the property to Michipicoten Harbour, by rail, is 40 miles.

A highway built by the Provincial Government extends from Goudreau throughout the whole length of the property. At the present time part of this highway is incorporated with sections of the railway grade, but provisions have been made to release these sections when necessary. The power line of the Great Lakes Power Company crosses this property making electric power immediately available.

ORE DEPOSITS

Practically the whole length of the property is traversed by wide bands of iron formation. At several points in these bands deposits of pyrite have been located and partially explored. The main orebody, known as the "C" deposit, is located on Claims J.L. 9 and 15. At this point a flat dipping lens of pyrite was mined by open pit methods by the Nichols Chemical Company, who held the property under option during the First World War, and 310,000 tons were mined. There still remains a considerable tonnage that could probably be mined by open pit, but ultimately underground methods will have to be resorted to due to the heavy overburden and rock covering that would have to be stripped to allow for continued open pit operation. There is evidently a large tonnage of pyrite remaining in this deposit, but no accurate estimate can be made until further drilling could be carried on. The average grade mined was 28.33% sulphur, but it is obvious that considerable dilution took place in the open pit system of mining, and it is quite probable that this grade could be raised considerably when underground operation would take place.

North of the "C" deposit, and located in Claims J.L. 16 and 21, a considerable body of pyrite has been indicated by some surface work together with four shot drill holes. This orebody is known as the "A" deposit. From the scant information available, it is possible that this orebody may have an ultimate length of 4,400 feet, and appears to have an average width not much less than 100 feet. The grade indicated by No. 3 hole is 26.37% sulphur, but there are certainly sections of this zone much higher in grade. Dr. Collins, of the Federal Geological Survey, stated that there possibly existed six million tons in this deposit to a vertical depth of only 150 feet, and it is reasonable to suppose that much greater depths would be found.

A third orebody is known as the "Bear" deposit, located on Claim J.L. 28. The Nichols Chemical Company prepared to open this deposit by open pit method, but before operations commenced the pyrite market became almost non-existent, and they suspended all work in this field. Very little is known about the tonnage available at this point, but it obviously was of sufficient interest to the operators to spend a considerable amount of money in preparation for mining.

In the southeast corner of J.L. 1, and extending westerly through Claims J.L. 2 and 5, there is a band of iron formation which is a continuation of that found on Claims A.C. 50 and A.C. 44, of the Irsugo Consolidated Mines, Limited.

On the Irsugo Property a body of pyrite 40 feet in width and averaging 38% sulphur has been partially opened up by an open pit. No diamond drilling has been done, but it appears to be a body of considerable extent, and it is quite possible that this orebody would extend onto J.L. 1, of the Algoma Ore Properties, Limited, and possibly continue on this property still further to the east. No work has been done by the Company at this point, but it would seem to be a very promising place for further exploration.

The iron formation, which contains the "A" deposit, continues westward through Claims J.L. 22 and 27 an additional distance of 2,600 feet. This also offers a favourable area for prospecting, due not only to the fact that the "A" deposit is located immediately to the west, but also due to the fact that another very large deposit is located immediately to the east on the property of the Algoma Exploration Company. Both of these deposits are on the same band of iron formation.

Collectively, the various bands of iron formation total four or five miles in length, and out of this only a few thousand feet have been partially explored.

An interesting feature in connection with the drilling of the "C" deposit is that ten of the diamond drill holes gave from .02% to 1.10% nickel, with an average for the ten holes of .38% nickel. Traces of gold were found in many of the holes, and due to the fact that gold has been found in the immediate vicinity of this property, it would not be surprising if a commercial orebody of gold would be found somewhere on this group.

The property is wholly owned by the Algoma Ore Properties, Limited.

Concentration tests have been made on Goudreau pyrite at the ore-dressing laboratories of the Department of Mines, at Ottawa. These tests have shown that a flotation concentrate containing over 50% sulphur and 47% iron can easily be made. No detrimental ingredients were found to exist in the pyrite concentrate. The ratio of concentrate was approximately two to one.

MORRISON NO. 1 PYRITE PROPERTY

This property consists of a group of twelve patented claims containing 437.7 acres located in the southeast portion of Township 27, Range 27, Sault Ste. Marie Mining Division. This group is registered as two

parcels. Parcel No. 931 contains Claims 1711 and 1772.. Parcel No. 932 contains Claims 1708, 1709, 1710, 1769, 1770, 1771, 1775, 1776, 1777 and 1778.

A good road suitable for motor traffic extends from the Algoma Central Railway at Goudreau to this property, a distance of seven miles. The power line from the Great Lakes Power Company plant on the Michipicoten River extends through the southern part of the property and makes sufficient power available for all mining purposes.

A band of iron formation from 80 feet to 140 feet in thickness extends almost the full length of the property. On the easterly claims this band is folded and in appearance has the outline of the letter "Z". It is in these folds that pyrite orebodies have been found.

Nineteen drill holes have been put down along the apex of one of these folds in Claims S.S.M. 1709 and 1710, and several bodies of relatively high grade pyrite have been indicated.

The pyrite varies in width from 12 feet to 110 feet, and has been found in lenses for a length of at least 450 feet. The deepest pyrite was cut at a vertical depth of 200 feet. These orebodies are estimated to contain 300,000 tons of pyrite averaging 38.5% sulphur, together with an equal amount of low grade ore.

The topography of the country on these claims is relatively flat, and most of the property is covered with gravel overburden. The iron formation, however, and pyrite have been indicated on surface by a number of trenches. As a whole, however, the surface is not well exposed. It would appear, quite probable that further drilling both lateral and at depth would show other important lenses of pyrite.

It will be noted that the ore on this property is much higher in grade than the general run of the Goudreau pyrite properties.

Algoma Ore Properties, Limited, owns 76% interest in this property.

November 2, 1944.

GOUDREAU PYRITE PROPERTY

The Goudreau Pyrite Property consists of a group of twenty-eight patented mining claims numbers J.L. 1 to J.L. 28 inclusive. All of these claims with the exception of two are registered as Parcel 412 Algoma West Section. Mining Claims J.L. 3 and 16 are registered as Parcel No. 911. The total acreage is 1032.19 acres.

This Property is located in the northwesterly part of Township 27, Range 26, and lies immediately east of the main line of the Algoma Central Railway at Goudreau, 178 miles north of Sault Ste. Marie. A standard gauge Railway spur was constructed from Goudreau across the westerly half of the Property, and a series of narrow gauge Railway lines connected this spur with more remote parts of the Property. The rails on these lines have now been taken up, but the right-of-way remains, and these lines could quickly be put back into service again.

A highway built by the Provincial Government extends from Goudreau throughout the whole length of the Property. At the present time part of this highway is incorporated with sections of the Railway grade, but provisions have been made to release these sections when necessary.

ORE DEPOSITS

Practically the whole length of the Property is traversed by wide bands of Iron Formation. At several points in these bands deposits of pyrite have been located and partially explored. The main ore body, known as the "O" Deposit, is located on Claims J.L. 9 and 15. At this point a flat dipping lens of pyrite was mined by open pit methods by the Nichols Chemical Company who held the Property under option during the War, and 310,000 tons were mined. There still remains a considerable tonnage that could probably be mined by open pit, but ultimately underground methods will have to be resorted to due to the heavy overburden and rock covering that would have to be stripped to allow for continued open pit operation. There is evidently a large tonnage of pyrite remaining in this Deposit, but no accurate estimate can be made until further drilling could be carried on. The average grade mined was 28.33% sulphur, but it is obvious that considerable dilution took place in the open pit system of mining, and it is quite probable that this grade could be raised considerably when underground operation would take place.

North of the "O" Deposit, and located in Claims J.L. 16 and 21, a considerable body of pyrite has been indicated by some surface work together with four shot drill holes. This ore body is known as the "A" Deposit. From the scant information available it is possible that this ore body may have an ultimate length of 4,400 feet, and appears to have an average width not much less than 100 feet. The grade indicated by No.3 hole is 26.37%

GOUDREAU PYRITE PROPERTY

The following notes on the Goudreau Claim Group summarize all the author was able to learn concerning the deposit from an afternoons visit to the property, a perusal of Geological Survey Bulletins dealing with this area and the mine records of the Nichols Chemical Company:

General Information

1. Sulphur

The principal producer is the U.S.A. which accounts for 92 per cent of the worlds production which is found primarily in Louisiana and Texas. "Bedded sulphur" is mined by the Frasch process. Water is injected into the sulphur bearing strata at 160 degrees C. The sulphur is melted by heat transfer and enabled to migrate to a position from which it is lifted by air pressure to the surface. Sulphur obtained by this method is remarkably pure varying from 99.5 to 99.9 per cent S. The production in the U.S.A. in 1948 was approximately 5 million tons, valued at $18.00 per ton. Price in 1950, f.o.b. Texas, was $18.00 per ton. Principal uses of sulphur are in the manufacture of chemicals, fertilizers, pulp and paper, explosives, dyes and rubber.

2. Pyrite

The chief producers of pyrites are Spain, Portugal, Norway, United States and Italy. Spain is the chief of those producing about 4 million tons yearly. The price quoted in 1948 for pyrites containing 48 per cent sulphur was $7.00 per long ton.

Property Holdings

Algoma Ore Properties holdings in this area consists of 28 patented claims J.L. 1 to J.L. 28 inclusive which cover the central portion of the iron formation. The Morrison No. 3 group, consisting of 7 claims, 38, 39, and 40, 42, 43, and 2054 and 2055, which are owned by Algoma Exploration Company cover the northeastern extremity. The southwestern end of the iron formation falls on claims 50 and 44 which are two claims of a block of four (44, 45, 46 and 50) owned by the Rand Consolidated Mines which have been offered to Algoma Ore Properties for purchase. The northwestern extremity also lies outside Company holdings on claims 102 and 94 owned by J. A. McPhail and associates. In this respect it should be noted here that there is very little protection on the dip on claims J.L. 1, J.L. 4 and J.L. 7. In the event that further work proves up good widths in this locality, it would be wise to purchase those claims which lie immediate north, i.e. 107, 3816 and 3467. Claims No. 3815 and 150, while not immediately necessary, would become so in the event of large scale mining operations on the western part of the deposit.

History

The property was first investigated in 1902 and diamond drilling, trenching and some pitting were carried on in 1903, 1907, and 1909. In 1913 the property was explored by the Madoc Mining Company, predecessor at Goudreau to the Nichols Chemical Company.

The first ore was mined from C ore body in 1914, operations culminating in 1918 after an estimated 250,000 tons had been quarried. In 1915 a steam power plant, office buildings and boarding house were erected. The ore was mined by open pit method. After removing the over-burden, the ore was blasted down, hauled by railroad some 1500 feet to the mill, fed into a gyratory crusher and reduced to a maximum 3 inch dimension. Waste was removed by hand picking and the results screened into a plus 1/2 inch product (lump ore) and minus 1/2 inch fines. The resulting product was hauled 40 miles to Michipicoten Harbour for shipment to Lake Erie ports. In 1918 Collins reported the C open pit dimensions to be 1100 feet E/W by 800 feet N/S.

During 1918 the Bear claim was readied for open pit work but only a small amount of ore was removed. During 1919 a shaft was sunk at 45 degrees for 300 feet on the Morrison No. 3 property. However fire gutted the buildings late in 1919 since when no work has been done.

The Rand Consolidated Mines worked an open cut on Claim 44 for 3 years and shipped a considerable tonnage from Michipicoten Harbour. No beneficiation was required apparently as the ore was only crushed and screened. In each of the above cases the depression of the pyrite market that followed the cessation of World War I stopped further development.

Geology - Memoir 147

The iron formation is little folded, seldom dipping more than 70 degrees and occasionally as flatly as 15 degrees. The volcanic formation which lies above it is an ellipsoidal greenstone. The upper portion of the iron formation, in sharp contact with this greenstone, is a white quartz. It is lacking locally and occasionally pyrite intervenes between it and the greenstone, but normally it is the upper most member. The banded silica gives place downward to the pyrite member, which in turn, by gradual displacement, gives way to a main zone composed of pyrite, pyrrhotite, and a variable admixture of carbonates of lime, iron, magnesia and manganese. Occasionally lime predominates to form a crystalline limestone. More often red-weathering siderite is to be found beneath the pyrite. The carbonate band may be absent locally. The carbonate grades downward into a acid light-coloured volcanic. The sulphides are for the most part concentrated under the silica member, tending to become diluted with carbonate deeper in the succession.

The banded silica is a firm brittle formation, brecciation being a common local feature. It contains much loose granular silica. Microscopically the silicious layers are irregular interlocking quartz grains about as large as fine sand grains. No dust rims are evident or other signs of sand derivation. There are a few shreads of secondary mica present.

The pyrite member varies in thickness from 120 feet at Goudreau to 5 to 60 feet at the Helen. The pyrite is richest immediately under the banded silica but for some distance above the ~~mine~~ pyrite member there may be alternations of pyrite and banded silica. The lower pyrite boundary is rather indefinite; there is an easy gradation from sulphide rich carbonate to carbonate rich sulphide rock. Vague patches of carbonate and volcanic schists are scattered throughout the pyrite member like horses in a replacement deposit.

The pyrite is normally coarse and granular and is about the size of sand grains. The granular ore is often traversed by harder, lustrous pyrite veinlets. Lean ore (siderite and pyrite) consists of pyrite, pyrrhotite and magnetite grains and pyrite crystals clustered together or singly in a matrix of finely crystalline carbonate.

The carbonate member is present in only the larger iron formations. It varies from 240 feet at the Helen to a minus quantity in certain portions of the iron formation. It is looked upon as the ultimate source of all iron deposits in the range. It grades gradually into acid lavas which are tuffaceous in places. Occasionally the carbonate member at Goudreau is a siderite. However, normally it is a coarsely crystalline limestone reminiscent of the Grenville, with spattered pyrite grains and splotches of brown weathering iron carbonate. Microscopically the carbonate is a fine mosaic of carbonate grains (lime, iron, etc.) with scattered quartz grains, good pyrite crystals, a few magnetite grains and shreads of chlorite more or less replaced by carbonate.

Origin

Collins and Quirke considered the silica member to be deposited from hot highly siliceous waters which flowed out on the surface from hot springs. The pyrite carbonate members were the result of replacement beneath the surface by the hot uprising water.

Moore and Grout disagree with this hypothesis. They prefer to have the pyrite in carbonate member formed entirely by replacement, i.e. the silica member deposited on surface and then buried at depth. The carbonate and pyrite were deposited against impermeable silica by waters of higher temperature and under greater pressure.

Bruce takes this hypothesis even further. He believes the pyrite and siderite to be a replacement deposit formed after the silica was tilted into its present position. Solutions rose along zones of fracture and shearing alongside the banded silica.

Bear Ore Body

This showing was haphazardly drilled over a length of 1500 feet. It shows surface horizontal widths of from 50 feet to 180 feet over this length, tapering to the east and west. The strike of the ore body is approximately E/W. A series of ten sections based on diamond drilling show that the ore dips south at about 50 degrees in the central and western section and probably flattening at the east end.

Rand Mine

> Note: While this property, consisting of Claims AC 44, 45, 46, and 50, is not included in the property holdings to date it is mentioned here in view of the fact that it has been offered to Algoma Ore Properties for purchase.

A sheet of pyrite of width 60 feet lies between the banded silica member to the north and an attrelite porphyry to the south. The pyrite dips 60 to 80 degrees to the north and the porphyry contact is gradational.

A Ore Body

> Note: The western extension of this ore zone on claims numbered 94 and 92 is not Company owned but held by J. E. McPhail and associates.

"A" deposit is a part of a band of iron formation that extends from the centre of claim J.L. 21 4,400 feet westward to the centre of claim No.102. The iron formation, according to Collins, varies between 140 and 220 feet in thickness and dips generally north at 30 to 45 degrees. Green schists overlie the iron formation to the north and schistose porphyry underlies it to the south. The eastern part is swampy; the west too is in flat but somewhat drier ground. An older diabase dyke-fault displaces the iron formation at the western end. The banded silica member is either absent or thin in this area.

Collins estimates the ore body, in this locality, as being at least 1800 feet long and from 20 to 100 feet in thickness. He estimates the ore reserves for this section alone at between one million and six million tons to a vertical depth of 150 feet.

Judging by diamond drilling that was completed after Collins finished his report the dip is a lot steeper than his estimated 45 degrees. In certain sections it appears vertical, in others steeply north, and in still others there appears to be a flat roll which may give a local south dip to the ore body. Judging by the sections examined some 18 holes were put down over a length of about 600 feet. The Nichols Chemical Company estimated the positive ore on A body as approximately 400,000 tons of 32 per cent sulphur over a length of 550 feet to about 200 feet vertical.

B, D, and E Ore Bodies

According to Collins the iron formation appears to be at a maximum in claims J.L. 4 to J.L. 8. The outcrops are poor, however, and the continunity is in doubt. The low dips which vary from 15 to 45 degrees suggest a good open pit tonnage may be quickly available. Good pyrite was found in the shaft at the S/W corner of J.L. 4.

Drill hole sections of D ore body corroborate Collins' estimated dip. Structure appears to be intricate in this locality in as much as holes drilled 350 feet north of the occurrence proper encountered good width (of 100 feet). This occurrence is probably the north limb of the syncline. Grades on the southerly occurrence have reached about 30 per cent S. while those to the north were somewhat lower--23 per cent S. The positive ore summary for D deposit shows 60,000 tons of 30 per cent S. over a length of 400 feet to 40 feet vertical.

In E ore body the pyrite appears erratic and widely scattered. Only two main outcroppings are to be seen. The north one was drilled and shows the pyrite to be dipping flatly (20 degrees) to the north. The maximum width cut in the bore holes was 30 feet averaging 30 per cent S. Apparently the pyrite rolls flatly back to form the southern deposit. No estimate of tonnage was made on E ore body.

Morrison No. 3

In memoir 147 Collins gives a N/S section as follows:

Green Schist, silica member, pyrite band and some siderite grading into light grey porphyry which forms the ridge to the south. The banded silica is composed of quartz interlaminated with magnetite. Collins gives the pyrite width of up to 50 feet and usually of a good grade.

The diamond drilling map shows tonnage figures of 1,200,000 tons positive ore grading 31 per cent S. over 1100 feet to a depth of 250 feet. Probably ore totals about 750,000 tons of 25 per cent S. Judging by diamond drilling sections the ore body splits up into three lenses just west of the shaft. These lenses average about 25 feet in width. East of the shaft the ore is represented as being a solid mass varying from 40 to 120 feet in width. Dips are from 45 to 70 degrees north. Hole 21, drilled from the north side at 45 degrees, cut the ore at 100 feet vertical 300 feet east of the shaft and intersected 75 feet of pyrite grading 31 per cent S. A hole drilled by Algoma Ore Properties in 1950 cut the ore at 1000 feet vertical and intersected 75 feet of pyrite and chert which averaged 17.6 per cent S.

A sketch of the underground workings shows the inclined shaft and two levels. Only 100 feet of drifting and 50 feet of crosscutting were done on number 1 level. On the second level the ore was cut in two

places (1st) directly opposite the shaft, (2nd) 500 feet east of the shaft. These two entries are joined by a 500 ft. drift in the south wall of the ore body. The ore width in the "shaft" crosscut is 55 feet and in the east crosscut approximately 80 feet. Sampling showed better than 30 per cent S. in the "shaft" crosscut. Two north trending dykes were encountered in drifting on the second level.

C Ore Body

Mining operations centered chiefly on the C ore body. Here the iron formation locally strikes N/W and dips approximately 20 degrees south. Collins states that the west and southern faces of the open pit consist of 10 to 30 feet of banded silica underlain by about 20 feet of pyrite. The floor of the pit is in volcanic rock. A diabase dyke-fault interlopes the ore at the western of the pit. Overall grade for C ore body was probably about 30 per cent. Collins mentions a large pyrite outcrop a few 100 feet south of C open pit. This deposit was not touched in early mining operations although grade and tonnage expectations were good.

Summary

Pyrite-siderite lenses of varying grades and sizes occur in the footwall of a banded silica member which extends for about 6 miles along the contact of basic lava flows which lie to the north and above the deposit with acid tuffs and lavas lying to the south. Two of these pyrite deposits were mined by open pit methods for 3 or 4 years prior to 1919 and a pyrite ore was shipped. Apparently little or no attempt was made to prove the continuity of these lenses. The diamond drilling that was done is best termed haphazard and there is no record of any geophysical work.

Suggestions

If a lense or a series of lenses of pyrite of sufficient tonnage should be proven by future work the question remains as to what is the most profitable manner in which to utilize the ore.

1. The pyrite could be crushed, concentrated and sold as such.

2. The pyrite could be burned on the property and the resulting sulphur or sulphuric acid sold.

3. However, the most efficient manner in which to employ the pyrite ore, especially in those lenses in which the iron and manganese carbonate content is high, would be to produce pyrite and/or carbonate concentrates. These ores would then be shipped to the Helen, mixed with the siderite ores to produce a self-burning concentrate and roasted in the Sinter Plant there. In this manner all products would be fully utilized.

Recommendations

1. Cut two base lines, one paralleling the major north limb, the other the south limb, their exact position to be determined by the topography.

2. Cross lines to be cut to intersect the iron formation at 200 feet intervals.

3. Run a dip needle survey over the iron formation.

4. Where a depth of overburden and/or lack of pyrrhotite are suspected of giving false results to the dip needle survey, a magnetometer or an electro-potential survey to be substituted as the occasion warrants.

5. Mapping of the deposits on a scale of 1" - 200' with special emphasis on structure.

6. Acquisition of the aforementioned properties which lie to the north to afford protection on dip.

7. With the aid of the geophysical survey and geological map a plan of diamond drilling be drawn up.

J.Booth/sl
September 11th, 1951.

Sulphide Deposits of the Goudreau Area Algoma

George Vibert Douglas

Introduction

The Goudreau sulphide deposits which are dealt with in this report lie to the east of the Algoma Central Railway. This railway connects Sault-Ste-Marie with Franz on the mainline of the C.P.R. and Hearst, a station on the C.N.R. Goudreau is now a small settlement and station with about 27 persons living there but during the first World War it was much larger with a population of over 700.

Goudreau is connected by road to Lochalsh on the C.P.R. and to the Amherst mine west of the A.C.R. The distance from Goudreau to Lochalsh is 18 miles and to the Amherst is 6 miles. There is no road connection to the other roads in the province and a motorcar has to be brought into the area by railway.

Goudreau has the following approximate position - 48°20' north latitude and 84°30' west longitude.

Acknowledgments

The writer wishes to record his appreciation of the help he received from many persons connected with Algoma Ore Properties and the Helen Mine. Especially is he indebted to Mr. George S. Gilbert who supplied him with so much information and the fruits of his own experience. Mr. Carl Beck and Mr. William Martin were extremely kind at the Helen Mine.

To his own party he owes much. Mr. Peter Mingo was a very great help because not only did he carry out the surveying but his critical sense was very stimulating. To my son, I owe the historical data and help in the field with the survey and dip needle traverses. To my wife, the party owes much for she added to its interest in the country by her sketches, some of which are reproduced in this report.

The Capellani family provided for our commisariat very efficiently.

History

Michel Goudreau was the first man to come into the territory about the time when the C.P.R. was being planned. According to Michael Rowan, who lives in Goudreau and is probably the oldest inhabitant of the area, Goudreau discovered the pyrites at what is now known as the Nichols' Chemical deposit.

In 1897 Benjamin Boyer discovered the hematite on the Helen range. He was backed by Alvis Goetz who sold the property to C. V. Clergue. Work on the Helen began in 1900 and this event stimulated prospecting in the area. Morrison came into the area during the first decade of the century and staked the Morrison claims and the Bear (circa 1910 and 1911).

During the first World War some of these deposits were operated because of the demand for sulphur. The companies involved were the General Chemicals and its subsidiary the Madoc Mining Company. Later the Nichols' Chemical got control.

In 1914 a branch spur from the Algoma Central Railway was built from Goudreau to the Nichols' Chemical pit. In 1918 a narrow gauge line was built from this point into the Bear pit. In the same year Morrison number 3 was trenched and a 45° shaft sunk about 300 feet on the incline. Morrison number 1 had been trenched and drilled in 1914. "A" deposit was drilled in 1918. The Rand Consolidated deposit began w in 1917. When the first war came to an end and Spanish pyrites again came on the market all these operations ceased.

The plants were dismantled and the settlements gradually disappeared. A small cemetary east of Goudreau, shews that the Spanish flu' of 1917-18 took its toll in the community; most of the names on the tombstones are Italian. The Goudreau pyritic deposits have not been worked since and only the large brick stack at Nicho lake, the colourful pits and a few foundations, bear witness that a community, once numbering several hundred, lived and worked in the area.

Recently there has been an awakening interest in these deposits and most of them have been acquired by Algoma Ore Properties. (G.P.C.V.D.)

Topography

The Goudreau area is on the Canadian Shield. The hills are low and shew an accordance of level. The land surface is in the stage of late maturity, that is, since the peneplain was developed, the stages of youth and maturity have passed and the relief will gradually get less and less until a new peneplain is produced. Some of the hills are almost flat on top and cover a few acres. Others are fairly narrow. There appears to be a definite connection between the shape of the hill and its geological structure. East of Goudreau the alignment of these hills is approximately east by north and west by south.

General Geology

Collins and Quirke (1926) have described the geology of the area. Their geological column is as follows:-

Pleistocene	-	drift
Late Precambrian	-	younger diabase older diabase
		granite gneiss
Early Precambrian	-	Post-Dorean volcanics with interstratified iron formation and local sedimentary deposits
		Doré Series
		Pre-Dorean volcanics, including iron formations.

E. S. Moore 1931 and other writers followed Collins in time

but not necessarily in interpretation and then in 1940 E. L. Bruce gave his column of geological events:-

Quaternary	-	Recent and Pleistocene	- sand, gravel, glacial sands and gravels
		great unconformity	
	Post-Doré	Younger diabase	
		Older diabase (quartz hornblende)	
		Felsite	
		Quartz porphyry	
		Feldspar porphyry	
		Granite, syenite, nepheline syenite	
		Granodiorite	
		Diorite	
Precambrian	Timiskaming Doré Series	Conglomerate, slate, greywacke and quartzite	
		unconformity	
	Keewatin	Mainly basic lavas and tuffs	
		Iron formation	
		Local sedimentary lenses	
		Mainly acid lavas and tuffs	

As will be seen Bruce places all the iron formation in the Pre-Dorean while Collins and Quirke believe that there are at least two ages of iron formation.

The present writer confined most of his work to the geology of the pyritic deposits and therefore most of his ideas were formed

from the rock exposures in their immediate vicinity. Two trips were made to see the Doré Series one north of Goudreau along the line of the A.C.R. and the other to a cutting on the main line of the C.P.R. west of Lochalsh. The C.P.R. exposure is more informative for the sediments can at least be recognized and granite can be seen cutting them. The geological events with which the writer is concerned involve both Pre-Dorean and Post-Dorean but the Doré Series itself plays no part. It is a real case of Hamlet without the Prince of Denmark.

It will therefore be convenient to list the geological events relating to the deposition of the ores under the names of the various investigators:-

C. K. Leith	-	Basic volcanics Iron formations by sedimentation Acid volcanics
W. H. Collins and T. T. Quirke	-	Basic volcanics Iron formations from hot springs emanating from the volcanics. (Evidently the underlying acid volcanics) Acid volcanics
E. S. Moore	-	Mineralization Basic volcanics Silica and iron carried by surface waters in the colloidal state, that is they are in the form of gels. These colloidal

E. S. Moore (cont'd) - substances are precipitated when the solution enters salt water.

Acid volcanics

(Basement)

E. L. Bruce - Basic volcanics

Hydrothermally introduced sulphides and carbonates under a banded silica

Acid volcanics.

T. L. Tanton - "Iron range rocks are not of surficial or sedimentary origin. They meet the host rocks in which they occur as irruptive bodies or primary replacement deposits. ..... Iron range rocks are interpreted as products of differentiation, by liquation in ore-forming magma. They are of igneous origin."

The present writer, impressed by the brecciated character of the iron formation, the pronounced shearing of the foot and hanging wall rocks of the deposits, the freshness of the sulphides and carbonates and their manner of emplacement between acid and basic volcanics postulates a different order of geological events:-

G. V. Douglas - Mineralization - Introduction of sulphides and carbonates by hydrothermal solutions.

Igneous activity - granites and granodiorite, etc.

Mountain building - Area folded, resulting in brecciation and shearing

Sedimentation - Doré Series

Basic volcanics - flows and tuffs

Sedimentation - banded silica and other sediments

Acid volcanics

(Oldest) An earlier granite as seen in the xenoliths found at the Bear Pit.

In his presidential address to the Geological Society of America E. L. Bruce qualified his previous views as follows: "It is more likely that only the banded silica rock is true iron formation and that the carbonate and pyrite were formed by metasomatic reactions, not contemporaneously with the Keewatin rocks, but long after they had been tilted into their present attitude."

In a personal communication from Dr. E. S. Moore to the writer he says:- "There is absolutely no doubt in my mind that the great quantities of siderite in Michipicoten were formed by hot waters much later than the deposition of the banded silica. The siderite replaces rocks later than the silica. It replaces the silica and fills interstices all through this rock where it is brecciated. The silica there (Michipicoten) is unlike that in much of the iron formation in Michigan which has been so clearly described in recent years by

Dr. James, who has shewn the carbonate to be part of the sedimentary series".

The present writer, independently, came to a somewhat similar view. It differs in some respects as will be seen in the section dealing with mineralization in this report.

In Memoir 147 of the Geological Survey of Canada by Collins and Quirke mention is made of an othelite schist formation in the acid footwall rocks. These authors, after proving that the mineral is othelite, one of the chloritoid group of minerals suggest that this occurrence represents a new habitat for othelite. Harker (1932) discussing the work of Gosselet in the Belgian Ardennes says - "..... more striking is the "metamorphisme locale", in which the relation of cause and effect is very clearly displayed. The well-known othelite-schists have this origin. They are found in the southern borders of the Cambrian massifs of Stavelot and Serpont, where répeated overthrusts have piled up the Cambrian phyllites and intercalated among them wedges of Devonian strata. Abundant flakes of othelite have been developed in both formations, but only in the near vicinity of the overthrusts. The most interesting localized effects are seen in what Gosselet styles - "metamorphisme par flexion", which stands in close relation to anticlinal or synclinal folds".

This reference removes the peculiarity of the ottrelite occurrence in the Goudreau area. Its presence has a definite significance. Harker places this discussion of the ottrelite schist in the category of metamorphism brought about by the generation of heat

within a rock which results from the mechanical forces developed by folding or thrusting. The occurrence of the ottrelite in the footwall gives some idea of the energy released when those rocks were folded for ottrelite is developed in millions of tons of rock in that area.

Bruce's map 49 g published by the Ontario Department of Mines was found to be most helpful. Moore's earlier map of 1946 is also valuable. Much of Bruce's work depended on Moore's, the chief difference being that Bruce had the benefit of air photographs whereas Moore had not.

The present work was confined to the area along the northern boundary of the acid volcanics as shewn by Bruce and to the east of the McVeigh fault which the Algoma Central Railway parallels at Goudreau.

Mineralization

There is great diversity of opinion regarding the origin of the siderite and pyrites, the chief ore-minerals, in the area. The older view that these minerals were of sedimentary origin is held by many both old and young. The other school of thought believes that the ore-minerals were introduced by hydrothermal solutions into zones when the conditions were favourable for deposition and replacement. These two hypotheses appear to have more supporters than the remaining two ideas - hot springs and igneous injection.

In this connection it may be pointed out that other ore-bodies such as Sudbury, Kiranavaara and the Banket gold ores of the Witwatersrand have also got their different theories of origin which again have able geologists supporting them. The science of ore deposition has made notable advances in the last seventy-five years, but it has not yet reached the state of finality or what we call finality in physics or chemistry, when it can be said the following facts mean so and so. At best the deductions of the mining geologist on many matters are to be rated as opinions not as finalities. The part of geology that is accurate is mineralogy and the measurement of such things as contacts, strikes and dips. Apart from these it is opinion backed by experience. So it comes about that in this controversy regarding the iron formations there is no doubt about the identity of siderite, hematite, pyrites and quartz but there is great diversity of opinion on their genesis.

The present writer knows of these diversities of thought and

and has made his choice, based not on any one authority but on what he saw in the field. He does not make any more claim to finality in his judgment than do the others. The following descriptions should be read in this light. If a new interpretation of the field facts came to light which he could accept, he would be prepared to change his views, - until this happens he holds that the hydrothermalists have come closest to the truth.

There is no doubt in stating that the volcanics of the Goudreau area have been folded. Nor is there much doubt that the mineral deposits in that area occur between the predominantly acid footwall and the basic hanging wall. Furthermore these volcanic rocks have been cut by later igneous rocks - granites, granodiorites and diabase dykes. These are all field facts. Those who postulate a sedimentary origin for the siderite and pyrites have to account for the veining character of the pyrites and siderite and invoke some mineralizing process to get these minerals into the hanging wall rocks.

The others have to account for considerable regularity in the layering of the banded quartz, with pyrites below it and the siderite below the pyrites.

The writer's opinion of the order of events and the processes is as follows:-

In the Keewatin, vulcanism was common in this part of the Shield. Predominantly acid volcanics and tuffs were poured out over the area. When these rocks cooled erosion took place and the product was deposited in the low portions of the surface. The evidence for

this statement is the fine siliceous siltstone which can be seen at the west end of the Helen mineralized zone and the banded quartz or silica in the Goudreau area. This interpretation states that the banded quartz is derived by erosion from these acid volcanics and associated tuffs. Vulcanism again broke out and the basic flows covered most of the Goudreau area. Some of these flows are ellipsoidal which supports the idea of the presence of surface waters. Then came another period of erosion and sedimentation which resulted in the Doré Series. It is possibly significant that the Doré sediments are darker in colour than the banded quartz for these were derived from light coloured acid rocks whereas the Doré came from darker basic rocks as well as the acid ones.

The next event was mountain-building resulting in folding and possibly some thrusting. When anything is folded there is differential movement between the particles making up the material. If there is one layer over another there will be movement between these layers if they are folded. If there are three layers, the bottom and top layer being strong (competent) and the middle layer being weak (incompetent). When these layers are folded there is a tendency for the incompetent layer to take up most of the differential movement. That is most of the shearing and brecciation will occur in the weak layer. The amount of differential movement which will take place on each flank is $\frac{1}{2}\pi \times$ thickness of the beds. As there are hundreds and possibly thousands of feet involved it will be seen that on the flanks of each fold there are π times these thicknesses to be

accounted for by differential movement. Some of this movement is taken up in the minute folds in the fabric of the rock and some by the brecciation and shearing in the incompetent layer. (Fig. 5.)

The folding was more intense in the south west, that is in the region of the Helen than it was in the Goudreau area. Figure 6. shews the writer's interpretation of the basic structure at the Helen before the area was invaded by igneous intrusions or faulted.

As will be seen the basic structure is thought to be a series of nappes or overturned anticlines which originally may have been more recumbent and have been tilted into their present position by a general warping of the terrain in which the southern part of the field has gone down and the northern part up. This structure is similar to and of about the same magnitude as some of the nappes which can be seen in the valley of the Arve in the Haute Savoie. As an appendix to this report there is a separate of a paper describing these folds and their manner of origin.

Igneous intrusion followed mountain-building and mineralization follows igneous intrusion in so many known cases that Niggli states it as an acknowledged principle.

Granites and granodiorites definitely intrusive to the volcanics and Dore Series are found to the north of the volcanics in the Goudreau to Lochalsh area. Hydrothermal solutions, first charged with quartz and carbonates then with pyrites and finally with quartz emanated from the intrusive rocks. The channelways for these solutions were many but the dominant path of least resistance was the

brecciated and sheared incompetent layer.

The minor paths were the shear planes within the volcanics, tuffs and sediments, and fissures which are seen at various places cutting the volcanics. (Fig. 7) These occurrences constitute strong evidence against a sedimentary origin for how can these minerals which are common to the large incompetent layers be also found in the hanging wall if they were deposited by surface waters before any hanging wall existed? Some of the exponents of a sedimentary origin suggest that these impregnations of the basic lavas and tuffs were a surface effect, the materials being derived from the erosian of the deposits. Considering this possibility it should be borne in mind that the carbonates penetrate all through the volcanics, being especially strong near the incompetent layer and replace the fabric of the rock. Weathering, which is really what these suggestions amount to, has only penetrated a few inches of the present surface.

There is a further strong piece of evidence in the character of the carbonates. In general the siderite is found close to the incompetent layer and ankerite ($Ca.Mg.Fe.CO_3$) is the common carbonate found in the wall rocks and in the veins which cut those rocks. This is a broad statement - it does not mean that no siderite is found away from the incompetent layer nor that all the carbonates of this layer are sideritic. The statement means that predominantly the siderite is found in the ore zone. This is very similar to the distribution of carbonates in the Fen district of Norway where N. L. Bowen of the Carnegie Institution in Washington showed that there was a radial

distribution of the carbonates with siderite at the centre, dolomite further out and calcite on the outside. It is also interesting to note that when the present writer visited Norway in 1928 the ideas which the Norwegian geologists, (Brøgger, Goldschmidt) held at that time were that those carbonates were igneous injections. Since Bowen's visit these ideas have been dropped.

W. H. Twenhofel in the Principles of Sedimentation, in discussing the Pre-Cambrian hematites and the various theories that have been invoked says - " .... a source for the iron and silica has been sought in magmatic waters derived from lavas, from magmatic waters derived from hot springs, or from reactions of marine waters with lava flows. The magmatic waters or the lava flows are assumed to have carried large quantities of iron and silica, and on contact with colder salt waters the iron and silica were precipitated as iron carbonates, perhaps iron oxides, iron silicate, and chert. (Van Hise and Leith) However if the atmosphere had its present composition in Pre-Cambrian times, it seems unlikely that iron would have been precipitated as the carbonate if deposits made from the waters of submarine hot springs in the Aegean Sea southeast of Greece in the vicinity of the volcano Santorin are representative of what takes place. The waters of these springs contain iron carbonate in solution, discharge is known to have begun as early as 1650 and to have been practically continuous from 1707 to 1848 and from 1869 to 1933. The sea in the vicinity of the springs is said to be coloured yellow-green and red over a considerable area. But the carbonate quickly oxidizes, the colour

of the water changes to some shade of red and the precipitates over the bottom are not carbonate, but iron oxide or hydroxide."

Twenhofel devotes some pages to a review of the contributions of various geologists which is worth careful reading. His views may be summed up in two quotations - "It may well be that the Pre-Cambrian iron formations derive their iron and silica from magmatic waters, but it should not be considered certain that a normal sedimentary origin is precluded" and "If the carbonates are penecontemporaneous, it is possible that the iron was first deposited as ferric oxide and that deoxidation and carbonation followed burial."

It is clear from these quotations and the rest of Twenhofel's text that he does not consider the straight deposition of iron carbonate in open water to be feasible. Whereas in veins or permeable rocks where oxygen is not available there are hundreds or thousands of examples of carbonate minerals which were formed from ascending waters, i.e. hydrothermal solutions.

There are further facts which favour a hypogene epigenetic origin. There are a great many veinlets in the acid footwall which contain sulphides, carbonates and quartz. Most of these small veins are less than an inch in thickness but there are some up to six inches. There are inclusions of the volcanics in the ore zone.

If the pyrites had been of sedimentary origin and thus formed before the extrusion of the basic lavas and before the folding, it would have been severely brecciated and slickensided. In the Nichol's Chemical deposit the shape of the ore viewed in section is decidedly

puckered but the pyrites shows no slickensiding which means that it was introduced after the rocks were folded.

These are facts which apparently those favoring a sedimentary origin have not explained.

The great pyritic deposits of Huelva, such as Rio Tinto, are faulted in places and adjacent to these faults the pyrites exhibits wonderful slickensided surfaces with a high degree of polish.

It is clear from the evidence presented in this section that the writer favours a hydrothermal origin for these deposits and as has been pointed out E. S. Moore and E. L. Bruce hold and held similar views with some reservations.

The Various Deposits

Here follows a detailed description of the various deposits.

Morrison No. 1

As the crow flies Morrison No. 1 is six miles ENE from Goudreau Station. The mineralised outcrops are north of the road to Lochalsh and parallel it roughly. Bearpaw lake and the creek from Bearpaw to Goudreau lake are south of the road.

Topography

The area is generally flat with low ridges running parallel to the road which is about east and west at this part of its length. North of the mineralised ridge there is low country with a pond and considerable swamp. Some of the deep holes at the western part of the deposit were drilled from this swamp, evidently in the winter when it was frozen or else before the beaver had dammed the outlet and flooded the area.

Geology

The geology is simple but difficult. The mineralisation lies between the acid and basic lavas and tuffs and that simple relationship holds but the difficulty comes from the true interpretation of the acid and basic types.

Previous writers in the Michipicoten area have noted acid flows within the dominantly basic and basic within the acid. Add to this condition the silification and carbonatization due to the mineralising process and it is evident that great care must be exercised in naming the rocks. The thick vegetation further impedes the mapping.

As at the other deposits in the Goudreau area the main pyritic horizon lies between the acid and basic members of the volcanics. Furthermore the best pyrites favours the folds. As already pointed out this apparently simple relationship requires some very careful interpretation for there appear to be some basic members in the foot-wall rocks and some acid ones in the hangingwall.

The interpretation adopted in the mapping is that the mineralization is at the contact and that the rocks below are members of the acid and those above of the basic. The silica member is well developed in places along the length of the deposit and can be mistaken for an acid outcrop because the surface is often surface hardened as the result of leaching by ascending waters charged with sulphates and sulphuric acid.

To understand the form that the mineralization takes in this deposit it will be convenient to start at the east end which is in low ground with no rock shewing on the out line. To the north at a distance of over 200 feet there are large whaleback outcrops of basic volcanics with a graben or sunken area, bounded by faults, cutting them. Proceeding to the west the banded silica is seen in a small outcrop on the north of the line. Then a swampy area is passed, through which a fault is postulated because on the western side of the low ground there is an escarpment with pyrites shewing on the southern side of the ridge which dips down to the road. This mineralization is either capped over by the basic rocks or pinches out to the east of the line running north from the claim stake (Claims 1703, 11046 and 3317) which was taken as the starting point for the present survey. This stake

lies south of Bearpaw Creek and west of the point extending into Bearpaw lake at the northwest corner.

There is another small fault with the western side upthrown and again an exposure of the pyrites on the south slope. The basic volcanics outcrop as a scarp along the cut line and the pyritic zone can be seen immediately below it on the south slope.

The line then cuts across the banded silica, presumably at the place where Collins and Quiske describe a considerable thickness of the granular silica. This slope indicates a minor anticlinal fold plunging about 9° to the west. Immediately to the north there is a complimentary syncline which turns the silica up sharply and forms an escarpment. To the north there is the next small anticline which brings the pyrites to the surface. The northern limb of this anticline dips under the swamp. It is not thought that the pyrites is very thick on this fold, for a few feet to the west, the acid lava shows upon the old road. To the west of the plunging nose and cutting it off there is a fault which has brought the pyritic horizon close to the surface. Here it can be seen in the trenches which lie astride of the line.

Still further to the west the mineralised zone plunges down under a swamp and rises again to the west. There is probably no fault here but it is more likely to be a downwarp in the axis. It is immediately to the north of this western side of this downwarp that bore hole No. 8 encountered the notable thickness of pyrites which was mentioned by Collins and Quirke. Still further to the west large massive slabs of pyrites are to be seen on the north of the cut line.

At both of these slabs longitudinal faulting has brought up the foot-wall in fault relationship with the pyrites (Fig. 8.) The western end of the line ends in a swamp which is south of the small pond.

Quantities

It will be difficult to estimate the quantities of material in this deposit. The reason being that the position of the bore holes cannot be determined accurately. The old sheet shewing the barhole sections has a small plan in one corner but it is evidently only a sketch map for the direction of the claim lines does not agree with Map 49 g of the Ontario Department of Mines, nor do the outcrops agree with the mapping done in 1952. No co-ordinates are given for any of the holes and the sketch map only shews the approximate position of holes one to eight inclusive. There is no plan apparently which shews the position of holes nine to eighteen. Most of this drilling was done in 1944 and the pits and blazes are obliterated. At Morrison No. 3 small patches of coal and cinders helped to fix the approximate position of the holes but no such coal patches were found on Morrison No. 1 and it is possible that petrol driven drills were used.

The Sections which accompany this report are therefore based on insecure information and must be considered only as giving the general shape of the pyrites and not as mathematically correct. Furthermore the information available is contradictory. Bore hole No. 8 is given in the section of the hole as having an inclination of -50°. On the sketch map where No. 8 is shown in plan it is marked as a vertical hole. Collins and Quirke in Memoir 147 also report

it as a vertical hole. It is unfortunate that the position of the holes has been lost when a pile of rocks would have left a record, that could have been picked up in later years. The money spent in drilling surely justifies the extra expense of building some monument which will be lasting and which will make the location of the boreholes possible for future generations.

Morrison No. 3

The hill on which the Geoditic Tower with the west end of the base line is situated is composed of acid volcanics. To the south is the Bear deposit and to the north Morrison No. 3.

This deposit has a proven strike length of over 2500 feet. Most of the territory to the north of the outcrop is flat, some of it is swamp and some open water.

An old railway grade, a spur from the line to the Bear Pit parallels the strike of the mineralized lens from the westner end to the old two compartment shaft towards the east.

Just east of the shaft there are two dumps of pyrites which contain 6,500 tons (6,519) using twelve cubic feet to the ton for the material on the dumps. (78,238 cu. ft.) These items are decided assets.

Geology of the Deposit

The deposit now is essentially monoclinal but it is believed to have been originally the northern flank of an anticline which extended over the geoditic hill and formed the Bear deposit on its

southern limb with the complimentary syncline. The crest of the fold is eroded and there does not appear to be a vestige of pyrites left on the top of the hill.

In the writer's opinion there is only one long lens. The apparent triple division of the mineralized east end is due to minor drag folding of the banded silica before the pyrites was introduced. The present topographic surface has just happened to expose some of the pyrites and leave some of the hanging wall which gives the impression of three lenses though in reality there is only one.

The Bear Deposit

The history of this deposit is given by Collins and Quirke in Memoir 147.

The Bear deposit lies in a syncline with acid volcanics outcropping to the north, east and south. The western end is open, that is banded iron formation extends on the limbs of the syncline in a westerly direction. According to Bruce, the northerly limb runs along the line of the old railway grade and becomes deposit "C" (Nichol's Chemical). The southerly limb parallels it and apparently pinches out north of Dobbs lake.

At the east end of the opencast of the Bear the syncline is fairly flat with minor folds. To the west these folds get more complicated.

The present writer's sections do not agree with the Tentative Structure Sections by Wyser dated 21 September 1918. They do however explain the drill records as shown on a blue print dated

10 November 1915, Madoc Mining Co., as drawn by J.A.D. and traced by E.I.W. with a 10 in the lower right hand corner. Furthermore these sections agree with what can be seen in the pit 1952.

The sections shew that there is not much pyrites left at the east end of the pit but that there is still a considerable body at the west end. As is to be expected in a mineralized zone of this type there are many bands of unreplaced material which will reduce the tenour. The present sections do not attempt to shew all these fragments of schist which will be found between what is shewn as the footwall and hanging wall of the pyrites.

The unsigned and undated plan of the Bear Deposit on a scale of one inch equals one hundred feet appears to be a very serious attempt to estimate the tonnages of various grades in the deposit. The original of this plan is on tracing linen and the print included in this report is taken directly from it.

The value of these figures depends on the interpretation of the bore hole data. Presumably this interpretation is that of D. C. Wysor as shewn on the print of 21 September 1918. The compiler of the unsigned and undated plan has assessed the bore hole record in terms of sulphur percentages which should prove of great value when new estimates are being made.

"A" Deposit

Introduction

"A" Deposit and "A" Deposit Extension are very probably on the same strike as Morrison No. 3. It can be reached from the Goudreau Lochalsh road by a cut line which leaves the road 690 feet from the forks where the old grade runs into the Bear Pit. The line which was cut in is over swampy ground until it encounters a moraine or outwash plain. It follows this moraine to the deposit. At the deposit there is a shallow shaft 4½ x 4 feet with a low cliff of pyrites to the west.

Geology

There is not much geological information to be obtained at this deposit, for, except for the "pyritic acre" there is very little rock showing in situ. The interpretation of the drill holes shown in P. N. E. Mingo's three dimensional projection is based on the old drill records. There are very few measurable strikes and dips and hence it is possible that the writer's picture may be in error, if the drill cores were wrongly logged.

The writer's interpretation is that the general structure is anticlinal, with the axial plane dipping north. The anticline is the crest of a large drag fold on the north limb of a major anticline. This major anticline is the extension of Geodetic hill which continues to the north of the Nichol's Chemical opencast. The Nichol's deposit is on the south side and the Morrison No. 3, "A" and "A" extension on

the north side of the axis.

As structural theory would demand, the axial planes of the drag folds south of the main axis should dip south and those north should dip to the north. This relationship holds true for these deposits.

The western end of the deposits is more complicated. There is a carbonate and a shaly rock which has been mapped as country rock. In the past the carbonated rock has been considered to be a limestone. The writer is not convinced of this interpretation. It is possible that it is a carbonate gangue introduced during the mineralizing process. The usual relationships of acid and basic lavas with the mineralised zone in between are not exposed. The only rock is to be found on the "pyritic acre". Dip needle observations were taken to extend the axis to the east; these positions are shewn on the map. This line was not carried east beyond the main road. At this point there is a strong local magnetic attraction but there is also a diabase dyke in the vicinity and it is thought that the metamorphic effect of the diabase where it cuts the siderite has produced some magnetite. The effect is not over a large area but is confined to a small patch, shewn on the map.

To the north of the pyritic acre there is low country with few outcrops. A few hundred feet to the north there is a low mound of acid lava which has apparently been faulted against the basic. The fault lines are exposed in east-west gullies. Just to the south of the acid mound there is a small local magnetic anomally. This area was not mapped.

"B" Deposit - Wysor Lake

This deposit shewn on the General Plan Section B is a syncline with the nose of the fold exposed on the south side of Wysor Lake. Most of the pyrites would lie under the waters of this lake which would have to be drained if the mineral was to be extracted.

"C" Deposit - also known as the Nichols Chemical Deposit

This deposit, which is about two miles east of Goudreau Station, was explored for the General Chemical Company by its subsidiary, the Madoc Mining Company from 1913. Later the property was taken over by the Nichols Chemical Company.. (Collins 1926)

The deposit is like a crumpled sheet lying between an acid volcanic series and capped by a basic series of lavas. It has been worked by opencast methods, the pit being about 800 feet long and 75 feet wide on the average. The footwall of acid volcanics is a sheared rock, light in colour and with a glassy texture. Sometimes it has a sugary appearance. The typical rock is however a rhyolite and there are dull reddish tinges which show up clearly when the specimen is wetted and viewed under a good hand lens. The hanging wall is a grey greenish rock, on the weathered surface, with a blueish to dark greenish appearance on a fresh surface which contains eyes of a blue quartz about a tenth of an inch in cross section. This is the rock which is described by Ellis Thomson as a latite, a term used by Ransome for a trachyandesite. It is a lava.

The mineralized zone lies between these two volcanic series. The word series is used purposely for it must not be imagined that these are single flows of uniform composition. Both the footwall and hanging wall are made up of a number of flows, how many in each has not been determined but probably a large number. The importance of the banded iron horizon is that it is the boundary between predominantly acid volcanics on the footwall and predominantly basic volcanics of the hanging wall. From the structural point of view it is the incompetent layer between two very strong competent members. This layer has taken up much of the differential movement between the lower and upper volcanics when these were folded.

There is still a considerable tonnage of ore to be expected lying south of the opencast.

Mr. Michael Rowan shewed the writer a shaft near the old foundations at the stack on the road or old railway grade near Nicho lake. According to Mr. Rowan pyrites was encountered in this shaft.

The drill holes immediately south of the opencast should be extended down to the road level to test the possible extension of the main zone with the pyrites reported by Mr. Rowan.

"D" Deposit

Introduction

This deposit is on the Wysor lake Rand Pit Contact. It is west of Wysor lake and can be reached from the Wysor lake base line, (3,200 feet from west end base line) or from the Goudreau Lochalsh road by a short trail. The old Goudreau Lochalsh wagon road, now abandoned up to the Bear Forks passes to the north of this deposit. It would not be a difficult matter to put this old road in commission and extend it to "D".

Geology

The deposit is an eroded anticline within the larger Wysor lake syncline. In previous years it has been drilled by about 18 holes. The anticlinal interpretation fits the drilling record as do also the field facts. The southern rim of the area has pyrites with a small exposure of sugary quartz on the south flank and carbonate float to the north. This relationship means that the pyrites is dipping south. The northern flank has the opposite relationship. Pyrites forms the core of the northern ridge with carbonates in place on the south side and sugary quartz on the north flank. The space intervening between these two limbs is low and covered with detritus and vegetation. One large overturned tree held in its roots an angular fragment of a carbonate.

On some maps the north limb is called "E" Extension but it is more convenient to refer to it as the northern part of "D" of which it is an integral part.

The general structure would suggest a plunge to the east and also to the west. In both of these directions there is low ground. If it is deemed advisable in the future to explore these noses - drilling should be vertical, and as nearly along the axis of the fold as possible. It would also possibly be advisable to carry out this drilling during the freeze up. It will thus be seen that not only is there an anticlinal structure but very possibly this anticline is part of an elongated dome.

Note re Plans in possession of Algoma Ore Properties Ltd.:

There is a linen tracing marked Deposit "D", Algoma Steel Corporation, drilling done prior to 1920, scale one inch to fifty feet. On this tracing hole 15 is shewn south of hole 13 and north of hole 17.

In late August further information became available from the Sault Ste Marie office and a blue print of "D" deposit, done by the Madoc Mining Co. June 14, 1914, on a scale of one inch to fifty feet. This plan shews bore hole 16 south of 13 and north of 17 and bore hole 15 east of bore hole 11.

Furthermore in the sheets giving assay results and the logs of the holes it is stated that bore hole No. 1 is at the lower end of the most westerly trench.

Without this information we had assumed that the two bore holes which can still be seen were holes 9 and 10. The plan which accompanies this report has been redrawn to conform with the blue print of the Madoc Mining Company.

"E" Deposit

This deposit in township 27, range 26, on Claim J.L.5 can be reached from the motor road, Goudreau to Lochalsh about 0.7 of a mile east of Goudreau Station and 500 feet south of the road. There does not appear to be any considerable body of ore present which statement confirms the opinion of previous workers.

The interest in the deposit is connected with its structure. The plan and section shew a small anticline and syncline which has been faulted. The carbonate encountered in the shaft did not appear to be siderite.

The relation between structure and mineralisation is very strong. The places where the structure is most complicated, where the folding is strongest appears to be the places where mineralisation is also best developed. A tight contact between the acid and basic volcanics has little or no ore associated with it.

This observation is probably connected to three factors.

1. The presence of a sedimentary formation resting on the acid footwall which was laid down just after the acid volcanics had cooled or was possibly connected with the extent of the tuffs deposited either by water or directly from the air as falling ash.
2. The differential movement producing shearing, brecciation and folding.
3. The broad principle that if there is differential movement there will be places of compression and places of slack on the flanks of the fold.

The Rand Deposit

This deposit near Goudreau Station does not belong to the Algoma Ore Properties Ltd. but lies adjacent to their claim lines.

The length of the exposed pyritic body is 700 feet on a strike of 40° true. The dip is to the northwest and varies from 40° to 65°. There is a smaller lens en echelon at the south end of the pit. It is parallel to the main lens but in the footwall and fingers out to the northeast. The southern end of the main lens is the place where Collins & Quirke described the silica and pyritic sand. The true hanging wall of the main lens cannot be seen (1952) for it lies under the fill of the railways grade but it can be assumed that this grade was not built over the mineralized body.

The main lens contains a horse of schist and this horse contains the blue opalescent eyes of quartz which characterize the lavas of the hanging wall. Therefore here we have further confirmation of the contention that the mineralising process followed the outpouring of the basic lava and was later than the folding of these two large competent bodies.

Recommendations

1. Future drilling to be done with the express purpose of proving ore. Choose some figure say 500 feet vertical and prove the ore along the strike of the ore body at that depth, to have an estimate of tonnage based on measurement of length, true width and some reasonable depth is the next step. Drilling deep holes before this essential drilling is done is not economical.

   (a) The costs are high and the progress slow.

   (b) The money invested in a deep hole when there are large unmined reserves unproven at a higher level, will not pay dividends for a long time.

   (c) The same money if used to prove ore at reasonable depth will yield so much more information.

2. The site of the drill stance should be marked with a cairn or some monument so that its position can be found 50 years afterwards.

   We experienced the greatest difficulty in finding the 1914 drill stances at Morrison No. 3. We could only be sure of one. At Morrison No. 1 we could not find a single one. Drilling is fairly costly and if it is worth doing it is worth recording.

3. Plans and sections of all holes should be drawn, and these should show the assay results.

4. Morrison No. 3 appears to be the deposit on which to make a start.

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Appendix

Department of Geology,
Dalhousie University,
Halifax, N. S.,
December 12, 1952.

Mr. George MacLeod,
General Manager,
Algoma Ore Properties Ltd.

Dear Mr. MacLeod,

Mr. Gilbert passed on your message regarding reserves. As you know there is very little data available and I have done the best I could to arrive at a reasonable conservative estimate, then as you will note I suggest multiplication by three or four!

Yours sincerely,

G. Vibert Douglas.

G. Vibert Douglas.

Goudreau Area

Estimates of Reserves

Estimates of reserves in the Goudreau area must be considered as being very speculative due to the lack of positive information relating to thickness and depth of mineralization. The records of the early drilling and even the location of many of the drill stances are not now available.

In giving these estimates the writer has taken the length of the exposed mineralization multiplied by the true width which has been estimated and by a depth factor which was either assumed or else represented the depth of known drilling. Ten (10) cu. ft. were taken as equivalent to a ton.

Morrison No. 1

$$\frac{2{,}000 \text{ ft. long} \times 20 \text{ ft.}}{10} \times 300 = 1{,}200{,}000 \text{ tons}$$

or 4,000 tons/ft. of depth, down dip.

Morrison No. 3

$$\frac{2{,}400 \text{ ft. long} \times 20}{10} \times 300 = 1{,}440{,}000 \text{ tons.}$$

or for 1,000 ft. at

a reduced tenour = 4,800,000 tons

or = 4,800 tons/ft. of depth down dip.

Bear Pit

Estimate based on new interpretation from drilling records by G.V.D. 1952

Area of section on line of holes 14, 12, 16		=	7,500 sq. ft.
" " " "	32, 25, 35	=	11,250 " "
			18,750 " "
	Average		9,375 " "

Distance between these two sections is 800 ft.

Therefore $\frac{9,375 \times 800}{10}$ = 750,000 tons

Some of the 1,061,500 gross tons reported in old records has been mined.

"A" Deposit

$\frac{200 \text{ ft. long} \times 70 \text{ ft. width}}{10} \times 85$ ft. depth = 119,000 tons

To this should be added the pyrites of the pyritic acre about 9,000 tons

128,000 tons

This estimate takes no account of possible extensions to the west or east nor for depths greater than 85 feet. The old records show an estimated tonnage of 432,375 tons but it is difficult to see how this tonnage was calculated.

"C" Deposit

The writer believes that there is an area south of the opencast

$$\frac{1{,}000 \text{ ft. long} \times 600 \text{ ft. wide} \times 25 \text{ feet depth}}{10} = 1{,}500{,}000 \text{ tons}$$

It must be admitted that this is very speculative.

Wysor Lake and "E" Deposit

Both of these deposits are small and very little is known about their extension.

"D" Deposit

There is not much known about this deposit on which to base an estimate.

South flank

$$\frac{400 \text{ ft. long} \times 25 \text{ ft. width} \times 300 \text{ feet (assumed)}}{10} = 300{,}000 \text{ tons}$$

North flank

$$\frac{110 \text{ ft. long} \times 100 \text{ ft. width} \times 300 \text{ ft. (assumed)}}{10} = 330{,}000 \text{ tons}$$

630,000 tons

There is the possibility of a considerable tonnage to the east and on the northern flank.

Rand Deposit

$$\frac{700 \text{ ft. long} \times 25 \text{ ft. wide} \times 300 \text{ ft. (assumed)}}{10} = \underline{525{,}000 \text{ tons}}$$

These figures give a total of 6,173,000 tons which can be considered as a conservative estimate. This figure might possibly be multiplied by three or four, to enviseage the potentialities of the area.

At best these estimates are intelligent guesses and what is needed is a drilling programme designed to prove tonnage to some depth, say 500 feet down dip. The deep holes at Morrison No. 3 were costly ventures and if the same amount of money had been spent in a number of shallow holes, along strike, there would have been exact information regarding tonnage over a portion of this fine deposit.

Copy of paper given to Royal Society of Canada London Ont. June 1953.

PYRITIC MINERALIZATION IN THE GOUDREAU AREA OF ALGOMA

George Vibert Douglas, F.R.S.C.

The Goudreau area is approximately 176 miles from Sault-Ste-Marie on the line of the Algoma Central Railway. The pyritic deposits dealt with in this paper lie to the east of the railway and can be conveniently reached from the Goudreau-Lochalsh road. Fig. 1.

There have been numerous workers in the field from the days of Sir William Logan and Dr. Robert Bell to the present. It is possible that there are at least forty or fifty references in the literature to these deposits. Michel Goudreau was probably the first prospector in the area about the time of the building of the C.P.R. In 1897 Benjamin Bonger discovered the hematite at what is now the Helen Mine. There was considerable mining activity in the area during the first World War. Between the first and second wars interest in gold mining superceded the mining of pyrites. In recent years the area has been dormant.

The purpose of this paper is to discuss the genesis of the pyritic mineralization. The writer is grateful to the management of the Algoma Ore Properties of Sault-Ste-Marie for whom

the work was done for permission to present these results.

The Goudreau area is on the Canadian Shield. The hills are low and show an accordance of level. The grain of the country is east by north and west by south. In general the grain reflects the geology.

The oldest rocks in the area are acid volcanics which include flows and tuffs. These rocks are considered to be Keewatin in age. The rest of the geological history can be put in columnal form and also shown graphically. Fig. 2.

Latest event	Mineralization	- Introduction of sulphides and carbonates by hydrothermal solutions.
	Igneous activity	- Granites, granodiorite, etc.
	Mountain building	- Area folded, brecciation and shearing
	Sedimentation	- Doré Series
	Basic Volcanics	- Flows and tuffs
	Sedimentation	- Banded silica and other sediments
	Acid volcanics	- Flows and tuffs
Oldest	An earlier granite as seen in the Xenoliths found at the Bear Pit. Fig. 5.	

It will thus be seen that these two periods of vulcanism were each followed by erosion and sedimentation; one large period of

mountain building followed by the usual igneous intrusions and later mineralization.

The facts and observations which support these views are as follows:-

1. The mineralization occupies the sheared and brecciated incompetent layer between the acid footwall and basic hanging wall. Figs. 4 & 6.

2. The acid footwall has been sheared and in some of its members ottrelite has been developed.

3. The basic hanging wall has been cut by veins of carbonates which carry sulphides. Fig. 7.

4. The carbonates close to the incompetent layer are iron rich, those at a distance which are found carbonatising the hanging and footwall rocks are more ankeritic.

These facts will now be considered in more detail.

1. There is no doubt in stating that the volcanics of the Goudreau area have been folded. Nor is there much doubt that the pyritic and sideritic mineral deposits occur between the predominantly acid footwall and the basic hangingwall. In Keewatin times, vulcanism occurred in this part of the Shield. At first, predominantly acid volcanics and tuffs were poured out over the area. When these rocks cooled erosion took place and the product was deposited in the low portions of the surface. The evidence for

this statement is the fine siliceous siltstone which can be seen at the west end of the Helen Mine and the banded quartz or silica, a sandstone in the Goudreau area. This interpretation states that the banded sandstone is derived by erosion from these acid volcanics and associated tuffs. In his presidential address to the Geological Society of America the late Professor E. L. Bruce stated:- "It is more likely that only the banded silica rock is the true iron formation and that the carbonate and pyrite were formed by metasomatic reactions, not contemporaneously with the Keewatin rocks, but long after they had been tilted into their present attitude."

Vulcanism again broke out and the basic flows and related tuffs covered most of the area. Some of these flows are ellipsoidal which supports the idea of the presence of surface waters. Then came another period of erosion and sedimentation which resulted in the Doré Series. It is possibly significant that the Doré Sediments are darker in colour than the banded sandstone for these were derived from light coloured acid rocks whereas the Doré came predominantly from darker basic rocks.

The next event was mountain-building resulting in folding and some thrusting. When anything is folded there is differential movement between the particles making up the material. If there are three layers which are folded, the top and bottom layer being strong (competent) and the middle layer being weak (incompetent)

there is a tendency for the incompetent layer to take up most of the differential movement. The amount of differential movement which will take place when these layers are folded through π radians will be $\frac{1}{2}\pi$ times the thickness of the beds on either flank. As there are hundreds and possibly thousands of feet involved in the folding, the amount of differential movement is considerable. Some of this movement is taken up in the minute folds in the fabric of the rock and some in the brecciation and shearing in the incompetent layer.

Igneous intrusion followed mountain-building as is so frequently the case, and mineralization followed the igneous activity. Granite and granodiorite invaded the area and intrude the volcanics and the Doré Series. Hydrothermal solutions, first charged with quartz and carbonates and later with pyrites and quartz emanated from the intrusive rocks and passed into the channelways of the brecciated and sheared incompetent layer. Minor paths for these solutions were in shear planes within the volcanics, tuffs and sediments and fissures which can be seen at various places cutting the volcanics. Fig. 7. These occurrences constitute strong evidence against a sedimentary origin.

2. In Memoir 147 of the Geological Survey of Canada by Collins and Quirke mention is made of the occurrence of ottrelite in the footwall rocks. These authors, after proving that the mineral is

ottrelite, one of the chloritoid group of minerals suggest that this appearance of the mineral represents a new habitat.

Harker (1932) discussing the work of Gosselet in the Belgian Ardennes says - ".... more striking is the 'metamorphisme locale', in which the relation of cause and effect is very clearly displayed. The well-known ottrelite-schists have this origin. They are found in the southern borders of the Cambrian massifs of Stavelot and Serpont, where repeated overthrusts have piled up the Cambrian phyllites and intercalated among them wedges of Devonian Strata. Abundant flakes of ottrelite have been developed in both formations, but only in the near vicinity of the overthrusts. The most interesting localized effects are seen in what Gosselet styles 'metamorphisme par flexion', which stands in close relation to anticlinal or synclinal folds."

This reference removes the peculiarity of the ottrelite occurrence in the Goudreau Area. Its presence has a definite significance. Harker places this discussion of the ottrelite schist in the category of metamorphism brought about by the generation of heat within a rock which results from the mechanical forces developed by folding or thrusting. The occurrence of ottrelite in the footwall gives some idea of the heat energy developed when those rocks were folded for there are millions of tons of it in the area. This heat energy may also explain some of the facts which those

favouring an igneous origin have observed.

3. The carbonate veins and carbonates in the hangingwall and footwall constitute the strongest argument for an epigenetic hypogene origin. Those who advocate a sedimentary origin for the ore have to find a mechanism whereby the carbonates and sulphides are carried upwards into the basic volcanics and downwards into the acid rocks below the sedimentary ore-bed. Furthermore they have to time this movement after the basic volcanics were poured out over the ore which by their theory had been previously deposited.

4. There is further strong evidence in the character of the carbonates.

In general, the siderite is found close to the incompetent layer and ankerite is the common carbonate found in the wall rocks and in the veins which cut these rocks. This is a broad statement - it does not mean that no siderite is found away from the incompetent layer nor that all the carbonates of this layer are siderite. The statement means that predominantly the siderite is found in the ore zone. This distribution of the carbonates is similar to that in the Fen district of Norway where N. L. Bowen showed that there was a radial distribution with siderite at the centre, dolomite further out and calcite on the outside.

The present writer visited Norway in 1928 and at that time the Norwegian geologists, Brøgger and Goldschmidt held that these

carbonates were igneous injections. Since Bowen's visit we do not hear very much about carbonate magmas.

If the pyrites had been of sedimentary origin and thus formed before the extrusion of the basic lavas and before folding it would have been severely brecciated and slickensided.

In one of the Coudreau deposits the shape of the ore-body viewed in section is decidedly puckered but the pyrites shows no slickensiding which means that it was introduced after the rocks were folded.

The pyritic deposits of Huelva, such as Rio Tinto, are faulted in places and adjacent to these faults the pyrites exhibits wonderful slickensided surfaces with a high degree of polish.

It is clear from this discussion of the evidence that the writer favours a hydrothermal origin for these deposits which does not differ widely from his interpretation of the views held by E. S. Moore and the late E. L. Bruce.

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Apr. /1958

Goudreau Pyrite Ore Bodies

The Goudreau ore bodies consist of a pyrite band bordered on the north by a narrow band of silica or chert lying between volcanics on the north and schisted tuffs to the south.

The gangue material of the pyrite bodies consists of siderite with about 5% to 10% magnetite.

Within these bodies are many inclusions of dark green schist or white quartz, from a few inches to 4 or 5 feet in width.

Between these inclusions the pyrite runs from 30% to 35% sulphur and with the inclusions the ore bodies run about 26% sulphur and 40 to 42% iron.

From 1914 to 1920 inclusive the Nichols Chemical Company mined and shipped pyrite from the "C" ore body which they leased from the Lake Superior Corporation.

The following tonnages were shipped:-

1914	-	2,997	Gross	Tons
1915	-			
1916	-	67,577	Gross	Tons
1917	-	110,306	"	"
1918	-	90,614	"	"
1919	-	28,030	"	"
1920	-	13,550	"	"
Total	-	313,074	Gross	Tons

All shipments were made from the "C" ore body although they prepared the Bear Pit for open cut mining and also sank an inclined shaft 250' deep on the Morrison No. 3 property.

Originally ore was hand cobbed in the pit to remove the schist inclusions and up the grade, but late in 1916 a regular crushing plant was installed followed by a 30" wide picking belt.

The first shipment made in 1916 from ore taken from the south end of the pit ran 27.6% S. In checking this assay they also assayed for silica. This assay was 3.27% SiO2, the only silica assay given for any of the cargoes shipped. The 26 succeeding cargoes of approximately 4,000 tons each always graded over 30% S. with an average grade of 31.8% S.

The mine was shut down on July 4th, 1919 and the broken ore left in the pit was shipped in 1920. The last shipment on September 30th, 1920. In 1919 an estimate of the ore remaining in the mine was:-

2,500 tons broken ore in the pit	Grade 30.5 S.
87,000 tons stripped ready for mining	
113,000 tons to be stripped	
247,500 tons of underground ore	Grade 30.9 S.

Also an estimate of 34,700 yards of rock to be stripped in the pit.

Rand No 1. was mined by the Rand Consolidated Co. We have no production records.

The bulk of the Goudreau ore reserves is the ore along the steep dipping north limb on the Morrison 3, "A", Rand No. 1 and McPhail.

The most of this ore will have to be mined by underground methods. While there are many locations for open pit operations on the B, D, E and F deposits they are too small to individually supply the required tonnage which will be 500 tons per day for 2½ years of 900 days, a total of 450,000 tons.

The properties that could supply the tonnage required are the Rand No. 1, The Bear, The A and McPhail combined, and the C.

The Rand No. 1

The Rand No. 1 is located 650' south of Goudreau station and 1200' east of the Algoma Central Railway.

The ore body has an average width of 42' and dips north at 65° to 70°.

In this width there are many rock inclusions which would have to be sorted out. In the centre of the body is a higher grade section with an average width of 29 feet. The body runs along the top of a fairly high ridge and could probably be open pitted to a depth of about 60 feet.

Length 2800', width 42' to a depth of 60'. cobbing out waste.

This depth could be carried $\frac{2800 \times 42 \times 60}{10}$ = 705,600 Tons less 20% for cobbing.

Average Grade:-	Fe	SiO2	S
after cobbing.	40.45	7.37	26.88
	40	7.50	26

or mining only the centre higher grade section.

$\frac{2800 \times 29 \times 60}{10}$ - 487,200 Tons

Average Grade:-	Fe	SiO2	S
	41.35	5.48	25.15

"A" Ore Body

The "A" ore body is located 2½ miles by road from Goudreau station on the Algoma Central Railway. It dips north at from 60° to 70°.

Its length is 1900' with an average width of 60'. Its silica content is from 3½% to 4% lower than that of the Rand.

Due to its location in flat swampy ground only a short length of the ore body could be mined by open pit methods.

One fifty foot cut and one forty foot cut could probably be taken for a length of 400 feet.

The first cut would be $\frac{400 \times 80 \times 50}{10} = 160,000$ Tons

The second cut would be $\frac{400 \times 60 \times 40}{10} = 96,000$ Tons

Total = 256,000 Tons

The McPhail

The McPhail ore body is the western continuation of the "A" ore body separated from it by a wide diabase dyke.

It has not been drilled but has been outlined by a few cross trenches and some surface exposures. An early report states it is 2300' long, with an average width of from 30 to 40 feet and of similar grade to "A" body.

For about three quarters of its length it appears to be 50' to 60' above the surrounding low swampy ground.

From an electro-magnetic and geological survey we made in 1954 by H. Metcalf it would appear that there should be some wider rolls in this body as there are in the "A".

If the grade matches the "A", there should be about 500,000 tons of open cut ore there.

The Bear Pit

The Bear Pit is located 2.8 miles from the Algoma Central station at Goudreau. A gravelled railway right of way goes right into the pit.

The Bear ore body is the bottom of a flat lying syncline where both limbs come together to make a wide zone which can be very readily open pitted.

The exposed ore in the present pit has a great many large schist inclusions in it giving a subsequent lower sulphur content to the ore.

From a study of the drill sections farther west we find there are very few rock inclusions and the sulphur grade appears to be as good as any of the other properties except the Morrison 3.

There are three parallel beds divided by two dykes running lengthwise with the ore body. This body could be readily open pitted to an approximate depth of 100 feet for a length of about 800 feet.

If a fifty foot cut was taken in all three bodies starting from the west end, the following tonnages could be produced:-

Length	x	Width	x	Depth		Tons
700	x	55	x	50	=	192,500
800	x	65	x	50	=	260,000
400	x	65	x	50	=	130,000
				Total	=	542,500 Tons

Sulphur grade around 30%
No information on SiO_2

October 1959

GOUDREAU PYRITE

General:-

The individual pyrite deposits at Goudreau, with the possible exceptions of deposits B, C, E and D, have been mapped in some detail but have not been adequately tied together and fitted into an overall interpretation of the area. Such an interpretation would aid in understanding the individual deposits.

Proposed Work:-

1) To complete the mapping and exploration of the ground between the known deposits.

2) To map in detail deposits B, C, D, E and A.

3) To prepare an up-to-date set of maps for the area as a whole and for individual deposits where necessary.

Method:-

The iron formation would be located and outlined by magnetometer and possible electromagnetic surveys and then mapped.

As this would be mainly fill-in work on known deposits it should not take precedence over more direct exploration but should be set up as a project that could be worked at intermittently by dividing the area into a number of smaller jobs that could be completed one at a time.

Time would have to be allowed during the summer months to do geological mapping over areas picketed the previous winter to take advantage of the lines before they are overgrown again.

J. V. Huddart.

ALGOMA ORE PROPERTIES, LIMITED

Memorandum

Goudreau Area -

1.) Although individual pyrite deposits have been mapped in some detail, there is need for systematic mapping of the area between the tracks and Morrison 1 in order to tie the deposits in to an overall, regional interpretation. Such work could outline 1) possible extensions of known deposits, and 2) favourable contact zones not yet investigated.

2.) Some of the known deposits require detailed mapping, e.g. D, B, E, F, A.

This work could be done by geologist and assistant in roughly three months, provided adequate line cutting were completed. A plane table would assist detailed mapping of individual deposits.

"A. M. GOODWIN"
22 March 1960.

ALGOMA ORE PROPERTIES DIVISION
of
The Algoma Steel Corporation, Limited
Inter-Departmental Correspondence

November 9, 1960

Mr. J. E. Worley,
Superintendent-Mines.

Goudreau Pyrite

Introduction

An inquiry has come from the Exploration department regarding possible exploration work in the Goudreau area. Specifically, they ask, 1) what detailed work would be desirable in the immediate future, and 2) what are the long term pyrite requirements.

Review of Goudreau Ore Reserves - (All open pit, direct shipping ore):

Assured	-	296,000 tons	(as of January 1, 1961)
Indicated	-	730,000 "	
Possible	-	500,000 "	(representing possible extensions to "C" deposit, together with "B", "D", "E" and McPhail deposits.)

In summary, the total open pit, direct shipping ore reserve are in the order of 1.5 million tons, or 5 years supply at current rate of consumption.

Further Goudreau ore requirement over and above these reserves would presumably be met by, a) underground operations, b) open pit, beneficiated ore, or c) discovery of new deposits, or extensions to known deposits.

Ore Requirements

Short term - the assumption is made that some pyrite will be required during the period of present sintering operations which may last another 3 years. Current consumption is 300,000 tons annually. Therefore, the short term pyrite requirements may be in order of 1 million tons.

Long term - pyrite requirements of the proposed roasting process are uncertain.

In view of the above situation, the question arises as to how much exploration work should be carried out in the Goudreau area to satisfy both short term and possible long term requirements.

Comments and Recommendations

1. Short Term:

a) "A" Deposit - detailed mapping and geophysical surveys (magnetometer and E.M.) are desirable in order to explore for possible extensions to the ore body before further drilling.

b) "C" Deposit - ground work as in a) above required in order to explore in detail the area of "C" extension. It would be advisable to have this completed before further drilling in this area.

c) Others - The "B", "D" and "E" deposits are relatively small, flat lying pyrite bodies. Limited work has been done on them. Their flat lying nature and proximity to Goudreau station (they lie west of the "C" deposit) are attractive features. A limited amount of ground work would probably reveal their ore and grade potentials.

2. Long Term:

The need for long term pyrite requirements at the mine are uncertain at present. However, the following points suggest that it would be in the interest of the mine to support any long term, systematic investigation of the Goudreau area. ~~Long term pyrite requirements are a possibility.~~

a) Goudreau represents a favourable area for discovery of new pyrite deposits or significant extensions to known deposits along the favourable acid-basic volcanic contacts. Additional pyrite reserves would presumably be of general value to the company even though not used at the mine in the near future.

b) Ground surveys of the type required to investigate the favourable contact zones are time consuming. This applies not only to actual field work, but to proper interpretation and evaluation of the results. This type of work, in addition, is relatively inexpensive. It could possibly be carried on by the exploration department at their convenience over a period of years.

Conclusions

1. A limited amount of surface work is required on the "A" and "C" deposits, plus possible work on the "B", "D" and "E" deposits.

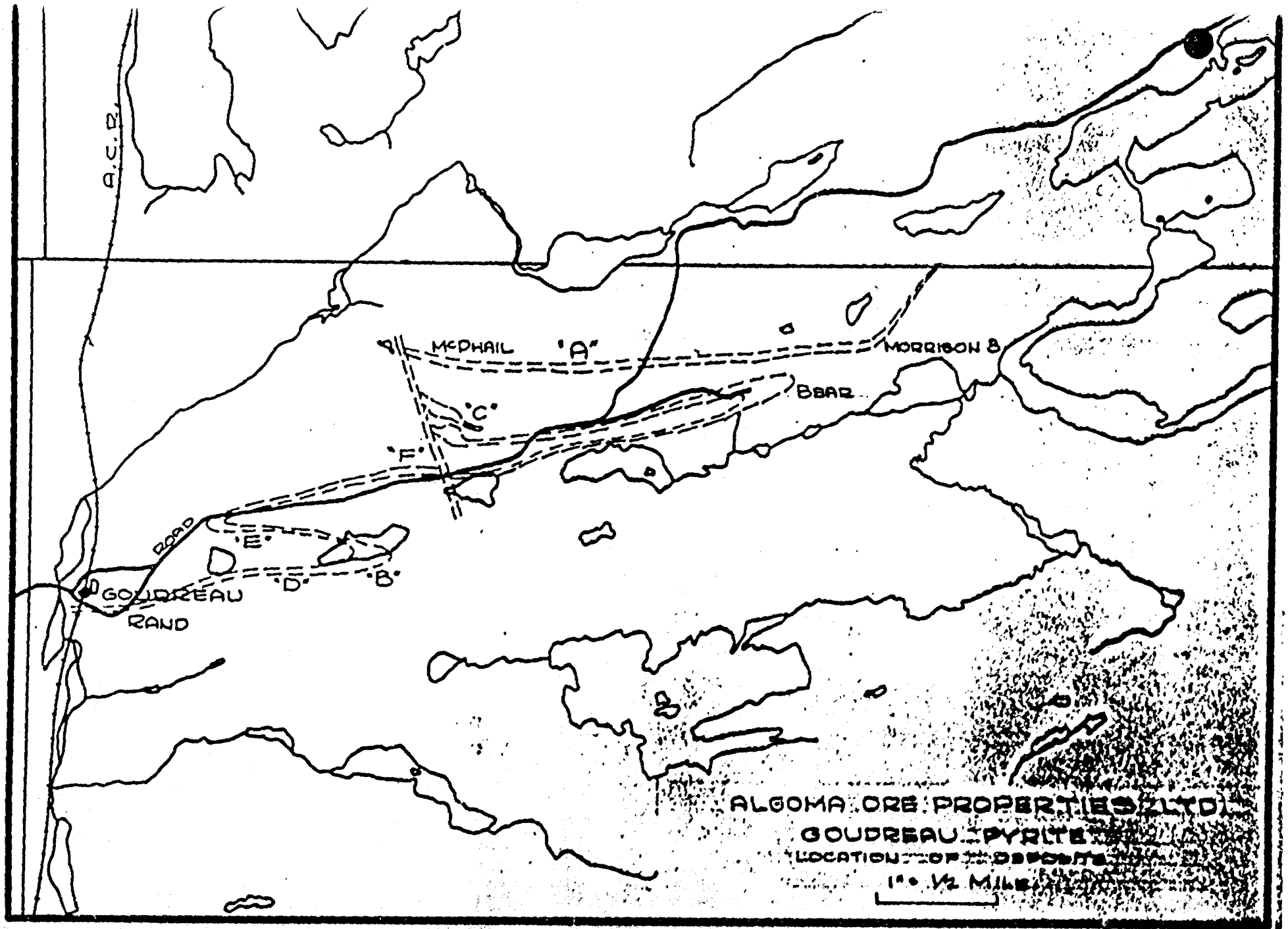
2. Any long term investigation of the Goudreau area should be supported particularly while long term pyrite requirements at the mine

remain a possibility.

A. M. Goodwin.

AMG:gr

cc: Messrs. R. F. Palmer (2)
E. W. Cokayne
G. S. Gilbert
J. V. Huddart


A.C.R.
McPHAIL
'A'
MORRISON &
BBAR
'C'
'F'
ROAD
'E'
'D'
'B'
GOUDREAU
RAND
ALGOMA ORE PROPERTIES LTD.
GOUDREAU PYRITE
LOCATION OF DEPOSITS
1" = 1/2 MILE

Superseded

Drill Program - Goudreau

First drill the McPhail with seven holes spaced 400 feet apart drilled at a vertical angle of 30° and to a depth of approximately 150 to 200 feet depending on the width of ore encountered.

If results obtained were comparable to those obtained on the "A" property, further drilling at 100 foot intervals would be carried out. This program would amount to approximately 5,000 feet of drilling at $3.75 per foot or $18,750. plus approximately 20% for moving at $22,500.

While this drilling was being carried on a magnetometer survey of the western continuation of the Bear deposit should be completed. This would take three men one week to complete.

If the first two holes on the McPhail failed to give the required grade or widths we would then move to the west end of the Bear deposit and drill eight 300 foot holes drilled at a vertical angle of 30°.

The Bear deposit has already been drilled on sections 200 feet apart.

Sulphur values are good in these intersections but we know nothing of the silica values. The eight holes would be drilled midway between the presently drilled sections, so that including the previous drilling of two holes on the McPhail we showed to be a total footage of 2400 feet @ 3.75 + 20% = $12,500. Should the first four holes not disclose the grade, widths, etc. required, we would then move to the Rand No. 1 and drill ten holes to fill in between our present holes Nos. 1 to 6, which are very widely spaced.

This would mean a total of two holes on the McPhail, two on the Bear and ten on the Rand No. 1 or 3,500 feet @ 3.75 + 20% = $15,600.

Drill Costs

McPhail Complete	-	$22,500.
2 McPhail holes 8 Bear holes	-	$12,500.
2 McPhail holes 2 Bear holes 10 Rand No. 1 holes	-	$15,600.

In order to complete this program we should allow for the maximum program, 5,000 feet of drilling at 3.75 per foot plus 20% of this cost for moving the long distances between set ups, or a total of approximately $22,500, plus 1,500 for supervision, engineering, etc. $24,000.

G. S. Gilbert.

April 21st, 1958

GOUDREAU PYRITE

Proposed Drilling Program

Purpose:-

To locate and outline 1/2 million tons of high iron, low silica, pyrite ore that can be readily mined by open pit methods.

Estimated Cost:-

$30,000.00

Areas selected for investigation:-

1. The McPhail Deposit.

This property is the westward continuation of the "A" Deposit. The "A" Deposit contains some good grade, low silica, pyrite ore but its location is poor for an open pit. The McPhail showing is suitable situated for pit mining and the possibility that it might contain the required ore should be tested.

There is no drilling on the McPhail claims except for one hole at the boundary between the McPhail and "A" Deposit. This hole cut 123' of pyrite material at a depth of 250'. Within this zone there is a 40' section which gave the following assays:-

Fe	SiO2	S	Mn
42.72	4.98	30.13	1.11

2. The Bear Deposit.

The Madoc Mining Company drilled 38 holes in the property in 1914, outlining a shallow pyrite deposit containing about 10,000 tons/vertical foot on a length of 1200'.

The drill core was assayed only for sulphur and it is recommended that the deposit be sampled by several diamond drill holes to indicate the iron and silica content.

3. The Rand #1 Deposit.

Six holes over a length of 2800' have been drilled on this Rand deposit intersecting the pyrite at depths between 250' and 350'. This drilling indicates the possibility of obtaining the required tonnage with a reasonably low silica content by selectively mining narrow widths over a long length or by mining wider widths and hand cobbing the material to reduce the silica.

Procedure:-

a) Ground surveys to be carried out on the McPhail property followed by test drilling if this is warranted by the survey results. Four holes should be sufficient to indicate the properties possibilities.

b) Four holes to be drilled on the Bear Deposit to indicate grade.

c) The results available on the three properties to be assessed and areas chosen for detailed drilling. This detail drilling should be at 100' intervals to prepare for the small scale, selective mining operation that is being considered.

Costs:-

It is estimated that 5000' of drilling will be required to complete this program.

Drilling costs: 5000' @ (approx.) 3.75/ft.	=	$18,750.00
Plus 20% of this figure for moving, road cutting, etc.	=	3,750.00
Assaying	=	3,000.00
Preparation, supervision, etc.	=	4,500.00
		$30,000.00

Sault Ste. Marie, Ontario.

July 25, 1962.

Mr. E. W. M. Cokayne,
Chief Mine Engineer.

Goudreau Area Exploration

The pyrite deposits in the Goudreau Area occur along a volcanic contact that extends from the A.C.R. tracks eastward for about 12 miles. Most of the known deposits of significant size occur within 3½ miles of the tracks, i.e. between and including the Rand #1 and the Morrison #3 deposits, the exceptions being the Morrison #1 and the Bearpaw Lake Deposits, which are located farther east. The rocks in the area have been subject to intense folding and faulting.

In 1961 a program of exploration was proposed and approved for the western 3½ mile portion of the contact area. It was divided into two parts. The first part was to be the investigation of the area containing the Morrison #3, the "A", the McPhail, and the "C" deposits. The second part was to cover the remaining favourable ground from the "C" deposit westward to the A.C.R. tracks in which the Rand #1, the "D", the "E", and the "F" deposits occur. Work was started late in 1961 and has continued intermitted since then.

Magnetometer and electromagnetic surveys have been completed on Part I of the proposed program but some geological mapping remains to be done. E.M. surveys were not possible on the Morrison #3 deposit and part of its westward extension because of interferrence from the power line paralleling the pyrite zone.

The magnetometer survey indicates the contact zone but the area of high magnetic intensity does not necessarily coincide with the pyrite mineralization. The vertical loop and horizontal loop electromagnetic instruments were tried and both reacted well to the sulphide zones; however, it was decided to use the horizontal unit for most of the work as this gave a better width indication. Mapping to date has not located any new pyrite outcrops of significant size (i.e. all major outcroppings of pyrite were previously known). Its chief purpose will be to aid in interpreting structure.

Several locations seem to warrant some further investigation to (a) test for potential pyrite ore and (b) to obtain rock intersections to guide the interpretation of geophysical data in this area and to evaluate the techniques being used.

It is recommended that the following five locations be tested by diamond drilling:

1) "A" North Zone

A conductor 500 feet long and 50 feet wide is indicated 500 feet north of the east end of the "A" deposit. No outcrops were found.

2) "A" East Zone

A conductor about 50 feet wide is indicated extending from near the east end of the "A" ramp 600 feet east to where it is offset north by a fault or fault dike. No rock outcrops were found on the conductor.

3) McPhail Deposit

The surface geology of this deposit as mapped by A. M. Goodwin shows a 35' horizontal width of pyrite bounded on the south by limestone that averages about 100' in horizontal width. (See report and map by A. M. Goodwin - McPhail Pyrite Deposit June 17, 1958.)

The E.M. survey indicates a broad conductor extending in many places over the ground mapped as limestone and it is proposed to re-examine the deposit to study the feasibility of a structural interpretation that would account for the apparent conductor indicated by the E.M. work.

4) "C" West

In the area west of the "C" dike a relatively narrow continuous conductor was traced for about 1000' and north of this several short disconnected lenses are indicated. Outcrops suggest that the area is covered by basic volcanic rocks with minor acid bands. One outcrop of granular silica was seen.

The McPhail and the "C" deposits represent respectively the north and south limbs of an anticline with the "C" north and south zones representing secondary anticlinal axes on the south limb. It is suggested that the conductors located west of the dike represent continuations of these secondary anticlinal axes that have been displaced downward by fault movement along the line followed by the diabase dike. The presence of granular silica at one location seems to indicate a shallow covering of basic volcanics.

5) "C" East

There are indications that the "C" south portion extends eastward with some width to the vicinity of a major N.W.-S.E. trending diabase dike. This would take it about 600 feet past the area previously investigated. Overburden may present a problem in this eastern portion.

Work on Part II of the original program will proceed whenever personnel are available.

Pyrite - General

In 1958 the mine began using pyrite as a fuel in their sintering operations. They found that in addition to its fuel value it apparently improved the quality of the sinter. Approximately 16,000 tons were used in 1958, 150,000 tons in 1959, 227,000 tons in 1960, and 204,000 tons in 1961. About 200,000 tons a year or 25,000 tons

a month except during the four months of the growing season are required to maintain the desired 5.5% S. in the sinter plant ore feed. With the introduction of screening and the increase in sinter returns it will be desirable to increase the sulphur in the feed to about 7.5% or about 40,000 tons a month.

Planning for the use of pyrite has always been on a short term basis. Some reasons for this have been:

a) Initial uncertainty as to the effect of pyrite on the sinter.

b) Pyrite is a relatively high cost iron ore and its value as a fuel had been demonstrated only on the method of beneficiation presently in use at the mine. Active research and planning had been in progress on the conversion to roasting and pelletizing processes and the value of pyrite in roasting was uncertain.

The date for conversion to magnetizing roast has now been moved into the future, probably ten years or more.

c) Government concern over sulphur fume damage to vegetation.

(The company is co-operating with government officials in seeking a solution to this problem.)

Conclusions

1. Pyrite apparently has a beneficial effect on the structure and grade of MacLeod sinter.

2. Pyrite is profitable in its own right. Its sinter value plus fuel credits give it a lower cost per ton than MacLeod sinter.

3. Its continued use for at least the next ten years seems desirable.

4. The aim with regard to reserves should be based on a similar period.

Goudreau Pyrite

The pyrite ore used to date has been mined from the Goudreau deposits. There are a number of pyrite occurrences in this area and all of the more significant ones are owned or held under lease by this company. Because of the apparent quantities of massive sulphides the area has always been considered to be of potential importance and work has been done intermittently on individual deposits and along sections of the favourable volcanic contact. A sustained, systematic study had not been made however as a use for the pyrite had not developed to give the deposits a commercial value.

The use of pyrite in sintering at Nava created a new interest in the area but as its continued use was uncertain emphasis was on proving sufficient tonnage at known occurrences to meet the needs of one or two year periods.

It now appears that the demand for pyrite may increase and continue for an indefinite time thus requiring substantial reserves. Goudreau is a favourable area in which to look for these reserves.

Some Recommendations for Goudreau

1. Establish a resident geologist in the area. There is the need for someone who would be familiar with the preliminary exploration (now done by the exploration department) and the later development drilling and mining operations (now supervised by the mine). He would correlate all the available information and aid in planning and guiding all work in the area.

He could also familiarize himself with the Michipicoten Iron Range and particularly with the Bartlett, Ruth and Lucy properties.

2. Continue preliminary exploration of the general area. This should include exploratory diamond drilling.

3. Detailed investigation by diamond drilling of any promising locations followed by development drilling of any deposits scheduled for early operation. The Morrison #3 deposit is listed in the mine schedule for Goudreau production as 130,000 tons to be mined in early 1964. This tonnage figure is based on a study of early records of the deposit and from some preliminary drilling by the exploration department. If scheduled for production in 1964, the class of reserves of this deposit should be improved in the near future.

4. Beneficiation of the Goudreau ore should be considered. In the present operations material containing 15% or so waste is discarded. By high-grading the deposits in this manner the lower grade material is converted into waste as it is not probable that there would be any future increase in the value of pyrite sufficient to make reworking of this material, by itself, economical. Careful study should be given to obtaining the maximum tonnage economically possible from such unrenewable resources.

5. Underground mining should be considered as a possibility and exploration should not be restricted entirely to material that can be mined by open pit methods.

6. Tax exemption for the Goudreau area should be further studied (see report by D. A. Machum - Goudreau Pyrite Deposits - Background and Tax Considerations - December 21, 1960)

Sayer Lake Pyrite - Siderite

This high sulphur siderite body lies immediately west of the MacLeod shaft pillar. The iron and silica grade is of the same order as Goudreau ore but the sulphur content is about 14-15% as against 25% plus, for Goudreau.

The deposit has been drilled quite extensively to a depth of 100 feet and there is one hole intersecting the zone 500 feet down and another at 900 feet. It is believed to be a triangular shaped body 60 feet thick and 1000 feet long near surface but tapering toward a zero length at a vertical depth of about 1000 feet.

The proven or class I ore reserves are calculated as 193,000 tons (sufficient fuel for about five months operation at 5.5% sulphur in the ore feed), the class III reserves at 1,058,000 tons, and it is considered possible that the deposit could contain up to 3,000,000 tons. If about 1,000,000 tons of ore can be proven the cost per iron unit including fuel value would be about 3.7 cents or slightly higher than Goudreau. If 3,000,000 tons can be proven the cost per iron unit would be about 2.8 cents or somewhat less than Goudreau. (E.W.M. Cokayne - Sayer Lake Exploration - March 1962)

The need for reserves of fuel ore and the economics of a Sayer Lake deposit containing a million or more tons makes this an important project for investigation. However the proposed expenditure of around $100,000 for rock work at the H-2 level to prepare for diamond drilling does not seem warranted without more definite indications that the required tonnage will be found. Unless there is some reason why surface drilling cannot be continued it would seem advisable to proceed further with the exploration of the deposit by this method before resorting to expensive rock work.

Assuming the body is wedge shaped in the longitudinal plane with the point of the wedge 1000 feet below the surface three quarters or 2¼ million tons of the hoped for 3 million tons lie between surface and 500 feet. The first stage of exploration should only concern itself then with this upper 500 feet.

Suggested Surface Drilling

Note: Drilling should be done if possible from north to south, i.e. drill off Sayer Lake in the winter. This would mean a substantial saving in footage.

1. A series of four holes at 200 feet intervals to intersect the zone at about 300 feet below the surface or approximately at the same elevation as D.D.H. 1255.

2. Depending on the results of (1) drill two holes 200 feet apart to intersect the zone at about 500 feet or approximately at the same horizon as D.D.H. 1256.

If drilling is done from north to south the footage involved would be about 2,000 feet for (1) and about 1,500 feet for (2). The cost would probably be around $10,000.

This work would guide further exploration of the deposit.

J. V. Huddart,
Ass't. Supt. - Exploration.

JVH/ae

cc: C. H. Beck
G. S. Gilbert ✓

Sault Ste. Marie, Ontario.

September 12, 1962.

Mr. E. W. M. Cokayne,
Chief Mine Engineer.

Goudreau Pyrite
Diamond Drilling - Progress Report

Approximately 4,000 feet of diamond drilling has been completed in the general McPhail A and C areas at five different locations.

1. North Conductors

North of the Morrison 3-A - McPhail contact a number of relatively low intensity anomalies were picked up. One of these about 500 feet north of the east end of the "A" pit was tested by a drill hole. About 15 feet of mixed silica, pyrite and chlorite schist followed by about 10 feet of fair pyrite - siderite material was intersected.

These north pyrite bands are probably not part of the main pyrite horizon but represent a horizon (or several horizons) stratigraphically above the main zone. These secondary bands are not likely to be important as a source of pyrite. They could be valuable as marker horizons to aid in locating faults and folds in the main zone.

2. "A" Deposit - East Extension

Four holes were drilled east of the "A" pit at 200' intervals. Number 1 hole on 14+00 E. did not intersect the pyrite. The other three holes gave an average core length of about 60 feet assaying 41% Fe, 7% SiO2, and 31% S.

A segment of the pyrite zone between 14+00 E. and the start of ore in the pit at 8+00E. may have been faulted 3 - 400' south by two parallel faults. The fault in the vicinity of 14+00 E. could be dipping flatly eastward cutting off the pyrite at a shallow depth and hole A-1-62 may have gone under it. The geophysical indications of a conductor on this line are good.

Hole A-4-62 was located too far north thus the deep intersection (177'-220'). The hole had been located with regard to the E.M. indications and these had proved generally correct in previous holes but checking based on this drilling showed there the E.M. technique could be improved. The "C" and McPhail locations were resurveyed before drilling.

Recommendations:

It seems probable that a pyrite band 30' - 60' wide extends from the "A" to the Morrison #3. (From east part of the "A" at 14+00 E. to the Morrison #3 proper is a distance of one mile.) It will be interrupted by faults and dikes.

E.M. surveys could not be done past 24+00 E. due to power line interference. East of here the favourable contact area has been indicated by magnetometer only and other methods of outlining the zone should be tried. Self potential units are presently being tested.

This should be followed by diamond drilling which could be as part of the investigation of the Morrison #3 deposit.

3. "C" East Extension

East of previous work at this deposit a broad saucer shaped conductor extending east to a major dike was outlined. East of the dike the power line cut off the E.M. but no strong contact zone was indicated by the magnetometer.

Five holes were drilled. The pyrite zone seems to be thin and flat lying with some high silica sections. Hole C-1-62 was apparently drilling with the dip and was stopped without intersecting the pyrite zone. Overburden in places reaches a thickness of 30 feet.

Recommendations:

The area should be tested by a series of short vertical drill holes to check on the possibility of a roll in the bed that might make minable material. Also it might be possible to extend the present proposed "C" pit further east particularly in the north portion where the overburden is lighter.

4. "C" - West Extension

Two conductors west of the "C" dike were each tested by one diamond drill hole.

Narrow bands of lean ore, granular silica, and limestone were intersected and no further work is recommended for this area at present.

5. McPhail Deposit

Five sections at 400' intervals were drilled and this is being followed by drilling at 200 foot intervals.

Present indications are that the property can be divided generally into two portions separated by the dike that crosses the zone at 14+00 E. (McPhail chainage).

In the west portion the pyrite seems to occur along a fairly predictable horizon and is of generally uniform grade. East of the dike its location and grade seems more erratic.

Prior to completion of drilling and assaying, it appears that the west section may contain a lense of ore 500' - 600' long and about 50' wide. The grade as indicated from 2 holes is Fe 40%; SiO2 6%; S. 38%. To outline an ore zone east of the dike may be a difficult problem.

Plans are being forwarded under separate cover.

J. V. Huddart,
Ass't. Supt. - Exploration.

JVH/ae

Encl. - Preliminary logs.

cc: Messrs. C. M. Book
G. S. Gilbert

D R A F T

ALGOMA ORE PROPERTIES DIVISION

THE ALGOMA STEEL CORPORATION, LIMITED

EXPLORATION DEPARTMENT

GEOPHYSICAL REPORT JULY, 1964

Introduction

Work done in the Goudreau area during July was a clean-up of winter lines.

These lines were surveyed using both a Sharpe A-2 Vertical magnetometer and Ronka Horizontal Electro magnetic unit.

A geological survey was also carried out at this time.

To date, all work outlined last winter and spring has been completed for several areas. These areas are:

(a) Wysor Lake area - to be completed after freeze up

(b) Graveyard Lake (Rand Deposit), completing after free up

(c) Jarvis Deposit, South of road in wet swamp, to be completed after freeze up.

(d) A General Self Potential survey to be completed when time permits.

The work done this month was done in certain areas and will be explained as such.

Rand Deposit

Work done on this zone was East of the already proven Rand Pit. Cross Section 8 to Cross Section 22. Results of the survey were:

(a) A definite H.E.M. anomaly 1,400 ft. in length averaging 24' in width.

(b) Magnetic anomaly occurring along the H.E.M. zone

(c) Anomaly caused by Iron Sulphides with a percentage of magnetite.

Having completed the survey, the results are on file and recorded both on 50' to the inch and 200' to the inch sheets. Remaining work on this zone is winter work.

Readings both H.E.M. and magnetometer were recorded at 25' intervals. A total of 5.5 miles was traversed.

"D" Deposit

This deposit is located North and East of the Rand deposit.

A.H. E. M. survey outlined an interest zone at 3 + 005 on lines 24 + 00 W to 30 + 00 W.

This zone averages 85' in width and is caused by iron sulphides with the same concentration of magnetic material.

Three and one half miles were traversed and recorded on the field sheets using the standard scales.

Jarvis Deposit

Work on this zone was limited due to heavy swamps and power line interference. An interesting H.E.M. anomaly south of the Pocklash Rd was noted.

This area is in a wet black spruce swamp, and a knowledge of width and length of anomaly will not be determined until after freeze up.

Wysor Lake Area

Work in this area was also limited, due to the lake.

Magnetometer work was done before breakup and outlined an interesting magnetic anomaly south the the lake. This anomaly was investigated and found to be sulphides and magnetic material again, but an H. E. M. survey will prove most interesting across Wysor Lake. This work is recommended after freeze up.

Bear Deposit

A most interesting anomaly was outlined both South and North of already proven Bear pit.

North anomaly was located as such:

Line 30 + 00 E to 40 + 00 W at 9 + 00 N averaging in width to 110'.

This zone can not be traced further east due to the location of the Bear pit. A base line North of the Bear Pit and cross sectional lines cut off of this would outline North contact.

A southern anomaly of equal interest occurs on lines 28 + 00 E to lines 38 + 00 W.

The anomaly occurs at 4 + 00 N throughout the anomaly.

Average width 75'

Magnetics are more defined on the Northern anomaly.

Drilling is recommended on the Southern zone.

The mine dept. did a limited amount on the Northern zone but more drilling would gather more knowledge on formations.

Conclusion:

The amount of work done in Goudreau at this time brings the Goudreau area more closer to an end.

A code map of the Goudreau area is now being drawn up, and future work will be concentrated North and East of Wysor Lake.

ALGOMA ORE DIVISION
THE ALGOMA STEEL CORPORATION, LIMITED
SAULT STE. MARIE, CANADA

May 23, 1967.

Mr. J. E. Barber,
Assistant to Vice President - Operations.

Re: Preliminary Estimates for Goudreau Pyrite Development

Attached are estimates arising from the meeting with representatives of Allied Chemical Canada Ltd. on February 28th and March 1st, 1967.

These estimates are pre-design and preliminary in nature only and are considered only sufficient to test the soundness of further investigation into Allied's proposals.

It must also be pointed out that these estimates do not cover the full scope of the project at this time as we have only been requested to provide estimates for the cost of producing ore and concentrates.

It is believed they answer Allied's queries as fully as possible at this time and should set the stage for a further meeting if it is considered warranted.

J. G. Morrow provided considerations of milling plant capital and operating costs. J. V. Huddart was contacted in regard to exploration costs.

W. A. Jarvis

WAJ/jm

W. A. Jarvis
Senior Project Engineer

Copies: Messrs. J. E. Barber(3)
J. V. Huddart
J. G. Morrow

Encls.

May 23, 1967.

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W. A. Jarvis
Senior Project Engineer

Copies: Messrs. J. E. Barber(3)
J. V. Huddart
J. G. Morrow

Encls.

ALGOMA ORE DIVISION
THE ALGOMA STEEL CORPORATION, LIMITED

PROJECT ENGINEERING

GOUDREAU PYRITE DEVELOPMENT

(1) SUMMARY

A preliminary estimate indicates that Goudreau pyrite could be mined, beneficiated and separated into an iron sulphide concentrate and iron carbonate concentrate at a cost of $4.80/gross ton of ore treated.

The above cost includes write-offs and depreciation, the rates for which are calculated on the tonnage required for a 20 year project, but excludes the cost of interest on the money invested.

Pre-production funds required to accomplish the above mining and treatment only is estimated at approximately $11,000,000.

Transportation costs beyond Goudreau are not included in the above cost as several transportation alternatives may eventually be considered. Estimates are provided for some of the transportation alternatives.

Although it is normal to show costs as a cost per ton of product it is not done in this case as there is more than one end product. The estimate as presented can be used as a base however for discussions to determine if further investigation is warranted.

A preliminary estimate of pre-production funds required is given on Table 1 while Table 2 is a summary of post production capital costs depreciable and total capital costs depreciable. A summary of estimated costs is provided on Table 3, with estimated mining costs on Table 4 and milling costs on Table 5. Fuel oil cost estimates are provided on Table 6

(2) ORE RESERVES

A detailed assessment of ore reserves is being done by the Exploration department. Due to time limitations it was not possible to include the results as a part of this study. It was therefore necessary to make a rapid preliminary assessment to form a basis for cost estimates.

(2) Ore Reserves Continued .....

In past, during the first world war and in the 1958 to 1963 period, mining was all by open pit mostly in shallow surface folds where ore was exposed at surface in larger quantities. Some mining of steep limbs was done particularly on the Rand and "A" deposits. The latter mining period proved to be costly for open pit mining as is shown on Table 7 where average costs for the period are shown as approximately $2.84/gross ton of ore loaded on railway cars. These costs are high in part due to the low mining rate (823,000 G.T. in approximately five years) but also due to the considerable overburden and face waste mining necessary to produce the ore. An abnormal amount of diamond drilling was also necessary to delineate the ore zones which often were complex. The only economic justification for our mining of Goudreau pyrite in this period, in favour of Wawa siderite was by the savings in fuel for sintering although other physical factors were involved at the time which were of greater importance.

A preliminary estimate of possible ore sources is shown on Table 8. As most of the known surface zones have been mined out by open pit mining most of the tonnage required to justify a plant for a 20 year project will have to come from underground sources.

Over 400,000 gross tons of pyrite is proven and immediately available for open pit mining in the "C" extension pit. It is likely that a similar open pit tonnage may be mined in the McPhail and Morrison 3 zones which should probably be open pitted initially to clear off surface overburden. Other possible sources may be the "B", "D" and "E" deposits which received preliminary exploration in Goudreau's early history but very little since.

The outlook for large tonnages of open pit ore is not optimistic and the total has been held at one million gross tons for the purposes of this report although even this tonnage is not certain.

The possibilities of underground ore tonnage are more hopeful. At present there are four known zones each approximately 1,000 feet in length which are located on steep dipping limbs of the iron formation,horizontal widths average approximately 55 feet.

The first of these, the Rand deposit located near the railway track at Goudreau, was mined during both mining periods by open pit.

The others including the McPhail deposit "A" deposit and Morrison 3 deposit are located on the north limb of the iron formation and commence at a point 1½ miles north east of Goudreau station. The deposits are distributed over a two mile length to the east of this point. This north limb at present appears to contain the major potential for reserves. In most cases the zones have been well drilled at surface and have occassional deeper holes which show the formation continue to depth.

(2) Ore Reserves Continued .....

From the widths encountered at surface it is estimated that it would be necessary to mine all four zones to a depth of one thousand feet below the open pits to obtain project tonnage requirements of about 17 million gross tons of recoverable ore.

A preliminary estimate of the cost of proving this reserve to the point where capital expenditure may be warranted is $375,000. This involves some 50,000 feet of diamond drilling and would take 9 to 12 months to complete.

A detailed assessment of grade was not made for this study. From review of the drill logs and with past mining experience in mind it is expected the grade would approximate 37.5% Fe, 9.0% SiO2 and 25.0% S as delivered to a mill site.

No attempt has been made to estimate the percentage of ore that may be recovered as a direct ore (high sulphur, low silica) and as a concentrating ore(low sulphur, high silica) partly because there is not sufficient drilling on which to base an estimate. It is considered that very little ore could be mined as direct ore from underground due to narrow mining widths and waste bands within the ore. Experience in open pit mining showed it was difficult to predict where waste bands would cut the ore. Flat sill dikes were encountered that were often missed in the exploration drill holes.

A selective mining system would tend to increase mining costs. Additionally in the milling scheme proposed there would be no need for segregation of ores.

(3) MINING

It is anticipated the open pit ore would be mined out in the initial stage before underground ore could be developed sufficiently to supply full requirements. It is also anticipated this would be done by a contractor as the tonnage would not justify purchasing open pit mining equipment.

It is estimated that approximately 850,000 gross tons of ore per year would be required for the minimal sulphur plant requirement of 200,000 gross tons of sulphur in sulphur plant feed per year.

For underground cost development the following was assumed:

There are four ore bodies each containing to a 1,000 ft. depth below open pits	-	5,250,000 G.T.
Estimated non mineable due to wall limits irregularities etc.	-	750,000 G.T.
Remaining to be developed		4,500,000 G.T.

(3) Mining Continued .....

	Developed	Recovered
Tonnage in stopes	2,250,000 G.T.	2,250,000 G.T.
Tonnage in pillars	2,250,000 G.T.	1,750,000 G.T.
Total	4,500,000 G.T.	4,000,000 G.T.

Assumed diluted grade of recovered ore	-	Fe	37.5 %
		SiO2	9.0 %
		S	25.0 %

Each of the four ore bodies would have a combined service and production shaft. Two shafts would be developed initially and two shafts would be in production at all times. Ore hoisting would be at the rate of approximately 1,400 gross tons per shaft per day for a total of 2,800 gross tons per day.

Full capital costs have been allowed for equipping three shafts and surface plants with new equipment. It is assumed the fourth shaft will be equipped from one of the originals and moving and installation costs only have been allowed for the fourth shaft.

Costs have been developed on a 3 compartment timber shaft 10' x 20' in rock size equipped with two 75 cu. ft skips and one 12 man cage. The hoists would be a 4' x 5' double drum grooved for 1" rope. Shaft depth would be 1,400 feet after allowing for the depth mined by open pit, 1,000 feet of mining depth plus allowances for crusher station, loading and spill pockets. Mining levels are at 200 foot vertical intervals.

The head frame would be of timber construction 100 feet in height and painted with fire retardant paint. Surface facilities provided include hoist house, electric load centre, 3-2000 C.F.M. compressors, light repair shop and equipment, dry for 75 to 100 men, central boiler plant, underground ventilation facilities and miscellaneous buildings and mobile equipment. Three 30 ton trucks are provided for ore transportation to the mill site or central shipping point.

For the present shrinkage stoping is visualized as the mining method. This could be converted to open stope mining with long hole drilling if ground conditions permit. Ore would be loaded at draw points and transported to an ore pass by scooptrams or similar rubber tired transporters. Ventilation raises would be provided and serve as secondary escape ways. Ore would be crushed to 5" nominal size in 30 x 42" jaw crushers before hoisting to surface.

Mining development costs were estimated using a mining contractor's current competetive rates. Stoping and production costs were estimated by the same contractor but were modified.

(4) METALLURGY AND MILLING

At present there is a minimal knowledge of the mineralogy and metallurgy of Goudreau pyrite. It is known to be mainly a mixture of iron sulphides (mostly pyrite) with siderite as a fine ground mass.

For the purposes of this estimate it is considered the ore, after crushing underground to nominal 5" size, will be ground to where the bulk is in the 80 mesh range in an autogenous mill. After this it will receive a primary flotation to remove sulphides as a sulphur concentrate and a secondary flotation on the remainder to remove the iron carbonates.

For the purposes of this report it is assumed this will result in tonnages and grades of products as listed in Tables 9 and 10.

It was at first considered that it would be best to establish the estimate on the assumption that a simple gravity concentrate at coarse (-½ size) would be made. This would create a circuit with probably 2 stages of crushing and 3 stages of screening but would not have the material at the size required for the sulphur plant. It would therefore be necessary to add a grinding circuit or fine crushing circuit after coarse concentration.

It was therefore concluded that autogenous grinding to the required sizing for the sulphur plant from run of mine ore followed by two stage flotation may prove to be the lowest cost method.

It must be emphasized however that no test work has been done to establish the amenability of the ore to this proposed treatment. An allowance of $100,000 has been made in mine preparation costs to cover this work.

The flotation method would have the additional advantage of supplying a much higher sulphur feed to the sulphur plant than gravity concentrates. This would probably be of economic importance considering fuel requirements in the sulphur process.

As most of the ore is centred around a point some 2 to 2½ miles east of Goudreau it is assumed the original rail line will be relaid and a loading siding established. This also means a new access road from Goudreau to the mine sites will be required as the old rail bed currently serves as road access. These items have been considered in cost estimates.

At this time the actual location of the various plants required is not considered due to the many possible alternative sites. This would be unrealistic until the general economics as inferred by this report are considered. A list of transportation cost estimates for ore from Goudreau to Sault Ste. Marie, Wawa and Michipicoten Harbour are appended to the summary of estimated costs Table 3. At this stage it is assumed that flotation concentrates may be in the same order as the process has been largely one of separation to this point.

(5) TOWNSITE - SERVICES ETC.

No estimate would be complete without consideration of possible townsite costs to house employees. For this estimate it is assumed that no townsite will be built at Goudreau. It could be expected, with a 20 year capital commitment of this nature, that a road built at government expense would be extended from Hawk Junction a distance of 13 miles. Hawk Junction is 16 miles from Wawa by paved highway. It is expected then that Wawa would provide the necessary townsite facilities with employees travelling the 30 miles by road to work. This is not uncommon in many areas.

Power is available from the Great Lakes Power Co. Ltd. at Goudreau. Whether or not the lines have sufficient capacity for an operation of this size has not been determined. In any event it would effect production costs only slightly if new lines are required as their policy at present is to charge the consumer with the cost of new lines but refunding the cost at 15% of annual power bills.

Water supply - No major rivers flow near Goudreau therefore it is most likely mill water would have to be reused if a grinding and flotation plant was at Goudreau. McVeigh Creek flowing through Goudreau may provide sufficient water under these circumstances. An alternate source may be Goudreau Lake to the east.

W. A. Jarvis

WAJ
May 23, 1967.

ALGOMA ORE DIVISION

THE ALGOMA STEEL CORPORATION, LIMITED

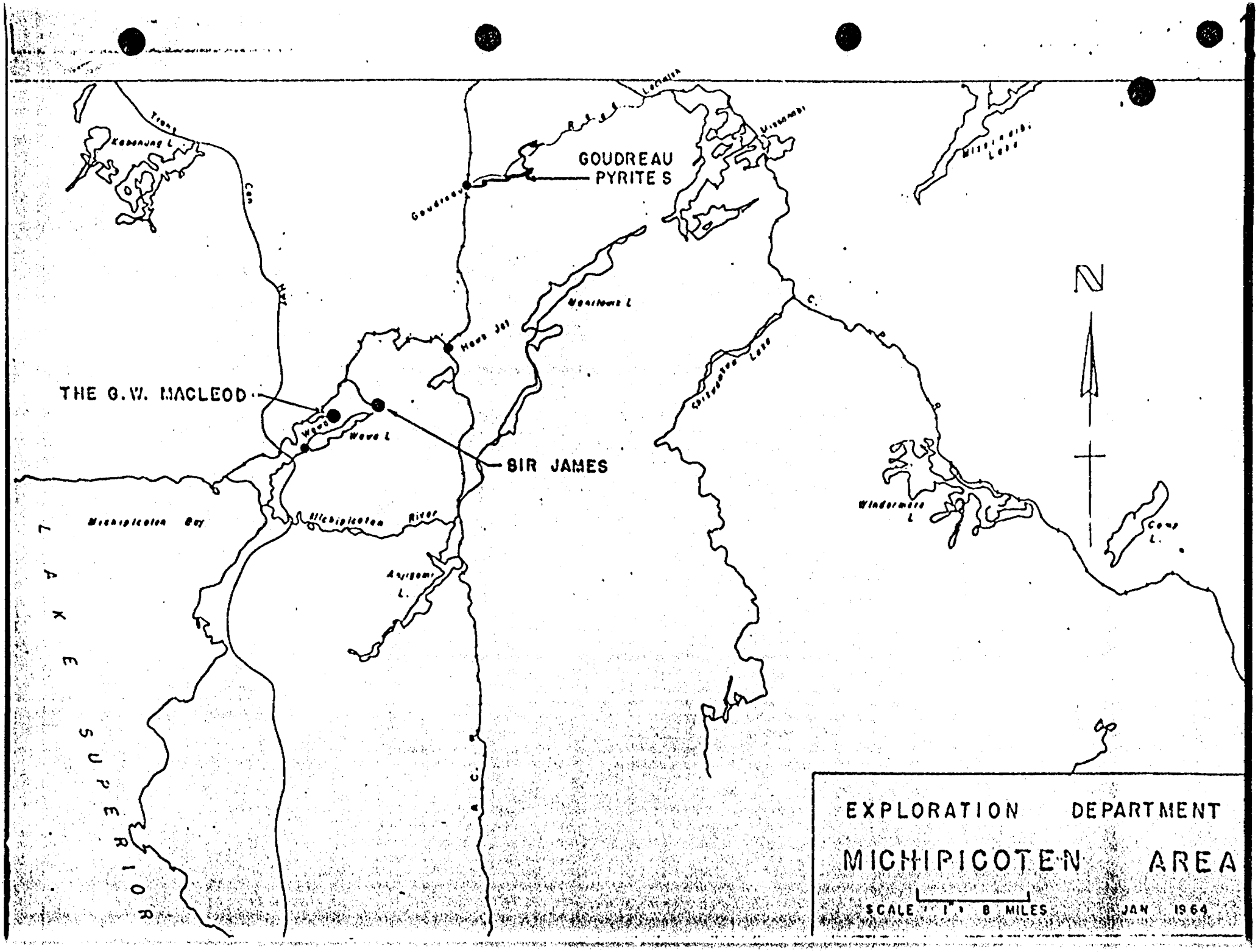
EXPLORATION DEPARTMENT

REPORT ON GOUDREAU PYRITE

May 26, 1967

P. Leahy

CONTENT


GOUDREAU
PYRITE S
THE G.W. MACLEOD
SIR JAMES
Wawa L
Wawa Jct
Goudreau
Michipicoten Bay
Michipicoten River
Agisemi L.
Windermere L
Conn L.
Collingwood Lake
Wissinaibi Lake
Kamanjab L
Trout
Can
Hwy
Lochalsh
Ruby
Wisamoti
C.
A.C.
LAKE SUPERIOR
N
EXPLORATION DEPARTMENT
MICHIPICOTEN AREA
SCALE 1" = 8 MILES
JAN 1964

INTRODUCTION

The pyrite-rich zones of the Goudreau area i.e. the Rand No. 1, A, etc., have been known since the turn of the century. Over the last 60 years various deposits and parts of deposits have been mined for their sulphur and iron content.

This report presents the results of an investigation to ascertain the quantity of mineable pyrite material still present in these deposits and to investigate the possibility of new mineable zones being found in the immediate area.

PART 1

ESTIMATE OF TONNAGE AND GRADE FACTORS

RAND NO. 1, MCPHAIL, A, AND MORRISON NO. 3 DEPOSITS

ESTIMATE OF GRADE AND TONNAGE FACTORS

RAND NO. 1, MCPHAIL, A, AND MORRISON NO. 3 DEPOSITS

The total estimated pyrite reserve for the four deposits is 24,000 tons per vertical foot containing 37.4 per cent iron and 29.5 per cent sulphur.

The pyrite reserves for the individual deposits are as follows:

Rand Deposit: Zone below Rand pit, from 100 west to 570 east - south Rand base line

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent	Silica Per Cent
670	58	4,300	39.3	30.7	7.64

McPhail Deposit: Zone from 900 west to 2,100 west - McPhail base line

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
1,200	65	8,400	35.1	30.0

A 40 foot wide diabase dyke crossing the zone between 1,360 and 1,400 west has not been given consideration in this estimate of tons and grade.

A Deposit: Zone below A pit from 244 east to 985 east

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
741	63	5,200	42.3	32.9

Morrison No. 3 Deposit: Zone below a depth of 200 feet from 6,200 east to 7,280 east

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
1,080	52	6,100	$35^{+}_{-}2.5$	$25^{+}_{-}2.5$

Cont'd.....

Estimate of Grade and Tonnage Factors Cont'd.....

Additional Figures

Rand Deposit: Zone east of Rand pit from 570 east to 800 east

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent	Silica Per Cent
230	38	975	42.0	29.6	4.47

McPhail Deposit: Zone from 135 west to 850 west

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
715	36	2,855	36.2	29.0

Morrison No. 3 Deposit: Zone from surface to depth 200 feet, from 6,200 east to 7,280 east

Length (Feet)	Width	Total Tons to - 200 feet	Iron Per Cent	Sulphur Per Cent
1,080	Variable	1,600,000	$35^{+}_{-}2.5$	$25^{+}_{-}2.5$

PART 2

NOTES ON INDIVIDUAL DEPOSITS

NOTES ON INDIVIDUAL DEPOSITS

Rand Deposit:

The zone below the Rand pit from 100 west to 570 east has been drilled at approximately 100 foot intervals along the strike. This gives a good picture of the tons and grade in the zone just below the pit. The estimate of quantity and grade of pyrite is as follows:

Rand No. 1: Zone below Rand pit

From	To	Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron %	Sulphur %	Silica %
1+00 west	5+70 east	670	58	4,300	39.3	30.7	7.64

West of the Rand pit the iron formation becomes very siliceous as can be seen in the assays obtained in hole R7 (25.5% iron, 4.0% sulphur, 43.15% silica). This area does not appear to warrant further investigation at this time.

The sparse drilling east of the Rand pit and the electromagnetic and magnetic surveys indicate a thin horizon of pyrite running east from the Rand pit, south of Wysor Lake to the "B" deposit at the south-east corner of Wysor Lake. The area south of Wysor Lake should be remapped and tested by diamond drilling. This drilling could be done with a pack-sack drill.

McPhail Deposit:

The zone on which tonnage calculations were made appears from the drilling to be fairly uniform. The estimate of tons and grade is as follows:

McPhail Deposit: Zone from 900 west to 2,100 west

Length (Feet)	Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
1,200	65	8,412	35.1	30.0

This zone is cut by a 40 foot wide diabase dyke between 1,360 west and 1,400 west. The dyke material has not been included in the tonnage and grade calculations.

Between 900 west and 135 west the pyrite horizon is thin and irregular with grade and tonnage figures as follows:

McPhail Deposit: Zone from 850 west to 135 west

Length (Feet)	Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
715	36	2,800	36.2	29.0

Cont'd.....

Notes on Individual Deposits Cont'd.....

The large conductor widths obtained from the electromagnetic survey over the McPhail deposit are at present attributed to a 10 to 15 per cent pyrite content in the limestone and silica members on either side of the pyrite horizon.

If the results of the gravity survey now being carried out on the west end of the McPhail deposit are relatable to the information obtained by drilling in that area then a complete gravity survey should be made over the McPhail deposit.

"A" Deposit:

The interpretation of the drill sections in the "A" pit was interpolated down to the 870 foot elevation and the tons per vertical foot and grade were calculated at this elevation. The estimate is as follows:

"A" Deposit: Zone below A pit from 244 east to 985 east

Length (Feet)	Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
741	63	5,200	42.3	32.9

The results of the magnetometer survey indicate that a zone of similar dimensions to the "A" pit extends off the west end of the A pit for 400 feet to approximately 200 west where the pyrite horizon is displaced to the north. This material should be proved or disproved by diamond drilling. Deep drilling is required below the A pit to see if the width and grade of pyrite obtained just below the pit bottom continues at depth.

Morrison No. 3 Deposit:

The pyrite horizon of the Morrison No. 3 deposit is from 40 to 60 feet wide and dips at 55 degrees to 80 degrees to the north-north-west. Between the present rock surface and a depth of 200 feet an irregularly shaped mass of pyrite with above average width has been created by folding.

The tonnage and grade factors for the zone between surface and minus 200 feet is separated from the tons per vertical foot estimate calculated for the deposit as a whole.

The tonnage and grade factors for the Morrison No. 3 deposit are as follows:

Morrison No. 3 deposit: Zone from 6,200 east to 7,280 east

Length (Feet)	Average Width (Feet)	Tons per Vertical Foot	Iron Per Cent	Sulphur Per Cent
1,080	52	6,100	35±2.5	25±2.5

Zone between 6,200 east and 7,280 east, total tons and grade for irregular pyrite mass between surface and minus 200 feet.

Length	Width	Total Tons	Iron Per Cent	Sulphur Per Cent
1,080	Great Variation	1,600,000	35±2.5	25±2.5

The following work is suggested as an initial stage to further investigation of the deposit.

Diamond drilling is required to determine whether the pyrite horizon continues at depth with widths similar to those obtained in the near-surface interpretation. It is suggested that holes be drilled on cross sections 6,000, 6,400, 6,800 and 7,200 east to cut the pyrite horizon at a depth of 250 to 300 feet.

The area east of the diabase dyke cutting the pyrite horizon at 7,300 east should be investigated by diamond drilling with the possibility that the type of material found in the Morrison deposit continues east.

PART 3

RECOMMENDATIONS FOR FUTURE INVESTIGATION OF THE GOUDREAU PYRITE DEPOSITS

RECOMMENDATIONS FOR FUTURE INVESTIGATION OF THE GOUDREAU PYRITE DEPOSITS

The pyrite reserves of the Rand No. 1, McPhail, A and Morrison No. 3 deposits must be tested by further diamond drilling. This drilling can be layed out from present information.

The pyrite horizons between the McPhail and A deposits and between the A and Morrison No. 3 deposits warrant further drilling with the possibility of outlining zones of pyrite of mineable dimensions.

Depending on the results obtained from the gravity survey over previously drilled sections of the McPhail deposit a semi-detailed gravity survey on lines right across the iron formation from north to south could outline pyrite zones that do not outcrop and have not been located by previous near-surface investigations. The area east of Wysor Lake should be investigated by a gravity survey based on the east-west trend of the pyrite horizons and the electric conductor obtained on a single line east of Wysor Lake. In conjunction with these gravity surveys detailed geological mapping of the areas between and outside of the known deposits would aid in interpretation.

The above mentioned drilling, geological mapping and geophysical work could be carried out simultaneously. This would obtain results sooner and is the most economical approach.

Included in the above program would be a further evaluation of the Rand No. 2 and other small deposits.

The result of this work would be an accurate picture of the pyrite reserves in the main deposits and the locating of new targets for drilling to obtain new reserves if these exist.

D R A F T

ALGOMA ORE DIVISION
THE ALGOMA STEEL CORPORATION, LIMITED

SUMMARY OF ALGOMA ORE
FILE 2G2-01 (GOUDREAU PYRITE)

1943 to 1966 Inclusive

J. E. Barber

October 23, 1967

FILE 2G2-01 - GOUDREAU PYRITE (Cont'd.....)

March 1, 1951 - Option to purchase with Wm. E. Markes Mining Claims 3001, 3002, 3003 and 3004 in Township 27, Range 25 under lease from ACR and stake 5 additional claims (3 on the South & 2 on the East).

March 26, 1951 - F. M. Passow, Mining Engineer, Sherbrooke, Quebec, interested in an option on the Goudreau Pyrite.

March 28, 1951 - S. E. Wolfe, Dept. of Mining, University of Toronto interested in an option of the Goudreau Pyrite.

March 30, 1951 - W. M. Goodwin advised A.O.D. should get pyrite bulk samples to Ottawa for mill tests to determine best way to obtain pure pyrite.

April 5, 1951 - North America Cyanimid Limited interested in pyrite to make acid for their Welland Plant near Niagara Falls.

April 28, 1951 - J. B. Taylor, Mining Engineer with Kelborn Engineering Co. interested in obtaining a lease on J.L. 16, 21,& 22 in Twp. 27 Range 26 from A.O.D. and Claims 88, 91, 92, 93, 94 and 103 from Algoma Pyrites Co.

August 7, 1951 - Forbes Wilson of Freeport Sulphur wished to secure long term reserves of pyrite. At present (Freeport advised) pyrite or pyrrohtite deposits cannot be considered as economic operations except in certain favourable geographical locations and limited to acid making operations. Thanked George Gilbert for conducting Freeport Engineer, Mr. Eugene Pflieder over the Goudreau Deposits. Advised Mr. Pflieder wrote an interesting report on the sulphide deposits which occur in the iron formation.

October 11, 1951 - C. Michaels of Great Lakes Paper Company Limited interested in Goudreau pyrite. Their consultant Mr. T. L. Dunbar, Montreal.

October 29, 1951 - Great Lakes Paper Company, Purchasing Agent H. G. Rivers, wished to use the Dow Company Fluo Solids installation for the production of SO2 Gas from pyrite.

October 30, 1951 - David D. Haley, lawyer, Hibbing, Minnesota interested in pyrite. Mentioned royalties from Nicholls Chemical Co. were 35 cents per ton of ore mined.

December 20, 1951 - Walter H. Aldridge of Texas Gulf Sulphur Company wrote Sir James Dunn re hoping to meet in New York regarding Goudreau Pyrite.

December 27, 1951 - A.O.D. released Wm. E. Markes from staking 5 additional claims and Markes granted A.O.D. an extension of 6 months on all payments. Mr. MacLeod advised October 17, 1967 these claims were no good.

FILE 2G2-01 - GOUDREAU PYRITE (Cont'd.....)

January 12, 1952 - Preferred Service Co. Indiannapolis advised that Mr. Selvage of Irsurgo Consolidated Mines Ltd. would sell their four claims near Goudreau for $25,000 U.S. no strings attached. Claims 44, 45, 46 & 50 Sec. 24 Twp. 27

February 2, 1952 - Spruce Falls Paper Company. Nouville, Willson & Creswell P.A. saw Messrs. Derrer and Haycock of Algoma re Noranda pyrite - assays which Spruce Falls proposed to use to make sulphurus acid. They wished advice on disposal of the iron units to Algoma.

February 15, 1952 - Irsurgo sent agreement to sell the 4 claims.

August 19 & 25, 1952 Letter
Mr. C. T. Hill Vice President
R. D. Mollison
from phone calls advised will arrive in Sault Sept. 9, 1952.

Sept. 8, 1952 - D. S. Holbrook gave 2 copies of Coverdale-Colpitts informed report "Preliminary Investigation of Iron and Sulphur Recovery from Iron Pyrites for Algoma Steel Corporation, April 1950" to Secretary for the Company files.

Dec. 23, 1952 - Irsurgo offer on 4 pyrite claims for $25,000 U.S. accepted.

Jan. 29, 1953 - L. N. Allen, Chief Chemical Engineer for Chemical Construction Corporation, New York, acknowledged visit in Sault with Mr. Holbrook during previous week. He gave cost estimates on recovering 70% iron sinter and elemental sulphur by the de Jahn process.

Feb. 4, 1953 - Mr. C. T. Hill wrote Mr. MacLeod assuring him of continued interest in Goudreau and wishing to meet Sir James Dunn in New York.

June 12, 1953 - Mr. MacLeod went to Toronto to see Mr. S. S. Mills of Kingsmill, Mills, Price & Fleming, Barristers, Toronto, about the purchase of Algoma Pyrites for $25 to $35,000.

June 23, 1953 - Dept. of Mines Report MD Test Report No. 595-QD Pilot Plant Run on Pyrite Ores from the Goudreau property of A.O.D. Ltd. Mineral Dressing Division R. J. Taill, Chief.

August 13, 1953 - Mr. Hill, Vice Pres. Texas Gulf wrote Mr. MacLeod advising that Mr. W. H. Aldridge, Chairman and H. R. Wemple of Texas Vice Presidents March 24, 1953. Sir James mentioned D.S.H. had met with Chemical Construction on a new process and A.O.D. were in the midst of acquiring more land (Algoma Pyrites).

FILE 2G2-01 - GOUDREAU PYRITE (Cont'd.....)

February 25, 1954	-	Mr. Hill, Vice Pres. Texas Gulf wrote Mr. MacLeod. Advised had seen Sir James again on Feb. 5th and were to keep in touch.
April 23, 1954	-	White Pine Copper Company, Michigan, interested in pyrite 50 tons a day 3/8" size 95% Fe & S
May 21, 1954	-	Canadian Pyrites Limited, Welmington, Delaware offered for sale the Hollsworth Property for $250,000.
July 15, 1954	-	Mr. Hill wrote Mr. MacLeod regarding a visit by Mr. Dick Mollison during week of July 26.
Aug. 11, 1954	-	Ore Trading Corporation, New York, interested in buying pyrite for Europe.
Feb. 2, 1955 to April 21, 1955	-	White Pine Copper 350 tons per week required.
Jan. 27, 1956	-	Meeting in Sault with Mr. Driver of Noranda re Noranda Sinter (Niagara Falls) and Cutler Sinter mid 1957 and pyrite calcine 14 free cars for treat.
April, 1958	-	A resume of the Goudreau Pyrite Ore Bodies and production data of the Nicholls Chemical Co. G. S. Gilbert - C. M. Beck
March 12, 1958	-	Irsurgo Consolidated Mines Limited. Advised they wished to sell remainder of their interests in Goudreau. Reply by A.O.D. March 18 and May 5, 1958 advising interested in nominal price only - no further correspondence.
Sept. 11, 1958	-	James A. Bates of Temiskaming Construction Ltd. attaching quotation for mining Goudreau Pyrite also MacIssac Tunneling and R. F. Fry & Associates.
Sept. 26, 1958	-	Recommendation by C. M. Beck to G. W. MacLeod with data to start mining Goudreau Pyrite at 450 to 550 tons per day up to 400,000 G.T.
1959 & 1962	-	Notes on mining of Goudreau Pyrite by E. M. Cokayne — June 8, 1959 G. W. MacLeod — June 24, 1959 E. M. Cokayne — June 2, 1960 D. A. Machum — June 13, 1960 " — July 4, 1960 J. V. Huddart — July 25, 1962
July 4, 1960	-	Memo from D. A. Machum re the economics of opening Calabogie or Goulais Iron Properties and applying for new mine status at Goudreau because of amalgamation and depletion through to hot metal.

E 2G2-01 - GOUDREAU PYRITE

Letter dated May 12, 1943 by Professor McBride, McGill University and report Professor McBride had prepared by Prof. MacEvan on sulphur was largely based on information furnished him by Sir James Dunn who, in turn, obtained it from Lord McGowan, Chairman of Imperial Chemical Industries Ltd. (Not in file).

January 16, 1946 - Letter from J. A. Hussey re Morrison No. 1 Advised can deliver 176/756 (24%) on the basis of $55,000 for the whole property. (not much as pyrite G. W. MacLeod verb to Kremzar)

March 20, 1950 - H. L. Noblett - his pyrite process under consideration by the Ontario Research Foundation (fluo-solids)

January 13, 1951 - G. C. Bateman advised that Lucien Walker of Texas Gulf Sulphur New York wished one of his men to visit the Goudreau Pyrite Properties

January 16, 1951 - G. C. Bateman advises he has written to Bill Roscoe, Vice President of Noranda to see if Noranda would talk about their pyrite - sulphur process.

April 28, 1951 - Globe and Mail report on Noranda included reference to pyrite sinter, elemental sulphur (one third of sulphur) and SO2 gas recovered as sulphuric acid.

Jan. 22, 1951 - W. M. (Bill) Goodwin advises increased world demand for sulphur

Paul Gishler - worked for Noranda on pyrite concentrate - advised that if he had a granular pyrite rather than dust his process would be a great deal easier to operate

A.O.P. to send Dr. Gishler 100 lb. sample. Dr. Gishler was visited by Dr. Willey and Mr. G. W. MacLeod on Feb. 1, 2, 1951 W. M. Goodwin advised location of Goudreau gives it a $5.00 a ton or more advantage in freight over pyrite concentrate from the northern mines.

Jan. 23, 1951 - Mineral Resources Division advised of a sudden United States request for Canadian Pyrite and inquired about Goudreau. Mr. MacLeod and Gordon Willey went to Ottawa to see the National Research Council February 1, 2, 1951.

Meeting arranged by Dr. R. T. Elworthy, Non Metallic Minerals Commodities Branch.

1967 - a copy of this is found in ODM Mineral Resource Circ. #5.

Goudreau Pyrite Deposits*

The main pyrite deposits are associated with an iron formation that extends eastward from Goudreau Station (mile 177, Algoma Central Railway) for 7 miles to the east boundary of township 49. These deposits are the Morrison #1, #3 and #4 deposits, the Bear deposit, the McPhail deposit and deposits A, B, C, D, E and F. All are owned by The Algoma Steel Corporation Limited.

The following is a general section downward across the pyrite:

Keewatin Formation	(Dark coloured ellipsoidal basic volcanics - Iron Formation (Light coloured acid volcanis

The iron formation is subdivided as follows:

Iron Formation	(Banded Silica member - Pyrite member (Carbonate member

Pyrite Member:

The sulphides usually have a well developed granular texture but locally the rock is massive and fine-grained. Grain size ranges from 0.01 to 0.8mm. in diameter.

The rock often appears to be composed entirely of pyrite but this is seldom the case. The sulphur content is generally less than 40 percent - equivalent to about 75 percent pyrite.

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*Information supplied by J.V. Huddart, geologist, Exploration Department, Algoma Ore Division, Algoma Steel Corporation, Sault Ste. Marie, Ontario.

Pyrrhotite is a normal constituent but seldom exceeds 10 percent of the total sulphides. Chert and iron carbonate occur in disseminated form in the more massive sulphide deposits and as lenses and beds in the leaner material.

Structure:

The iron formation lies in open folds and forms a series of "S" shaped traces at the surface. It is broken and offset by faults.

The usual normal thickness of the pyrite member is probably between 50 and 60 feet. Greater concentrations occur where secondary drag folding is present and at the noses of anticlines and synclines.

Production:

In the 1914 - 1918 period Nichols Chemical Company mined and shipped 300,000 to 400,000 tons of pyrite ore grading about 30°/$_o$S. Practically all production was from the "C" deposit. In the same period Rand Consolidated Mines Limited mined a few thousand tons with an average grade of about 38°/$_o$S from the Morrison #4 deposit. This deposit contained a pocket of secondary pyrite sand (grade plus 45°/$_o$S).

From 1959 to 1962 Algoma Ore Properties Division of The Algoma Steel Corporation Limited mined and shipped to Wawa about 850,000 tons of ore. This production was obtained by open pit operations at the Morrison #4, the Bear, the "C" and

the "A" deposits. The approximate average grade was iron 40°/o and sulphur 25 to 30°/o.

Reserves:

The structure of the iron formation has revealed deposits in synclines or at the crests of folds that have impressive surface dimensions and limited vertical extent. Concentrations will occur on the main limbs of the folds where crinkling or drag folding is present but the average thickness of the pyrite member is 50 to 60 feet. A major sustained operation would require underground mining.

Other Deposits:

(1) The Morrison #2 is 1½ miles south of Goudreau and ½ mile west of the Algoma Central Railway (and the McVeigh Creek fault). The deposit may be at the same stratigraphic horizon as the main formation east of the tracks. The deposit is owned by Irsugo Consolidated Mines Limited.

(2) The Holdsworth Pyrite Deposit is not associated with iron formation and has the features of a secondary deposit. It is owned by Dupont of Canada.

(3) The Wilcox or Webb Deposit is part of one of the many smaller iron formations within the basic volcanic rocks.

(4) The Hamilton Pyrite Deposit is not at the same stratigraphic horizon as the main Goudreau range.

Rand Consolidated Mines Limited

Morrison #4 Deposit

Location: Township 27, range XXVI; west end of Goudreau range, claims AC 44, 45, 46, 50.

Minerals Present: Pyrite, siderite.

Development: Staked by J.W. Morrison about 1916; transferred to Algoma Exploration in 1917; purchased by Rand Consolidated Mines; acquired by Irsugo Consolidated Mines in 1927; purchased by Algoma Ore Properties in 1953. Mined by open pit in 1918-1919. 67000 tons of pyrite mined by Algoma Ore Properties in 1958 and 1959.

Geology: A sheet of pyrite 40 feet thick lies between banded silica on the north and ottrelite porphyry on the south. The contact with the latter is transitional. Depth probably good; band is 3000 feet long and 40 feet wide, grading 40.5%Fe, 7.4%SiO_2, 26.9%S.

Reference: Collins, Quirke and Thomson (1926, p. 107); J.V. Huddart (personal communication).

Goudreau Pyrite Deposit B

Location: Township 27, range XXVI, district of Algoma;

Minerals Present: Pyrite, pyrrhotite, siderite.

Development: Pits and trenching.

Years of Activity: 1918-1919.

Geology: Pyrite-bearing zone has a length of 900 feet in an east-west direction. Pyrite is interbanded with green schist.

Reference: T.H. Janes (1952, p. 59).

Goudreau Pyrite Deposit D

Location: Township 27, range XXVI, district of Algoma.

Minerals Present: Pyrite, pyrrhotite, garnet.

Development: Test pits, diamond drilling.
Outcrops on two limbs: South limb, 16 holes, 1914, 150,000 tons at 28.4%S, 41.3%Fe, average width 95 feet. North limb, 3 holes, 1914, tonnage about 150,000 tons, grading 24.15%S, 36.38%Fe.

Geology: A small low grade pyrite deposit related to secondary folding.

Reference: J.V. Huddart (personal communication).

Goudreau Pyrite Deposit E

Location: Township 27, range XXVI, district of Algoma.

Minerals Present: Pyrite, pyrrhotite.

Development: 9 holes drilled in 1914; old shaft or pit.

Geology: A shallow shell of a deposit with minor tonnage. Interbanded pyrite, green schist, carbonate and silica are exposed over a width of 250 feet.

Reference: J.V. Huddart (personal communication).

Goudreau Pyrite Deposit F

Location: Township 27, range XXVI, district of Algoma.

Minerals Present: Pyrite, pyrrhotite.

Development: 1 hole drilled in 1951 by Algoma Ore Properties.

Geology: Deposit located on the main limb and has good depth but is lensy and narrow.

Reference: J. Huddart (personal communication).

Goudreau Pyrite Deposit C

Location: Township 27, range XXVI, district of Algoma; claims JL 15 and 9.

Minerals Present: Pyrite, pyrrhotite, siderite.

Development: 1914-1919: Open pit production of 250,000 tons by Nichols Chemical Company. Pit measured 1100' by 700 feet and is 60 feet deep at the west end. 1961: About 75000 tons of ore remaining was mined by Algoma Ore Properties.

Geology: A secondary anticlinal structure on the main fold. A pyrite lens 200 to 300 feet wide, 50 feet thick and over 600 feet long is bounded by andesite and diorite on the north, and rhyolite and pyroclastics on the south. The lens strikes east-west and dips southwest at 18 to 40°. The ore averages 28.33°/₀S.

Reference: Collins, Quirke and Thomson (1926, p. 108); J.V. Huddart (personal communication).

C Extension

Location: Township 27, range XXVI, south of C orebody.

Minerals Present: Pyrite, pyrrhotite, siderite.

Development: Mined by Algoma Ore Properties in 1962-1963. About 400,000 tons at 38.9°/₀Fe, 23.6°/₀S are blocked out.

Geology: A shallow saucer-shaped secondary structure.

Reference: J.V. Huddart, (personal communication).

Goudreau Pyrite Deposit, Bear Claim

Location: Township 27, range XXVI, district of Algoma; claim JL 28.

Minerals Present: Pyrite, pyrrhotite.

Development: Test pits and stripping by Nichols Chemical Company in 1918-1919. Drilled in 1958 by Algoma Ore Properties. Open pit production of about 350,000 tons by Algoma Ore Properties in 1959-1961.

Geology: A shallow syncline; the pyrite-bearing zone has an east-west length of 1500 feet, a width of 100 feet and a depth of 120 feet. The walls of the deposit are green schist. The remaining reserves are negligible.

Reference: Collins, Quirke and Thomson (1926, p. 109); J.V. Huddart (personal communication).

McPhail Pyrite Deposit

Location: Township 27, range XXVI, district of Algoma. West of 'A' deposit on north range.

Minerals Present: Pyrite, pyrrhotite.

Geology: Consists of 3 main sections:

(a) West section: Pyrite forms a regular zone 500 to 600 feet long and about 40 feet wide, grading 40%Fe, 6%SiO_2 and 38%S.

(b) Centre section: A pyrite member and a considerable thickness of crystalline limestone. The relationship between the two units is irregular.

(c) East section: The west part of the section is on high ground and cut up by dikes; the east part is low and swampy.

Reference: J.V. Huddart (personal communication).

Goudreau Pyrite Deposit A

Location: Township 27, range XXVI, district of Algoma: Claim JL 16 and 21.

Minerals Present: Pyrite, pyrrhotite, siderite.

Development: Trenching and diamond drilling by Nichols Chemical Company in 1914, 1918-1919. Drilled by Algoma Ore Properties in 1960. ~350,000 tons (?) mined by Algoma Ore Properties from an open pit in 1960-1961.

Geology: The A orebody is part of the main north range extending from the McPhail to the Morrison #3. The swelling at "A" was due to drag folding on this limb. The main body of pyrite is 1800 feet long and 20 to 100 feet thick; it dips northward at 30 to 45° and is overlain by green schists and underlain by schistose porphyry.

Reference: Collins, Quirke and Thomson (1926, p. 109). J.V. Huddart (personal communication).

Morrison #3 Deposit

Location: Township 27, range XXVI, district of Algoma; claims AC 38, 39, 40.

Minerals Present: Pyrite.

Development: Trenched and drilled in 1918; in 1919 a 47° inclined shaft was sunk to 230 feet with levels at 100 and 210 feet by Nichols Chemical Company. Limited lateral work. Drilled by Algoma Ore Properties in 1963 indicating an open pit potential of 130,000 tons grading 40%Fe, 6% SiO_2 and 31.7%S.

Geology: Pyrite occurs in a secondary fold on the main north limb of the range. Lens of pyrite 1250 feet long and up to 115 feet wide. Orebody dips 40 to 70°N and lies on the south side of a band of iron formation.

Reference: J.V. Huddart (personal communication).

Morrison No. 1 Deposit

Location: Township 49, district of Algoma; claims SSM 1708-11, 1769-72, 1775-78.

Minerals Present: Pyrite, magnetite, siderite.

Development: 8 holes drilled in 1914. Drilled in 1953. Ore reserves estimated at 300,000 tons running 38-42%S.

Geology: A shallow synclinal structure; lens of pyrite 400 feet long, 12 to 110 feet thick.

Reference: Collins, Quirke and Thomson (1926, p. 110).

Rand Consolidated Mines Limited

Morrison No. 2 Deposit

Location: Township 28, range 26, 1½ miles south of Goudreau Station.

Minerals Present: Pyrite, siderite.

Development: Staked by J.W. Morrison; trenching and drilling 1915-1916; 1920: Sold to Rand Consolidated Mines who started an adit which was abandoned after driving 100 feet. Acquired in 1927 by Irsugo Consolidated Mines.

Years of Activity: 1915-1920.

Geology: North band has minor pyrite in lenses 4 to 6 feet wide. South band has pyrite lens 2000 feet long and 15 to 50 feet wide, averaging 30 feet. The grade averages 37 percent sulphur. Also considerable siderite on the south band.

Reference: Collins, Quirke and Thomson (1926, p. 103); J.V. Huddart (personal communication).

Hamilton Pyrite Claims

Location: Not part of Goudreau range; located near Smith Lake, 5 miles east of mileage 171 on the Algoma Central railway.

Minerals Present: Pyrite.

Development: Test pitting.

Years of activity: 1913-1914.

Geology: Massive pyrite lens 15 feet wide.

Reference: T.H. James (1952, p. 61).

Holdsworth Pyrite Deposit

Location: Township 28 range 25, claim SSM 1054; Township 28 range 24, claim SSM 1055.

Minerals Present: Pyrite.

Development: Algoma Steel Corporation drilled 22 holes in 1918-1919. Purchased by Grasselli Chemical Co. in 1926 and by Can. Pyrites Limited in 1929. Sold to Dupont of Canada in 1959.

Geology: Not associated with iron formation. Two lenses of pyrite 200 feet apart dip north at 65 to 70°, and

lie between volcanic green schist on the north and light grey sericite schist on the south. The east lens is 1100 feet long and 18 to 25 feet wide. The west lens is 600 feet long and up to 31 feet wide. Two lenses estimated to contain 900,000 tons of pyrite averaging 46.31 percent sulphur.

Reference: Collins, Quirke and Thomson (1926, p. 123).

Wilcox or Webb Claim

Location: Township 26, range 27, district of Algoma.

Minerals Present: Pyrite, limonite.

Development: Pits and trenches.

Geology: Trenches expose a thick gossan of limonite and pyrite for widths of 20 to 30 feet.

Reference: Collins, Quirke and Thomson (1926, p. 111).

NOTE: THE FOLLOWING TEXT REPRESENTS ADDITIONAL INFORMATION TO REPORT AGUONIE-0017.

Y 8 8 1

MORRISON PYRITE #3
CLAIMS.
Twp. 28. Range XXVI.
ALGOMA.
Southwest of Goudreau Siding.

copy to Has 10/30

DATE OF VISIT: These claims were examined by the writer on Oct.20th, 1914. Mr. Ed. Topel, one of the syndicate owning the claims, acted as guide.

LOCATION: The claims lie in Twp. 28 Range XXVI, Algoma, the easterly side of the stakings extending from Mile 175½ to Mile 176, along the A C & H B Ry. main line, one mile south of Goudreau Siding.

PROPERTY: The claims, which are 10 in number, were staked from 17th to 22nd Sept.1914. They are recorded in the records of Lands Dept. of the A C & H B Ry. as Claims Nos. 8 - 17 inclusive.

TITLE: As these claims lie in the A C & H B Ry. Land Grant, assessment work must be done as set forth in the Land Grant regulations. First assessment work must be completed and recorded within a year after staking.

OWNERS: The claims are staked by a syndicate comprising Jos. Morrison, R. Sadler, Geo. Godemair, B.Kreusar, A.V.J.Selkirk, O.Lanier and Ed.Topel of Franz, and O.Hodge and Jos. Corr.

HISTORY: The iron range showings in claims 9 and 10 were located by Jas.Bartlett during his prospecting in 1913 as will be seen by reference to map and report covering his work.Mr. Bartlett was moved to another part of the district before he had an opportunity to follow up his discovery and in his report he says "this range should be investigated more fully".

The claims at the extreme west of the group are reported to have been staked by "Doc." Carrick of Wawa in 1909, but were not recorded.

TOPOGRAPHY: Eight of the claims form a strip of land with a ½ mile of frontage on the Ry., and stretching one mile west. At a distance of 1500' from the Ry. the elevation varies from 450 to 500' above the Ry. This elevation is maintained fairly well for about ½ a mile west, but beyond, the elevation gradually decreases. In claim No.11 the hill reaches its greatest elevation and this hill is the highest in a radius of several miles.

GEOLOGY: Greenstone and green and grey schists predominate over the claims. Within these are included bands of iron formation. Diabase and granite dikes cut the older Keewatin rocks.

WORK DONE: Two trenches, 18' and 24' long respectively, dug by Mr. Bartlett are located in claim #10 about 1000' from the #1 post and close to the east boundary.

Morrison and his associates have done no work at all so there are only natural exposures available for examination.

DESCRIPTION OF EXPOSURES: Claims Nos. 8 and 9 along the Ry. show numerous "floats" of iron formation, most of which are composed

of granular silica and a few of which are pyrites, and a few siderite. It is doubtful if there are any iron range rocks in place showing on these two claims.

Along the east side of claim 10 there are four exposures of iron formation in place, two of which are the trenches mentioned earlier. These show reddish and brown granular silica, chiefly massive; some pyrite, more or less mixed with carbonates, and silica; and siderite, the latter of which is remarkable in that it is to some extent interbanded with layers of black hornblende.

The strike of the formation is about east and west, and the dip probably approaching the vertical. While the extreme distance from north to south between outcrops is about 200' the indications are that this zone is occupied by more than one band of iron formation.

Occasional outcrops of iron formation may be uncovered with a pick for a ½ mile west but one can get no definite idea as to width or continuity of the iron formation bands, tho the impression gained is that they are not likely of any importance.

Claim #14, the next to the west is reported to have showings of rusty earth and limonite in a swamp adjoining a small pond.

The discovery post on claim #11 is located at a showing of pyrite, which may, or may not lie in place. Close at hand, there is an outcrop of iron range cut off on the west by a rather fine-grained diabase dike.

The range seems to be offset to the south by the dike for a distance of about 200'. Where picked up across the dike it is almost entirely obscured by drift, but the north iron-stained wall is well exposed and this is the highest point on the whole hill. There is evidently a well-defined and continuous iron range stretching for 25 or 30 chains west from here, in which distance there is not much difference in elevation. Numerous showings of good looking pyrite, siderite and granular silica can be found by doing a little picking. The greatest width actually exposed is 110' at the discovery post on claim #12. The top of this hill seems to have only a light covering of overburden, and it is probable that the width, length and character of the iron formation bands could be shown up cheaply and effectively.

In claims Nos.15, 16 and 17 many small outcrops of good looking pyrite were seen but these are chiefly confined to small knolls in a swampy area in which underbrush is thick. It does not seem improbable that these may be part of the same band which lies nearly due east in claims #11 and 12. About half way across claim #17 the iron formation is cut off, and apparently faulted by a diabase dike beyond which it has not been picked up.

CONCLUSIONS: Across the northerly row of claims, Nos.9,10,13 and 14 there may be a band of iron formation, or possibly several small ones. Judging from the meagre showings the chances for a band with any deposits of pyrite of economic interest, seem poor.

In the southerly row of claims there is a band of iron formation which is evidently continuous for at least 20 chains, and which may be a mile in length. The width is not likely great enough to furnish any large bodies of pyrite but there seems to be a fair chance that enough tonnage might be proven

by exploration to make a small mine. Were the prospect the property of the Algoma Steel Corporation I would recommend systematic trenching along this band, after the completion of which a decision as to further work would be made. Fifteen days' work with a gang of 5 men should demonstrate whether the property is worth drilling or not.

TIMBER: A large proportion of the area included in the claims is covered with small second growth timber. Plenty of spruce suitable for firing is obtainable within a mile of any part of the property. A little cedar exists in the swamps but most of this was taken out for ties when the A.C.R. was being constructed from Hawk Jctn. to Frans. An old log road extends back about a mile from the Ry.

WATER: There are a couple of small lakes in the westerly part of the property, but if drilling were being done on claims Nos. 11 and 12, water would have to be pumped about ½ of a mile and probably against a head of from 200 to 300'.

Soo Ont
Oct.22/14.
L.L.B.

MORRISON PYRITES.

10 Claims, Twp. 28. Range xxvl - ALGOMA.

DATE OF VISIT: These claims were examined by the writer on April 26th to 28th, 1915. Mr. J. C. Morrison and Ed. Topil, two of the syndicate owning the claims, acting as guides.

LOCATION: These claims lie in Twp. 28 Range xxvl. Algoma, the easterly side of the stakings extend about ¾ mile along the A.C. Ry. main line, one mile south of Goudreau Siding.

PROPERTY: These claims, which are ten in number, were staked from the 17th to the 22nd. of September, 1914. They were properly recorded in the records of the Lnds Department of the A.C.Ry. as claims eight (8) to Seventeen (17) inclusive, on Sept. 28th, 1914.

TITLE: As these claims lie in the A.C.R Land Grant Assessment, work must be done as set forth in the Land Regulations. First assessment work of eighty (80) days per claim must be completed and recorded within one year after date of staking. This must be repeated the following two years, making three years in which to do 240 days work on each claim held. This may, however, be done in as short a period as desired. The recording of the work will hold the property for that time, when you are required to apply for lease. You are then allowed an additional year (making four years) before paying royalty. After that date you are required to ship or pay royalty on a minimum of 2000 long tons for each 40 acre claim held, at the rate of 10¢ per ton. You are not compelled to ship, but you are compelled to pay this royalty which will be credited when shipments are made.

OWNERS: These claims were staked by a syndicate, known as the Morrison Prospecting Syndicate; Joseph C. Morrison, President, Ed. Topil. Secretary, and A.V.J.Selkirk, Treasurer, all of Franz, Ont., Shareholders, Geo. Godemair, R. Sadler, and B. Creamer, C. Tainer, Joe Carr, and G. Hodges, scattered through out the District.

HISTORY: The iron range showings on claims nos. nine (9) and ten (10), were located by Jas. Bartlett, while in charge of a prospecting party for the Algoma Steel Co. in 1913. As I have seen by his map and reports covering his work, Mr. Bartlett was moved to another part of the District before having an opportunity to follow up his discovery, and in his report, says, "This range should be investigated fully". Mr. Bartlett is now Inspector of Mines for the Ontario Government, I met him on my trip north at Franz, and discussed the situation with him. He expressed surprise at the Company throwing such a promising field open. He seems to hold to the opinion that an iron deposit as well as a pyrites, might be reasonably looked for.

TOPOGRAPHY: Eight of the claims form a strip of land with a half mile frontage on Ry. and extending one mile west. At a distance of about 1500 ft. from the Ry. the elevation starts, and varies from 400 to 600 ft. above the Ry. This elevation is maintained for about half a mile west, beyond it gradually decreases. In claim #11, the hill reaches its greatest elevation and this hill is the highest in a radius of several miles. A small ravine running northwesterly cuts up through claims nos. eight (8) and Nine (9) into claim ten (10), where a small stream has its source in a swamp at the top of the hill, which I will later refer to. There are also several small lakes showing on an accompanying plan.

GEOLOGY: Greenstone, Green and Gray Schists, predominate over the claims, within these are included bands of iron formation, diabase dikes cut out the older Keewatin rocks in places.

WORK DONE: Practically no work of any description has been done on any of the properties. Two trenches 12 ft. and 24 ft. respectively dug by Mr. Bartlett, are located in claims No.10, about 1000 ft. from the No.1 Post and close to the east boundary. Morrison and his associates had done no work at all until I accompanied them on the 26th. Only natural exposures were available for examination. On the 27th, two men were put to work trenching about 200 ft. below Bartlett's work on claim No.9, while two more accompanied me with powder and drills. Several holes were put in and blasted of which I took samples.

EXPOSURES: Claims Nos. eight (8) and nine (9) along the Ry. show numerous "floats" of iron formation, most of which are composed of iron stained granular silica, pyrites and some sidirite. I did not see any of these iron range rocks in place showing on these two claims. Along near the east side of claim No.10, there were three or four exposures of iron formation in place, two of which were the trenches dug by Mr. Bartlett. These show a reddish brown granular silica, some pyrites, mixed with sidirite, interbanded to some extent with lyers of black horn blend. In one day the two man succeeded in putting a trench across the strike on claim No.9, (which apparently runs a little north of west) exposing iron formation for over 200 ft. consisting of gosin stained granular quartz and limonite or brown iron ore of fairly good quality. (Sample of which I have marked No.1) While it cannot be determined, there are likely more than one iron band capped over by this gosin and drift. This showing occurs on a low flat marshy ground just below the swamp referred to as being the source of a small stream. This stream flows through this low ground into the ravine. The bed of this stream is covered with iron rust and stained sediment. I did not have the opportunity to examine the swamp, as it was wet and partly frozen. Out - crops of iron formation may be uncovered with a pick across claim No.13. One could not get a definite idea of width or conformities. Claim No.14, the next west is reported to have showings of rusty earth and limonite in a swamp adjoining a small lake, but I did not have time to visit this claim, as I gave most attention to the south row of claims. The discovery post on claim No.11 is located on a natural exposure of good pyrites. Possibly 6 X 10 ft. I did not do any work as this might possibly not be in place, although I believe it is. Close at hand there is an iron range apparently cut off on the west by a diabaise dike and the range seems offset considerably to the south by this dike. When picked up across the dike it is almost entirely obscured by drift, but the north iron stained wall is well exposed and this is the highest point on the whole hill. We had no appliances for stripping, but made an exposure, put in a shot. This disclosed the presence of a fine grade of pyrites, at least six ft. wide from which samples No. 2 were taken. There is evidentlya well defined and continuous iron range stretching west from here across the row of south claims. The elevation gradually decreases after crossing claim No,12, numerous showing of good looking pyrites and sidirite can be found by doing a little picking. The greatest width actually exposed, is 110 ft. near discovery on claim No.12. A shot was put in near the boundary of 11 and 12, from which sample No,3 was taken, also No.4 of finds from a natural exposure. Claim No.15 has many exposures of good looking pyrites and sidirite, chiefly in small knolls in swampy area in which under brush is thick. From one high place, a shot was put in and sample No.5 taken. Claims 16 & 17 have good surface showings of both sidirite and pyrites. Sample No. 6 was taken with a pick. About half way across claim No.17 the iron formation is apparently cut off and faulted by a dike, beyond which it has not been picked up.

TIMBER: A large proportion of the area included in these claims is covered with small second growth timber. Plenty of spruce and white birch suitable for firing is obtainable on the property. A little cedar remains in the swamp but most of this was taken out during railway construction. An old log-road extends back almost a mile. Any timber outside of the white pine goes with the property free of dues of any kind.

WATER: As shown on plan, there are a couple of small lakes on the westerly part of the property, but if drilling were being done on claims Nos. 11 or 12. I believe that sufficient water could be obtained from a shallow well sunk into the swamp nearby. Water from lake would have to be pumped about half a mile against a head of from 200 to 300 ft.

CONCLUSIONS: Across the northerly row of claims Nos. 9, 10, 13 & 14, there is a band of iron formation or possibly several small ones. Judging from the showing made on No.9, the chances of finding a deposit of iron or pyrites or both of economic value seem good. In fact the whole surface surroundings and conditions remind me of the Helen Mine when it was only a prospect.

In the southerly row of claims Nos. 11, 12, 15, 16 & 17, there is a band of iron formation, composed of sidirite, which apparently follows the south wall, with pyrites in the centre and granular quartz to the north, which evidently continues for at least one mile in length. The average width can not be definitely stated. I am inclined to believe, when stripped, the ore bodies will be found to be less shaped in form. However, this may be, I feel certain that enough tonnage of pyrites can be proven to make a profitable mine and the sidirite should by no means be overlooked. I cannot believe it possible that as continuous a showing as this can prove a shallow deposit. The remarkable shipping facilities, the distance to Michipicoten Harbor, and water transportation being less than forty miles. No railway to build, as it is already within 1500 ft. of the top of the hill. This is a proven country of both iron and pyrites. The Goudreau to the northeast (Pyrites). The Magpie to the west (Sidirite-iron), and the Helen to the south (both sidirite, Hemitite and Pyrites).

NOTE: Sample No.7 shows Sidirite taken from different places. Sample No.8 shows Iron formation and Wall rocks.

Sault Ste Marie
May 3rd 1915

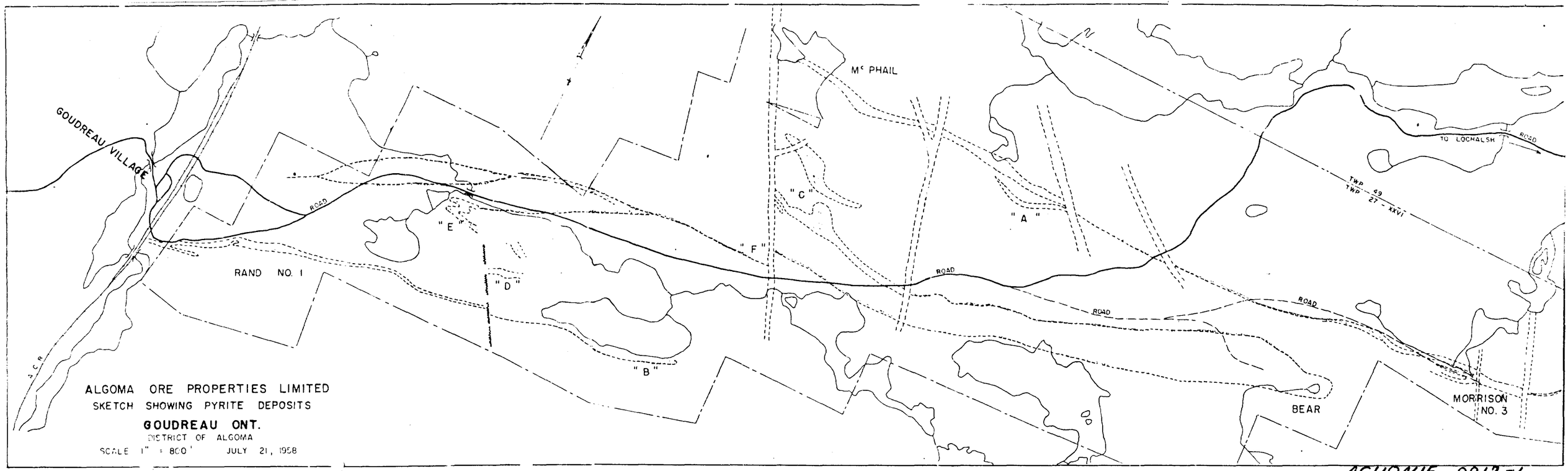
Gordon L Mickle

FOR ADDITIONAL

INFORMATION

SEE MAPS:

AGUONIE-0017 #1-6



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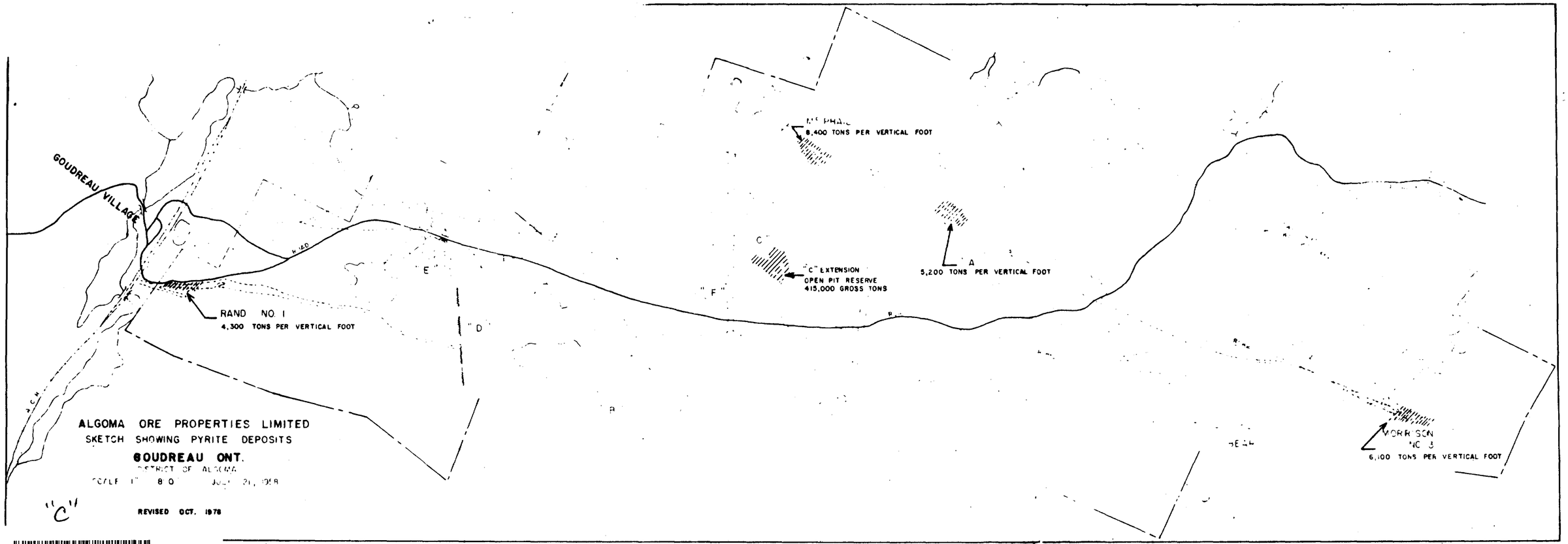
0017-1



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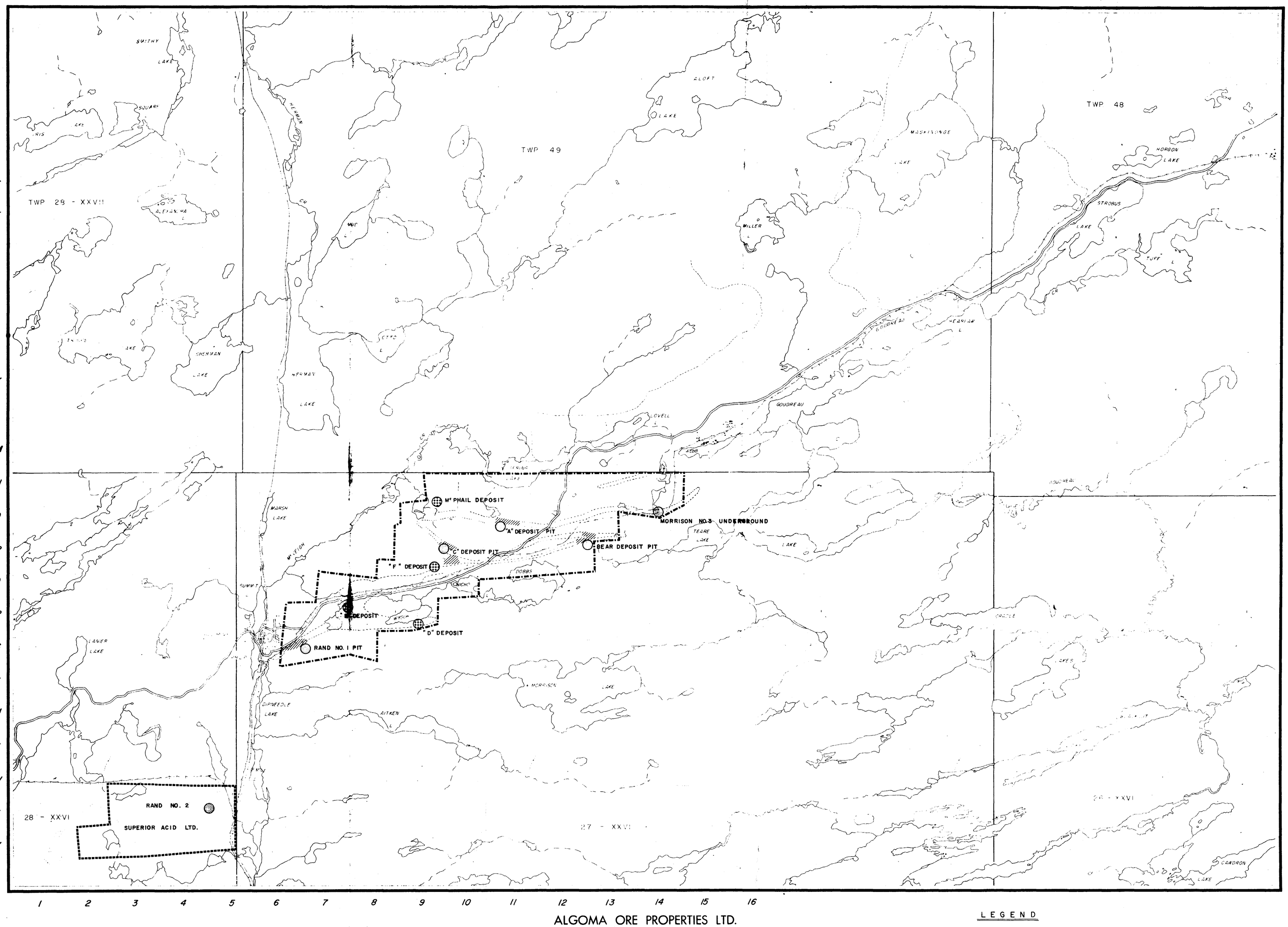


ALGOMA ORE PROPERTIES LTD.

EXPLORATION DEPARTMENT

GOUDREAU PYRITE

GENERAL LOCATION PLAN

SCALE 1" = 1/4 MILE MAY 20, 1960

LEGEND

- MINED OPEN PIT
- DEPOSITS NOT MINED
- UNDERGROUND DEVELOPMENT, NO PRODUCTION
- PIT LOCATION

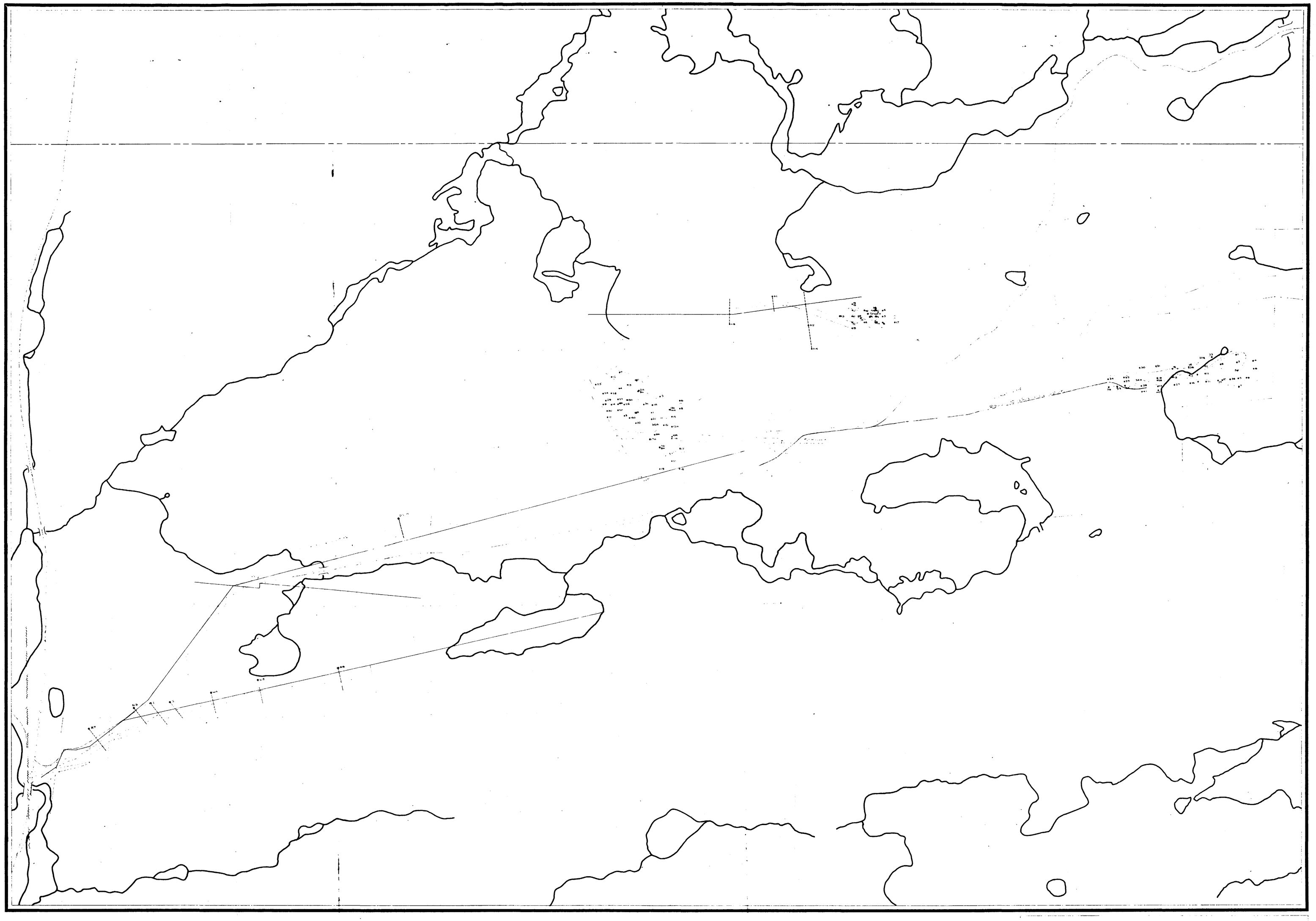
REVISED MAY, 1977

220

"C"

AGUONIE 0017-3

AGUONIE - 0017-#3



ALGOMA ORE PROPERTIES LTD.

EXPLORATION DEPARTMENT

GOUDREAU PYRITE

GENERAL PLAN

Scale: 1" = 400' Apr: 7/88

"C"

230

Aguonie 0017-4

SYMBOLS

- Main Roads.
- Trails, old roads.
- Railroad.
- Power line.
- Shaft or adit.
- Outcrop boundary.
- Defined contact.
- Assumed contact.
- Fault indicated.
- Strike and dip of bedding.
- Strike and dip of Schistosity or shearing.
- Strike and dip of cleavage or jointing.
- Strike and dip of gneissosity.
- Direction of top of bed from flow gradation or pillows.

GEOLOGICAL MAP

TOWNSHIP 27 RANGE 26 - NORTH PORTION TOWNSHIP 27 RANGE 25

GOUDREAU AREA

DISTRICT OF ALGOMA

SCALE - 1" = 1/4 MILE

OCT. 1953

GEOLOGY BY H.S.K. METCALF

TRACED BY W.T. LOVE

Supt. of Exploration

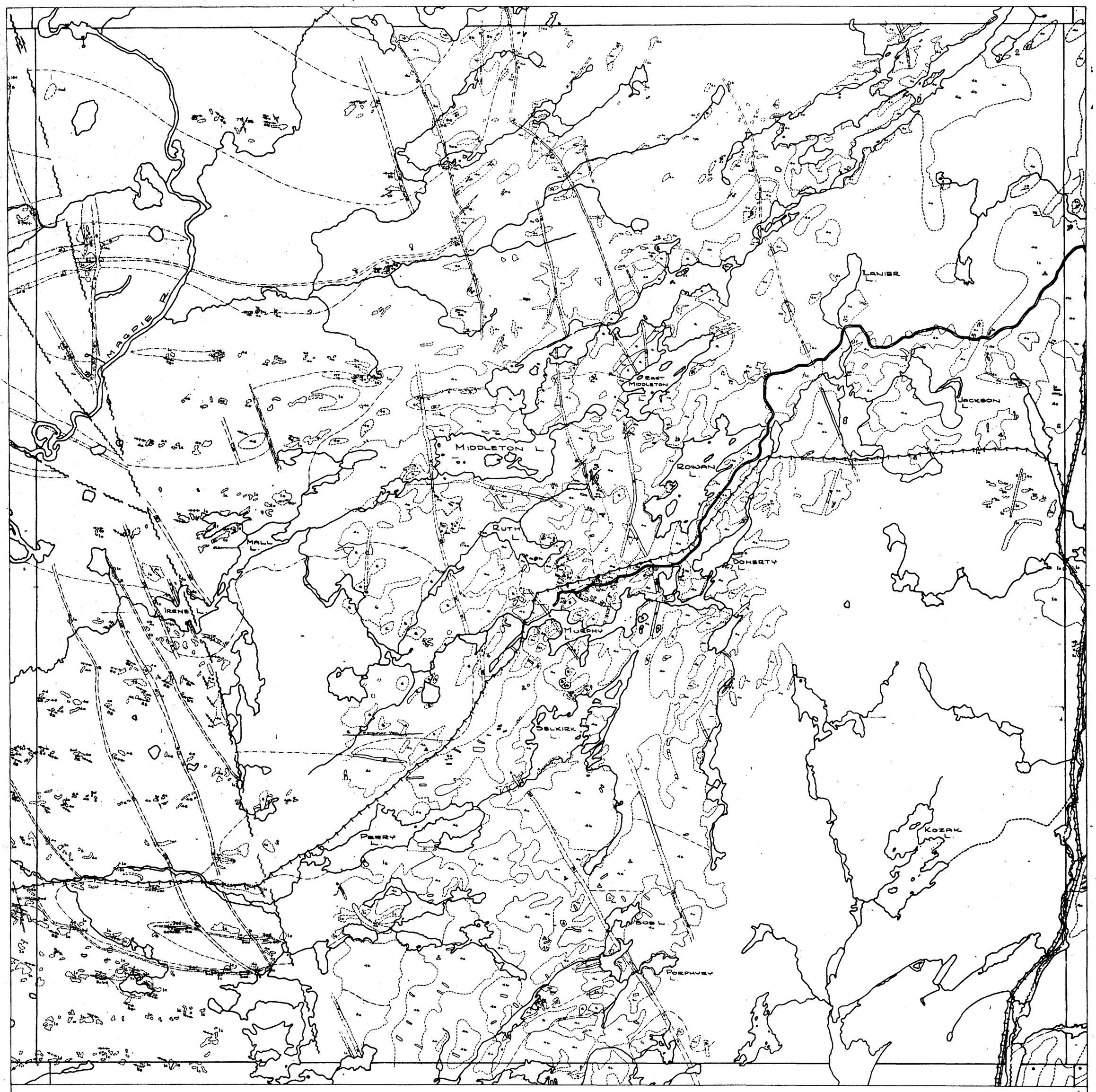
LEGEND

- Diabase.
- Quartz-porphyry.
- Granite.
- Granodiorite.
- Diorite.
- Dore Series: 5a-Conglomerate; 5b-Quartzite; 5c-Argillite; 5d-Arkose.
- Basic Lavas: 4a-Massive; 4b-Pillow.
- Iron Formation: 3a-Cherty, banded; 3b-Granular Silica; 3c-Pyrite; 3d-Sideritic Magnetite.
- Sediments: 2a-Quartzite.
- Acid Lavas: 1a-Structureless; 1b-Pillow; 1c Tuff; 1d-Agglomerate; 1e-Ottrelite Schist.

240

"C"

Aguonie 10017-5



SYMBOLS

- Main Roads.
- Trails, old roads.
- Railroad.
- Power line.
- Shaft or adit.
- Outcrop boundary.
- Defined contact.
- Assumed contact.
- Fault indicated.
- Strike and dip of bedding.
- Strike and dip of Schistosity or shearing.
- Strike and dip of cleavage or jointing.
- Strike and dip of gneissosity.
- Direction of top of bed from flow gradation or pillows.

GEOLOGICAL MAP

TOWNSHIP 28 RANGE 26

MAGPIE - GOUDREAU AREA

DISTRICT OF ALGOMA

SCALE - 1" = 1/4 MILE

OCT. 1953

LEGEND

- Diabase.
- Quartz-porphyry
- Granite.
- Granodiorite.
- Diorite.
- Dore Series: 5a-Conglomerate; 5b-Quartzite; 5c-Argillite; 5d-Arkose.
- Basic Lavas: 4a-Massive; 4b-Pillow.
- Iron Formation: 3a-Cherty, banded; 3b-Granular Silica; 3c-Pyrite; 3d-Sideritic Magnetite.
- Sediments: 2a-Quartzite.
- Acid Lavas: 1a-Structureless; 1b-Pillow; 1c Tuff; 1d-Agglomerate; 1e-Ottrelite Schist.

GEOLOGY OF WESTERN PORTION BY DR. A.M. GOODWIN

GEOLOGY OF EASTERN PORTION BY H.S.K. METCALF

TRACED BY W.T. LOVE

42C08SW0503 0017 AGUONIE

250

AGUONIE 0017-6

SSM-1024