

Property

The property consists of a group of 20 claims in the Northeast portion of Gautier Twp., East Kirkland Lake area of Ontario. The eastern portion of the claim group is 3/4 of a mile from the Upper Beaver Mine underground workings.

The group consists of the following claims:

L-96956	06061	96966	96971	97252
57	62	67	97151	97489
58	63	68	97204	97490
59	64	69	97250	91
60	65	70	51	92

Access

The claim group is accessible by road from highway 66 and the Upper Beaver Mine road, after which the property can be reached by following winter logging roads a distance of one to two miles.

Topography and Drainage

The group is largely covered by pleistocene overburden which consists of some low sand ridges, a few clay covered ridges with outcrops and much flooded muskeg or swamp. The Victoria River drains the area, but the high beaver population have constructed a series of dams along the numerous larger streams to flood much of the low ground. Heavy timbering for pulpwood has been carried out during the last three years and about 90% has been timbered out.

Previous Exploratory work on the property.

Sander Geophysics Ltd. of Ottawa carried out a magnetic and an Electromagnetic survey during the period 1966-1967 on a

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grid laid out with lines at 200 foot intervals and pickets marked every 100 ft. along lines. No electromagnetic anomalies of significance were encountered in the horizontal or the vertical coil survey methods. The magnetic survey indicated relatively flat magnetics with the exception of a chain of magnetic anomalies () spaced along the inferred location of the andesite-rhyolite contact.

During some period, at least twenty years ago, determined prospecting was carried out. There are numerous water and dirtfilled trenches of extensive lengths near most outcrops on the property.

James E. Thompson and A.T. Griffis of the Ontario Department of Mines issued map No. 500 in 1941 after a mapping of Gautier Twp. This geology was later compiled on Ontario Department of Mines Map No. 2046.

Geologic Field Mapping

Geologic field mapping was carried out by this writer during the period June 15th to June 30th on a scale of $1^{"} = 200$ feet. The picket lines were found to be well cut and marked and the lines easily recognized with the exception of about 20% of the grid area where logging was carried out during the winter of 1966-67 and the lines were completely obliterated.

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GENERAL GEOLOGY

The consolidated rocks of the area are pregambrian They consist of a complex of folded Keewatin in age. volcanics and Timiskaming sediments intruded by a great variety of rocks with granites, syenites, diabase and gabrro The rocks of the area are folded but the main being common. structural feature of the area is the easterly trending Larder Lake - Malartic - Cadillac fault. Subsidiary but strong faults occur and these strike about E-N-E to form the Kirkland Lake, Upper Canada and Horne Creek faults. Numerous major gold occurrences are found along or associated with all of these faults. Along the Horne Creek fault at the Noranda and Quemont Mines major deposits of Copper ore are found. Intense carbonatization occurs along the highly sheared Larder Lake fault. A later silicification brought in the gold and at the Noranda also copper mineralization.

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Upper Beaver Mines Ltd.

Note

The claim group mapped and covered in this report covers the westward extension of the same rhyolitic and andesitic formations that contain the Upper Beaver Mines ore, an introduction to the Geology of this mine is pertinent to this report. This writer appreciates the kind assistance of Mr. Bragg, Chief Geologist of the Upper Canada and Upper Beaver Mines, who presented and discussed the geology of the Upper Beaver Mine.

GEOLOGY OF THE UPPER BEAVER MINES LTD.

The main rock types in the vicinity of the mine are a fine-grained basic lava and a band of acid volcanics. Intrusives of hornblende symmite and symmite porphyry occur. A coarser-grained greenstone that may be an intrusive quartzdiorite or gabbro occurs in bands 100-250 feet wide which strike roughly parallel to the contact between the acid and basic volcanics.

The major structural feature at the mine is a strong N-S trending fault under Ava Lake and the Misema River. Much of this fault consists of a 2-5 foot width of fault-gouge, mud and calcite. The fault is largely filled by a diabase dyke.

The ore containing structures are northerly or northeasterly trending sets of fractures that occur immediately to the west of the Ava Lake fault. These fractures appear to be

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branch faults of the main northerly trending fault and they contain quartz-calcite veins which are mineralized with gold and chalcopyrite. In general the gold content is related to the degree of silicification but it is also always mineralogically combined with the chalcopyrite. Each individual stope has its particular copper to gold ratio. The mineralized veins are found in fractures that occur within fine-grained lava, coarse-grained greenstone (or gabbro) and syenite porphyry. The veins are usually narrow and occur from inches up to 4 feet in width.

The Upper Beaver Mine has been worked and explored intermittently since 1919 when it was known as the Argonaut Mine. From 1919-1928, \$800,000. in gold, copper and silver was recovered. Several exploratory efforts were carried out by different companies. By 1964, 34,337 tons grading 0.47 ounce gold and 1.17% copper were proven and developed. Upper Canada Mines decided to mine the ore, truck it to its mill, a distance of 5 miles, and produce a concentrate which is shipped to the Noranda Smelter to provide a recovery of 94\$ - 96.5\$ for both gold and copper. This production was started in January 1965 and is continuing at the rate of about 200 tons per day, During the first 1-1/2 years of production, emphasis was on mining the gold-rich but low-copper stopes. During 1967 and the latter part of 1966 mining of the copper-rich stopes was emphasized because of a higher copper price and the loss of status as a pure gold producer for E.G.M.A. assistance. Underground exploration and development has kept ore reserves well ahead of mining, eliminating the original salvage approach to the mining operation.

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Local Geology - of the mapped area.

Table of Formations

Precambrian

Keewatin

7 - Quarts veins

Basic Rocks

6 - Gabbro-diorite

5 - Andesite-basalt

Acia Rocks

- 4 Quartz-eye porphyry
- 3 Sheared rhyolitic tuff chloritic sericitic

2 - Rhyolitic agglomerate

1 - Rhyolitic tuff, sheared, sericitized, carbonatized

ROCK TYPES

(1) Rhyolitio Tuff

This rock occurs in the southeastern portion of the grid area and forms the most common rock type. In outgrops it weathers to white or light buff, it is highly sheared and strongly carbonatized and sericitic. Weathered surfaces hint at remnant agglomeritic structures but this is indefinite. A quartz voin in an old trench on line 66K at 75 was sampled and assayed a trace of gold. The shearing as marked on the map is near to E-W with dips from vertical to 85° north.

(2) Rhyolitic Agglomerate

Large outcrops of this rock was exposed by road clearing on lines 46E to 48E at 19S to 22S. Large fragments of rhyolite 1/2 to 1 foot long are aligned in an E-N-E direction. The fragments have chilled glassy rims and the matrix is a sericitic rhyolite-tuff. This band of agglomerate is at least 200 feet thick, and probably represents an "agglomerate forming" volcanic phase of rhyolite deposition which alternated with more tuffaceous phases of rhyolitic deposition.

(3) Sheared Rhyolitic Tuff, chloritic, sericitic

This chloritic tuff is found in two locations, one at 5N on lines 56E to 62E, the other at 15S on lines 78E - 80E. This chloritic tuff may well represent a more basic phase of the volcanic history of deposition of the tuffs. At 5N, however, proximity to the andesitic contact may well be the cause of basification of the rhyolitic tuff.

(4) Quartz-eye porphyry

This rock is found in a large part of the southwestern portion of the grid area where outcrops are sparse. This rock is of typical quartz porphyry composition; it is not sheared but massive and it contains about 2% quartz phenocrysts as "eyes" up to 2 mm diameter, a few small phenocrysts of pink feldspar are also present. The ground mass is grey, aphanitic

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and of rhyolitic composition. This rock must be an intrusive because it does not conform with the trends of the rocks and has a stock like form in plan.

(5) Andesite - Basalt

This rock is massive, basic and fine-grained. There is no strong schistosity although a weak schistosity parallels its southern contact with the rhyolitic tuffs.

(6) Gabbro - Diorite

This rock occurs in outcrops at 12N on lines 76E - 80E and is well exposed at the rapids cut by the Victoria River. Another exposure occurs at 20N near line 46E. The rock is medium-grained, gabbroic and contains 1% to 3% disseminated phyrrhotite. One sample taken was assayed and ran 0.01% nickel. The exposures of Gabbro coincide with a chain of magnetic anomalies within andesite. Each individual magnetic anomaly of the chain can be interpreted to represent a gabbroic intrusion.

(7) Quartz Veins

Extensive trenching was carried out over 20 years ago. The veins discovered are narrow and consist of quartz-carbonate with very minor sulphide mineralization. Three of these veins were sampled and assayed for gold with negative results.

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GEOLOGY :-

Outcrops are relatively sparse so that a detailed structural picture is not possible. The formations trend from $S-80^{\circ}-E$ to due east. The Keewatin rocks can be divided into two major groups.

(1) The acid volcanics which consist of carbonatized and sericitized, rhyolitic tuffs, chloritized and sericitized rhyolitic tuffs, and rhyolitic agglomerate. Then acid volcanics are intruded by a stock like mass of quartz porphyry in the southwestern portion of the grid.

(2) Massive basic volcanics occur as a major group to the north of the acid rocks, and that contact is near the trend of the Victoria river. About 600 - 800 feet north of that contact the basic volcanics contain a chain of small gabbroic intrusions which can be correlated stratigraphically to the "coarse-grained greenstone" of the Upper Beaver Mine.

A strong northerly trending fault occurs at the eastern border of the property, along line 80E from 35 to 85, where the rhyolitic-tuff has been intensely schisted. There is a drag folding of the schistosity from a normal easterly strike to south east at the fault. This schist occurs along a scarp about 100 fect in height and the fault follows a topographic depression.

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Conclusions

Mineralization similar to the Upper Beaver Mines ore would be difficult to detect by B-M or magnetic surveys. The claim group contains the same stratigraphic extensions of the andesitic and gabbroic rocks that contain the Upper Beaver Mine ore. Northerly and northeasterly trending fractures, subsidiary to a strong northerly fault, form the ore structures at the Upper Beaver Mine. If the geologic corollary may be carried to this claim group, then the most favourable area for exploration should be in the north-east corner of the claim group (on claim 97490), where a northerly trending fault crosses the andesitic and gabbroic rocks.

Another northerly trending fault may occur at about line 36E along the topographic depression of "Beaver Pond Creek", but there are no adjacent outcrops to provide Geologic evidence of such a fault.

6. J. Kurth

Chéster J. Kuryliw Consulting Geologist July 10, 1967.



SUMMARY:

A combined electromagnetic and magnetometer survey was conducted on the property of International Mine Services Limited in the Beaverhouse Lake area. The property consists of 25 claims which are situated approximately 1 mile to the west of the Beaverhouse Lake Mine and 3 to 5 miles from Larder Lake and Kirkland Lake respectively. The area is well suited for electromagnetic surveying, however, since the mineralization on the Beaverhouse Lake Mine increases considerably in width with increasing depth, it was decided to modify the conventional electromagnetic equipment in such a manner that it would achieve a maximum depth penetration. Two forms of electromagnetic surveying were employed, a vertical coil survey and a horizontal coil survey. Both surveys were modified to operate over a relatively large distance. The vertical coll survey for a distance of 800 ft. and the horizontal coil survey for a coil separation of 400 ft. A frequency of 440 cycles per second was employed. The survey was conducted over lines at a spacing of 200 ft.

No electromagnetic anomalies of significance were encountered and no further exploration can be recommended on the basis of the electromagnetic survey. The magnetic survey was capable of detailing the contact zone between the basic 020

volcanic rocks which underlie the northern portion of the surveyed area and the acid volcanic rocks to the south. Fairly strong anomalies were found within the basic volcanic rocks. None of these anomalies coincides with any electrical indications. The following report describes a combined electromagnetic and magnetometer survey on a group of 25 claims. A list of the number of claims is submitted in the annex of this report.

The property lies 4 miles to the northwest of the town site of Larder Lake and 8 miles to the east of Kirkland Lake in Gauthier TWP. The area had been prospected extensively for gold, however, the conventional means of surface prospecting are not effective as a large part of the area is covered by glacial sands and gravels. The claims lie about 1 mile to the north of the gold mine of Upper Canada Mines Limited and less than 1 mile to the west of the Beaverhouse Lake Mine which produces copper and gold on a small scale.

The property surveyed on behalf of International Mine Services Limited lies in the same geological environment and on strike with the Beaverhouse Lake Mine. It was the purpose of the combined electrical and magnetometer surveys to prospect the area for massive sulphide deposits.

ACCESS:

The claims are easily accessible from Highway 66 and from there by a number of bush roads. During the summer, it is possible to drive within 1 mile of the boundary of the property. A winter road transgresses the entire property. Should a minable

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orebody be found on the property, the vicinity of the many operating mines in the Kirkland Lake and Larder Lake area would be a distinct advantage.

TOPOGRAPHY:

The area is generally covered by overburden consisting of glacial sands. However, there are enough outcrops of Precambrian rocks to make it possible to map the area in general and to indicate that the overburden is not likely to be deep. In general, outcrops are more frequent in the eastern portion of the claim group and become rarer to the west. The property is transgressed by the Victoria Creek which is quite a substantial small river and by a small, unamed creek which runs out of little Larder Lake to the north and joins Victoria Creek. This small creek forms extensive beaver ponds in the central portion of the property.

GEOLOGY :

The geology of the Timmins-Kirkland Lake area is described on one of the recent sheets of the Geological Compilation Series of the Ontario Department of Mines. This map, designated as Map 2046, gives an excellent compilation of both the geological information and the known mineralization in the general area. Detail information can be gained from Map No. 50c, Township of Gauthier, also of the Ontario Department of Mines. The Beaverhouse Lake area lies to the north of an extensive belt of Timiskaming

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sediments and volcanics in which the Kirkland Lake-Larder Lake gold deposits are found. The deposit itself occurs within basic volcanic rocks of Kewatin Age close to the contact zone with acid volcanics. The greenstones are locally intruded by syenite and syenite porphyry. The northern portion of the surveyed claim group is transgressed by the same contact zone, but judging from the outcrops, most of the property appears to be underlain by acid volcanic rocks consisting of fragmental lava, agglomerates and tuffs. Geological information can be gained from Map 47G, Larder Lake, of the Aeromagnetic Series of the G.S.C. In the Beaverhouse Lake area, the aeromagnetic map reflects the basic volcanic rocks as an area of high magnetic intensity and the acid rocks as an area of low magnetic intensity. A north-south trending fault is indicated at the location of the Beaverhouse Lake Mine and a less pronounced parallel structure to the south of Larder Lake. The northern extension of this fault would follow the creek which transgresses the property.

GEOPHYSICAL SURVEYS:

PICKET LINES:

Picket lines were cut and chained every 200 ft. extending from an east-west trending base line. Since it was difficult to carry the lines across Victoria Creek, it was found necessary to use a second base line in the northern portion

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of the property. The lines were chained and picketed every 100 ft. using the conventional system of designating the location along the picket lines. Portions of the area to the north of Victoria Creek were chained and numbered from the second base line while others were chained from the main base line.

ELECTROMAGNETIC SURVEY:

The Beaverhouse Lake Mine consists only of a very minor mineralized sheer zone at the surface, however, it gains in width at a depth of a few hundred feet. For this reason, the electromagnetic survey was very much concerned with gaining a depth penetration which comes somewhat close to the limits of the capability of the method.

in order to achieve particularly good depth penetration, special equipment was built for this survey. While this equipment was essentially of a conventional nature, it might be of an advantage to discuss the electromagnetic method in general, and to point out the changes which were made to the instrumentation in order to achieve a better depth penetration.

There are two electromagnetic prospecting methods in wide use, the vertical and horizontal coil method. The vertical transmitting coil of the first method will couple well with vertical zones of mineralization. In this way, the method has a good depth penetration. However, the method measures

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the in-phase response of the field only and is incapable of detecting the out-of-phase response of an orebody which in some cases is the more sensitive measure.

The horizontal coil method is capable of measuring both the in-phase and out-of-phase response of an underground conductor to the transmitted field. However, since the two portions of the instrument have to be connected by a cable, the transmitting coil is held in a horizontal position which does not achieve as favourable coupling with narrow vertical conductors than the vertical coil method. However, by measuring the out-of-phase component of the electromagnetic field, this method gives a parameter which is entirely independent of misalignments of the two coils. In practice, it has been found to be a more sensitive indicator of anomalous conditions than the in-phase component. In order to be certain that no deep-lying conductor is missed, it was decided to survey the claim group with both methods. The same instrumentation was used for both surveys.

Since both electromagnetic methods relate the anomalous field to the normal field strength at the location of the receiver, greater sensitivity can be achieved by increasing the distance between the transmitter and the receiver. For the horizontal coil method, increasing the transmitter-receiver

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distance has the additional advantage of improving the coupling between the two horizontal coils and deep-lying vertical conductors. In practice, there are limitations to increasing the transmitter-receiver distance for both methods. A sufficiently strong transmitter has to be supplied in order to make reliable measurements at the location of the receiver. However, there is also an inherent limitation as the distance is increased and the system is made more sensitive, anomalous indications will be observed from conductors in the underground which are not sulphide zones but represent, generally, very large zones of moderately higher conductivity than the surrounding ground. Such anomalies might be created either by clay beds in the overburden or by sheer zones within the geological section or by argillaceous zones exhibiting some conductivity due to their content of graphite. Since these geological conductors are generally much larger than the sulphide zones looked for in prospecting, their response to electromagnetic surveying increases relatively more than the response of the sulphide zones as the survey system is made larger. To a large degree, this disadvantage can be overcome by using lower frequencies for the electromagnetic survey. A decrease in survey frequency will decrease the response of large moderate conductors and will allow a better depth penetration for the EM survey.

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In order to achieve a good depth penetration, this company developed an instrument which will operate at a frequency of 440 cycles per second and which can be used to operate as a horizontal coil instrument at a distance of 400 ft. between the transmitter and the receiver and as a vertical coil instrument at a distance of 800 ft. between the transmitter and the receiver. The transmitter delivers 40 watts at this frequency. While this transmitter is not too heavy to be carried by a single man, it was necessary to employ one extra helper on the horizontal coil survey in order to drag the 400 ft. long cable along the survey lines. With the addition of the extra helper, the survey was quite efficient and not much different from a conventional horizontal coil survey.

The vertical coil survey could be conducted by two men. Both transmitter and receiver positions were changed for each reading by moving along two different lines parallel to the strike of expected conductors. The only disadvantage which was found in using the large distance of 800 ft. between transmitter and receiver was that it is difficult to communicate between the two geophysical operators at this distance. Eight hundred feet is just about the limit over which a man can be heard in the bush. It is recommended to use small portable radio equipment for communications on future surveys.

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From previous experience with ground surveys and from experience with airborne survey systems which use transmitterreceiver distances of approximately 400 ft., it can be estimated that the horizontal coil method would be capable of detecting massive sulphide mineralization to a depth of 300 ft. and that the vertical coil survey would be capable of detecting massive sulphide mineralization in a vertical plane to a somewhat greater depth. We feel that the combination of the two surveys has explored the property very efficiently and that the fact that no significant electromagnetic anomalies were detected must be taken as an indication that no massive sulphide mineralization is present on the claim group.

MAGNETOMETER SURVEY:

The magnetic survey was conducted with a Sharpe MF-1 Magnetometer which is capable of measuring the magnetic field of the earth to an accuracy of 5 gammas. However, diurnal variations and instabilities of the instrument make the probable error \pm 20 gammas. For the purpose of mining surveys, this is well within the necessary limits.

Diurnal variations and instrument drifts were detected and eliminated by surveying the base line very accurately and by using crossing points with the base line as base stations. Readings were taken every 100 ft. with closer measurements where anomalies were encountered.

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RESULTS AND RECOMMENDATIONS:

The results of the three surveys are shown on three separate maps submitted with this report.

MAGNETOMETER SURVEY :

The results of the magnetic survey correlate well with the known geology of the area. The northern portion of the surveyed claim group is underlain by basic volcanic rocks which express themselves by a succession of anomalies of high magnetic intensity. The main portion of the surveyed property appears to be underlain by acid volcanic rocks in which the magnetic variations are extremely small. The general strike within the rhyolites appears to be east-west, however, the magnetic variations are so gentle that the strike direction is not expressed definitely. A series of fairly strong magnetic anomalies follows the contact zone between the andesites and rhyolites but appears to lie well within the basic portion of the volcanics. Magnetic anomalies of this nature are not uncommon within the Kewatin greenstone belts.

HORIZONTAL COIL EM SURVEY:

Neither one of the two electromagnetic surveys showed any significant anomalies. Fairly high background variations are shown on the horizontal coil EM survey, however, these are rather due to the fact that the coil separation had

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been increased to 400 ft. than to any specific conductors. As the coil separation of a horizontal coil survey is increased from 200 to 400 ft., the sensitivity increases by a factor of 8 and it is not astonishing that small out-of-phase anomalies are encountered. These background variations are likely to indicate changes in the conductivity of the bedrock which might either be due to compositional changes or, more likely, due to sheering which appears to be quite extensive in the area. The overburden consists mainly of sand which does not give rise to electrical anomalies easily. The topography in parts of the area is fairly rough which accounts for the relatively high background in the variations of the in-phase anomalies. Variations in the in-phase field on Lines 30E and 32E are due to the fact that the lines had to bend around the Beaver Pond and are not straight in this vicinity.

VERTICAL COIL SURVEY:

The vertical coil survey did not result in any anomalies of significance. Small variations in the observed data are either due to slight misalignments of the transmitting and receiving coil or to slight variations in the conductivity of the underground material. None of the small electrical anomalies coincides with the fairly prominent magnetic anomalies in the northern portion of the property and it appears that no

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massive sulphide mineralization was detected by the present survey.

Economical sulphide deposits occur in concentrations which are not detectable by electromagnetic surveying. However, such deposits are not too frequent in the greenstone belts of the Canadian Shield.

George W. Sando

George W. Sander, Ph.D., P.Eng.









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