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REPORT ON

GEOPHYSICAL SURVEY ON

HORSEFLY, PRINCETON AND ROLLO CLAIMS,

HEDLEY DISTRICT, BRITISH COLUMBIA.

Maps 5-104-1 and 5-104-2

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INTRODUCTION

During the period October 9th to October 21st, 1937, a geophysical survey was carried out on part of the Horsefly, Princeton and Rollo claims, in the Hedley district of British Columbia.

Since the co-ordination of geology with geophysical data is essential to properly interpret the results of the survey, the present report includes a short description of the known and anticipated geological conditions on the property, before discussing the geophysical results. The geological information was obtained from an examination of the outcrops on the property and on the adjoining Terrier claim, and from the following reports:-

(1) Camsell, C. Geology and Ore Deposits of Hedley Mining District, G.S.C. Mem. 2 (1910).

(2) Bostock, H.S. Geology and Ore Deposits of Nickel Plate Mountain, Hedley, B.C. G.S.C. Summ. Rept. 1929, Pt. A, pp. 198-252.

The surface geology on the Horsefly, Princeton and Rollo claims was mapped by Dr. S. Duffell, and the sedimentary horizons were correlated with the corresponding beds on the Terrier claim, which was mapped before the commencement of the survey.

Acknowledgements

The geophysical survey was greatly facilitated by the co-operation received from Dr. V. Dolmage, Mr. R.H. Stewart and Dr. S. Duffell. The core from the present drilling campaign was accessible for examination at any time and the geological information obtained by Dr. Duffell during the course of his summer's work,proved of great assistance in interpreting and evaluating the results of the survey. Before writing the report, the results were discussed with Dr. Dolmage and Mr. Stewart. Many of the ideas and recommendations embodied in the report are a direct result of these discussions.

Size and Location

The Hedley district is located in the Osoyoos Mining division of British Columbia. The Horsefly group of claims is on the western slope of a ridge extending in a southerly direction from the summit of Nickel Plate Mountain. The camp is located on the northeastern part of the Horsefly claim and can be reached by the Mascot branch of the new Nickel Plate road from Hedley, or the old Nickel Plate road,which joins the Penticton - Keremeos highway about 19 miles from Penticton. The distance from Hedley to camp on the new road is about 11 miles.

The Horsefly group of mining claims includes the Horsefly, Princeton, Rollo, Banner and King claims, with a total area of about 130 acres. The geophysical survey covered an area of about 45 acres on the Horsefly, Princeton and Rollo claims.

Topography

Regional

The Hedley area lies in the transition belt between the Okanagan Range and the Interior plateau of British Columbia. The country surrounding Nickel Plate mountain is a high, rolling, plateau-like surface, rising from elevations of 5000 feet to 6000 feet in the northwest, to elevations of 7000 to 8000 feet in the southeast, along the summit of the Okanagan range. The streams have incised deep valleys in the plateau surface, and the Similkameen river, flowing in a southeasterly direction through the town of Hedley, is more than 4500 feet below the summit of Nickel Plate mountain. Eighteen and Twenty Mile creeks, two southerly flowing tributaries of the Similkameen river, have cut smaller valleys in proportion to their size. These two tributaries, with the Similkameen, are the only non-intermittent water courses in the district.

The whole area has been glaciated, and the flatter portions are covered with a thin veneer of glacial drift. The valleys, in particular, show the effects of glacial action. The Similkameen valley has been modified into a U-shaped valley with truncated spurs, and the smaller tributaries drop abruptly from hanging valleys into the main valley.

Local

The Horsefly group of claims is located on the steep, westerly slope of the ridge extending south from the Summit of Nickel Plate mountain. The ground drops from an elevation of about 5400 feet along the eastern border of the Horsefly claim to an elevation of about 4000 feet on the western part of the King claim, a drop of 1400 feet in a horizontal distance of about 2400 feet. In places the slope exceeds 45 degrees.

The regularity of the mountain side is broken by deep westerly trending gulches and shallower gulleys. At least some of these depressions follow fractured and faulted zones in the rocks. The largest is Horsefly gulch, which crosses the northern part of the Horsefly and Princeton claims. A smaller gulch runs north of west across the Rollo claim.

The overburden on the property is light and outcrops are numerous. Rock cliffs occur in a number of places, particularly along the sides of the gulches. A large area of rock talus occurs in the bottom and along the northern side of Horsefly gulch. There is a lesser amount in the gulch on the Rollo claim.

GENERAL GEOLOGY

Regional

The geology of the Hedly district was described by Camsell (1) in 1910 and more detailed work was done on the summit of Nickel Plate mountain by Bostock (2) in 1926 and 1928. The Horsefly group of claims lies within the area mapped by Camsell, and is immediately west of the area mapped by Bostock.

The Hedley district is underlain by Triassic sedimentary and volcanic rocks, which have been intruded and almost surrounded by later Mesozoic and Tertiary intrusives. The sedimentary rocks are cut off on the north, south and west by granite, and are overlain to the east by Tertiary volcanics.

The rocks in the area, which have a bearing on the geology of the Horsefly group are summarized in the following table:-

Table of Formations

Post Triassic	Granodiorite Composes the batholith forming the base of Nickel Plate mountain, and forms a number of dykes cutting the older rocks. No exposures of this rock observed on Horsefly group.	
	Diorite Gabbro complex Occurs in a number of stock-like masses with many sill and dyke apophyses.	
	Nickel Plate Productive Beds Thinly bedded impure limestones and	200'

	Quartzite. The calcareous beds are metamorphosed to lime silicate rocks. Only the lower part of these beds occurs on the Horsefly group.	
Triassic. Nickel Plate Formation	Lower Silicious Beds Thinly bedded quartzite with a very few beds of impure limestone.	170'
	Sunnyside Productive beds Interbedded limestones and quartzites. Where observed not as intensely metamorphosed as Nickel Plate Productive Beds, except in immediate vicinity of ore deposits.	200'
	Sunnyside Limestone Relatively fresh, blue-grey and white crystalline limestones, with only a few narrow and discontinuous silicious beds.	

Local

The oldest rocks exposed on the property occur on the southeastern part of the Banner claim, and consist of massive, very little altered blue-grey Sunnyside limestones. Uphill, to the north, the Sunnyside limestone is overlain by the Sunnyside Productive beds, consisting of more thinly bedded, impure limestones with some silicious beds. Farther up the slope the silicious beds become more prominent, and the Productive beds give way to the overlying Lower Silicious beds. These in turn are overlain by the lower members of the Nickel Plate Productive beds, and these rocks form practically all the sedimentary exposures on the Rollo claim. The Nickel Plate productive beds are thinly bedded impure limestones and silicious beds. The impure limestones are more altered than beds of similar composition in the Sunnyside formation, and consist almost entirely of lime silicates, calcite only remaining in the originally relatively pure limestone beds.

Farther north, on the Princeton and Horsefly claims, the Lower Silicious beds, underlying the Nickel Plate Productive beds are again encountered.

The horizon of the beds along the northern part of the Princeton and Horsefly claims is not certain, but they consist principally of metamorphosed lime-silicate rocks interbedded with relatively pure quartzites. Lithologically they are very similar to the lower part of the Nickel Plate Productive beds, and it is probable that they belong to the transition zone between the Lower Silicious beds and the Nickel Plate Productive beds.

Except on the Banner claim, the slope of the hill corresponds very closely with the dip of the formations, so that over the greater part of the property there is only a very small section of the stratigraphic section exposed, consisting of the upper part of the Lower Silicious beds, and the lower part of the Nickel Plate Productive beds. On the lower part of the property, the slope of the hill is steeper than the dip of the sediments, so that the same beds outcrop near the top and bottom of the property. This is illustrated by the largest sedimentary band on the Rollo claim. The hill trends in a northeasterly direction, and as the sediments strike only slightly east of north, the formational contacts trend almost due west. This also accounts for the appearance of the Lower Silicious beds on the Horsefly and Princeton claims, beneath the Nickel Plate Productive beds on the Rollo claim.

STRUCTURAL GEOLOGY

Regional

The rocks near the summit of Nickel Plate mountain form the westerly limb of a northerly trending anticline. The rocks strike slightly east of north and dip from 20° to 30° west. This major structure is modified by a number of shallow anticlines and synclines, the axes of which strike in a northwesterly -

direction. The dips on these minor folds seldom exceed 45° and the distance between crests of anticlines is about 350 feet.

The faults most commonly encountered have steep, nearly vertical dips, but exhibit a wide range of strike. Bostock has found, however, that near the summit of Nickel Plate mountain most of the faults belong to one of two groups. One group strikes from N 65 to 85 W, with the downthrow on the north side. The faults of the other group strike N 15 to 35 E, with the downthrow on either side. In general, the displacement is less than 100 feet, however, the movement along the Bradshaw fault is at least 800 feet.

The faults are later than the diorite-gabbro complex, and most of them are later than the ore. One group of faults in the Nickel Plate mine may be pre-mineralization however, and on the Horsefly claim mineralization occurs in at least two zones of shearing.

Local

The formations have an average strike across the property of N 5 to 35 E and dip about 25° west. There are many local variations in dip and strike, some of which are due to intrusion of the diorite sills and dykes and some probably due to cross folding. It was not found possible to trace any of these minor structures across the property. Although outcrops are numerous, the rock on most of the exposures is loose and has moved varying distances down the hill, so that comparatively few reliable determinations of the attitude of the beds can be made. On X line, below the showings on the Rollo claim, the beds strike slightly north of east and dip about 50° north, indicating the southern limb of a minor syncline, which may extend up the hill in the vicinity of the showings. Another marked deviation from normal was observed in the pits C 9 and C 26 on the Horsefly and Princeton claims. Here the sediments strike northwest and dip southwest from 20° to 26°. Both these pits appear to be on the north limb of a minor westerly trending syncline. The variation in strike may, however, be due to faulting along Horsefly Gulch.

Cross faulting is difficult to prove on the claims, as the faults trend in a westerly direction, nearly parallel to the formational contacts. It is probable, however, that the faults observed and mapped on the Terrier claim continue west across the Horsefly group. The surface expression of faults observed elsewhere in the area is usually a topographic depression, particularly where the faults run down slopes. It is thus reasonable to assume that there is a fault down Horsefly Gulch, and probably another down the gulch on the Rollo claim.

The showings in pits C 1, 2 and 3 and in pits 7 and 7A, follow two zones of minor westerly fracturing, both of which dip to the south.

ECONOMIC GEOLOGY

Regional

The productive ore deposits of the Hedley district are of the contact ? metamorphic type. The ore occurs in impure limestones along, or near the contacts of diorite or gabbro sills. It consists of gold-bearing arsenopyrite in a gangue of metamorphic silicates. Other sulphides present in the ore are pyrrhotite, chalcopyrite, pyrite and minor amounts of sphalerite and galena. Pyrrhotite, commonly, occurs along sill contacts, but it is not gold-bearing unless arsenopyrite is also present.

The ore deposits which have so far yielded a profitable production occur in metamorphosed members of the Nickel Plate Productive beds and the Sunnyside Productive beds. The ore bodies are thus confined to impure limestone beds, and do not occur in the silicious beds between the two productive horizons, or in the purer limestone below the Sunnyside Productive beds.

In addition to variations in composition between the different beds, the ore-bodies are also controlled by the gabbro-diorite sills and by the structure of the sediments. In general the ore occurs in impure limestones along, or near sill contacts, and a sill usually forms the foot or hanging wall of an ore-body. In the Nickel Plate mine, the sills tend to step down along the bedding and thus have an average dip greater than the sedimentary beds. The ore-bodies here do not follow the individual beds, but have a dip somewhat greater than the sedimentary beds. The sills themselves are mineralized in the vicinity of ore-bodies, but the values are not sufficiently high to make ore. The sills appear to have acted as barriers to the mineralizing solutions, and to have produced favourable zones in the bordering sediments for the penetration of these solutions.

The Nickel Plate and Sunnyside ore-bodies occur along minor diagonal folds, which have been superposed on the major structure. The Nickel Plate ore-bodies are on the southwest side of the crest of an anticline and in the trough of the adjoining syncline. The folding appears to have increased the porosity of the strata making them more susceptible to penetration of the mineralizing solutions.

It is also worthy of note that faults are present in the vicinity of all the known ore-bodies. Although most of the faults are believed to be post-mineralization, they may have occurred along pre-existing zones of weakness, which previously afforded easy access for mineralizing solutions. Adjoining areas in which such faulting is in evidence may represent favourable ground for prospecting.

Local

Prospecting is difficult because of the small stratagraphic section exposed over most of the property. Except on the Banner claim, the exposures of lime-silicate rocks in which ore is likely to be found, are confined to the lower members of the Nickel Plate Productive beds. On the lower part of the property, the beds dip at a slightly smaller angle than the hill, so that the showings may be expected to extend eastward, up the hill from the surface exposures. However, as the dip of the beds corresponds very closely to the slope of the hill, none of the showings following individual beds reach any great depth and in many places, they are cut off laterally by comparatively shallow gullies and gulches.

As the whole property is underlain by the Sunnyside Productive beds, these beds might be expected to be the more favourable of the two productive horizons to prospect. Over most of the Rollo, Princeton and Horsefly claims, the base of the Sunnyside Productive beds, which is the horizon in which the Sunnyside ore-bodies occur elsewhere, is at a depth of 250 to 400 feet below the surface. Although the mineralization in the Sunnyside ore-bodies is often more massive than in the Nickel Plate ore-bodies, they are difficult to locate as the impure limestones, in which the ore occurs, are comparatively fresh near the ore and, in general, the ore-bodies are not surrounded by a large area of sparsely mineralized metamorphic silicates as in the case of the Nickel Plate bodies.

The best chance in prospecting the Sunnyside beds is probably to drill near the surface showings in the Nickel Plate beds, in the hope that the structural conditions giving rise to the surface showings, continue to depth and produce similar mineralization when the favourable Sunnyside beds are encountered.

<u>Surface Showings on the Rollo Mining Claim</u>

Disseminated and massive arsenopyrite is exposed in a large number of pits in lime-silicate rocks on the Rollo claim. The best looking showings are in the large area of sedimentary rocks on the western part of the claim. The beds here are dipping at a lower angle than the slope of the hill and the mineralization observed in the pits presumably extends uphill to the east. Farther up the hill, where the slope has flattened considerably, there is a good showing of arsenopyrite in C 15. Here the beds are dipping steeper than the hill. Down the hill, just beyond the western boundary of the Rollo claim, there is a showing in the Sunnyside beds. These all line up in a direction about N 70 W, suggesting a mineralized zone in this direction, probably following some minor structure. With this in mind, holes Nos. 5, 6 and 7 were drilled between pit C 21 and pit C 15 to intersect the lime-silicate beds in which the showings at the top of the hill and those on the sides are located. Holes 5 and 7 were continued deep enough to pass through the Sunnyside beds. Holes 5 and 6 intersected some arsenopyrite mineralization in the lime-silicate rock at about the same horizon as the showings in C 15 and C 21. However, the sedimentary beds were narrow and most of the favourable section was occupied by diorite. Hole No. 7 encountered diorite to a depth of about 100 feet and proved quite conclusively that there is little chance of the surface showings below this point extending any great distance up the hill. The drilling into the Sunnyside formation did not yield any encouragement.

The mineralization in C 18 consists principally of massive pyrrhotite with some arsenopyrite and is somewhat different in character from the other showings in the vicinity. The mineralization occurs in a limestone bed, but appears to be in a shear striking about S 42 E and dipping south. Hole No. 8 was drilled to determine the character of this showing. (Results not known).

Other showings are exposed in pits in small inclusions of lime-silicate sediments in diorite on the Rollo claim. In the majority of pits, the sediments are dipping at a flatter angle than the hill, but it is unlikely that the mineralization extends any distance uphill, as the inclusions have only a very limited lateral extent.

Surface Showings on the Princeton and Horsefly Claims

Most of the showings on the Princeton and Horsefly claims are in the lime-silicate rocks on the northern part of the claims. On the Princeton claim, on the north side of Horsefly Gulch, there is considerable disseminated arsenopyrite in a narrow band of sediments, between two diorite sills near picket 3N (150'N) on the geophysical line N. Above the sill, chalcopyrite and arsenopyrite are exposed in pit C36. To the south and east, these beds have been removed by erosion along Horsefly Gulch and there is very little room for ore on the property to the north.

South of the gulch, relatively massive arsenopyrite, accompanied by pyrrhotite occurs in calcareous beds in pits C26 and C29, and more sparsely disseminated sulphides are present in C10 and C11. In both C26 and C29 the mineralization occurs in calcareous beds on the lower side of a diorite dyke, dipping southwest at a steeper angle than the beds. The diorite may be in the form of a dyke which continues downward at about the same dip or it may be a sill locally stepping down across the bedding. From the exposures it is uncertain whether the sulphides continue up the dip of the beds any great distance or whether the mineralization is confined to the vicinity of the dykes. If confined to the vicinity of the dykes, it is possible that the orebodies may occur in favourable beds at lower horizons, near the lower contact of the dykes.

The showings in the northeast corner of the Horsefly claim are different in character, the mineralization occurring in east-west shear zones, which dip to the south. C3, C2 and C1 are on one of these zones and C8 appears to be on its continuation on the other side of the dioritic intrusive. C7 and C7a are on a more poorly defined zone, about 100 feet south. Near the surface the mineralization in the northern zone extends outward from the shear along a narrow limestone bed and it is possible that, at depth, where the shearing cuts favourable beds, ore shoots may occur. Hole No. 4 was drilled to intersect the shear zone in the vicinity of the Sunnyside Productive beds. Where intersected, the zone appeared weaker than at the surface. Nevertheless good assays have been obtained from the mineralization in these zones and this part of the property appears to be most favourable for further prospecting work.

THE GEOPHYSICAL SURVEY

General

In order to understand the application of geophysical methods to the prospecting for mineral deposits, the following information is essential.

The electrical conductivity of a rock in Nature depends almost entirely on its porosity and its content of moisture. Thus, granularity, texture, degree of alteration, the shape and orientation of the individual grains, etc., are of importance. Hardly two rocks are ever found in the same district that show identical electrical conductivity, and only a slight difference is sufficient to enable detection with sensitive electrical methods.

Sedimentary rocks have, as a rule, considerably higher porosity and consequently also higher conductivity than igneous rocks. Certain crystalline rocks show extreme density, especially when they are fine grained, as for instance, quartz and certain acid intrusives which therefore, as a rule, stand out in an electrical survey as very poor conductors.

On the other hand, when the normal rock has been subjected to schisting, fracturing, shearing, faulting, etc., the conductivity becomes highly increased, particularly along the lines of disturbance, so that they can be very easily detected and traced electrically.

By means of an auxiliary magnetic survey it is often possible to confirm the conclusions reached in the electrical survey, as certain rocks magnetically are more permeable, showing higher density of the magnetic lines of force than others. Thus it is often possible to determine magnetically a geological contact between, for instance, certain basic intrusives and lavas, more acid rocks, etc.

In addition, mineralizations containing magnetic minerals that often occur along lines of disturbance may be easily followed confirming the existence of such lines of weakness.

In other words, by using these methods in combination, it is possible to locate and trace, besides sulphide mineralizations, the extent of certain geological contacts, sheared, fractured or silicified zones, quartz veins, etc., which are important factors in the localization of ore deposits.

It goes without saying that all geophysical work should be carried out in closest coordination with the geology.

Personnel

Dr. G.K. Lowther was in charge of the geophysical work and made the preliminary interpretations of the results. Mr. F.J.P. Consitt carried out the magnetic survey and Mr. R.W. Brown the electrical survey.

Land Survey

The lines necessary for the geophysical survey were cut and chained under the supervision of Dr. S. Duffell. The lines were run by compass N 20 E on the Rollo claim and N 29 E on the Princeton and Horsefly claims. The lines are thus nearly parallel to the strike of the formations, but owing to the slope of the hill cross formational contacts nearly at right angles, as well as minor cross folds which appear to have played a part in the localization of the mineralization elsewhere. The lines were chained and picketed at 50 foot intervals. The location of the lines and the numbers on the pickets are indicated on the map showing the electrical results. In all, 17,300 feet of lines were cut and chained, and in addition, the claim line between the Horsefly and Princeton claims was chained.

Methods

The areas were surveyed both electrically and magnetically. A sensitive variometer (Schmidt Balance, Askania type) was used to measure the vertical component of the earth's magnetic field. Observations were taken at 50 foot intervals along profile lines and it was found that owing to the irregular shape and distribution of the magnetic anomalies, additional observations at 50 foot intervals between the profiles were necessary over the greater part of the area covered. Seven and a half field days were required to cover an area of approximately 43 acres.

Electrically the survey was carried out by means of a ratiograph instrument and by electromagnetic methods. The use of the ratiograph not only permits the detection of very small differences in electrical resistivity, but also of distinguishing between the differences due to the inevitable variation in surface resistivity and those caused by variations in deep seated formations. Thus it is possible to detect changes in rock structure from point to point even though they be covered by heavy overburden. The electromagnetic method was used to check the characteristics of the conducting bodies traced across the north end of the Horsefly claim. This method determines the differences in intensity of an electromagnetic field induced by an alternating current in an insulated wire laid upon the ground. Nine thousand four hundred feet of profile line were surveyed in 8½ field days by the ratiograph method and 2 days were spent resurveying 4350 feet of the same profiles by the electromagnetic method.

RESULTS OF THE GEOPHYSICAL SURVEY

The Maps 5-104-1 and 5-104-2

The results of the geophysical survey are shown on the maps accompanying this report.

Map No. 5-104-1 shows the results of the magnetic survey. The numbers express in gamma units the relative strength of the vertical component of the earth's magnetic field. Points of equal vertical intensities (N pole attraction) are coloured blue and negative intensities (S pole attraction) are coloured red. Deeper colouring indicates greater intensity.

Map No. 5-104-2 shows the geological observations and the interpretation of the electrical results. The electrical disturbances observed on the profile lines are correlated by means of iso-intensity lines and coloured orange, deeper colouring indicating stronger conductivity.

General

Preliminary work on the property showed that it was advisable to do most of the geophysical work over areas underlain by sedimentary rocks, where orebodies might be expected to occur reasonably close to the surface. The electrical and magnetic work revealed the presence of much scattered and irregular mineralization near the surface in both sedimentary and dioritic rocks.

The intensity of electrical and magnetic anomalies obtained over sulphide mineralization decreases rapidly as the depth increases. Where mineralization is comparatively strong near the surface, the anomalies due to the surface mineralization completely mask the weaker effects due to mineralization at greater depth. Where the mineralization is weak near the surface, the anomalies obtained are difficult to distinguish from anomalies due to larger bodies at considerable depth. On the property it was found that the diorite in particular, contained so many irregularly mineralized areas that it was impossible to locate with certainty commercial mineralization at any great depth in sediments below the sills.

Thus it was found that sulphide mineralization of possible economic value could be located directly only in the higher Nickel Plate formation. It is believed, however, that the results indicate the more favourable places to drill the underlying Sunnyside Productive beds. As already pointed out, the normal type of orebody in the district is not only confined to the favourable lime-silicate beds, but in addition follows along minor cross folding. Any folds or other minor structures localizing the arsenopyrite mineralisation in favourable beds near the surface, would be expected to continue downwards 200 to 400 feet and might result in the localization of similar mineralization in favourable beds at lower horizons. Thus by locating the position and trend of mineralization in the higher beds, and assuming that the areas of strongest mineralization follow definite structures, the most favourable sections in which to drill the underlying Sunnyside beds are automatically indicated.

In addition the survey indicates the major faults and shear zones trending across the property. Faulting is present in the vicinity of practically all of the orebodies in the district and, although in most cases the faults are later than the ore, they seem to have occurred along pre-existing zones of weakness, which earlier afforded access to mineralizing solutions. On the property it was possible to follow faults which are definitely earlier than the mineralization. As the faults are mineralized and the mineralization at the surface shows a tendency to spread out from the fault into favourable beds, it is believed that, where these faults intersect the favourable Sunnyside beds, there is a possibility of locating orebodies of economic value.

The Magnetic Results

In interpreting the results shown on the magnetic map, the following general information should be borne in mind.

(1) The magnetic anomalies are due principally to the presence of magnetite and pyrrhotite.

(2) Mineralization near the surface results in sharp and irregular positive and negative anomalies. Mineralization at depth results in a smoother anomaly of weaker intensity but spread over a greater horizontal distance across the strike.

(3) Steeply dipping magnetic bodies produce the strongest magnetic anomalies and the maximum positive intensity is very nearly vertically above the upper end of the body.

(4) Magnetic anomalies dipping gently to the west and approaching the surface at the western end (conditions on the lower part of the Rollo claim) produce a relatively weak magnetic positive anomaly along the south side and southwestern end of the body and may have a slight negative anomaly along the northern side near the western end.

(5) Magnetic tests made of pyrrhotite obtained from surface pits and drill cores on the property showed that its magnetic characteristics varied between wide limits. In places it is strongly magnetic while in other places it is practically non-magnetic. The absence of a magnetic indication, therefore, cannot be relied upon as indicating that there is absolutely no pyrrhotite present, although it is almost certain that any large bodies would be indicated. Where weakly magnetic pyrrhotite is sparsely disseminated in arsenopyrite mineralization, however, it might not produce any noticeable magnetic reaction.

The magnetic results on the whole show many strong and irregular positive and negative anomalies over the area surveyed. The character of these indicates that most of them are due to small concentrations of magnetic mineralization (magnetite or pyrrhotite) comparatively close to the surface.

The most marked anomaly extends in a northerly direction across geophysical survey lines A, B and C. Tests on the diorite beneath the southern part of the zone show that the rock is very magnetic. Although the direction of the indication is nearly parallel to the strike, it is almost at right angles to the normal trend of the sedimentary rocks and sills down the hill, and therefore does not appear due to a magnetic horizon in a sill. It is believed to be caused by a dioritic dyke striking nearly parallel to the formations, but dipping west at a steeper angle than the formations,thus accounting for its N-S trend at the surface. At the northern end of the anomaly, between C and CI lines, the magnetic disturbance becomes considerably broader and another indication occurs about 125 feet farther west on CI line. These may be due to magnetic mineralization in the sediments adjoining the dyke.

The anomalies extending eastward from the major zone are all narrow, indicating features near the surface,and may be due to mineralization extending outwards from the dyke, possibly in fractures in the adjoining rocks, or perhaps to small apophyses extending outwards from the dyke.

A positive anomaly due to pyrrhotite occurs over pits CI, C2 and C3. The fact that this does not continue west on the other side of the diorite does not prove that the mineralization ceases entirely, as the pyrrhotite may be replaced by non-magnetic pyrrhotite or arsenopyrite.

The magnetic indications obtained on the Rollo claim are all very local and there are no anomalies which can be interpreted as a large magnetic orebody extending up the hill parallel to the dip of the beds.

The Electrical Results

On the Rollo Claim

As might be expected, strong electrical indications were obtained in the vicinity of the pits on the lower part of the Rollo claim. The strongest anomaly occurs just south of Pits C25, C24 and C21. This indication appears to strike about S 55° E. The holes drilled up the hill from these showings were drilled along a section line striking S 69° E so that all the holes are slightly north of the projection of the maximum part of the electrical indication up the hill. However, as these holes showed that the favourable beds were largely cut out by dioritic intrusives and there is no reason to expect more favourable conditions immediately to the south, further drilling is probably not warranted. As the beds dip at a lower angle than the slope of the hill, the mineralization giving the indication, is removed below Y line. Since it appears to be cut out by diorite a short distance above line Z, there is insufficient room for orebodies of commercial size.

Another strong electrical indication, also striking about S 55° E, was obtained immediately to the south. The maximum anomaly occurs on line X where it coincides with a magnetic indication probably due to pyrrhotite. The pyrrhotite-arsenopyrite mineralization observed in Pit C18 is on the northern side of this conductor. It has already been pointed out that the mineralization in this pit differs from that in the pits to the north in that it appears to follow a southeasterly striking shear zone. Hole No. 8 was drilled to investigate the surface showing in C18 at greater depth. The mineralization encountered in this hole is not known to us, but it is reported that no values were obtained[1].

[1]Personal communication from Dr. Dolmage.

Although the electrical indication on X line is much stronger than at hole No. 8, if the results obtained from drilling were completely negative there is little space for commercial ore to the west.

On the Horsefly and Princeton claims

Strong westerly trending electrical indications were obtained across the Horsefly and Princeton claims due, in part to sulphide mineralization, and in part to faulting. The strongest electrical indication was obtained along the bottom of Horsefly gulch, and is believed due principally to faulting. The width and intensity of the conductor shows that the rock is badly shattered and broken up over a wide zone. There is no evidence of mineralization in the fault itself, but sulphides are exposed in lime-silicate beds on both sides of the fault. About 100 feet north of the fault, at picket 3N (150'N) on line N, a calcareous bed between two sills contains disseminated arsenopyrite and in pit C36, above the upper dioritic sill, chalcopyrite occurs as well. Immediately south of the fault, massive arsenopyrite occurs in C26 and C9.

Branching eastward from the major fault, three zones of minor shearing were traced across the northern part of the Princeton and Horsefly claims. Pits on the eastern part of the Horsefly claim show that the two southern "breaks" are mineralized with pyrrhotite and arsenopyrite and some good values have been obtained. The northernmost of the three zones has not been prospected, but as the indication is similar to the two zones immediately to the south, it is also probably pre-mineralization and may contain sulphides.

A positive magnetic anomaly, due to magnetic pyrrhotite, occurs over Pits CI, C2, and C3 on the central shear zone. The absence of a magnetic indication at the other places along the zones does not necessarily mean the complete absence of even pyrrhotite however, as the magnetic characteristics of pyrrhotite found on the property varied between wide limits. It is noteworthy that no magnetic anomaly was obtained over the mineralization in C7 on the most southerly of the three zones.

The strongest indications of conductivity obtained over the three zones occur near their intersection with the main fault down Horsefly Gulch. Of the three zones, the most northerly is the strongest and marked anomalies were obtained on A line at the north boundary of the Horsefly claim and on C and CI lines in the vicinity of two strong magnetic indications. As already explained, the most easterly of the two magnetic indications is on the continuation of the northerly trending magnetic anomaly, which was interpreted as a dioritic dyke. However, the magnetic anomalies over the shear zone are wider than to the south and may indicate mineralization in the shear zones at the sides of the dyke, or, as the indication is slightly separated from the remainder of the anomalies to the south, may be due entirely to mineralization in the shear zone. In order to test the two northerly conductors in the vicinity of the magnetic anomalies, the following holes are recommended:-

	Co-ordinates	Inclination	Direction	Horizontal Length
Hole No. 1	7000N, 4120E	30°	N 70 E	355 feet
Hole No. 2	6945N, 4156E	30°	N 29 E	245 feet

If the magnetic anomaly to be intersected by Hole No. 1 is due principally to a dioritic dyke, it is believed that the hole has been located so that it will pass through the dyke while still within the shear zone. If it does not, however, a steeper hole should be drilled to intersect the conducting zones in the sediments near the footwall of the dyke. From the results of these two holes, it should be possible to determine the dip (believed to be south) of these two zones and it is then recommended that deeper holes be drilled to cut the Sunnyside Productive beds near the downward continuations of the shear zones.

Drill Hole No. 3 is recommended to cut the most southerly of the three zones. From the electrical indication, this appears to be less favourable than the other two. However, the hole should give the approximate dip of the zone and if any encouragement is encountered, a deeper hole is recommended to intersect the Sunnyside Productive beds near the downward continuation of this zone.

Farther south, another strong electrical conductor was obtained from picket 10N (500'N) on A line to beyond picket 18S (900'S) on M line. This is believed to be the western continuation of a fault mapped on the Terrier claim. As evidence of mineralization was obtained in a survey of the Terrier claim in the Sunnyside beds immediately south of this fault, Drill Hole No. 4 is recommended to cut the Sunnyside beds on the Horsefly claim in about the same relative position to the fault.

A marked electrical disturbance occurs on line M from 9S to 15S. This appears to be due to a fractured zone running at an acute angle to the line, but the correlations shown are not definite. To outline this zone accurately would require electrical measurements along lines at right angles to those already run. As the rocks at the surface here are very siliceous and N-S fracturing, as far as is known, is of no special economic significance, the additional work involved was not considered warranted.

With regard to the showings in C9 and C26, it is believed that a little surface work would show whether the mineralization is extending up the dip of the beds or is confined to the vicinity of the dykes. If the mineralization is much stronger close to the dykes, a hole is recommended along the footwall of the dykes at an angle of about 60° west to intersect the Sunnyside formation.

SUMMARY

On the Rollo Claim

Strong indications of conductivity, due to mineralization in beds near the surface were obtained on the lower part of the Rollo claim. There is little likelihood however of orebodies of commercial size in these beds as they are cut off to the west by the slope of the hill and drilling to the east showed that most of the favourable horizon is occupied by diorite.

Unfortunately the holes into the Sunnyside formation are slightly north of the main mineralized zones indicated electrically. However, as practically no mineralization was encountered in these beds and they are practically unaltered where intersected, it is doubtful if further drilling is warranted.

On the Princeton and Horsefly claims

An intensely sheared and shattered zone was found to extend down the bottom of Horsefly Gulch. Extending eastward from this main fault, three minor zones of fracturing were located, two of which at least, are mineralized. Three holes are recommended to intersect these zones near the surface, two of the holes to intersect the most northerly of the zones beneath the magnetic anomalies. From the results of these holes, it should be possible to determine their dip and obtain some idea of their importance. Deeper holes are then recommended to intersect the Sunnyside formation on the downward continuation of these zones.

A fourth hole is recommended on the Horsefly claim to cut the Sunnyside Productive beds south of a fault which extends east onto the Terrier claim. Geophysical evidence was obtained of mineralization in the Sunnyside beds south of this fault on the Terrier claim.

In addition a small amount of surface work is recommended at C26 and C29 to determine whether or not the mineralization is localized along the lower contact of the dykes exposed in these pits. If so, a hole is recommended at C26 in the sediments along the footwall of the dyke to intersect the Sunnyside beds. This hole should be drilled to the west at an angle of about 60°.

RECOMMENDATIONS

Suggested Drill Holes

Hole No.	Co-ordinates	Direction	Inclination	Horizontal Length
1	7000N, 4120E	N 70 E	30°	355 feet
2	6945N, 4158E	N 29 E	30°	245 feet
3	6722N, 4535E	N 29 E	45°	155 feet
4	5955N, 4512E	E	65°	About 350 feet to intersect Sunnyside Productive beds.

Respectfully submitted,

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Montreal, Que.
December 9th, 1937.

Approved:

Hans Lundberg
President

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