REPORT ON THE MAGNETIC AND THE RATIO RESISTIVITY SURVEYS ON A PORTION OF THE PROPERTY OF ST. MARY'S EXPLORATIONS LIMITED BLOCK 10, GILLIES LIMIT, ONTARIO

DIGEST

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DIGEST

The ratio resistivity geophysical survey has located a few conductive zones that are believed to be caused by shearing and fracturing and incidental vein filling in the rocks below. The magnetic intensity is generally somewhat lower in the vicinity of the conductive zones.

Three sections of the conductive zones are selected for testing by drilling at a favorable geological horizon. The sections selected are located in areas of shallower overburden where the bedrock is expected to be at a depth less than fifty feet.

One drill hole cross-section will test each location. Following an examination of the drill core a decision may be made about further exploration of the zones.

Your property is crossed by the valley of the Montreal River. It is believed to be evidence of the faulting and fracturing that is necessary for silver deposition in the Cobalt area. The preliminary examination of this valley could be most effectively carried out by a continuation of this geophysical survey in the winter time on the ice.

Douglas Burton

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INTRODUCTION

Between the dates October 13th and October 30th, 1962, a ratio resistivity survey and a magnetic survey was completed on nine east-west lines on Claims T-50089, -90 and -91 in Block 10 in Gillies Limit, Ontario.

The faults and fractures in the Cobalt area are the loci of silver and sulpharsenide deposits. The geophysical surveys were carried out to locate conductive zones caused by these fractures and faults, and magnetic anomalies.

Mr. J. E. Jerome, your consulting engineer, selected the area to be examined. During the course of the survey the results were discussed with and reviewed by Mr. Jerome. Our discussions assisted in the interpretation of the geophysical results into geological possibilities and terms. His cooperation is greatly appreciated.

The sand and gravel surface is flat except along the steep banks of the Montreal River and Gillies Creek. Second-growth poplar, birch and pine, with low-growing brush, covers the property.

The weather during the course of the survey was good; rain on two days slowed up the field work. The leaves were off the trees.

A three-phase power line passes through your property along the east side of the Montreal River to the silver refinery three miles to the northwest.

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LOCATION, AREA AND ACCESSIBILITY

The area surveyed covers the three claims in the northeast corner of the 8-claim group of the company in Block 10, Gillies Limit. This comprises more than 80 acres to the east of the Montreal River.

The property is readily accessible from Cobalt by means of a side road off Highway 11, three miles west of Cobalt. This road passes by Bass Lake to the Monreal River a distance of less than three miles. The road south from Bass Lake was unimproved and deeply rutted. A light bull-dozer was hired to make this road passable by car.

THE LAND SURVEY

The point of origin for the land survey is the original one-inch round-iron survey post at the northeast corner of Block 10 in Gillies Limit.

Nine east-west lines 100 feet apart are laid out along the north side of Block 10. Base lines are established at E.5000, E 3200 and E 2100 to check the position of the east-west lines. The lines were turned off by transit and continued by picketing. All lines were taped at 50 foot intervals with the taping stakes clearly marked with their coordinate position. The nearby claim posts were located and their position is shown on the accompanying maps.

In all, 36,000 feet of line were cut out, picketed and taped at 50 foot intervals for the positioning of the geophysical survey measurements. This required 34½ man days to complete. About 80 acres were divided by lines 100 feet apart.

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THE GEOLOGY

GENERAL

The most comprehensive review of the geology and the silver production of the Cobalt and South Lorrain areas is in the Annual Report of the Ontario Department of Mines, Volume XXXl, Part 2, 1922, by Cyril W. Knight. The surface geology of the region was first mapped by Willett G. Miller and described in the Ontario Department of Mines Annual Report, Volume XIX, part 2, 1913: reprints of the map accompanying this report are still available.

A very thorough review of the local geology of the Cobalt area was recently completed by Dr. Robert Thomson, resident geologist for the Ontario Department of Mines. This work comprises some eight reports and twenty maps on a scale of one inch equals 400 feet. Your property is shown on Map P-83, and the local geology is discussed in Preliminary Report P.R. 1960-3, November, 1960 on pages 69 to 79.

THE GEOLOGY OF THE COBALT AREA

The basement rocks are a complex of lavas and sediments of Keewatin age, with infolded Temiskaming sediments and intrusions of Algoman granite.

The Cobalt sediments consisting of gently dipping beds of conglomerate, greywackes, and quartizites were laid down in Huronian time, unconformably on the old surface of the basement complex.

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The most important geological feature of the district is the Nipissing diabase sill which intrudes all of these rocks. It is believed that this sill has a genetic relationship to the silver deposits. This undulating sill, some 1000 feet in thickness, cuts across the above formations at a flat angle. It is surprisingly close to the present erosional surface for thousands of square miles. This large area therefore may be favorable for silver deposits simialr to those located at Cobalt.

Erosion has removed the sill entirely in places, and in other places it has exposed the diabase at various horizons. Where the sill dips below the present surface it is intact with the intruded rocks above and below.

Although the greatest production of silver has come from the Huronian conglomerate below the sill, silver does occur in commercial quantities in the diabase and in the Keewatin rocks. Silver occurs in faults and fractures and jointing in the vicinity of the diabase contact with the intruded rocks within approximately 400 feet either way from these contacts.

A feature of the silver veins in some localities is the attendant alteration of the wall rocks of the fracture zone. This alteration may reduce the magnetite to none-magnetic minerals. Thus the fracture zones may show up as a zone of low magnetic intensity.

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THE LOCAL GEOLOGY

The Montreal River crossing your property occupies a well-marked depression with approximately a northwest-southeast strike. The river is on the west side of the portion of the property geophysically surveyed.

Another topographic depression is found along Gillies Creek in Block 4 just north of Block 10. This has a more northerly strike. The southward extension crosses the area surveyed.

South and west of the Montreal River, Nipissing diabase, Huronian conglomerate and Keewatin rock outcrops are found. These formations are projected to be under the area surveyed.

ECONOMIC CONSIDERATIONS

On Map P-83, Dr. Thomson shows the Keewatin basement rocks under the east side of the area surveyed and the Nipissing diabase on the west side. The conglomerate lies between. The two upper formations dip flatly to the west. This sequence of formations has been silver-bearing in other parts of the Cobalt area.

Faults and fractures are of the utmost importance in localizing the silver veins. These should be located by topographical observations or geophysical surveys prior to drilling. Of course, some of these faults and fracture zones will be of post-ore origin.

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Magnetic anomalies, especially those of lower intensity may be indicative of favorable alteration processes where they coincide with conductive anomalies caused by fracture zones.

The surface of the Cobalt area was very thoroughly examined by prospectors in the early days of the Cobalt boom. Evidence of their work is found everywhere. It is believed unlikely that further surface examinations will lead to new silver deposits. Other methods of exploration must be used. Suitable geophysical examinations made where the geological conditions are favorable will locate conductive zones that may be tested by drilling.

The essential role of the ratio resistivity survey is the location of the conductive conditions believed to be caused by faulting and fracturing in the bedrock. Follow-up drilling may then test these zones at the most favorable geological horizon for silver and cobalt deposits.

The valley of the Montreal River should not be overlooked for exploration. It probably corresponds to a fault zone or shearing that in the proper geological environment may have silver deposits. A magnetic and ratio resistvity survey carried out in the wintertime on the ice would be a first step in the exploration of this valley.

Spectrographic analysis of the rocks for traces of silver and cobalt may serve as a guide to silver deposits.

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Where traces of silver are located near calcite veins and fractures it may indicate that further drilling is warranted.

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THE GEOPHYSICAL SURVEYS

Two methods are used to carry out this examination. The ratio resistivity method is used to locate deep-seated conductive zones in the bedrock, and the magnetic measurements of the vertical component of the earth's magnetic field were made in order to determine the relative magnetic mineral content below each observation point.

THE MAGNETIC METHOD

During five field days, 36,000 feet of profile were examined at 50 foot intervals by observations of the earth's magnetic field.

The recordings were made by means of an accurate magnetic balance adjusted to a sensitivity of ten gammas per scale division. The observations were carefully controlled to eliminate the effect of sporadic changes of the earth's magnetic field.

The plotted observations in gammas indicate the relative intensity of the vertical component of the magnetic field from point to point. By adding 50,000 gammas to the intensities plotted the true vertical component may be obtained.

The magnetic intensity at any point will usually differ from the average value for the region. Anomalous values are caused by magnetic minerals below. The magnetic susceptibility of rocks is mainly accounted for by the con-

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tained magnetite although other magnetic minerals may contribute to the observed intensity.

This method is used for the direct location of magnetic minerals. A magnetic survey also has indirect applications and frequently yields information of value for the solution of geological problems. Magnetic anomalies are often found associated with geological features. Dikes and contacts may be located and traced. Faults may be delineated where they are related to disseminations of magnetic minerals.

The magnetic values recorded on the accompanying map have been related to the magnetic intensity at the Larder Lake base station established by the Ontario Department of Mines. At this control station the magnetic vertical component is 57,800 gammas as determined on August 15th, 1948, by Mr. R. G. Madill, Chief of the Magnetic Division of the Dominion Observatory.

THE RATIO RESISTIVITY METHOD

Twenty-seven and one-half man-days were required to examine 31,600 feet of profile at 50 foot intervals. The area surveyed covers about 80 acres.

The ratio resistivity method will locate even slight conductivity changes in the bedrock at depth. In the Cobalt area, small fractures and faults, sulpharsenides, calcite and metallic silver veins have been found by drilling the anomalies located with this method.

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The electrical resistivity methods of geophysical prospecting are primarily concerned with the relative electrical conductivities of the underlying rock formations. The resistivity of the common rocks as they occur undisturbed in their natural state is chiefly determined by the number, size and orientation of the pore spaces and the water filling these voids. Saturated shear zones, schists and fault breccias will exhibit higher conductivity than the neighboring rocks. Metalliferous minerals, such as sulphides with a metallic luster, conduct current quite readily.

The reading circuit is an alternating current bridge connected to three grounding rods. It is adjusted to balance by means of earphones, and determines the ratio of the resistivity of adjoining 50-foot sections of ground. By means of a double adjustment the ever-present variations of the rod contact resistance are equalized and they do not affect the resistance ratio determined.

Alternating current of audible frequency is applied to the ground by means of widely-spaced ground contacts, exterior, colinear and far removed from the reading circuit. Two ratio readings at each profile position are made with the applied current at each end of the profile being tested. The two ratios are plotted and compared in such a manner as to eliminate the effect of near-surface conductors that might occur in the overburden or deeply-weathered surface rocks.

The plotted results from the ratio resistivity survey

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also permit an estimate of the depth of overburden to be made. This is valuable information for laying out drill holes where there are few outcrops or the survey is carried out on a lake.

Conductive anomalies are most effectively determined when the resistance variations are determined at right angles to the strike. Silver veins may strike at any angle. Anomalies on lines more or less parallel to the strike of the vein system will be difficult to correlate. It may therefore be desirable that a second grid of lines at right angles be examined in order that ratio resistivity determinations may cross the strike of some conductors at a more effective angle.

This ratio resistivity technique may be used on lakes from boats, or from the ice in the wintertime. In the latter case, contact must be made with the water below the insulating ice.

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THE RESULTS OF THE GEOPHYSICAL SURVEYS

THE MAPS

Two maps numbered 62-10-1 and 62-10-2, drawn on a scale of one inch equals 200 feet, accompany this report. A small key property map, scale 1" = 1320', shows the relation of the property to Block 10 and the interpolated geological contacts taken from the published maps. The area surveyed is emphasized by color.

The sections selected for testing by drilling are shown on both maps by heavy red bars.

Map No. 62-10-1 shows the magnetic results of the geophysical survey. The relative vertical component in gammas is shown on the profile lines. Equal intensity lines are drawn. The higher values above 7900 gammas are colored blue and the lower intensity areas (below 7800 gammas) are shaded in red.

Map No. 62-10-2 shows the results of the ratio resistivity examination. The curve drawn using the profile line as a datum shows the relative conductivity. The green shading indicates more resistive zones and the red tinting indicates the better conductive zones in the bedrock at depth. The axes of the conductive anomalies are drawn in.

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THE MAGNETIC RESULTS

The magnetic variations are from 57,530 gammas to 58,210 gammas, a difference of only 680 gammas. The horizontal gradient is small, two gammas per foot or less.

The higher magnetic values are above the Keewatin formations mapped under the eastern part of the area surveyed. These indicate the general strike for the magnetic anomalies to be about N 54° W.

The lower magnetic values are near the Montreal River where the conglomerate and the diabase is mapped below. Anomalies striking more or less at right angles are noted. The predominant one is N 46° E and the minor one is N 45° W, parallel to the Montreal River valley. A zone of low magnetic intensity is found along the Gillies Creek depression.

THE RATIO RESISTIVITY SURVEY RESULT

Several conductive zones may be traced from line to line. Three sections have been selected for testing.

The minor zones near the mouth of Gillies Creek are favored for examination first. These are the same type that in other places in the Cobalt camp have been caused by calcite veins with silver and cobalt sulpharsenides.

A persistent wide, conductive zone strikes in a more north-south direction near E 2700 in the central part of the area examined. This seems to denote a regional trend and appears to correspond to the zone of weakness indicated by the Gillies Creek valley. It may be tested by drilling a cross-

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section at E 2650 on Line N 5000.

The plotted results of the survey indicate deep overburden, in most of the area more than fifty feet. The sections chosen for testing are in the more shallow depths indicated, and it is believed that the depth of overburden is less than fifty feet. The bedrock surface where exposed on other nearby parts of the property shows abrupt elevation changes. This is expected to be also true of the bedrock surface in the area geophysically surveyed.

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CONCLUSIONS AND RECOMMENDATIONS

The conductive zones indicated by the ratio resistivity survey are of the type that in other parts of the Cobalt area have been caused by calcite veins with silver and cobalt sulpharsenides. They should be tested by drilling. The sections recommended for examination are in areas of low magnetic intensity.

The sections selected are located where the overburden is shallowest along the conductive zones.

The Montreal River valley should be explored. Ratio resistivity surveys combined with a magnetic examination may locate zones that should be further examined by drilling.

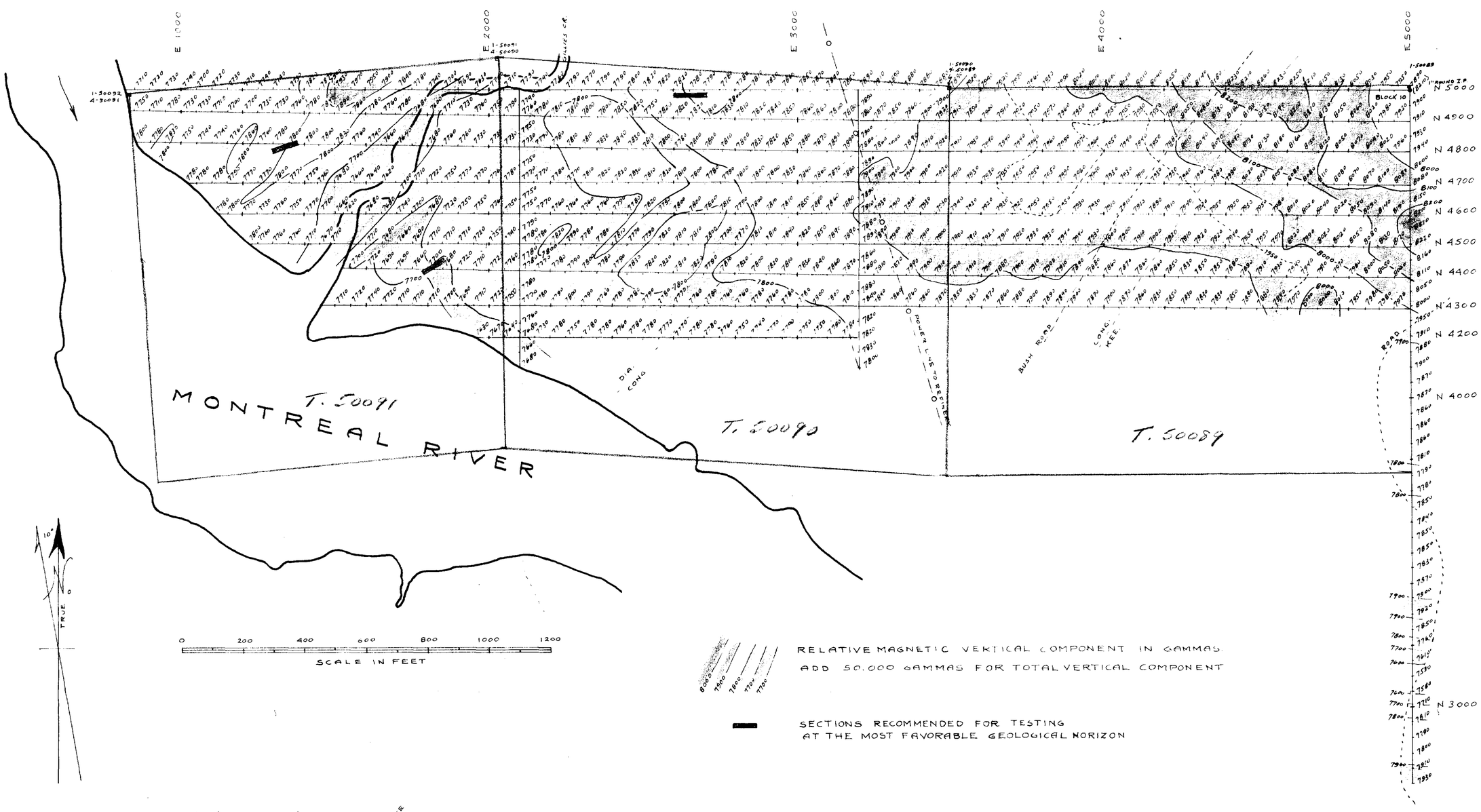
Spectrographic analysis of the drill core for traces of cobalt and silver may be a further guide to silver deposits near the holes drilled.

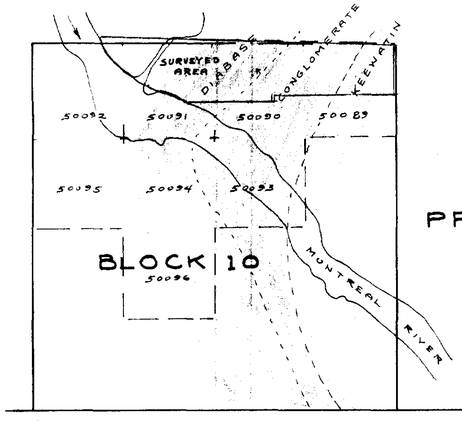
This report is,

Respectfully submitted,

Douglas Burton,
Geophysicist.

Cobalt, Ontario,
November 9th, 1962.





PROPERTY MAP
SCALE 1" = 1320'

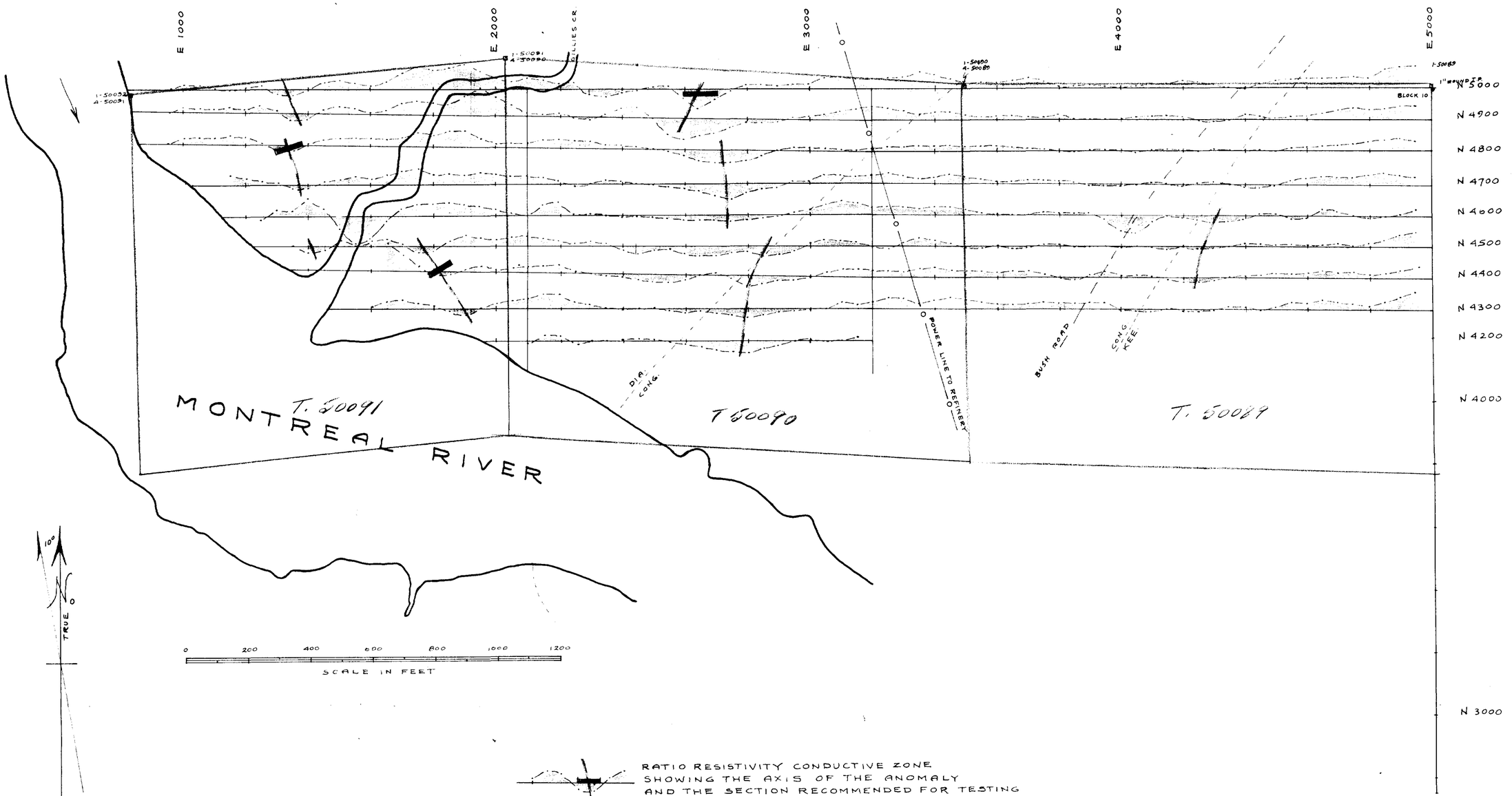
MAP SHOWING THE MAGNETIC RESULTS OF THE GEOPHYSICAL SURVEY ON A PORTION OF THE PROPERTY OF ST. MARY'S EXPLORATIONS LIMITED BLOCK 10, GILLIES LIMIT, ONTARIO

TO ACCOMPANY REPORT BY
DOUGLAS BURTON
COBALT, ONTARIO
NOVEMBER, 1962.

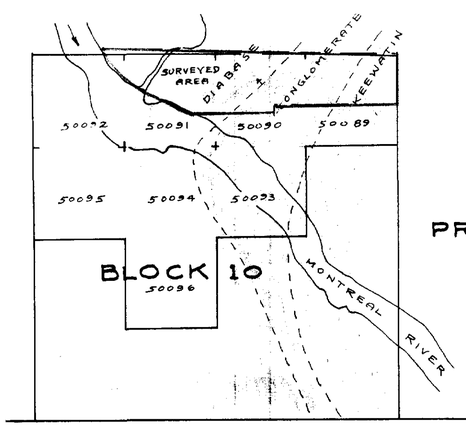
62-10-1

D.B. NOV. 1962

31M05SE0084 63.1209 GILLIES LIMIT



RATIO RESISTIVITY CONDUCTIVE ZONE
SHOWING THE AXIS OF THE ANOMALY
AND THE SECTION RECOMMENDED FOR TESTING
AT THE MOST FAVORABLE HORIZON



PROPERTY MAP
SCALE 1" = 1320'

MAP SHOWING AN INTERPRETATION OF THE RESULTS OF THE RATIO RESISTIVITY SURVEY ON A PORTION OF THE PROPERTY OF ST. MARY'S EXPLORATIONS LIMITED BLOCK 10, GILLIES LIMIT, ONTARIO

TO ACCOMPANY REPORT BY
DOUGLAS BURTON
COBALT, ONTARIO
NOVEMBER, 1962.

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62-10-2
D.B. NOV. 1962.

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