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REPORT ON
INDUCED POLARIZATION SURVEY
CARMACKS AREA. YUKON
ON BEHALF OF
YUKON REVENUE MINES LIMITED

By: J G Baird October 31, 1968

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INDUCED POLARIZATION SURVEY
CARMACKS AREA, YUKON
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by

Jon G. Baird, B.Sc., P.Eng.

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CLAIMS:

Name	Record Number
REVENUE 1, 12	Y26363, Y21273
REV 10	Y25958
ADDITION 3, 4, 5	74488, 89, 75323
INCA 1, 2, 4, 5, 6	Y21008, 10, 11, 12, 13
REVENUE COPPER 1 to 6	67180 to 67185

LOCATION:

About forty miles west of Carmacks, Yukon
62° 20" N, 137° 20" W

DATES:

September 26, 1968 to October 19, 1968

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SUMMARY

The present induced polarization survey has furnished a map of the metallically conducting content of the bedrock which may be useful in outlining areas containing commercial type sulphide mineralization.

The survey has revealed periferal areas of high chargeabilities surrounding a central area of low to moderate chargeabilities. The peak chargeabilities (induced polarization effects) observed on the property could be explained by distributions of metallically conducting material in the subsurface of up to about 8% by volume which could consist of sulphide mineralization, magnetite, carbonaceous material and/or other polarizable conducting minerals in unknown relative proportions.

A compilation of all available geological, geochemical, and magnetic data with the present induced polarization-resistivity results is recommended. On the basis of such a review diamond drilling may be recommended to test different environments occurring within the survey area which may be favorable for the occurrence of a porphyry-type copper deposit. Additional induced polarization surveying may be warranted if results are favourable.

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INTRODUCTION

During the period from September 26 to October 19, 1968, a geophysical field party under the direction of Mr. Francis Bourqui executed an induced polarization survey in the Carmacks area, Yukon on behalf of Yukon Revenue Mines Limited.

The property lies approximately forty miles west of Carmacks and is reached by unimproved road. The claims lie on the south side of the Big Creek Valley and are wooded by spruce trees. Elevations on the survey area range from about 2450' to 4500' above sea level. The mineral claims covered in whole or part by this survey are listed on the title page of this report and are shown on Plate 2 on the scale of 1" = 400'. These claims are held by Yukon Revenue Mines Limited.

Seigel MK VI time domain (pulse-type) induced polarization equipment had been employed on this property. The transmitting unit had a rating of 2.5 kw and equal on and off times of 2.0 seconds. The receiving unit was a remote, ground-pulse type triggered by the rising and falling primary voltages set up in the ground by the transmitter. The integration of the transient polarization voltages takes place for 0.65 seconds after a 0.45 seconds delay time following the termination of the current on pulse.

The purpose of an induced polarization survey is to map the sub-surface distribution of metallically conducting mineralization beneath the

grids covered. In the present area such mineralization could include chalcopyrite, pyrite, and other sulphide minerals. As well, magnetite, graphite and other metallically conducting minerals can cause responses not always distinguishable from sulphide mineralization by the electrical characteristics alone.

The accompanying copy of H. O. Seigel's paper entitled "Three Recent Irish Discovery Case Histories Using Pulse Type Induced Polarization" gives a description of the phenomena involved in this type of survey, the equipment employed, the field procedures and the nature of the results obtained over various base metal ore bodies.

On the present property a base line was laid out oriented north-south and grid lines were established oriented perpendicular thereto at 300' centres. The three electrode array with electrode spacings of 400' and station intervals of 200' was employed for reconnaissance purposes. In addition, the three electrode array with electrode spacings of 600', 300', 200', 100', 50' and 25' was employed in certain areas of interest to give additional detail.

GEOLOGY

The geology of the Revenue Creek property is described in a report by Douglas D. Campbell dated November 17, 1967. Plate 2 of the present report shows the generalized geology of the central part of the survey area as mapped by R. A. Granger of Yukon Revenue Mines Limited. Most of the area is overburden covered but appears to be underlain by intrusive rocks of a granodioritic composition. Different phases of these intrusives have been distinguished; the most important possibly being an altered rock which has been termed "brecciated porphyry". Dr. Campbell believes that this brecciated rock may be pipe-like in structure and could be a favorable indication for

the presence of a disseminated copper deposit. High grade veins containing chalcopyrite have been found. As well, disseminated chalcopyrite and pyrite have been observed to occur within the breccia and the surrounding granodiorite. Schistose rocks have been noted south and west of the grid.

Soil samples taken in the central part of the present survey area have been assayed for copper. The generalized results of this work are shown on the geology plan of Plate 2.

DISCUSSION OF RESULTS

Plate 2 consists of three plans on the scale of 1" = 400'. The geology plan is a generalization of the mapping done by Granger with the copper geochemical results superimposed. The resistivity and chargeability contour plans are for the observations taken with the three electrode array and the 400' electrode spacing. The contour interval for chargeability is 5.0 milliseconds while a logarithmic contour interval showing the 200, 400 and 800 ohm-metre contours has been chosen for the resistivity map.

Plate 3, on the scale of 1" = 400', shows the detail geophysical results in profile form. Two parameters are plotted separately; chargeability (the induced polarization characteristic of the rock) in milliseconds, and resistivity in ohm-metres. The vertical scales for these profiles are 1" = 10.0 milliseconds for chargeability and 1" = 1000 ohm-metres for resistivity. The interline spacing is not to scale. Different symbols explained in the legend have been used to denote the observations taken with the different electrode spacings. As well, for Line 24 S a profile has been plotted of magnetometer results supplied by Mr. Granger.

The observed chargeability values for the 400' electrode spacing reconnaissance survey range from a low of 6.5 to a maximum of 47.5 milliseconds. These chargeabilities are considered to be of a moderate to high

level by normal standards. Those areas where the chargeabilities are in excess of 20.0 milliseconds have been shaded on the chargeability contour plan. The chargeability results indicate that the entire survey area is underlain by rocks containing some metallically conducting material varying in percentage from about 1% by volume in the centre of the grid to a maximum of about 8% by volume in the southeast corner of the grid. The high chargeability areas are peripheral to the grid while the lowest chargeability observations occur in the central portion, coinciding more or less with the brecciated porphyry rock type.

Detail observations have been taken on sections of Lines 18 N and 24 N over the northwest area of high chargeability. Quantitative interpretation of these results indicates that the bulk of the chargeable material lies at depths below 70' from the ground surface within most of the shaded area on the chargeability plan of Plate 2. In two places, near 45 W on Line 24 N and near 40 W on Line 18 N, polarizable material contained in narrow bodies likely approaches to within 35' and 20' or perhaps closer to the ground surface on Lines 24 N and 18 N respectively. High resistivity values for the short electrode spacings indicate that the overburden may have a higher resistivity than the bedrock.

Detail observations on the west ends of Lines 15 S and 18 S lie within an area of high chargeability in the southwest corner of the grid. Quantitative interpretation of these results indicates that the upper surface of the main polarizable body is about 70' below ground surface. The narrow spacing profiles indicate that in some places, such as near 40 W on Line 15 S, some metallically conducting material may occur within 40' of the surface.

Some magnetic surveying has been carried out on the survey grid and although all the results are not presently available to the writer, an earlier review did not reveal any direct correlation between magnetic and

induced polarization features. One magnetic profile has been plotted on Plate 3 for Line 15 S. Although two small magnetic highs indicative of near surface magnetic features occur, the general character of the magnetic profile does not indicate any correlation with the induced polarization anomaly.

The resistivity results show a variation in apparent resistivities from less than 200 ohm-metres to a maximum value of 1420 ohm-metres. The resistivity pattern does not correspond directly with the chargeability pattern nor to the interpreted distribution of rock types. Since the overburden appears to be of much higher resistivity than the bedrock, the observed changes in resistivity may be more due to changes in overburden thickness than to any characteristics of the bedrock.

CONCLUSIONS AND RECOMMENDATIONS

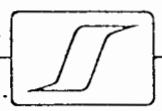
Three areas near the borders of the present survey grid are underlain by rocks of relatively high inherent chargeabilities indicative of large volumes of rock containing appreciable content of metallically conducting material. Moderate chargeabilities in the centre of the grid in the area underlain by a brecciated porphyry rock type reveal that this rock carries from about 1% to 1¼% by volume of metallically conducting material, which from present geological and geochemical data could be, at least partly, sulphide mineralization. To date, low grade copper samples have been taken and a limited amount of diamond drilling has been done. No distinct chargeability increases are noted to occur near this central area so that the induced polarization results do not indicate any significant increase in metallically conducting content within the area believed to be underlain by the brecciated rock type.

Due to the extensive overburden cover, very little is known of the

geology of the areas of highest chargeabilities so that it is difficult to predict the type of metallically conducting material which may cause the anomalies. Since schist rocks which may contain sulphides as well as other conducting minerals are known to occur near the grid, their existence in the areas of high chargeabilities must be considered a possibility.

The geochemical survey does not cover the entire area surveyed by induced polarization. It is recommended that this survey be extended to cover the present anomalous areas. In addition, a magnetometer survey may provide valuable aid in interpreting the geology of the property and therefore the significance of the present results. Since hydrothermal alteration may be important in the localization of sulphide mineralization, and since the distribution of magnetite is often affected by such alteration, the magnetic data may be important in discerning zones which may carry commerical type sulphide mineralization.

Since geochemical and geological work to date indicates that copper sulphide mineralization occurs on the property, the present areas of high chargeability may be of possible significance. These zones may be expected to contain the highest metallic content; however, they may not necessarily contain the highest copper values. A thorough compilation should be made of all available geological, geochemical, and geophysical data in order to select diamond drill targets which would most efficiently explore the different geological environments which may occur. The present detail chargeability results will be useful in precisely locating diamond drill holes in the areas of high metallic content.



Extensions to the present induced polarization grid would be predicated on the results of a program of diamond drilling.

Respectfully submitted,

SEIGEL ASSOCIATES LIMITED

Jon G. Baird

Jon G. Baird, B.Sc., P.Eng.
Geophysicist

P. Eng Yukon

Vancouver, B.C.
October 31, 1968

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Harold O. Seigel

President,
Harold O. Seigel & Assoc., Ltd.,
Downsview, Ontario

Annual General Meeting,
Toronto, March, 1965

Three Recent Irish Discovery Case Histories Using Pulse-Type Induced Polarization

Transactions, Volume LXVIII, 1965, pp. 343-348

ABSTRACT

In the intensive Irish exploration program which has followed the discovery of the Tynagh deposit (Northgate Exploration, Ltd.) in 1962, three base metal discoveries have been made to date. These include the lead-zinc-silver deposits at Silvermines (Consolidated Mogul Mines, Ltd.), which are now being readied for production, the copper-silver deposit at Gortdrum (Gortdrum Mines, Ltd.) and the lead-zinc deposits near Keel (Rio Tinto-Zinc Ltd.). Each of these discoveries is the result of a combined geological-geochemical-geophysical exploration sequence in which pulse-type induced polarization surveys defined the precise location and lateral extent of the near-surface metallic sulphide mineralization and guided the initial drilling program. Whereas the Silvermines mineralization is, in part, composed of massive sulphides, the other two deposits are characterized by generally less than 5 per cent conducting sulphides and constitute an excellent demonstration of the unique merits of the pulse-type induced polarization system.

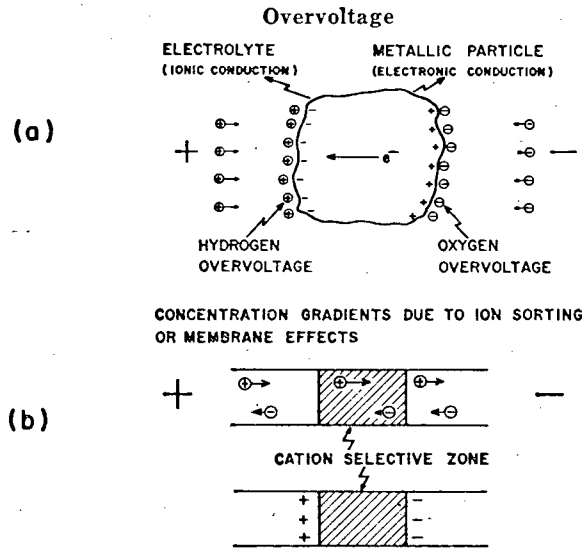


Figure 1.—Induced Polarization Agents.

Introduction

FOR the benefit of those who are unfamiliar with the induced polarization method in general or with the pulse-type method in particular, a few introductory remarks will be directed on the system employed in the present case histories. Those who wish a fuller treatment of the subject are directed to Seigel (1962),* which paper also includes an extensive list of references.

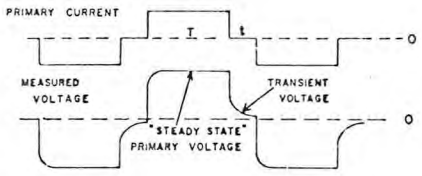
Induced polarization, in its broadest sense, means a separation of charge to form an effective dipolar (polarized) distribution of electrical charges throughout a medium under the action of an applied electric field. When current is caused to pass across the interface between an electrolyte and a metallic conducting body (Figure 1a) double layers of charge are built up at the interface, in the phenomenon known to the electrochemists as "overvoltage." This is the phenomenon which can be utilized for the detection of the metallic conducting rock-forming minerals such as most sulphides, arsenides, a few oxides and, unfortunately, graphite. In addition, effective dipolar charge distributions occur to some extent in all rocks, due to ion-sorting or membrane effects in the fine capillaries in which the current is passing (Figure 1b). Induced polarization responses may therefore arise from metallic or non-metallic agencies. Fortunately, the latter generally fall within fairly low and narrow limits for almost all rock types, although there is still no reliable general criterion for differentiating overvoltage responses from graphite and metallic sulphides, or for distinguishing between the responses of one type of sulphide and another. Despite these limitations, the induced polarization method has amply demonstrated its value in mineral exploration since its initial development as a useful exploration tool in 1948. (Wait *et al.*, 1953).**

*Seigel, H. O., "Induced Polarization and its Role in Mineral Exploration," C.I.M. *Bulletin*, Vol. 55, No. 600, pp. 242-249; *Transactions*, Vol. LXV, pp. 151-158; 1962.

**"Overvoltage Research and Geophysical Applications," *Pergamon Press*, 1959, edited by J. R. Wait.

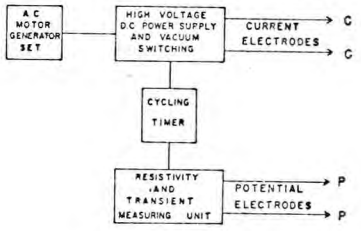
(a)

Wave Forms



(b)

Equipment Block Diagram



Three-Electrode Array

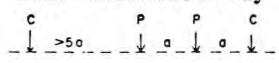


Figure 2.—The Pulse System.

Description of Method

For the present program, the pulse or time-domain system was employed. As shown on Figure 2a, the primary current wave form consists of square wave pulses of 1.5 seconds duration, separated by a 0.5-second gap and alternately reversed in direction. The polarization voltages established during the current-on time decay slowly during the current-off time. They are amplified, integrated over the current-off time and divided by the amplitude of the steady-state voltage measured during the current-on time. In this way, we determine the "chargeability;" i.e., the induced polarization property of the region under investigation. The units of chargeability are milliseconds. Normal (non-metallic) background chargeabilities in most rocks range from 1 millisecond to 5 milliseconds. A distribution of 1 per cent, by volume, of metallic conducting material of an average range of particle size may be expected to increase the response level by about 3 milliseconds, which is readily visible.

The pulse system provides an absolute measurement of induced polarization; i.e., the significant measurement is made in the absence of the primary field. As such, it is inherently more sensitive than the frequency variation system, wherein two measurements are compared, both of which are made in the presence of the primary field. This is a critical consideration when mineralized bodies of low sulphide content, small size or great depth are being sought.

Figure 2b shows a block diagram of the apparatus employed and the electrode array used. The spacing "a" of the three-electrode array determines the effective depth of penetration of the survey and is selected to give adequate penetration to the depth desired. By varying the electrode spacing over an anomalous area and comparing the responses on the various spacings, one may obtain an estimate of the depth of burial of the source and its dip, etc.

A photograph of the type of apparatus employed on these surveys is shown in Figure 3. This is known as Seigel Mk V equipment and consists of the following major components: (a) a 1,200-watt A.C. motor-generator set, (b) a power control unit capable of supplying up to 1000 volts and 2 amperes D.C. output current and (c) a measuring unit. All of these items are packboard-mounted for maximum portability.

Figure 4 shows a typical instrumental set-up in Ireland. In the normal operating procedure, the electronic chassis are set up in a tent and cables are fed out to the line being surveyed. As the line crew is prepared, both mentally and by apparel, to work under all types of weather conditions, the survey is not stopped by rain, etc. This is important in Ireland, where, traditionally, there are no more than 60 rain-free days a year.

For the primary survey coverage on most properties, an electrode spacing of 200 to 300 ft. was generally employed, with a station interval of 200 ft. and a line separation of 300 to 500 ft. On anomalous areas located by the primary coverage, more closely spaced stations and lines are employed, as well as additional spacings to supply the detail necessary for subsequent drilling, etc.

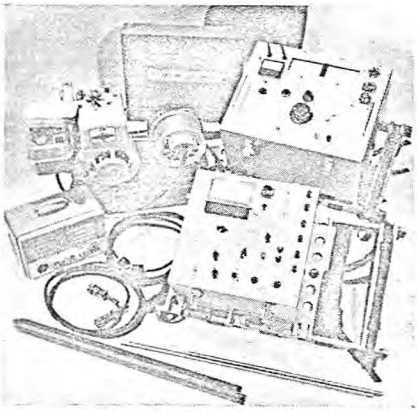


Figure 3.—(above)—The Seigel Mk V Induced Polarization Unit.

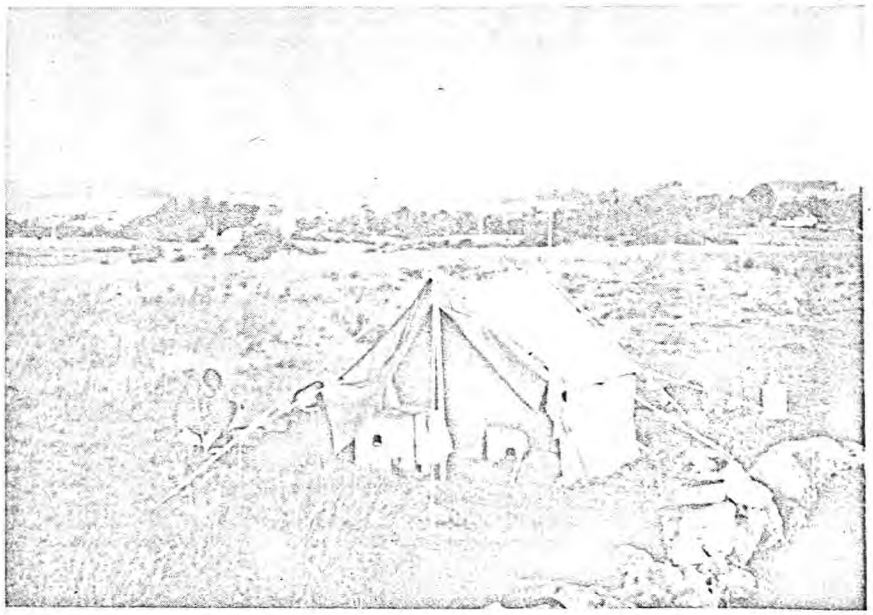


Figure 4.—(right)—Typical Field Operational Base in Ireland.

Case Histories

In presenting the three case histories that follow, it must be made perfectly clear at the outset that these mineral discoveries are the product of teamwork, involving geological, geochemical and geophysical phases. It is on the basis of the first two phases that the areas for geophysical investigation have been selected. As the writer and his organization have been concerned only with the geophysical phase, this paper will, naturally, appear to emphasize it. The contribution of others to the broader exploration program must not be minimized, however.

In January, 1962, a large lead-zinc-silver deposit of a very unusual type was discovered near Tynagh, Co. Galway, in the Republic of Ireland. This deposit includes both a supergene enriched, partly oxidized upper zone and a sulphide primary zone and lies in dolomitic reef limestones of Carboniferous age near a fault contact with Devonian sandstones. Similar rock types and contacts occur in many parts of Ireland, so that an extensive program of exploration was initiated by a number of mining companies, starting in the summer of 1962. Although the pace has slowed up somewhat from the hectic days of 1962 and early 1963, this exploration program continues to the present time.

The usual exploration sequence, although not followed in detail by all companies, is as follows:

1 . . . . . .

A selection of areas is made, based on the good government geological maps available. As nearly as possible, rock types and structures similar to those of the Tynagh deposit are sought. Those areas with known mineral showings are given high priority, of course.

2 . . . . . .

The stream sediments in the drainage pattern are sampled and analyzed for significant amounts of copper, lead and zinc. Soil samples may also be taken, often on a regular grid basis, and analyzed. In this fashion, areas of abnormal metal content may be broadly defined. In detail, such geochemical sampling has often been hampered by man-made contamination and confused by soil transport by glacial, fluvial or human agencies.

3 . . . . . .

Geophysical surveys, primarily the induced polarization type, are then conducted to map the subsurface distribution of sulphide mineralization and to provide guidance for a drilling program thereon.

This exploration program has already been remarkably successful, resulting, to date, in a new lead-zinc-silver mine-to-be at Silvermines, Co. Tipperary, for Consolidated Mogul Mines, Ltd., the probable copper-silver mine-to-be at Gortdrum, Cos. Tipperary and Limerick, for Gortdrum Mines, Ltd., and the interesting lead-zinc prospect at Keel, Co. Longford, for the Rio Tinto-Zinc group (Riofinex Ltd.). Figure 5 shows the location of the various recent mineral discoveries in Ireland. Despite a remarkable similarity in geological setting, the deposits are widely separated geographically, over a length of 80 miles, and no two are located on what can be called the same structure. This bodes well for the possibility of further discoveries being made in Ireland.

Each of the three case histories will be discussed below.

Silvermines Deposit

As the very name of the area implies, the Silvermines region had been known, for many centuries, as a locality mineralized with lead, zinc and silver. Metal production had taken place at several periods in the past, although at the time of the present investigations the mines were dormant. The very prominent Silvermines fault, striking about N 70°E, was known to be the significant control in the region, with the old mines and prospect pits scattered along its length over a distance of about 2 miles. Due to the past mining activity and transport by both drainage and man, a very extensive area gave rise to extremely high geochemical indications in lead and zinc. The induced polarization survey executed in late 1962 and early 1963 covered much of the concession area on 800-ft. sections and the geologically interesting portion thereof on 400-ft. sections. The three-electrode array, with 200-ft. electrode spacing, was employed on all lines, and spacings of 100 ft. and 400 ft. were also employed on the 400-ft. detail lines. In all, approximately 5 miles of the strike length of the Silvermines fault were covered by the present survey, 2½ miles in detail. At least ten distinct zones of abnormally high polarization were indicated, of which about half lay in the Silvermines mineralized belt and its extensions to the west and east.

One of these zones, designated the Garryard, has responded favourably to the subsequent drilling, resulting in the discovery of a mineable orebody.

To date, the announced proven tonnage figures include 12 million tons averaging approximately 8 per cent zinc, 3 per cent lead and 1 ounce of silver in the Garryard zone. This zone lies to the west of the zone from which the previous production had taken place.

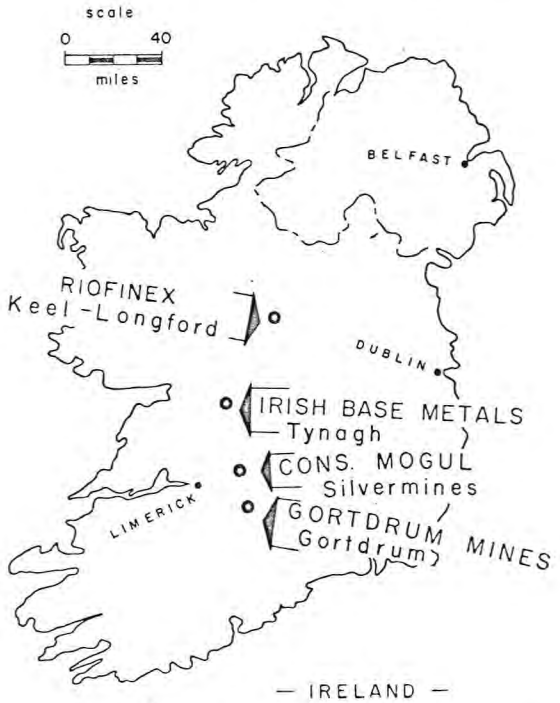


Figure 5.—Location Plan of Recent Mineral Discoveries in Ireland.

Figure 6 shows a typical discovery profile across the main ore zone, on the section 38,400E. The 200-ft. electrode spacing results, both chargeability and resistivity, are shown in profile form. The geologic section, as deduced from nine drill holes, is shown below the geophysical profiles. In a fashion almost identical to that of the Tynagh deposit, the Silvermines orebody is located in gently north-dipping dolomitic limestones adjacent to a fault contact with the Devonian "Old Red" sandstone. The mineralization here is composed of both massive and disseminated sulphides, with the former composed of a high percentage of pyrite. The mineralization is essentially conformable, in two distinct horizons, and is therefore flatly dipping except in the vicinity of the fault, where the dips are much steeper, perhaps due to "drag folding" on the fault.

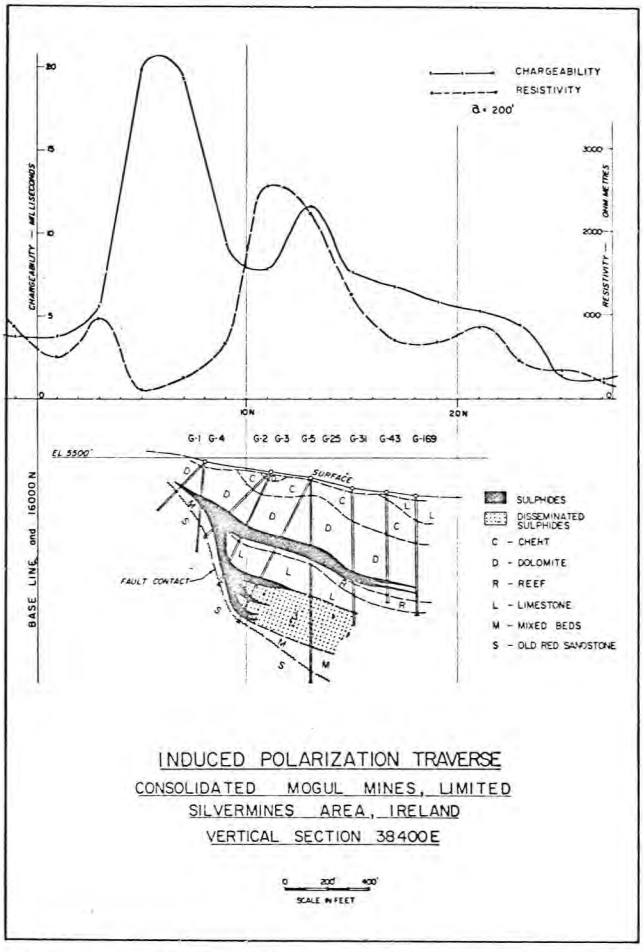


Figure 6.—Typical Discovery Traverse, Silvermines Deposit.

Because of the high pyritic content of the mineralization near the fault, along which it comes closest to the ground surface, we see both a marked increase in chargeability and a sharp decrease in resistivity in that vicinity. From a normal background of 2-4 milliseconds, the chargeability curve rises to a peak response of 20 milliseconds over the sub-outcrop of the body on this section. The subsidiary peak of about 12 milliseconds near 11N is believed to be due to disseminated pyrite in the chert horizon.

Figure 7 shows the multiple spacing chargeability results on the same section, using electrode spacing of 100, 200 and 400 ft. and the three-electrode array. On comparing the results with the various spacings, two items of interest may be noted; firstly, the progressive increase in peak amplitude with spacing, testifying to the increase of mineralization with depth, even down to a depth of 300 ft., and, secondly, the presence of buried material of high polarization at depth beneath section 10N to 18N on this line. The latter is undoubtedly due to the down-dip extension of the upper mineralized horizon, which is present at depths of 300 to 400 ft. over this region.

The induced polarization results on the Silvermines deposit were quite definitive and have provided good guidance for the exploratory drilling. It is true, however, that the massive sulphide portions of this deposit would be amenable to detection by the more conventional electrical methods, such as electromagnetic induction or resistivity. As such, it is not as good a test of the capabilities of the induced polarization method as are the two case histories which follow.

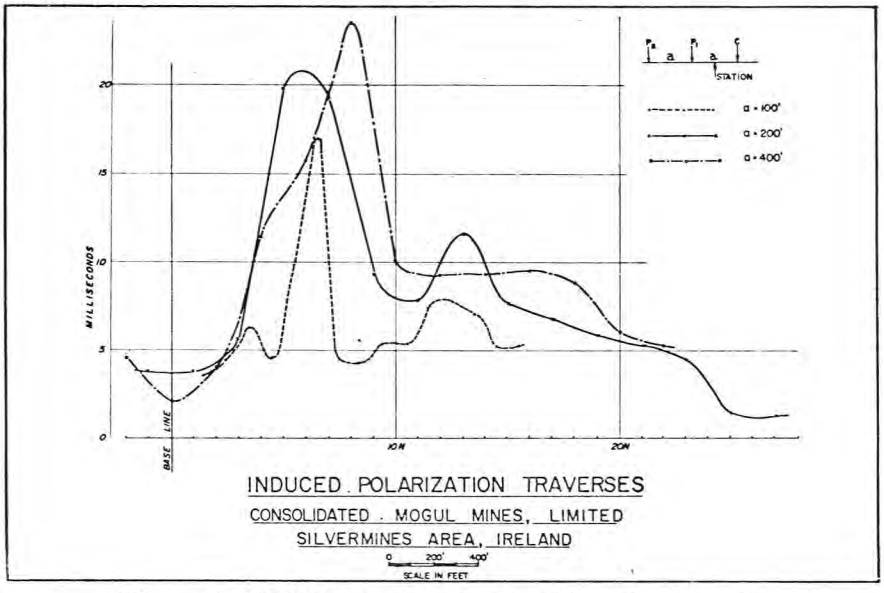


Figure 7.—Multiple Spacing Results, Silvermines Deposit.

Gortdrum Deposit

The Gortdrum area, near the mutual border of Cos. Limerick and Tipperary, was originally selected to cover the eastern extension of the former Oola Mines lead-zinc deposit, some 3 miles to the west. Regional geochemical sampling of the stream sediments in this area, followed by soil traverses, indicated a moderately strong copper soil anomaly. Induced polarization surveys were carried out in May, 1963, and January, 1964, leading to the localization of the sulphide mineralization associated with the geochemical anomaly. As there was a 300-ft. lateral displacement between the centers of the geophysical and geochemical indications and the surface topography is very gentle, it was initially queried as to whether the two indications

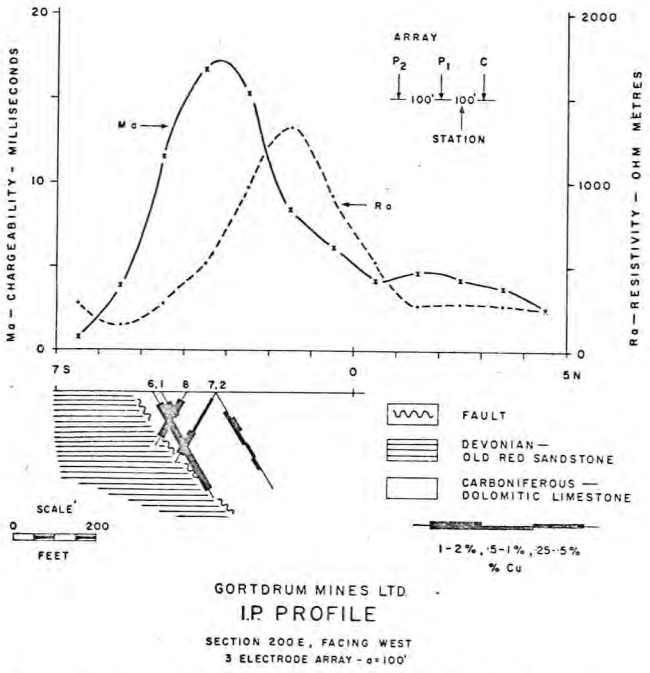


Figure 8.—Typical Discovery Traverse, Gortdrum Deposit.

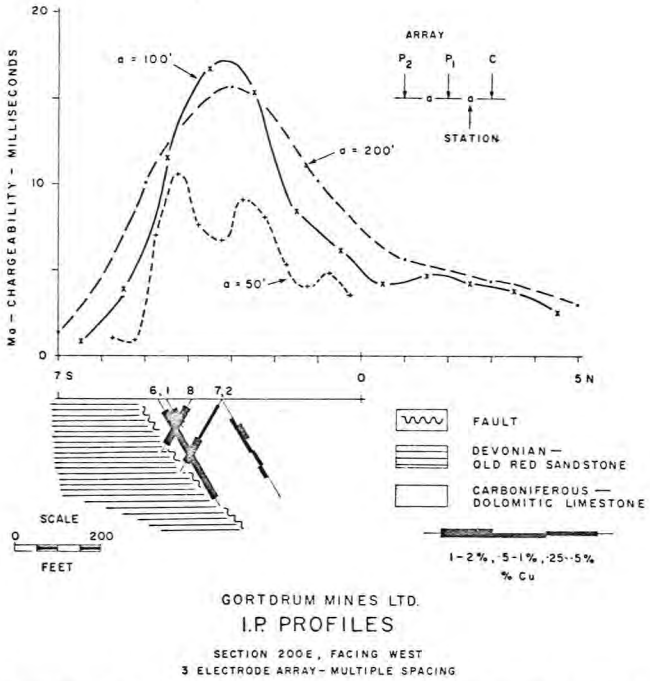


Figure 9.—Multiple Spacing Results, Gortdrum Deposit.

were related. The subsequent drilling has fully confirmed the geophysical predictions.

On the initial two geophysical programs, the three-electrode array with 100-ft. spacing was employed, as a relatively shallow source of the geochemical anomaly was expected. The survey lines were at 200-ft. intervals. Figure 8 presents a typical discovery traverse, showing both the chargeability and resistivity profiles as well as the corresponding geologic section. A peak chargeability of about 17 milliseconds is observed, rising from the normal background of 2-4 milliseconds. There is no resistivity expression of the mineralized zone, lying as it does on the flank of a high-resistivity area.

Figure 9 shows the chargeability profiles for electrode spacings of 50, 100 and 200 ft. Points of special interest deduced from these profiles include the following:

1.—The extremely sharp cut-off of the high chargeability levels on the south side of the area and the gradual drop-off in level on the north side. This was inconsistent with the thought of a bedded-type deposit conformable with the limestones, which are known to dip flatly to the south. A fault or other contact was postulated, dipping steeply, probably to the north. The initial drill holes on the section (Nos. 1, 2 and 6) were drilled to the north on the original geologic-dip premise, but the later holes (e.g., Nos. 7 and 8) have all been drilled to the south.

2.—The high-polarization material does not quite outcrop, but still comes within about 25 ft. of the ground surface across a width of about 200 ft., including two or more lenses. This material extends to at least 200 ft. in depth.

The actual drilling results confirm the presence of a zone of finely disseminated chalcocite and bornite, with very minor chalcopyrite, in dolomitic limestones. The mineralization is somewhat erratically distributed but, in general, increases as one approaches a north-dipping fault, which brings the limestones into contact with the Devonian Old Red sandstones. This fault has been found to strike about N 70°E. Geologically, therefore, this environment is almost identical to that of the Tynagh and Silvermines deposits. The mineralization in the Gortdrum area is quite different, however, both in type and amount. The average grade of the deposit is less than 2 per cent copper, with about 0.65 ounce of silver for each 1 per cent copper (although considerable potential open-pit tonnage may exist), so that the average sulphide content, by volume, is 3 per cent or less. The high chargeability responses observed over this deposit are a remarkable tribute to the sensitivity of the pulse-type induced polarization method, particularly when dealing with truly disseminated-type sulphide mineralization with a small average particle size.

As development drilling is still in progress on this deposit, no over-all grade or tonnage figures have as yet been released.

Keel Deposit

The deposits near Keel and Longford, Co. Longford, occur on a known limestone-sandstone contact, which is, no doubt, one of the reasons why exploration interest was attracted thereto. Soil sampling traverses by Riofinex Ltd., an exploration subsidiary of Rio Tinto-Zinc Corporation, Ltd., established the presence of anomalous lead and zinc concentrations. A horizontal-loop electromagnetic survey was initially executed in another attempt to determine the source of the geochemical indications, but with negative results. This was followed by induced polarization surveys in November and December, 1962. The three-electrode array, with an electrode spacing of 200 ft., was employed on the reconnaissance survey. Anomalous chargeability zones were indicated and exploratory drilling commenced shortly thereafter. Although no publication of results has been made, they are of some potential interest, as drilling has continued, at intervals, to the present time.

Figure 10 shows a typical section across the prospect, presenting the geophysical and geochemical results in profile form, as well as the geological section interpreted from three holes. The relationship between the mineralized horizon, the geophysical peak and the geochemical peaks is a matter of considerable interest. The sub-outcrop of the mineralized horizon and the geophysical peak are in good agreement (see also Figure 11). The lead peak is displaced about 400 - 500 ft. down slope to the south. The zinc peak is displaced still another 300 ft. to the south. Th actual topographic slope is only 1-2 degrees to th south, so that this displacement is difficult to a count for on the basis of soil creep. There is only minor resistivity depression associated with the mi eralization, indicating why the electromagnetic su vey failed to give any positive response to it.

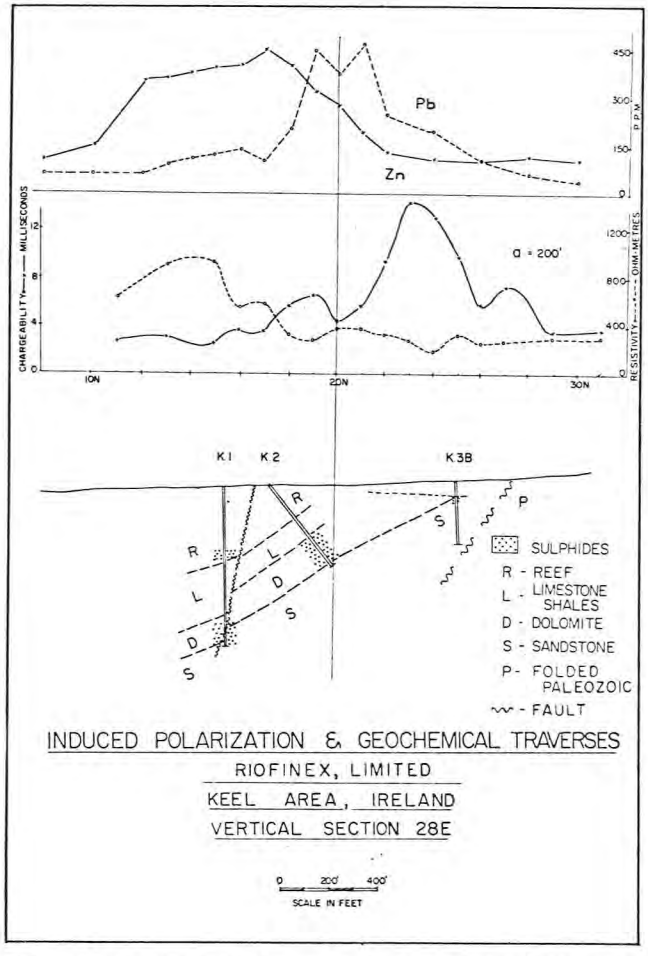


Figure 10.—Typical Discovery Traverse, Keel Deposit.

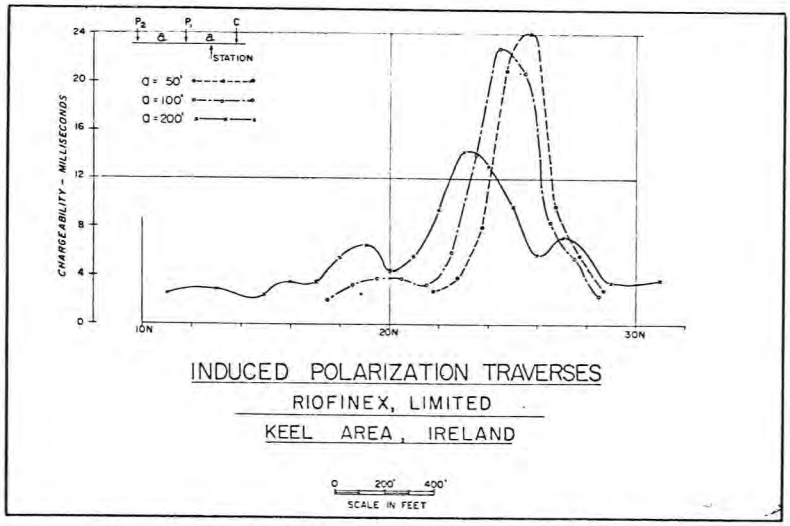


Figure 11.—Multiple Spacing Results, Keel Deposit.

The mineralization itself is primarily sphalerit with some galena and, on the average, less than 5 pe cent pyrite. It is found to lie primarily in a dolomit horizon adjacent to a contact with sandstone. In thi case, the contact may be largely a depositional on and not due to a fault. Mineralization occurs to a minor extent in the sandstone as well.

Figure 11 shows the chargeability results of the multiple spacing profiles on this section. Spacings of 50, 100 and 200 ft. were used. The progressive step-out of the peak values to the south with the increase in electrode spacing indicates the effect of the relatively flat dip to the south of the mineralization. The sub-outcrop of the mineralization is near station 26N, at a depth of less than 25 ft. As hole K3B, only 100 ft. away, intersected almost 60 ft. of overburden one must conclude that the bedrock surface is rather irregular in this area. The peak chargeability of 24 milliseconds would suggest a metallic conductor content of the order of 6 to 12 per cent, by volume, in this area.

It is the writer's hope that he has not given the impression that every induced polarization anomaly in Ireland inevitably defines an orebody, or that every exploration venture there is crowned with success. Aside from effects due to the many man-made conductors, such as grounded power lines, rabbit fences and buried pipe lines, there are certain carbonaceous sediments, in particular the Calp limestone, which overlies the ore-bearing dolomitic limestone in some places, which yield high polarization responses. Fortunately, the areal distribution of the latter is usually broad enough to suggest a formational origin. Also, fortunately, the Calp is, stratigraphically, sufficiently well separated from the ore-bearing limestones so that the effect from these two horizons may be resolved. With the geological and geochemical information available, one can usually determine whether a particular induced polarization indication warrants investigation by drilling. Despite its limitations, the pulse-type induced polarization method has well demonstrated its application to a broad range of base metal exploration problems in Ireland.

Acknowledgments

The writer wishes to express his thanks to Consolidated Mogul Mines, Ltd., and Dr. W. W. Weber, to Gortdrum Mines, Ltd. and Dr. D. R. Derry, and to Rio Tinto-Zinc Corp. Ltd. and Mr. Jocelyn Pereira, for their kind permission to present the geophysical and other details relating to their respective mineral discoveries. In addition, the writer wishes to acknowledge the able assistance of the staff of Canadian Aero Mineral Surveys, Ltd., with which our company, Harold O. Seigel & Associates Ltd., has acted on a co-operative basis in Ireland.

(*Reprinted from The Canadian Mining and Metallurgical Bulletin, November*, 1965)
Printed in Canada

PROVINCE OF BRITISH COLUMBIA. } In the Matter of a geophysical survey on behalf of Yukon Revenue Mines Limited

TO WIT: }

I, E. M. Flett for Seigel Associates Limited

of 750 - 890 West Pender Street, Vancouver

in the Province of British Columbia, do solemnly declare that an induced polarization survey has been executed on some REVENUE, REV ADDITION, INCA and REVENUE COPPER claims about 40 Miles west of Carmacks, Yukon between September 26 to October 19, 1968. The following expenses were incurred:

(1)	Wages			
	Francis Bourqui	24 days @ $35/day	$840.00	
	A. Broker	24 days @ $27.50/day	660.00	
	F. Heinrick	24 days @ $27.50/day	660.00	
	J. McKenzie	24 days @ $27.50/day	660.00	$ 2,820.00
(2)	Transportation & Shipping			1,316.98
(3)	Food & Living Expenses			341.30
(4)	Consulting Fees			
	19 days @ $175.00/day		$3,325.00	
	5 days @ $ 86.52/day		432.61	3,757.61
				$ 8,237.89

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City of Vancouver, in the Province of British Columbia, this 28th day of November, 1968, A.D.

E M Flett

A Commissioner for taking Affidavits for British Columbia or
A Notary Public in and for the Province of British Columbia.

PLATE I

YUKON REVENUE MINES LIMITED

CARMACKS AREA, YUKON TERRITORY

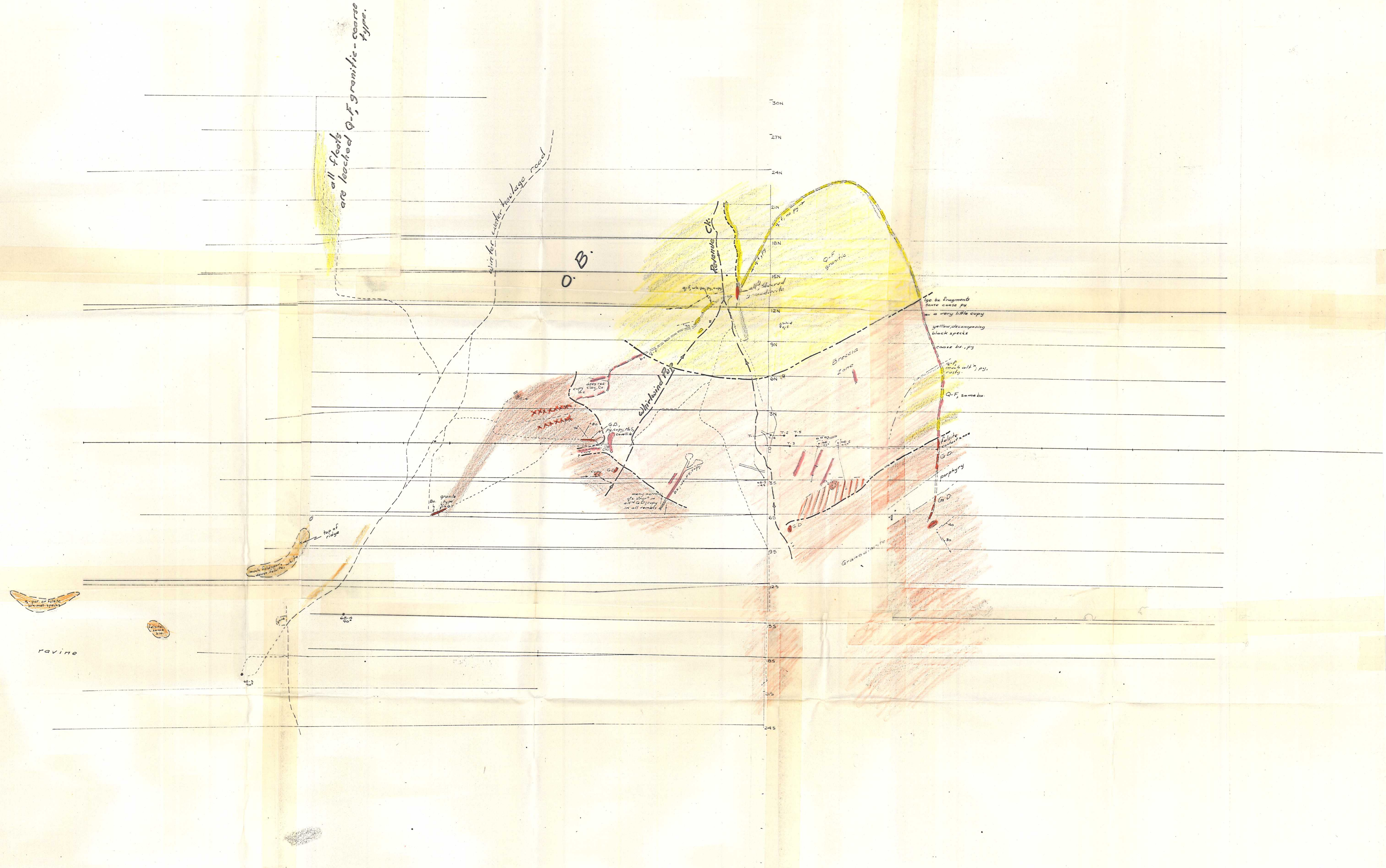
LOCATION PLAN

SCALE: 1 INCH = 32 MILES (APPROX)

SURVEY BY SEIGEL ASSOCIATES LIMITED

OCTOBER, 1968

REGISTERED PROFESSIONAL ENGINEER
J. D. BAIRD
PROVINCE OF ONTARIO



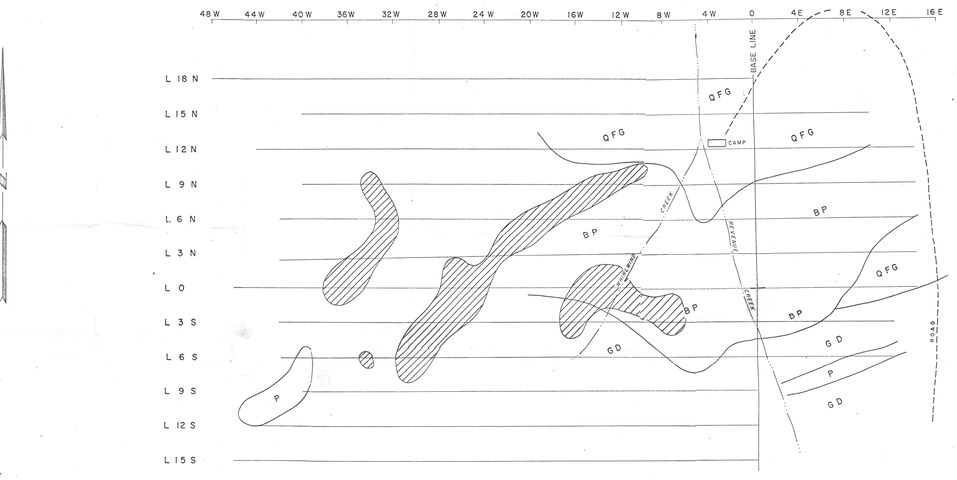
Symbols:

- T-1 Tech D.D.H.
- C-1 Canex D.D.H.
- 68-1 Revenue D.D.H.

Note: Lines diverging from normal are corrected locations.

SURFACE PLAN
WORK SHEET ONLY
YUKON REVENUE M.L.

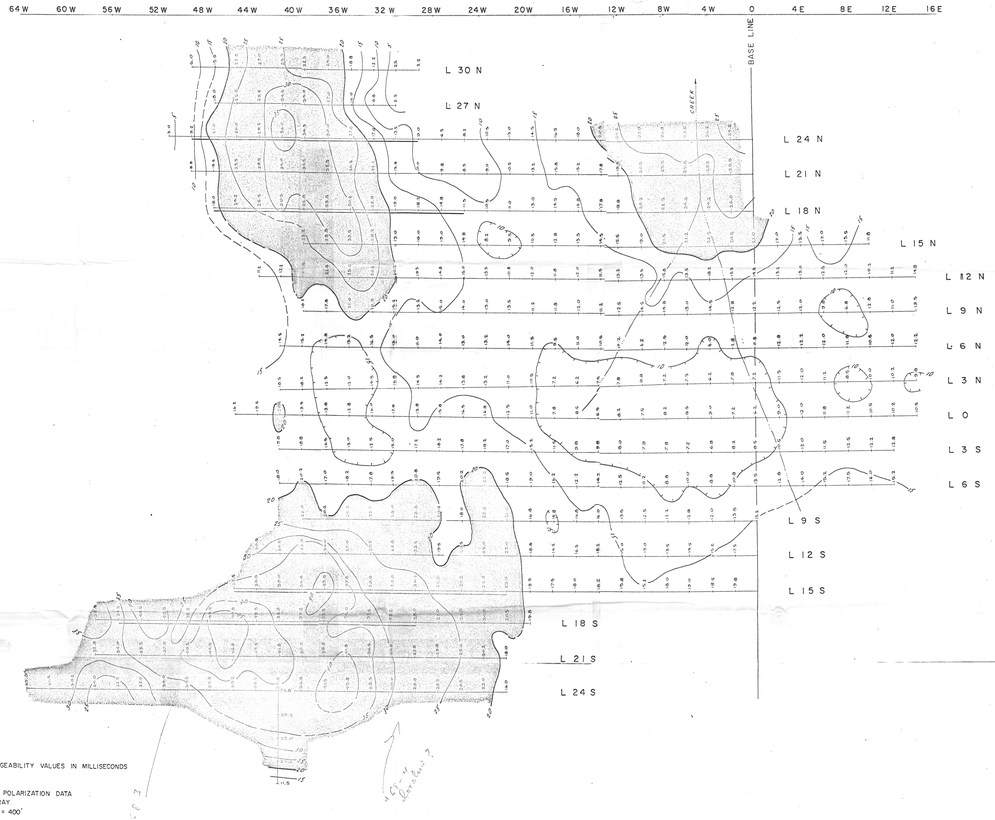
1" = 400'   Jan. 16/69   RAG.



GEOLOGY PLAN

LEGEND

BP BRECCIATED PORPHYRY
QFG QUARTZ FELDSPAR GRANITE
GD GRANODIORITE
P PORPHYRY
AREAS WHERE WHERE GEOCHEMICAL COPPER VALUES ARE IN EXCESS OF TWICE BACKGROUND LEVEL



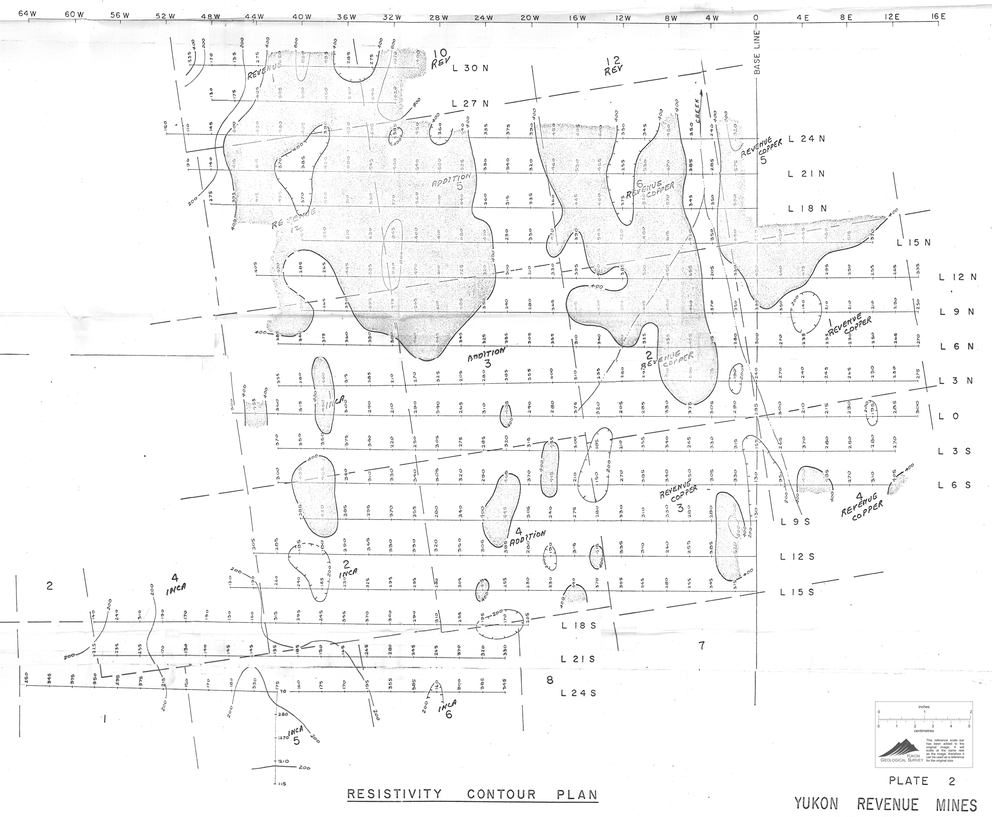
CHARGEABILITY CONTOUR PLAN

LEGEND

18 LINE TRACE WITH CHARGEABILITY VALUES IN MILLISECONDS
10 CONTOURS

NOTES: SEIGEL MK XI INDUCED POLARIZATION DATA
THREE ELECTRODE ARRAY
ELECTRODE SPACING a = 400'

LINES COVERED IN DETAIL (SEE PLATE 3)



RESISTIVITY CONTOUR PLAN

LEGEND

320 LINE TRACE WITH RESISTIVITY VALUES IN OHM-METERS
200 CONTOURS
200, 400 AND 800 OHM-METERS CONTOURS

NOTES: THREE ELECTRODE ARRAY
ELECTRODE SPACING a = 400'

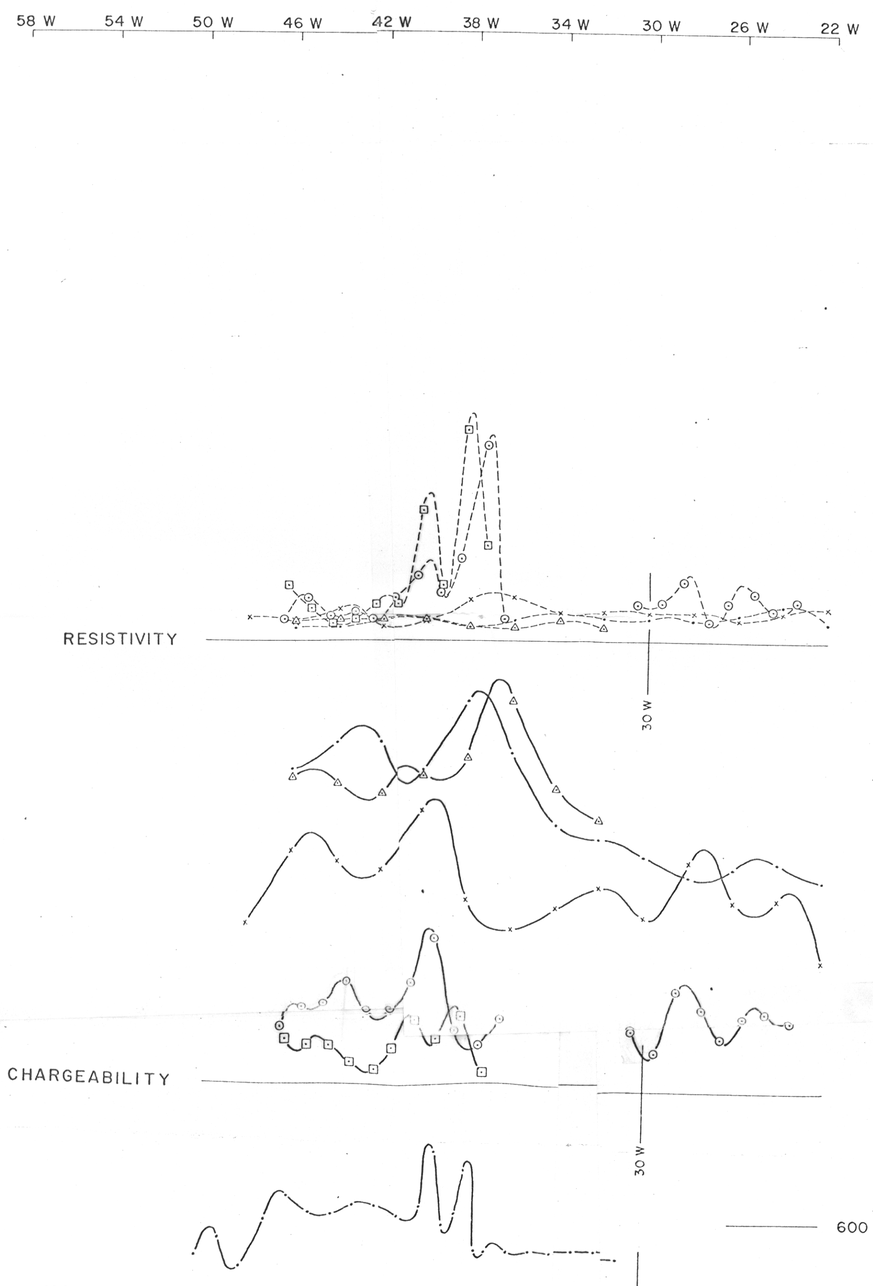
TO ACCOMPANY A GEOPHYSICAL REPORT
BY J.G. BAIRD DATED OCTOBER 31, 1968

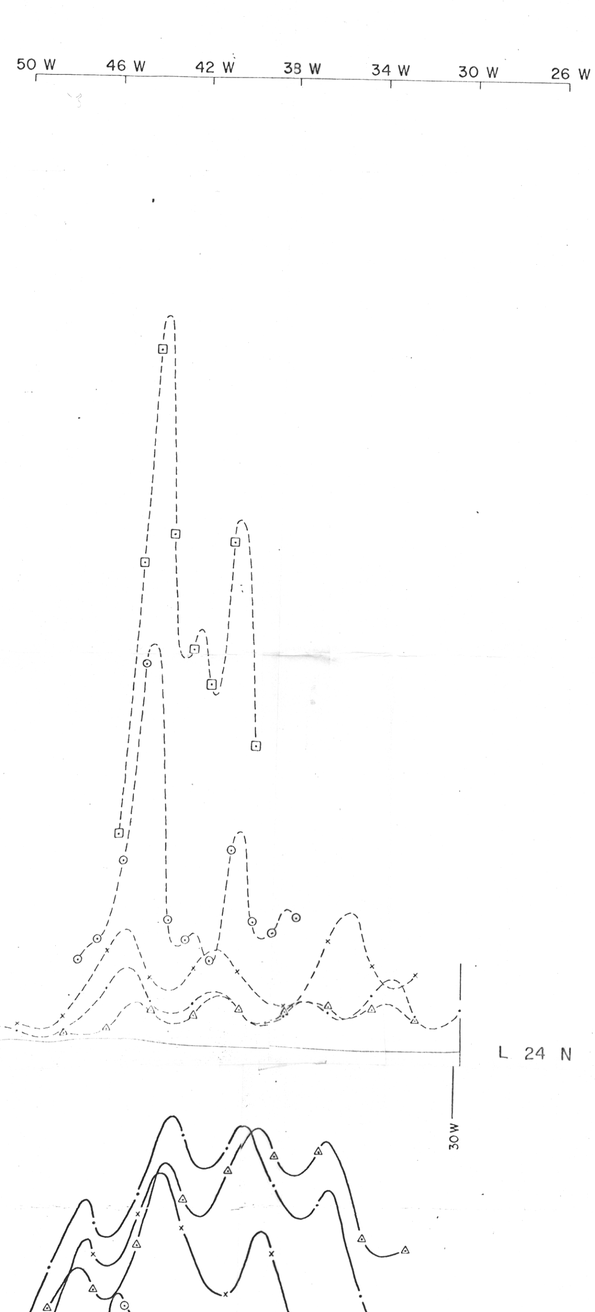
PLATE 2

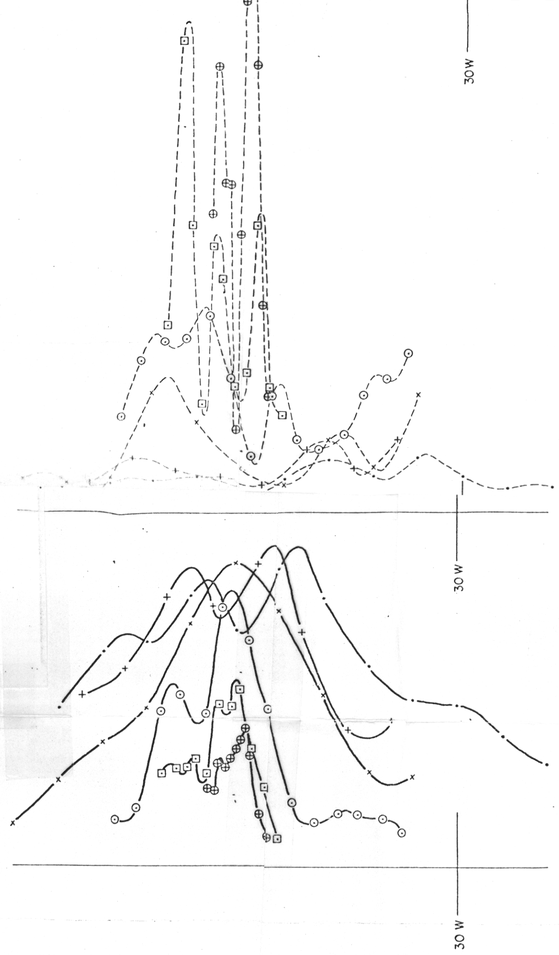
YUKON REVENUE MINES LIMITED
CARMACKS AREA, YUKON TERRITORY
INDUCED POLARIZATION SURVEY

SCALE: 1"= 400'

SURVEY BY SEIGEL ASSOCIATES LIMITED
OCTOBER, 1968







LEGEND:

CHARGEABILITY; SCALE: 1" = 10 MILLISECONDS
ELECTRODE SPACING: a = 600', a = 400', a = 300', a = 200', a = 100', a = 50', a = 25'

RESISTIVITY; SCALE: 1" = 1000 OHM - METRES
ELECTRODE SPACING: a = 600', a = 400', a = 300', a = 200', a = 100', a = 50', a = 25'

MAGNETICS; SCALE: 1" = 100 GAMMAS

NOTES: SEIGEL MK VI INDUCED POLARIZATION DATA
THREE ELECTRODE ARRAY
ELECTRODE SPACINGS AS INDICATED
MOVING CURRENT ELECTRODE EAST OF ARRAY

TO ACCOMPANY A GEOPHYSICAL REPORT
BY J.G. BAIRD DATED OCTOBER 31, 1968

inches
centimetres
This reference scale bar has been added to the original image to set scale at the same rate as the image, therefore it can be used as a reference for the original size.
YUKON GEOLOGICAL SURVEY

PLATE 3

YUKON REVENUE MINES LIMITED

CARMACKS AREA, YUKON TERRITORY

INDUCED POLARIZATION SURVEY

DETAIL PROFILES

SCALE: 1" = 400'

SURVEY BY SEIGEL ASSOCIATES LIMITED
SEPTEMBER - OCTOBER, 1968