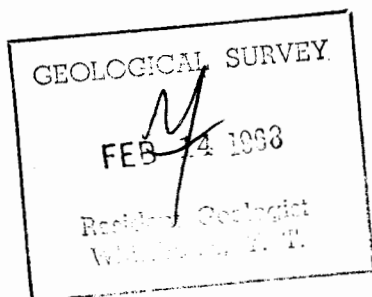


REPORT ON AN
INDUCED POLARIZATION SURVEY
MICRO CLAIM GROUP
WHITE RIVER AREA, YUKON TERRITORY
ON BEHALF OF
DISCOVERY MINES LIMITED

by

John S. Read, M.Sc.

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



This report has been examined by
the Geological Evaluation Unit
and approved as to technical worth by:

D. C. Fridley
Resident Geologist

Approved as to cost in the amount
of \$4800.00
H. S. Redden
Resident Geologist

Accepted as required by the work
under Section 30 of the Yukon
Mining Act.

James Smith
COMMISSIONER OF YUKON

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SUMMARY

An induced polarization survey on this property has revealed several zones of high chargeability which may be due to several sources, ranging from sulphide mineralization to graphite or serpentine. The known Canalask ore zone lies within the survey area and has responded to the induced polarization technique.

The results of a magnetic survey executed by P. H. Sevensma Consultants Limited are incorporated in this report. These data reveal the presence of a highly magnetic rock type underlying the southern portion of the area surveyed.

Diamond drilling and further geophysical surveying should be predicated on the results of a detailed geologic investigation.

SEIGEL ASSOCIATES LIMITED
GEOPHYSICAL CONTRACTORS AND CONSULTANTS

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REPORT ON AN
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INTRODUCTION

During May 1967, a geophysical field party under the direction of John S. Read, M.Sc., conducted an induced polarization survey of part of the Micro claim group, Yukon Territory, on behalf of Discovery Mines Ltd.

The Micro claim group lies athwart the White River about two and one half miles south of White River Lodge at mileage post 1169 on the Alaska Highway. The area covered by the survey was approximately one half mile by one half mile in extent and covers the whole or part of the following claims:

Per 1 & 2 (N85827 & N85828)

Micro 1 to 5 incl. (N86108, 9, 11, 12, 14)

Micro 10 (N86367).

Access was by truck along a gravel bush road from the White River Lodge.

Seigel MK VB time domain (pulse-type) induced polarization units were used on the present survey. These units have a current-on time of 1.5 seconds and an integrating time of 0.5 seconds. The accompanying copy of Harold 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 base metal ore bodies.

On the present property lines were cut orientated north-south at 400' intervals. The three electrode array, with an electrode spacing of 400', was employed for the reconnaissance survey with spacings of 200' and 600' utilized for additional detail. The station interval was 200' on all the lines surveyed. In addition, a resistivity depth determination using expanding Wenner configurations was performed on the bed of the river to determine the depth of gravel overlying the bedrock.

The purpose of the induced polarization survey was to map the distribution of subsurface electronically conducting mineralization. Such a distribution would be revealed as a higher-than-background chargeability response, which may be associated with a corresponding resistivity depression. In this area such mineralization could include the metallic sulphides pyrrhotite, pentlandite, pyrite and chalcopyrite. Serpentine (particularly with concentrations of magnetite) and graphite are noted as being non-metallic minerals which give good IP responses. Serpentine is known to occur in the area.

GEOLOGY

The topography of the area is rugged. The White River has formed a flat gravel bed which covers the centre portion of the property in a north-south direction. On either side there are steep slopes with gullies running down to the river bed.

The geology of the area is complex. In general, volcanic rocks are intercalated with sedimentary formations which strike roughly NW-SE

and dip steeply to the north. An ultrabasic intrusive body is known to lie in the southern portion of the grid area. Mineralization, consisting mainly of pyrrhotite and chalcopyrite, outcrops at several places. A disused mine (Canalask) is found on the east bank of the river within the survey area.

PRESENTATION OF RESULTS

Plate 1 is a location map on the scale of 1:2 million showing the position of the property relative to the Alaska Highway and the Canada-Alaska border.

Plate 2, on the scale of 1" = 400', is a plan of the grid lines showing their relation to topographic features and claims. Anomalous areas indicated by the present survey are also shown.

Plate 3 shows the IP survey results plotted in profile form on a scale of 1" = 400'. The chargeability profiles have a scale of 1" = 10 milliseconds and the resistivity profiles are plotted on a logarithmic scale of $1\frac{1}{2}$ " = factor of 10 with the line trace taken as base of 10 ohm-metres.

Plate 4 shows the results of the resistivity depth determination using expanding Wenner arrays.

Plate 5 shows magnetic profiles plotted from data supplied by P. H. Sevensma Consultants Limited.

DISCUSSION OF RESULTS

A large percentage of the area surveyed yields chargeabilities in excess of 5 milliseconds. Chargeability values on the north ends of the profiles are generally below 5 milliseconds, and the south ends of the curves appear to be returning to below this level. A zone of high

chargeability extends east-west in a belt about 1500' wide across the central portion of the survey area. The well defined north boundary of the high chargeability area has been indicated on Plate 2.

The magnetic profiles indicate that the southern portion of the survey area is underlain by a more magnetic rock type than the northern part of the grid. This contact is rather well defined (except west of line 20W) and has been indicated on Plate 2. It runs parallel to, and about 1000' south of the 5 millisecond contour. On lines 0, 4W and 8W it is noted that small increases in magnetic intensity correspond with the 5 millisecond contour. It is likely that the southern part of the survey area is underlain by a differentiated basic intrusive whose northern edge corresponds with the 5 millisecond contour and within which magnetite or pyrrhotite have been concentrated in the area of high magnetic intensities. The presently available geologic information reveals that much of the area is, in fact, underlain by gabbroic rock which is serpentized in places.

Within the area of high background chargeability there are six indications or zones of marked high chargeabilities usually coupled with distinct resistivity depressions. For purposes of discussion and reference these have been labeled 'A' through 'F' and indicated on Plate 2.

A discussion of the geophysical character of each zone follows:

'A' - At about 2S on lines 4W and 8W chargeability increases of up to twice background and distinct resistivity depressions are observed. There is a slight indication (particularly in the resistivity profile) that the zone may extend eastwards towards line 0. This anomaly corresponds very well with the Canalask ore zone where conductive mineralization is known to exist.

'B' - The chargeability and resistivity profiles on lines 24W and 20W indicate that a rather large zone of high metallic content may exist in that vicinity. No highly abnormal responses are observed on line 16W so the eastern side of the zone may be considered delimited, however it is still open on strike to the west. This high chargeability material comes within 100' and perhaps less of the ground surface. A magnetic high corresponds with the induced polarization-resistivity anomaly.

'C' - This zone of marked chargeability increase and resistivity depression is observed at 8S on line 4W and 12S on line 0 and corresponds closely with the north edge of the area of the area of high magnetics. A large volume of chargeable material is indicated which approaches within 100' and perhaps closer to the ground surface.

'D' - This indication of high chargeability and low resistivity responses lies well within the area of high magnetic intensities. A slight indication at about 6S on line 12W may correspond to the same anomalous zone.

'E' - This poorly defined indication appears to extend from 17S on line 10W to 16S on line 12W. It may lie near a southern border of the area of high magnetic intensities.

'F' - This very slight chargeability-resistivity distortion lying near the north boundary of the highly magnetic area may reveal a westward extension of Zone D.

The resistivity depth determination expanded about 3S on line 12W in a north-south direction using the Wenner array indicates that about 50' of high resistivity overburden (4000-8000 ohm-metres) overlies bedrock having a resistivity of about 500 ohm-metres. The former is likely gravel in the White River.

CONCLUSION AND RECOMMENDATIONS

'A' corresponds to the Canalask ore zone, a well studied deposit, and will not be discussed further except to point out the capability of the induced polarization method to locate such mineralized zones.

'B' and 'C' are large zones of high chargeability material while 'D', 'E' and 'F' appear to contain lesser amounts of conductive minerals. The observed geophysical responses could be due to several sources ranging from sulphide mineralization to graphite or serpentine. It appears that the present geologic environment is favourable for the presence of serpentine and such material must be regarded as possible explanations for the anomalies revealed by the present surveys.

Further investigation of the commercial possibilities of this property should consist of the following:

1. Detailed geologic mapping, particularly in the areas of high chargeability-low resistivity discussed above, to endeavour to determine the causes of these responses. Such geologic mapping may be aided by trenching or perhaps by drilling. Drilling can be recommended on the basis of present geophysical data but as there are so many targets, it is thought best to await a preliminary geologic investigation before locating drill holes.

2. If geologic studies reveal that the present geophysical results give valuable information on rock types, structure, or ore deposits, then it is recommended that further geophysical surveys should be executed. It appears, for example, that an extended magnetometer survey may be useful. As certain of the zones revealed by the induced polarization method seem to contain enough conductive material to be

detectable by electromagnetic methods, a test, preferably using an in-phase-out-of-phase system, would be warranted. If positive, this would be an efficient means of detecting these zones more rapidly and economically than the I.P. method.

AFFIDAVIT OF TIME AND EXPENDITURE

The appended affidavit presents the working days devoted by the corresponding members of our staff who were occupied in the execution of the induced polarization services on portions of the Micro claim group, Yukon Territory, on behalf of Discovery Mines Ltd., during May, 1967, and our charges for these services.

Respectfully submitted,

SEIGEL ASSOCIATES LIMITED

John S. Read

John S. Read, M.Sc.
Geophysicist

Jon G. Baird

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



Vancouver, B.C.
June 19, 1967

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA.
To Wit:

In the Matter of a geophysical survey on behalf of Discovery Mines Limited

I, Jon G. Baird

of 115 - 744 West Hastings Street, Vancouver

in the Province of British Columbia, do solemnly declare that an induced polarization survey was executed on the Micro claim group, in the Whitehorse mining district, Yukon Territory, during May, 1967.

The following expenses were incurred:

(1) Wages	
J. Read - 14 days @ \$35/day	\$ 490.00
C. Zogg - 14 days @ \$24/day	336.00
(2) Transport	
Airfares	307.00
(3) Shipping	
Geophysical equipment to Whitehorse from Vancouver and Pine Point	468.04
(4) Food and Accommodation	
Read & Zogg	42.72
(5) Rental of Geophysical Equipment & Consulting Fees	
14 days @ \$143.57/day	<u>2,009.98</u>
	\$3,683.74

Additional labour and field support was supplied by P.H. Sevensma Consultants Limited and these expenditures are not shown on this affidavit.

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 15th
day of June, A.D. 1967

Jon G. Baird

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

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.

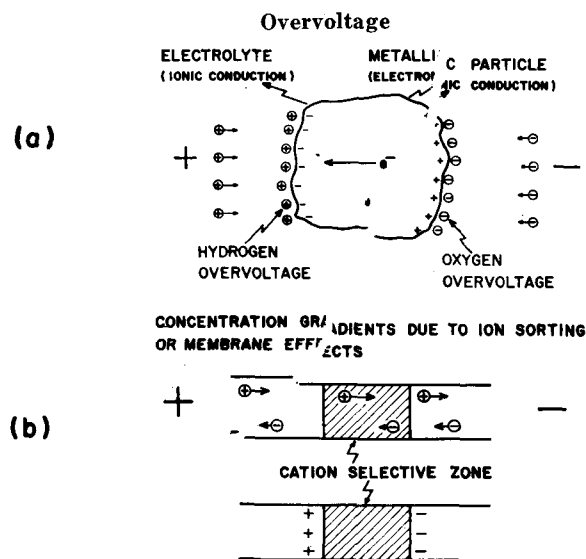


Figure 1.—Induced Polarization Agents.

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.

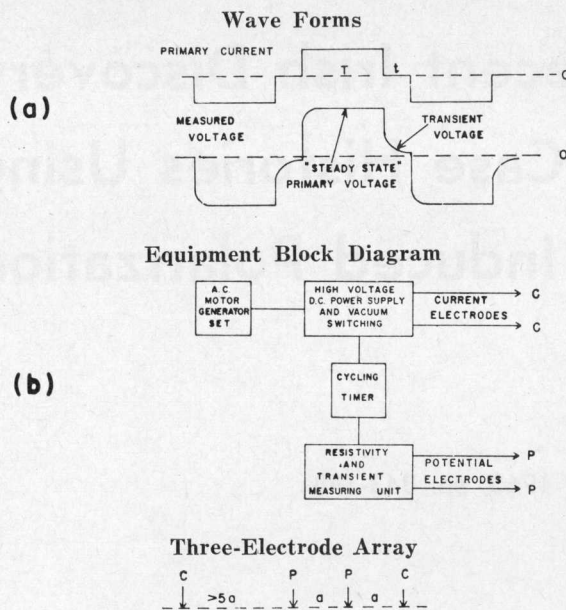


Figure 2.—The Pulse System.

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

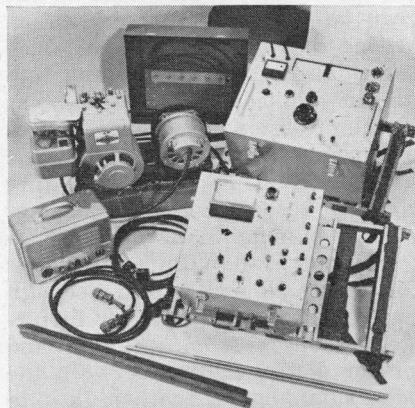


Figure 3.—(above)—The Seigel Mk V Induced Polarization Unit.

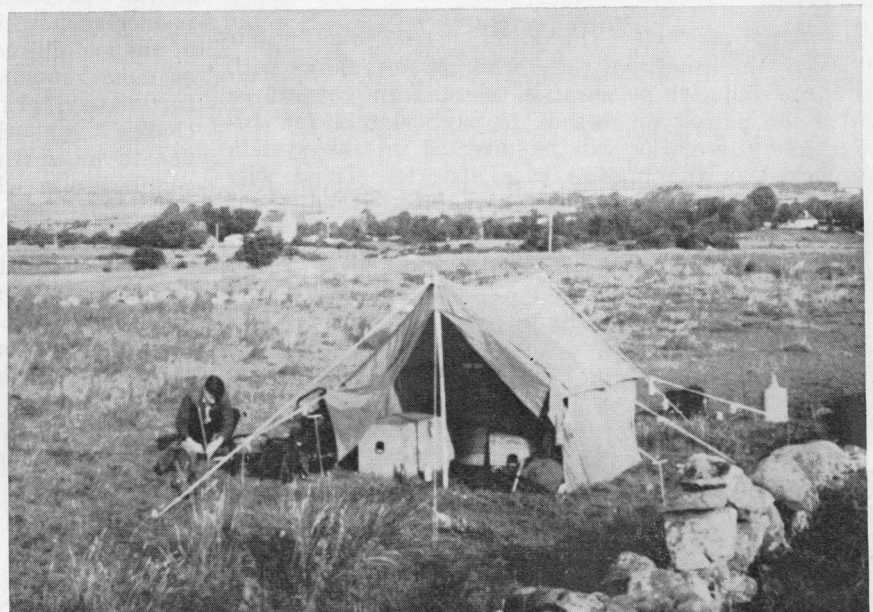


Figure 4.—(right)—Typical Field Operational Base in Ireland.

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.

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.

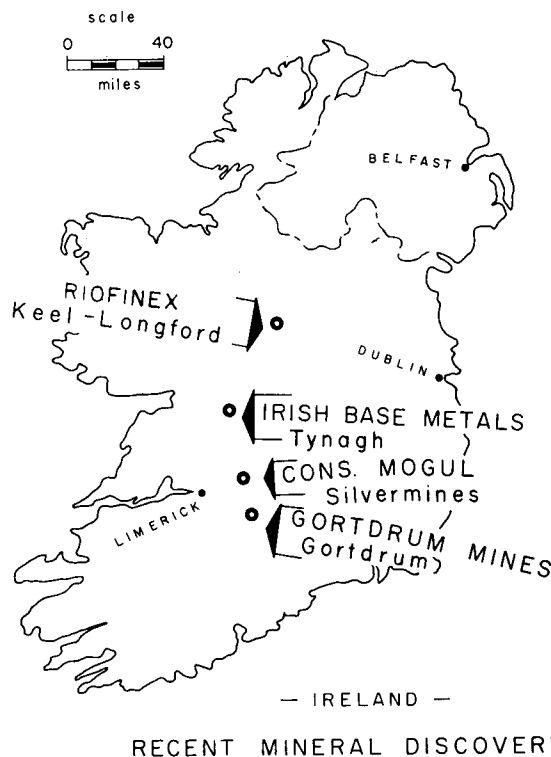


Figure 5.—Location Plan of Recent Mineral Discoveries in Ireland.

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 ore-body 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.

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.

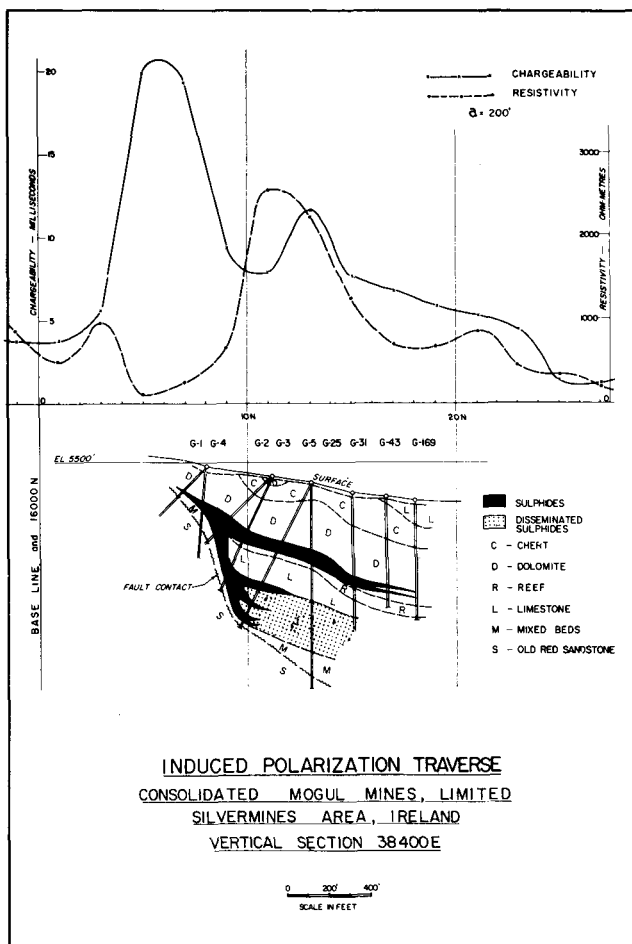


Figure 6.—Typical Discovery Traverse, Silvermines Deposit.

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

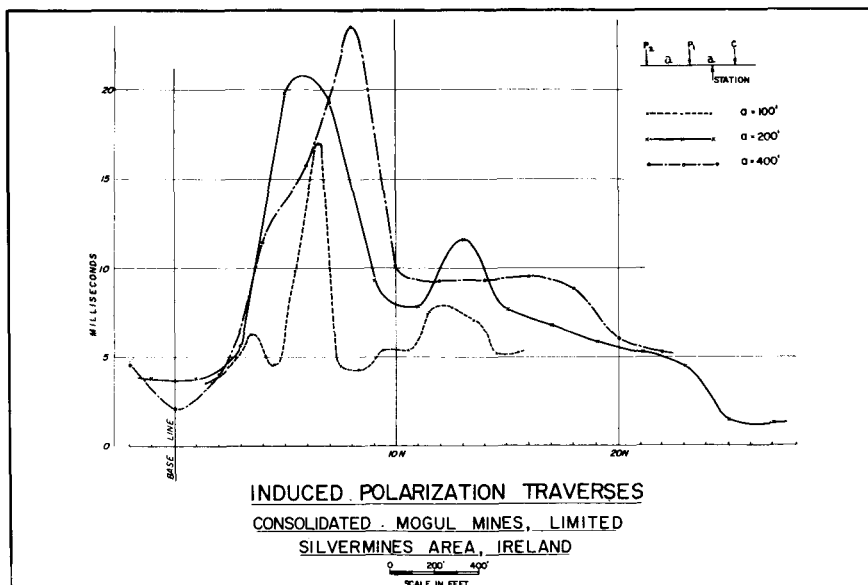


Figure 7.—Multiple Spacing Results, Silvermines Deposit.

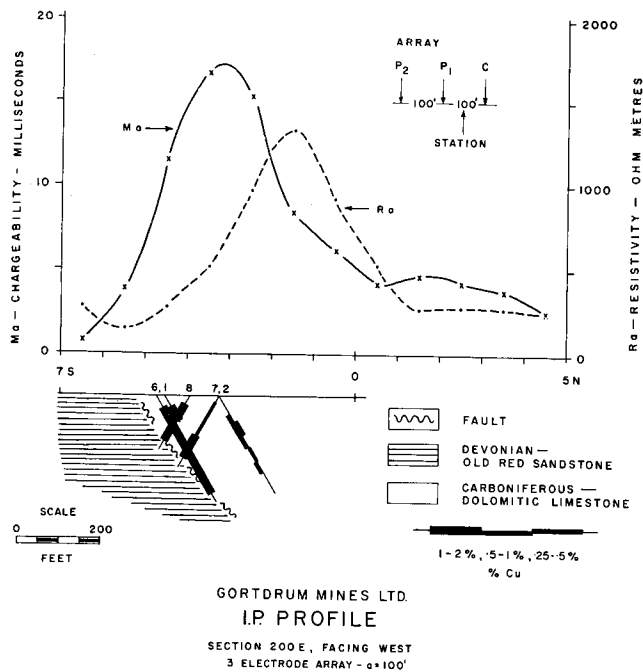


Figure 8.—Typical Discovery Traverse, Gortdrum Deposit.

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-

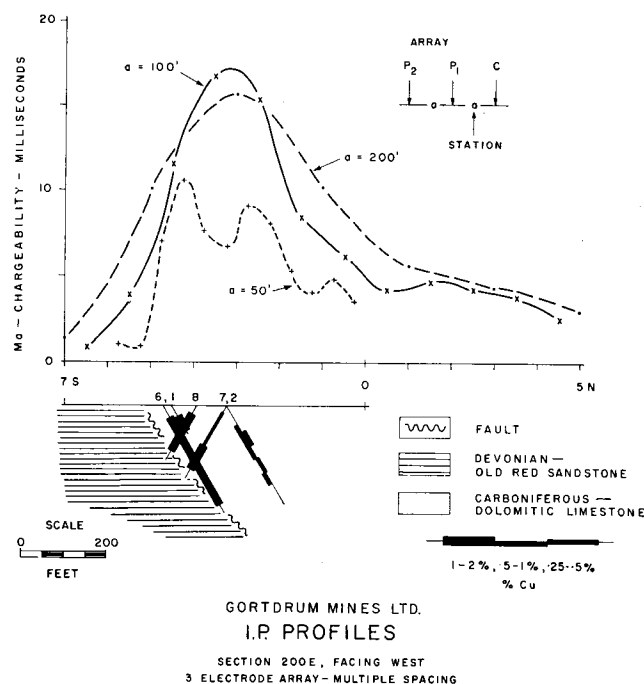


Figure 9.—Multiple Spacing Results, Gortdrum Deposit.

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. The actual topographic slope is only 1-2 degrees to the south, so that this displacement is difficult to account for on the basis of soil creep. There is only a minor resistivity depression associated with the mineralization, indicating why the electromagnetic survey failed to give any positive response to it.

The mineralization itself is primarily sphalerite, with some galena and, on the average, less than 5 per cent pyrite. It is found to lie primarily in a dolomite horizon adjacent to a contact with sandstone. In this case, the contact may be largely a depositional one 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 milliseonds 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.

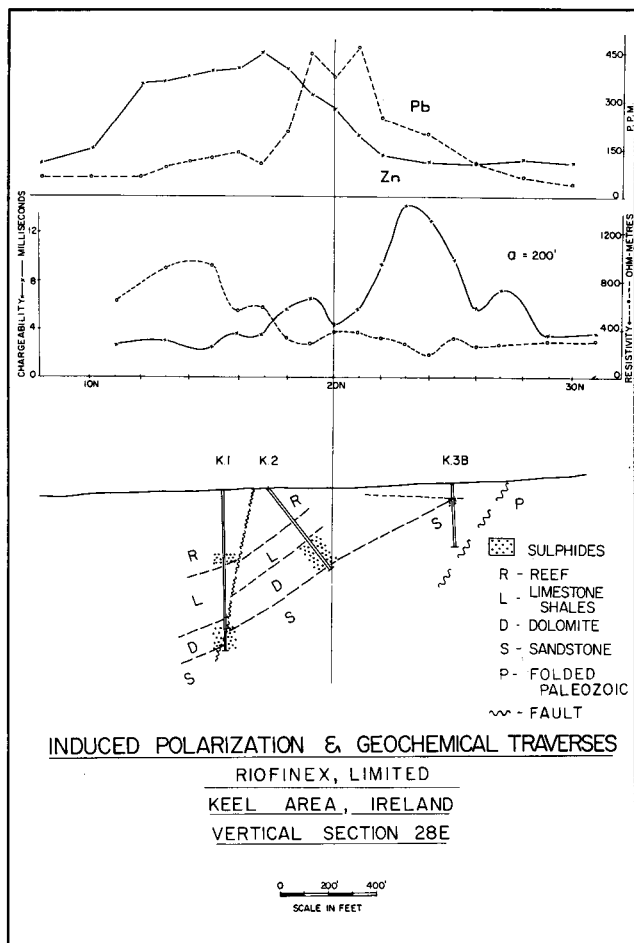


Figure 10.—Typical Discovery Traverse, Keel Deposit.

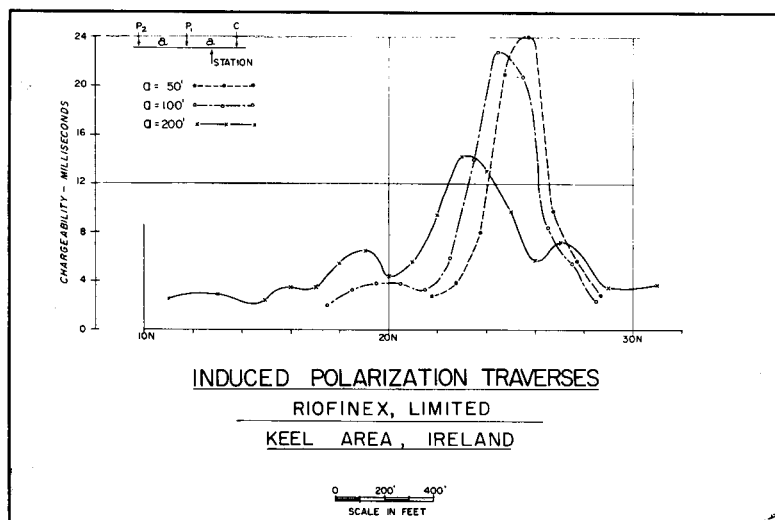


Figure 11.—Multiple Spacing Results, Keel Deposit.

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.

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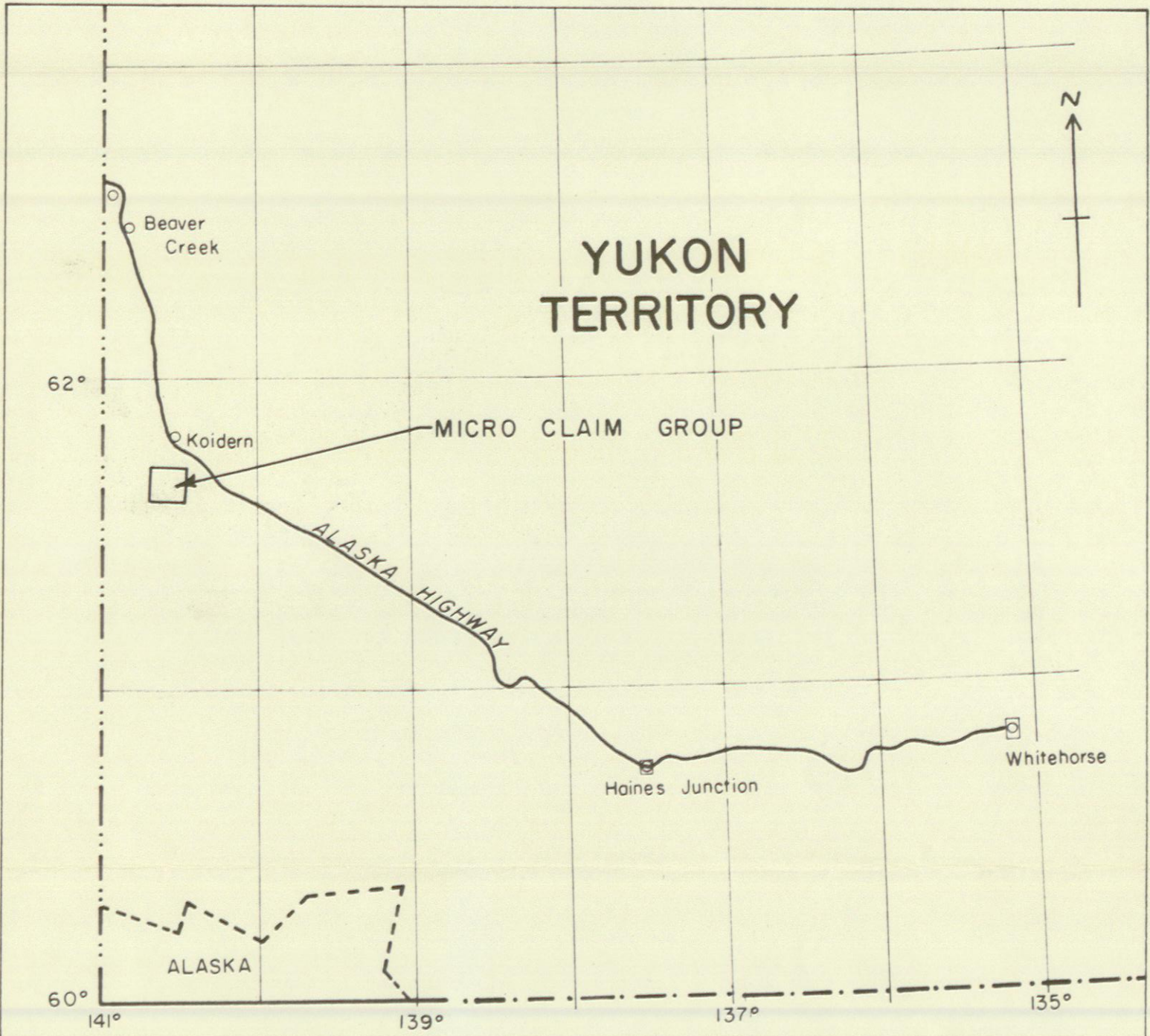
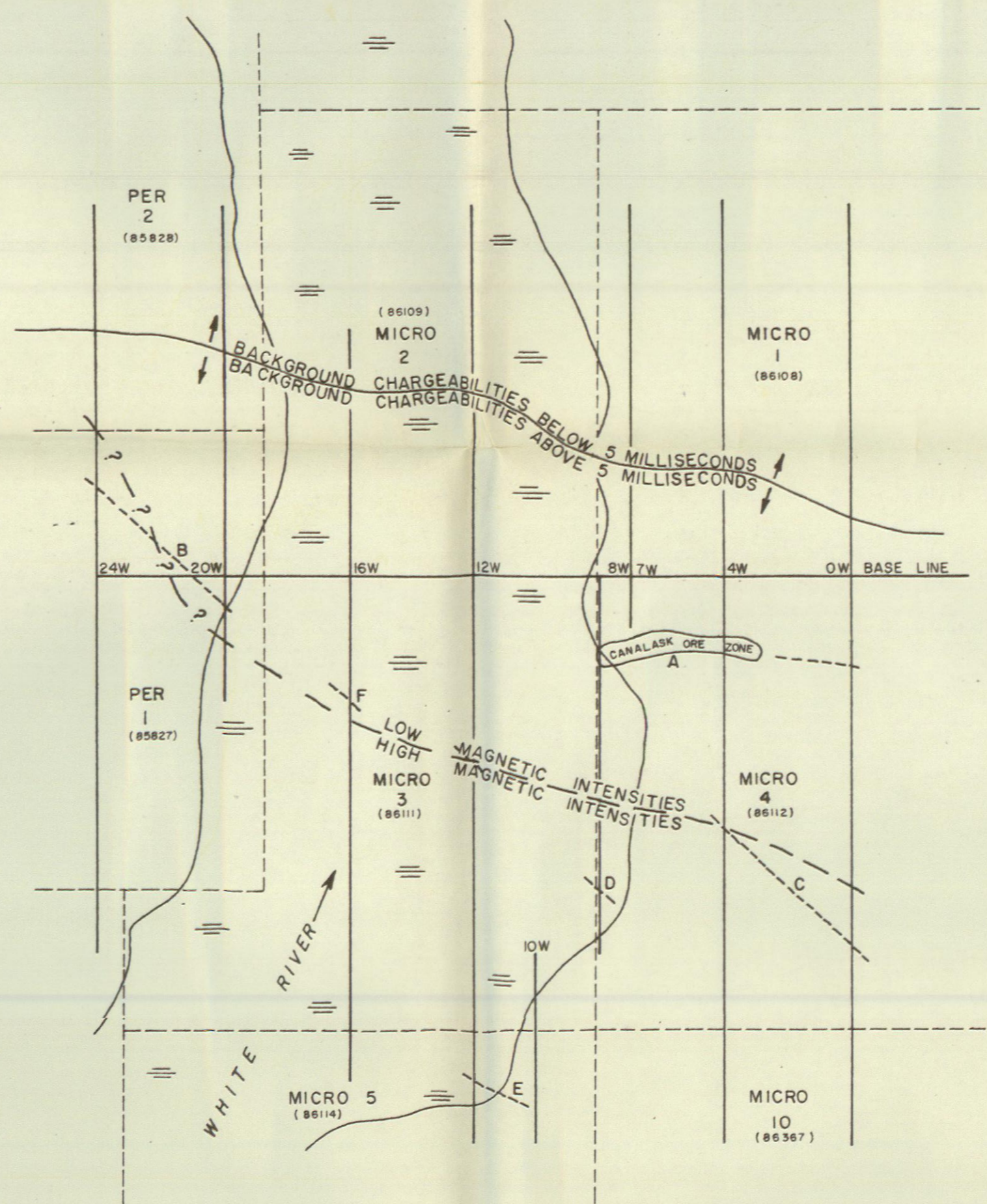


PLATE I

DISCOVERY MINES LIMITED
 WHITE RIVER AREA, YUKON TERRITORY
 MICRO CLAIM GROUP
 PROPERTY LOCATION MAP

SCALE 1:2 MILLION

SURVEY BY SEIGEL ASSOCIATES LIMITED
 MAY 1967

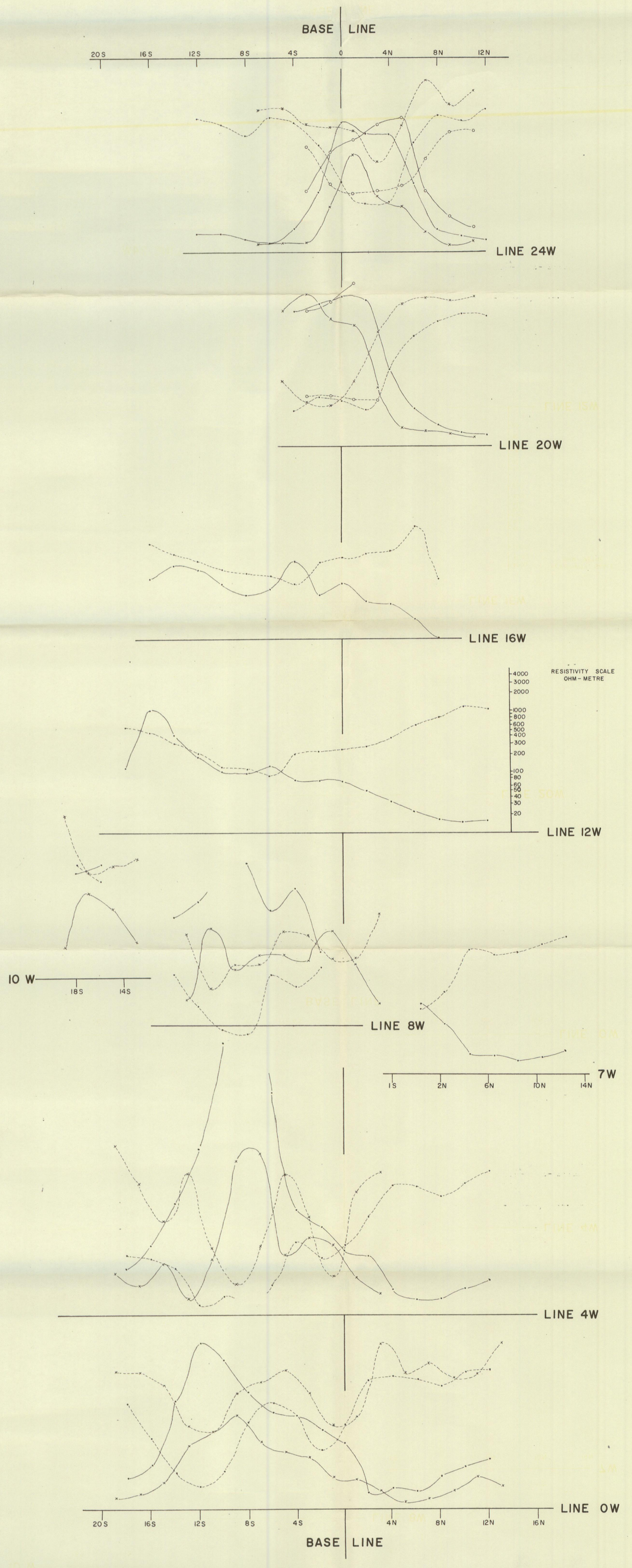


LEGEND:

- CLAIM BOUNDARY
- SURVEY GRID LINE
- ≡≡≡ GRAVEL RIVER BED

PLATE 2
DISCOVERY MINES LIMITED
WHITE RIVER AREA, YUKON TERRITORY
MICRO CLAIM GROUP
INDUCED POLARIZATION SURVEY GRID

SCALE 1" = 400'
SURVEY BY SEIGEL ASSOCIATES LIMITED
MAY 1967



LEGEND:

THREE ELECTRODE ARRAY
 CHARGABILITY; SCALE 1" = 10 MILLISECONDS

ELECTRODE SPACING	a = 200'	-x-x-x-x-
- - -	a = 400'	-x-x-x-x-
- - -	a = 600'	-o-o-o-o-

RESISTIVITY; SCALE 1/4" FACTOR 10: BASE 10 OHM METRES

ELECTRODE SPACING	a = 200'	-x-x-x-x-
- - -	a = 400'	-x-x-x-x-
- - -	a = 600'	-o-o-o-o-

PLATE 3
 DISCOVERY MINES LIMITED
 WHITE RIVER AREA, YUKON TERRITORY
 MICRO CLAIM GROUP
 INDUCED POLARIZATION SURVEY

SCALE 1" = 400'
 SURVEY BY SEIGEL ASSOCIATES LIMITED
 MAY 1967

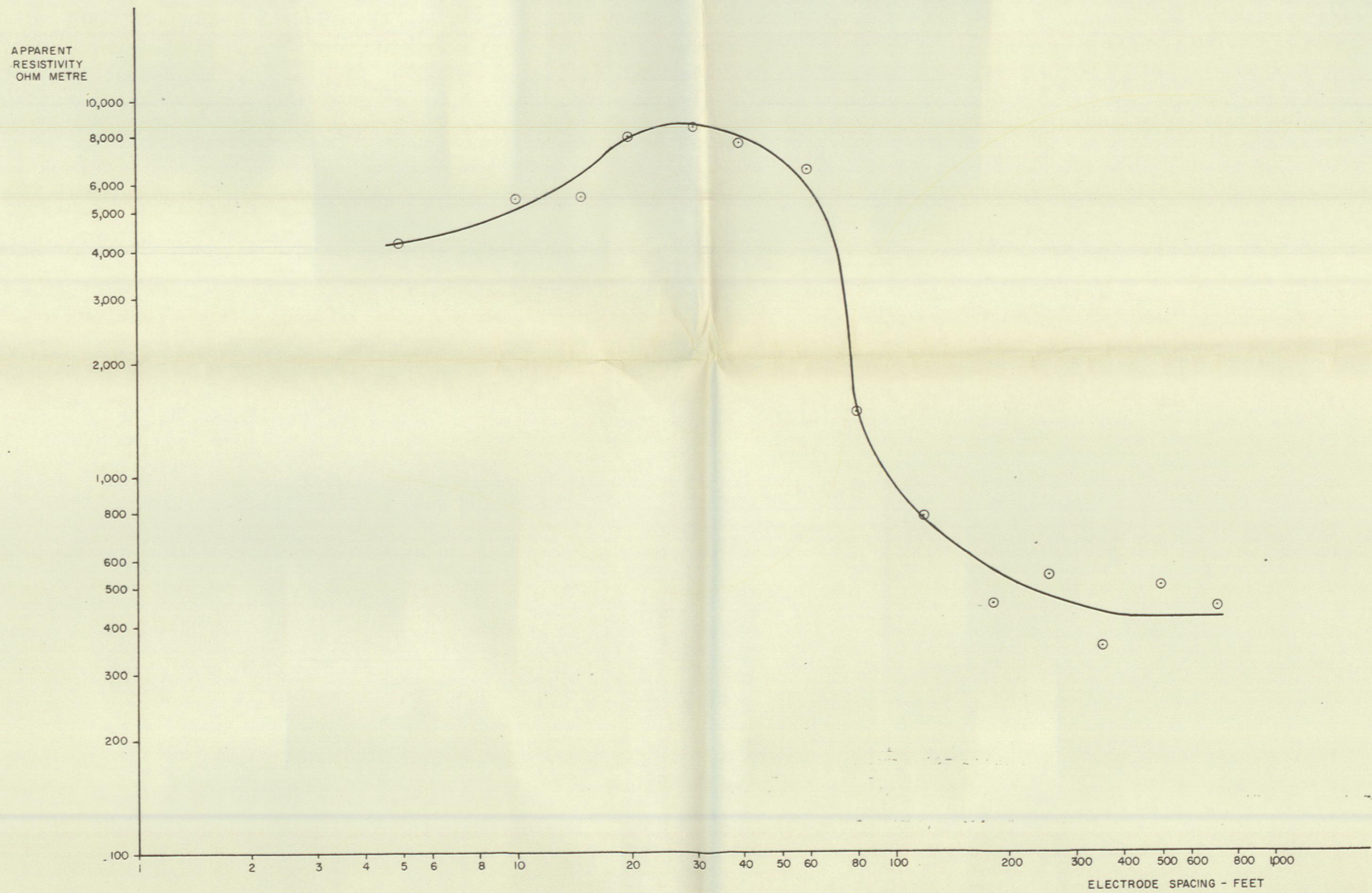


PLATE 4

DISCOVERY MINES LIMITED

WHITE RIVER AREA, YUKON TERRITORY

MICRO CLAIM GROUP

WENNER EXPANDING ELECTRODE RESISTIVITY SURVEY

SURVEY BY SEIGEL ASSOCIATES LIMITED
MAY 1967

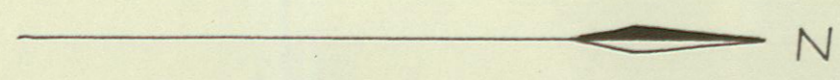
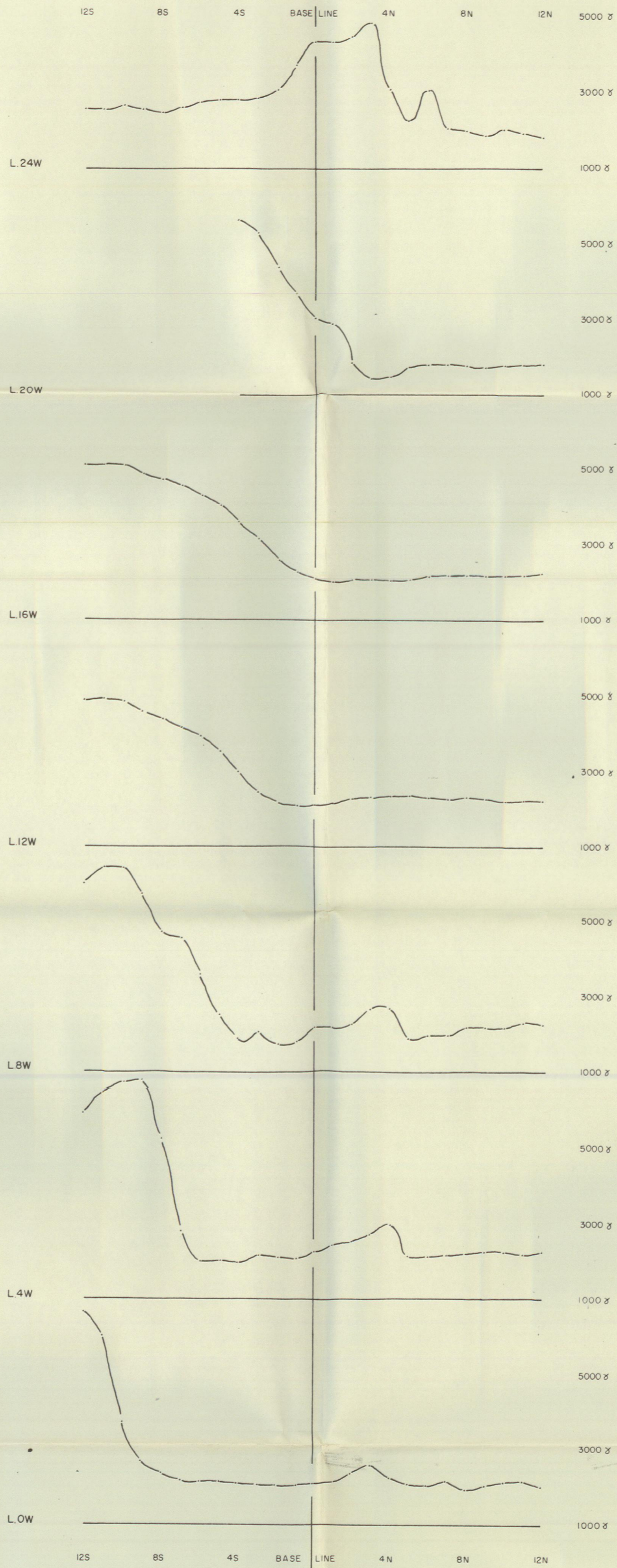


PLATE 5

DISCOVERY MINES LIMITED
 WHITE RIVER AREA, YUKON TERRITORY
 MICRO CLAIM GROUP
MAGNETOMETER SURVEY PROFILES

SCALE 1" = 400'

DATA SUPPLIED BY P. H. SEVENSMA CONSULTANTS LTD.
 MAY 1967