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Report on Induced Polarization Survey Kirk Claim Group Cassiar Area, B.C. for Cry Lake Minerals Limited

Nov. 25, 1968.

Jon G. Baird, P. Eng.

REPORT ON
INDUCED POLARIZATION SURVEY
KIRK CLAIM GROUP
CASSIAR AREA, BRITISH COLUMBIA
ON BEHALF OF
CRY LAKE MINERALS LIMITED

by

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

November 25, 1968

CLAIMS:

Names	Record Nos.
KIRK 1 to 4	18601 to 18604
KIRK 5 to 10	19728 to 19733
KIRK 26, 28, 30	

LOCATION:
Near the junction of Nizi Creek
and Fourmile River, about 30 miles
southeast of Cassiar, British Columbia.
Liard Mining Division
129° 59° SE

DATES:
October 20 to November 4, 1968

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SUMMARY

The present induced polarization survey has revealed one area of chargeability response indicative of above normal subsurface concentrations of metallically conducting material. Quantitative interpretation of the data reveals that the bulk of the conductive mineralization may occur in several parallel to sub-parallel, steeply dipping bodies. The nature of the conducting material responsible for the observed responses is not as yet known, however it could consist of sulphide mineralization, carbonaceous material, or other high polarization minerals in unknown relative proporations.

A detailed geological and geochemical examination of the anomalous area is recommended. Trenching or diamond drilling should be predicated upon these further investigations but may, if desired, be based upon the present induced polarization data. For this purpose two diamond drill holes totalling 900' in length are herein proposed to test the area of high chargeability. If further investigations yield favourable results, additional induced polarization surveying to extend the area of the survey grid may be warranted.

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INTRODUCTION

During the period from October 20 to November 4, 1968, a geophysical field party under the direction of Mr. Francis Bourqui executed an induced polarization survey on the Kirk claim group, Cassiar area, British Columbia, on behalf of Cry Lake Minerals Limited.

The property lies approximately 30 miles southeast of Cassiar, B. C. at a point about 18 miles south of McDame Post. The junction of Nizi Creek and Fourmile River lies just north of the claim group. The Kirk group is accessible by a rough road from the Watson Lake-Cassiar Highway or by fixed-wing aircraft or helicopter from Watson Lake.

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 Cry Lake Minerals Limited.

Seigel Mk VI time domain (pulse-type) induced polarization equipment has 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 second delay time following the termination of the current-on pulse.

The purpose of an induced polarization survey is to map the subsurface distribution of metallically conducting mineralization beneath the grids covered. In the present area such mineralization could include pyrite, chalcopyrite, possibly galena and other metallic sulphide minerals as well as magnetite, graphite and other minerals not always distinguishable from sulphides by their 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 results obtained over various base metal ore bodies.

On the present property a base line was laid out oriented N 50° W and grid lines were established perpendicular thereto at 400' intervals. Approximately 8 miles of line cover the area surveyed.

The three electrode array with electrode spacings of 200' was employed, for reconnaissance purposes, on this property. Station intervals were 200'. In addition, the three array with electrode spacings of 400', 300', 100', 50' and 25' was employed in certain areas for further detail.

GEOLOGY

The geology of the present property is the subject of a report by E. D. Black dated September 4, 1968. The Kirk claims are believed to be underlain by sedimentary and volcanic rocks of Upper Devonian or Mississippian age which are part of a belt of such rocks extending along the eastern side of the granitic Cassiar Batholith. Black reports that pyrite, chalcopyrite, sphalerite, and minor amounts of galena occur within silicified or carbonitized shears in volcanic rocks. The trend of these shears is generally northwest and their dip is vertical to steep northerly. Several showings are found on the property and Black reports a geochemical anomaly coincident with these showings.

DISCUSSION OF RESULTS

Plate 2, on a scale of 1" = 400', shows the geophysical results in contour form. Two parameters are plotted, chargeability (the induced polarization characteristic of the rock) and resistivity. A five milli-second contour interval has been chosen for the chargeability contours and a logarithmic contour interval has been used for the resistivity contours by showing the 400, 800 and 1600 ohm-metre contours.

Plate 3, also on the scale of 1" = 400', shows the detail chargeability and resistivity profiles. The vertical scales for these profiles are 1" = 10.0 milliseconds for chargeability and 1" = 1000 ohm-metres for resistivity. Symbols explained in the legend have been used to distinguish between observations taken with the different electrode spacings.

The chargeability contour plan indicates that the observed chargeability values range between a low of 1.0 and a high of 25.8 milli-seconds for the 200' reconnaissance electrode spacing. Chargeabilities over most of the grid are below 10.0 milliseconds, which is within the normal non-metallic chargeability range for volcanic rocks. One area in the south central portion of the grid is shown to exhibit chargeabilities in excess of 15.0 milliseconds. This northwesterly trending area is some 2000' in length by 800' in width and has been shaded on the chargeability contour plan. Since the chargeability response to a given body depends upon the geometry of the body and of the measuring electrodes among other parameters, chargeability contours are not necessarily indicative of the actual shape or location of polarizable sources. In most cases profiles are most useful for quantitative interpretation.

As shown on Plate 3, profiles using varying electrode spacings have been executed over the anomalous sections of L 48 E and L 56 E. Quantitative interpretation of these profiles reveals that the metallically conducting mineralization giving rise to the anomalous responses most likely lies in several parallel to sub-paralled steeply westerly dipping lenses. Since the lenses likely occur relatively close to one another and since the discrimination between such bodies diminishes with depth below surface and increasing electrode spacing, it is difficult to make precise determinations of the location, attitude and possible metallically conducting content of each body. The present data is for the three electrode array. A more precise interpretation may be possible by executing gradient array traverses over the anomalous sections of profile. Since precise determinations are difficult under the present circumstances, and since the survey lines are separated by a much greater distance than the width of the bodies, line-to-line correlation of the mineralized lenses would be tenuous to say the least. The 25' electrode spacing results on L 48 E indicate that the polarizable material comes to within at least 15' and perhaps closer to the ground surface at about 1+00 N, 3+00 S and 4+50 S. There are no 25' spacing data on L 56 E however the amplitude of the 50' spacing results indicates that the upper surfaces of polarizable bodies may also approach to within 15' of the surface along parts of the profile.

Resistivity results on L 56 E are rather uniform and no distinct pattern is seen with distance along the profile or with changing electrode spacings. The resistivity results on L 48 E, however, reveal a sharp resistivity low centred about 5+00 S which corresponds to a body of high polarization material interpreted from the chargeability results. This resistivity decrease could indicate that such a body contains a sufficiently high content of metallically conducting mineralization to permit some degree of interconnection between the conducting particles. As well, it is noted that for the resistivity results centred near the baseline on L 48 E, there is a distinct increase in resistivity with decreasing electrode spacing. This could indicate that at this point the overburden is more resistive than the bedrock.

An isolated chargeability response at 4 N on L 36 E and a small area enclosed by a 10.0 millisecond contour on the north ends of lines 56 E and 60 E are noted. This latter area exhibits below normal resistivity as well.

The resistivity contour plan indicates that apparent resistivities vary from a low value of 510 ohm-metres to a maximum observed value of 2500 ohm-metres. Most of the area exhibits resistivities in the range 800 to 1600 ohm-metres. Resistivity variations can be caused by many factors which are usually due to ionic conduction within the bedrock or overburden. It is noted, however, that a distinct resistivity low of less than 400 ohm-metres corresponds to part of the area of high chargeabilities. This resistivity low could be due, at least in part, to a high content of metallically conducting material in the subsurface.

CONCLUSIONS AND RECOMMENDATIONS

The present survey has indicated one main area of above normal chargeabilities and low resistivities, indicative of subsurface concentrations of metallically conducting material. The interpretation that such material may occur in northwest trending, steeply dipping lenses corresponds with the type of mineralized environment observed by Black in showings at the north end of Pond Lake some 2000' northwest of the present anomalies. No distinct chargeability response (for the 200' reconnaissance electrode spacings) has been noted in the area of these showings. This would indicate that any near-surface metallically conducting mineralization in this area is of small extent. If these showings are of sufficient interest, i.e. of high grade, detailed induced polarization surveying may be warranted in this area.

Since the present results indicate that parts of the anomalous sources may come very close to the ground surface, it is recommended that geological and geochemical surveys should be carried out over the present anomalous area which was not covered during Black's investigation and on which there is as yet no geological information. When these further investigations have been completed it may be advisable to trench or drill in the area of the present anomaly. Trenching could be carried out anywhere along the anomalous sections of profiles 48E and 56E but should be concentrated in the areas noted above where the present data show that the anomalous sources are particularly close to surface. Since the present bodies appear to be steeply dipping, it is recommended that inclined holes be drilled for exploratory purposes. If it is considered desirable to drill without the benefit of the above recommended geological and geochemical work, or if such work is confirmatory, the following two drill holes are recommended on the basis of the present chargeability and resistivity results.

Hole	Collar	Inclination	Bearing
DDH #1	L 56 E, 5+00S	45°	N 40° E
DDH #2	L 48 E, 5+00S	45°	N 40° E

Both holes should be drilled to a minimum depth of 450'. Further drilling may be predicated on the results of these first two holes. As well, if results are encouraging, additional detailed induced polarization surveying may be warranted to extend the present grid or to further test the high chargeability responses on Lines 36E, 56E and 60E.

Respectfully submitted,

SEIGEL ASSOCIATES LIMITED

Jon G. Baird
per ROC

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Geophysicist

Vancouver, B.C.
November 25, 1968

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.

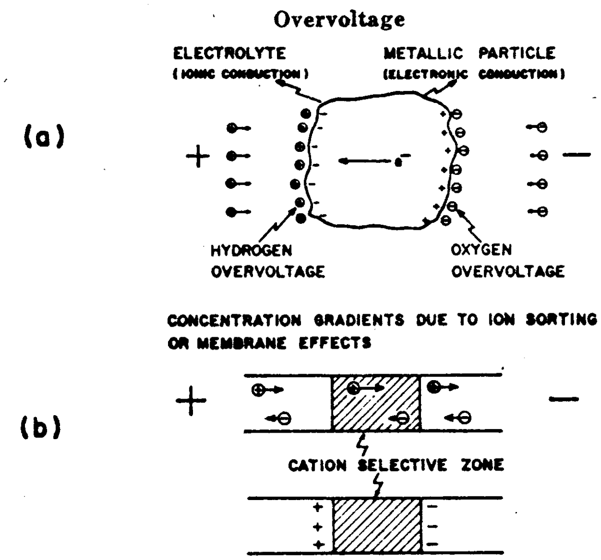


Figure 1.—Induced Polarization Agents.

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.

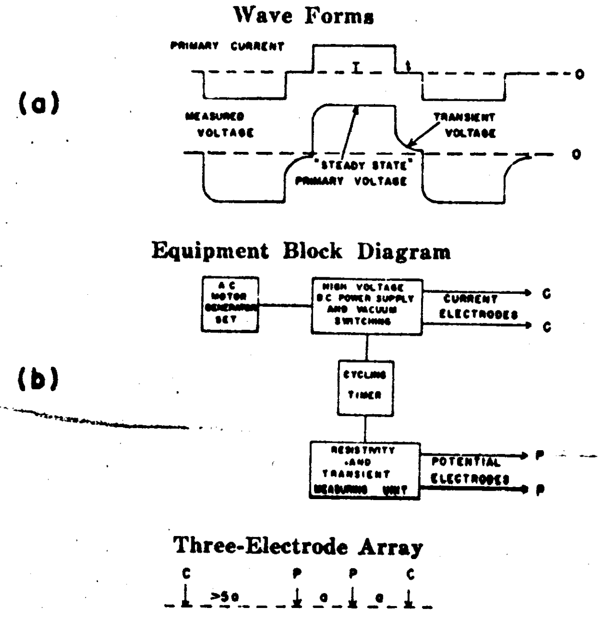


Figure 2.—The Pulse System.

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 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.

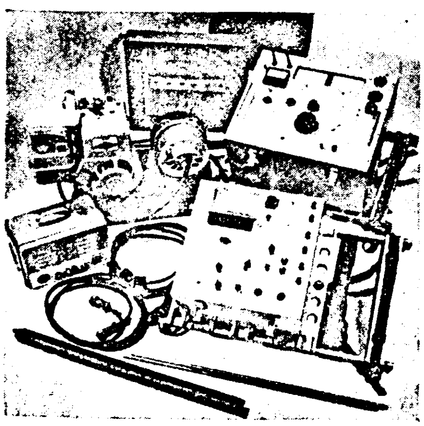


Figure 3.—(above)—The Seigel Mk V Induced Polarization Unit.

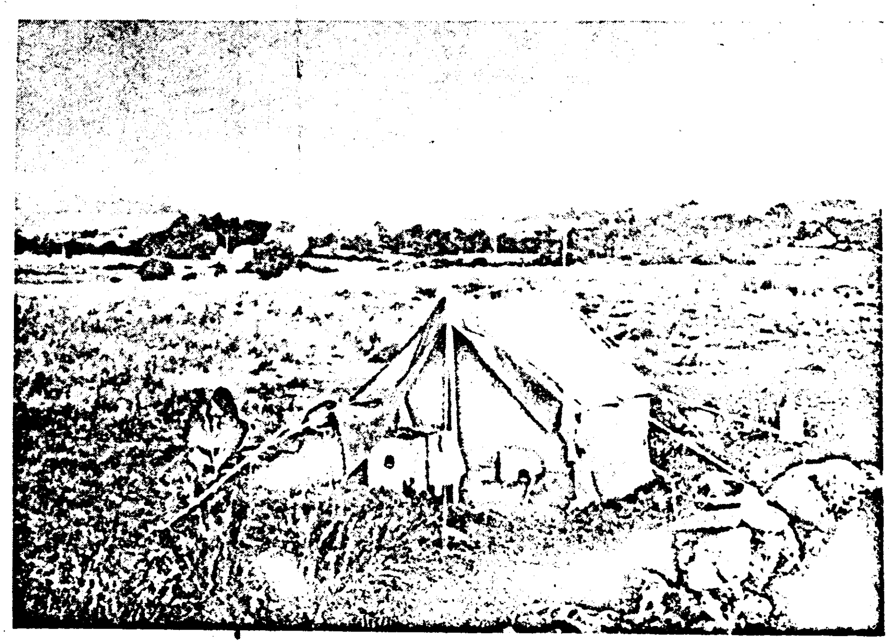


Figure 4.—(right)—Typical Field Operational Base in Ireland.

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.

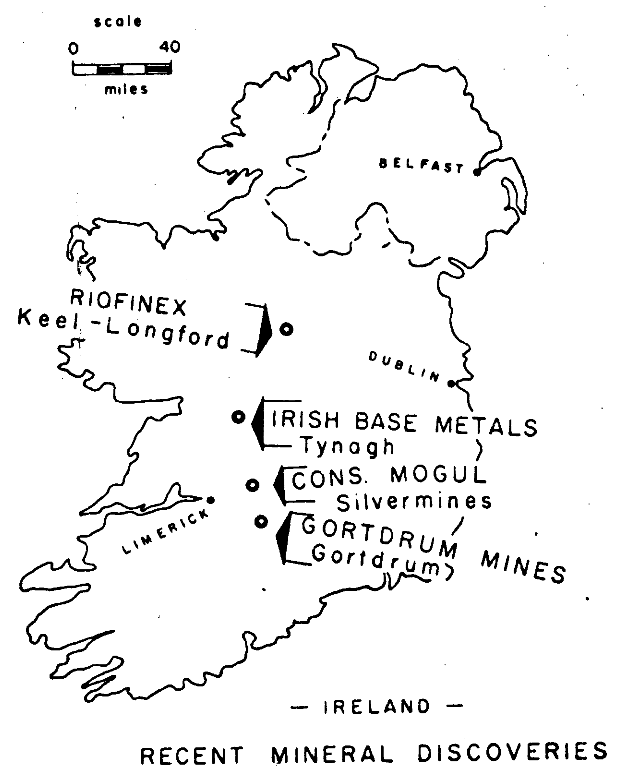


Figure 5.—Location Plan of Recent Mineral Discoveries in Ireland.

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 adajacent 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.

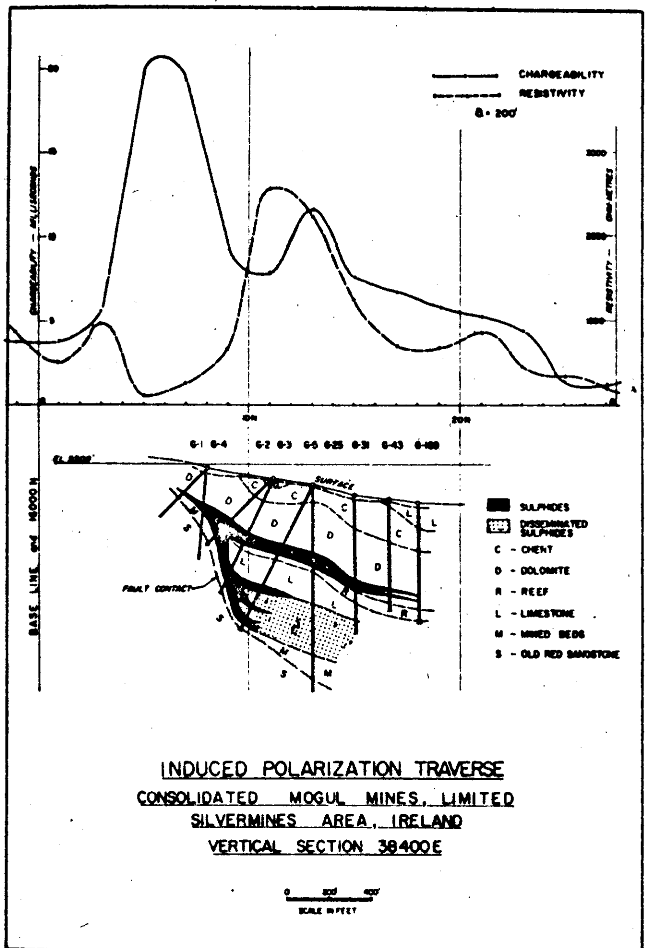


Figure 6.—Typical Discovery Traverse, Silvermines Deposit.

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.

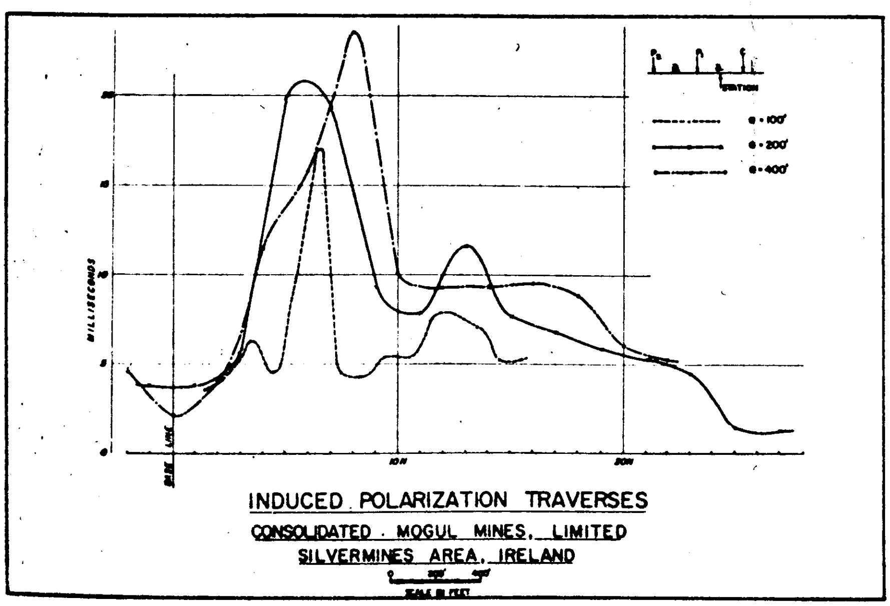


Figure 7.—Multiple Spacing Results, Silvermines Deposit.

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

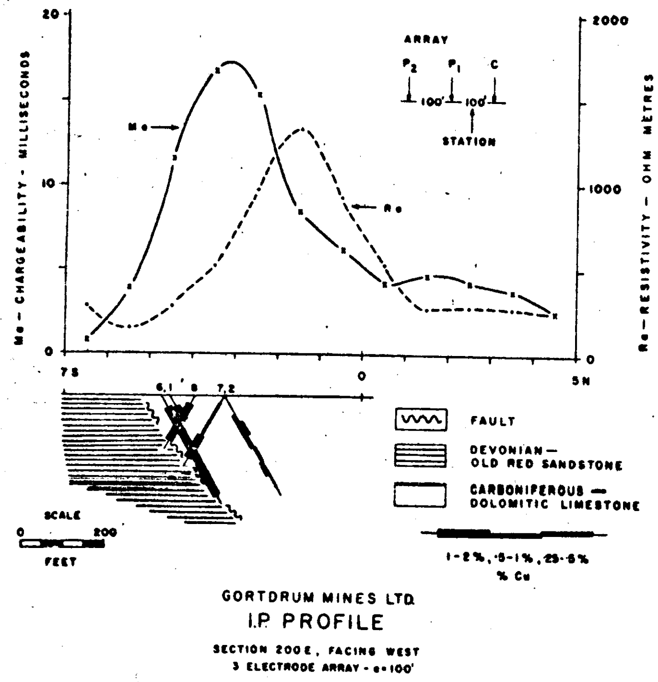


Figure 8.—Typical Discovery Traverse, Gortdrum Deposit.

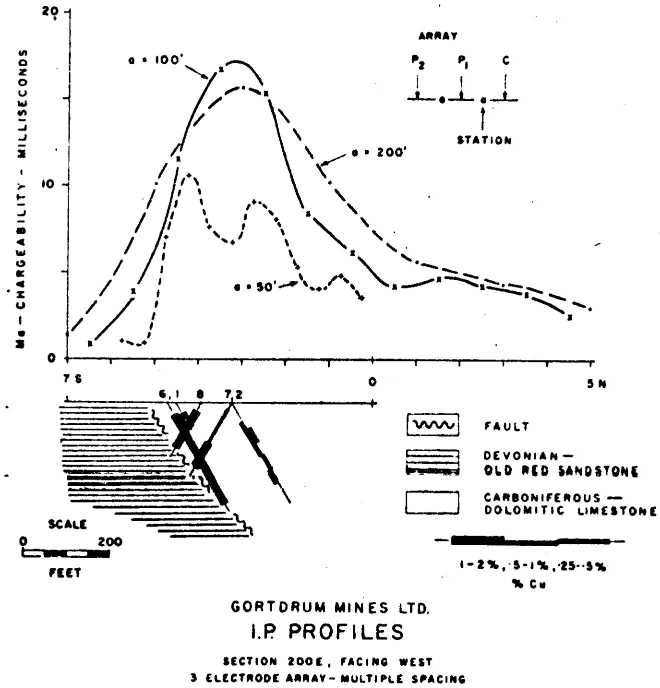


Figure 9.—Multiple Spacing Results, Gortdrum Deposit.

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. 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.

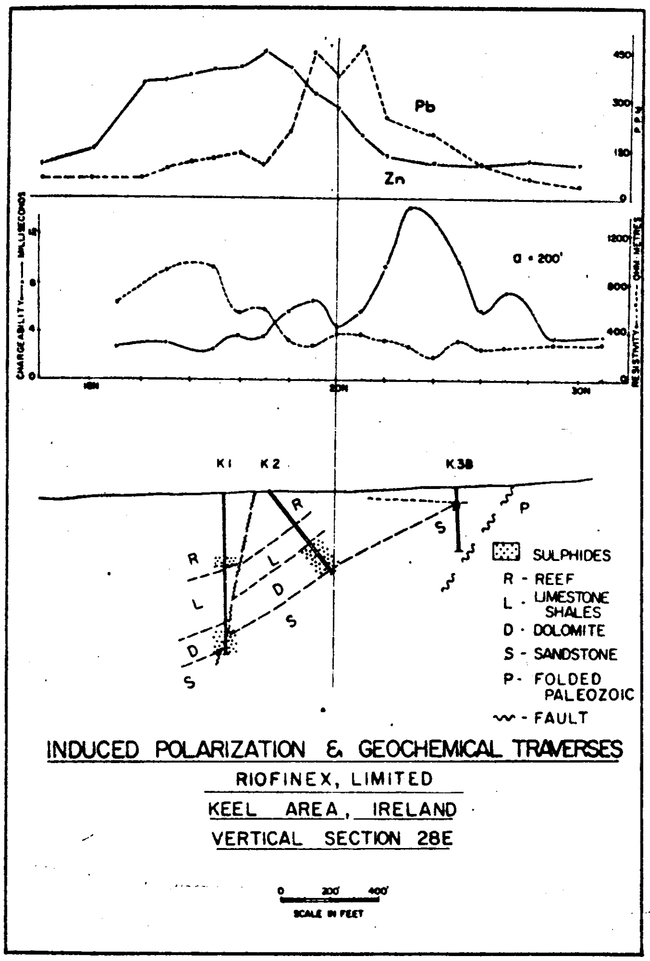


Figure 10.—Typical Discovery Traverse, Keel Deposit.

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 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.

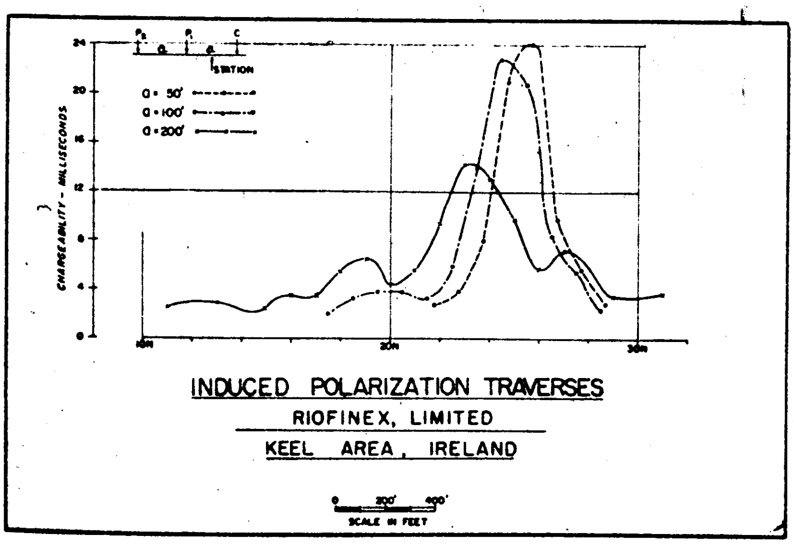


Figure 11.—Multiple Spacing Results, Keel Deposit.

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.

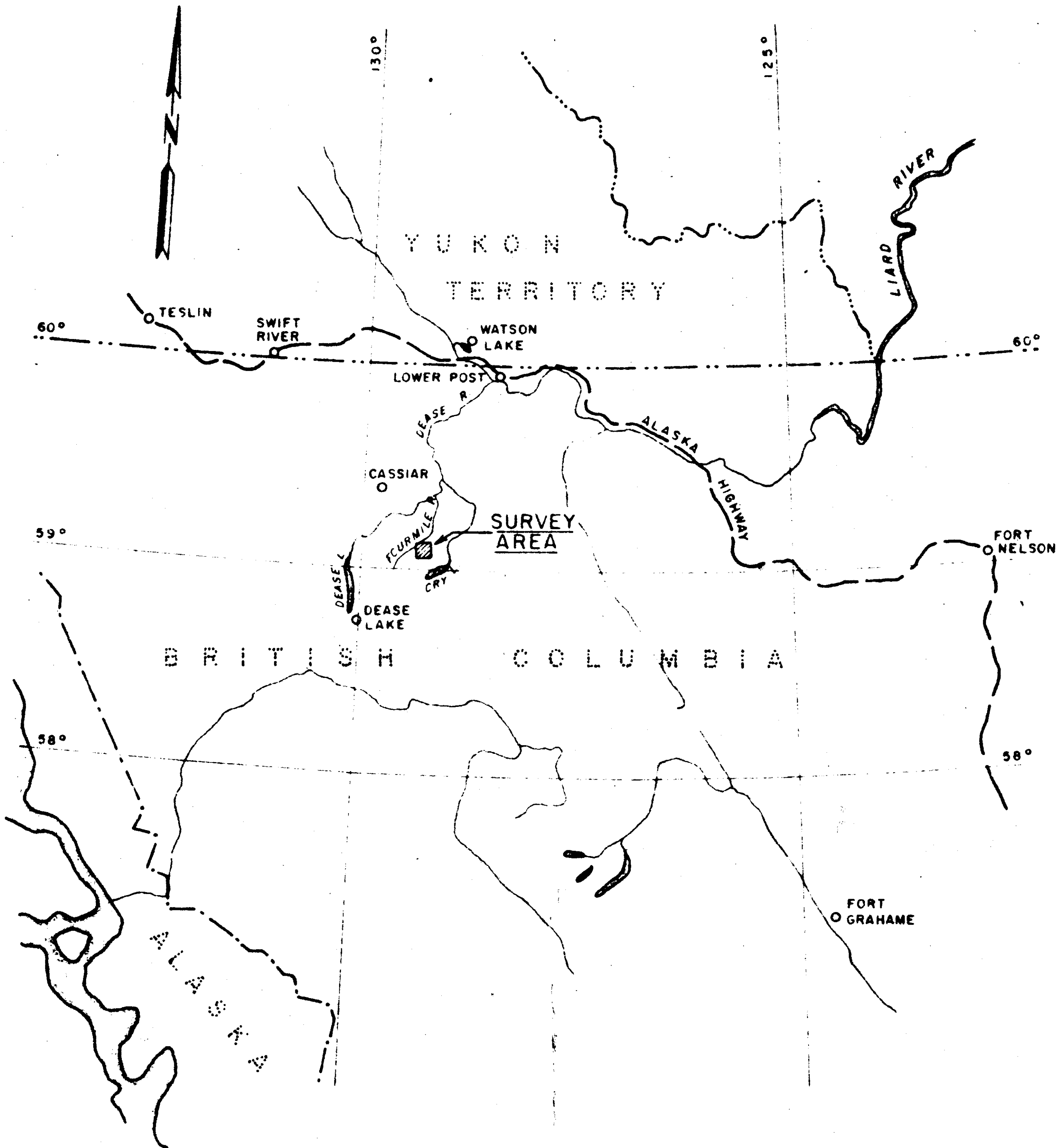


PLATE I

CRY LAKE MINERALS LTD.

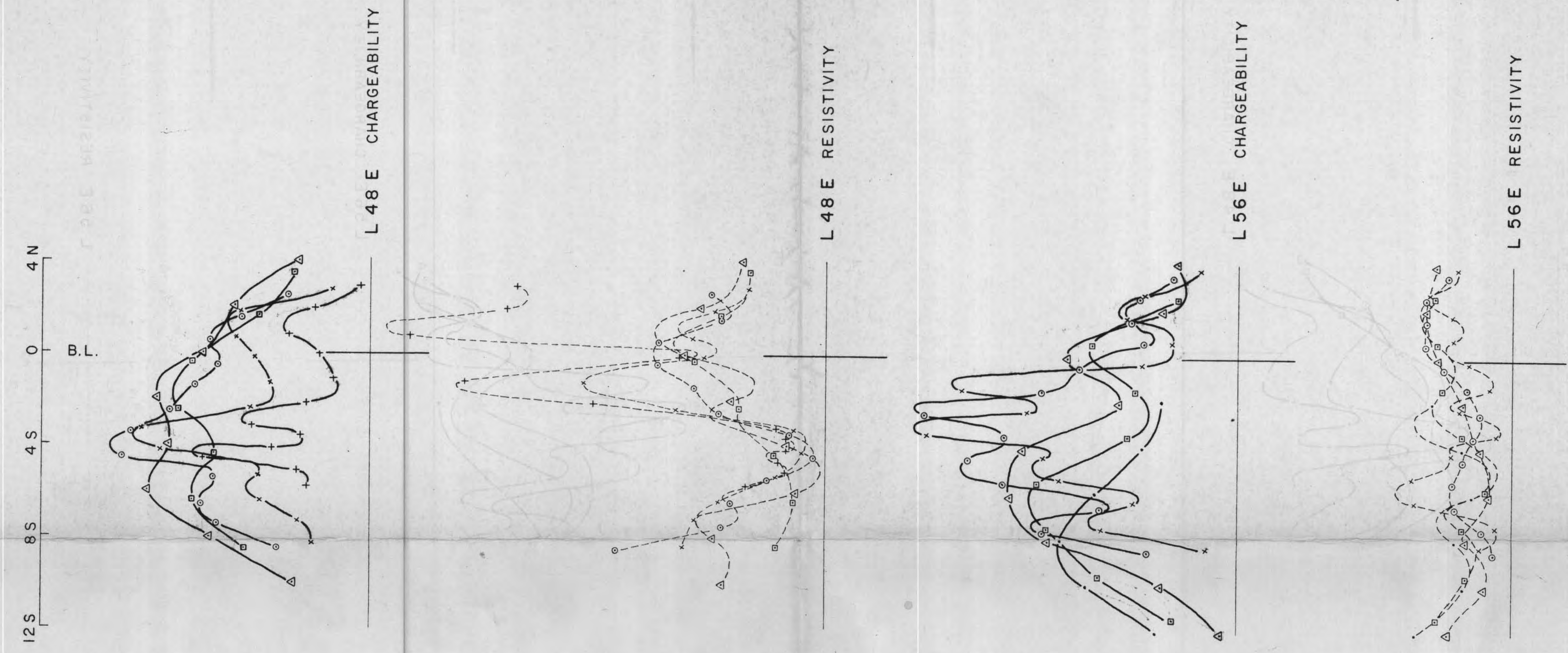
CASSIAR AREA, BRITISH COLUMBIA

LOCATION PLAN

SCALE: 1 INCH = 63.13 MILES

SURVEY BY SEIGEL ASSOCIATES LIMITED

NOVEMBER 1968



LEGEND:

CHARGEABILITY; SCALE: 1" = 10 MILLISECONDS
ELECTRODE SPACINGS: a = 400' •———•———•
a = 300' ⊡———⊡———⊡
a = 200' △———△———△
a = 100' ⊙———⊙———⊙
a = 50' ×———×———×
a = 25' +———+———+

RESISTIVITY; SCALE: 1" = 1000 OHM-METRES
ELECTRODE SPACINGS: a = 400' •– – –•– – –•
a = 300' ⊡– – –⊡– – –⊡
a = 200' △– – –△– – –△
a = 100' ⊙– – –⊙– – –⊙
a = 50' ×– – –×– – –×
a = 25' +– – –+– – –+

TO ACCOMPANY A GEOPHYSICAL REPORT BY
J. G. BAIRD DATED NOVEMBER 25, 1968

PLATE 3

CRY LAKE MINERALS LTD.

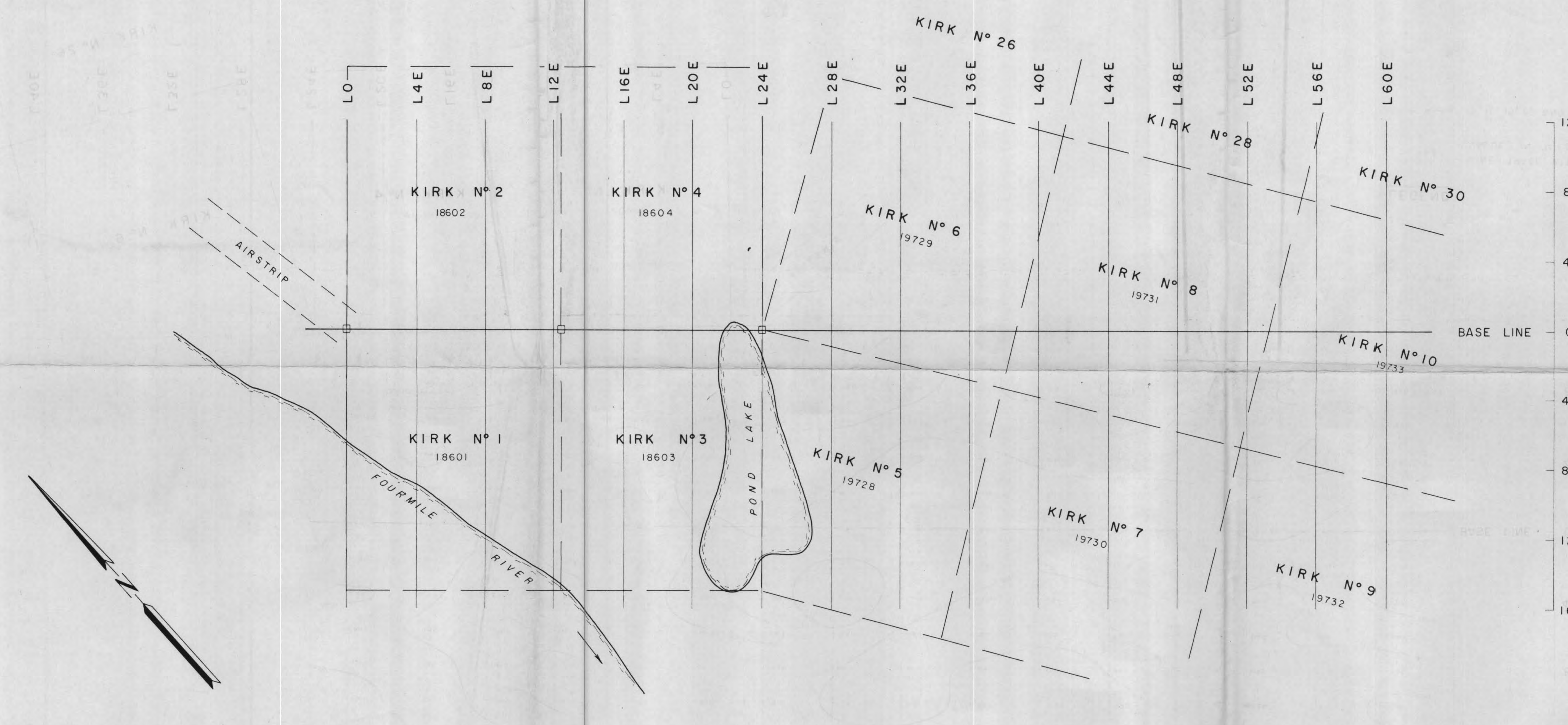
CASSIAR AREA, BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY

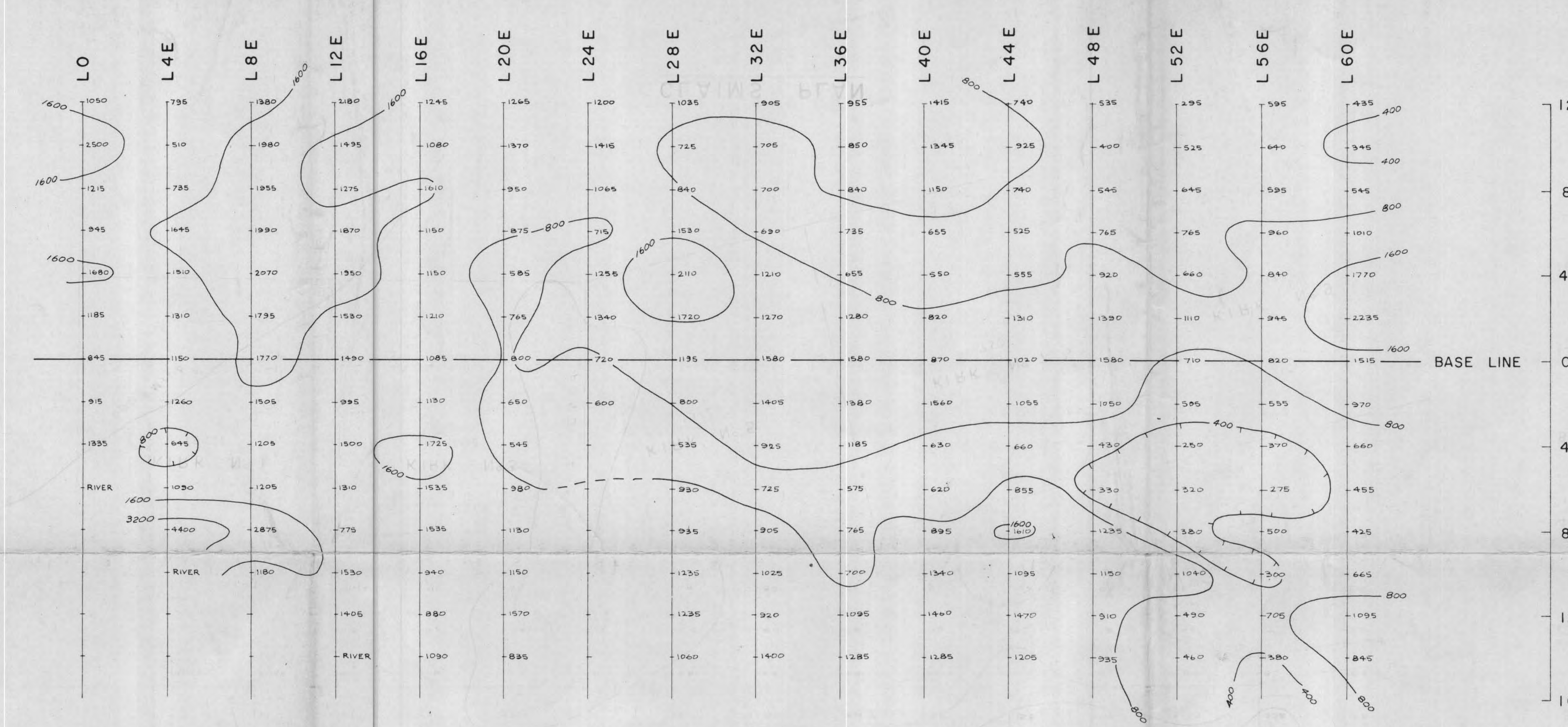
DETAIL PROFILES

SCALE: 1" = 400'

SURVEY BY SEIGEL ASSOCIATES LIMITED
NOVEMBER, 1968



CLAIMS PLAN

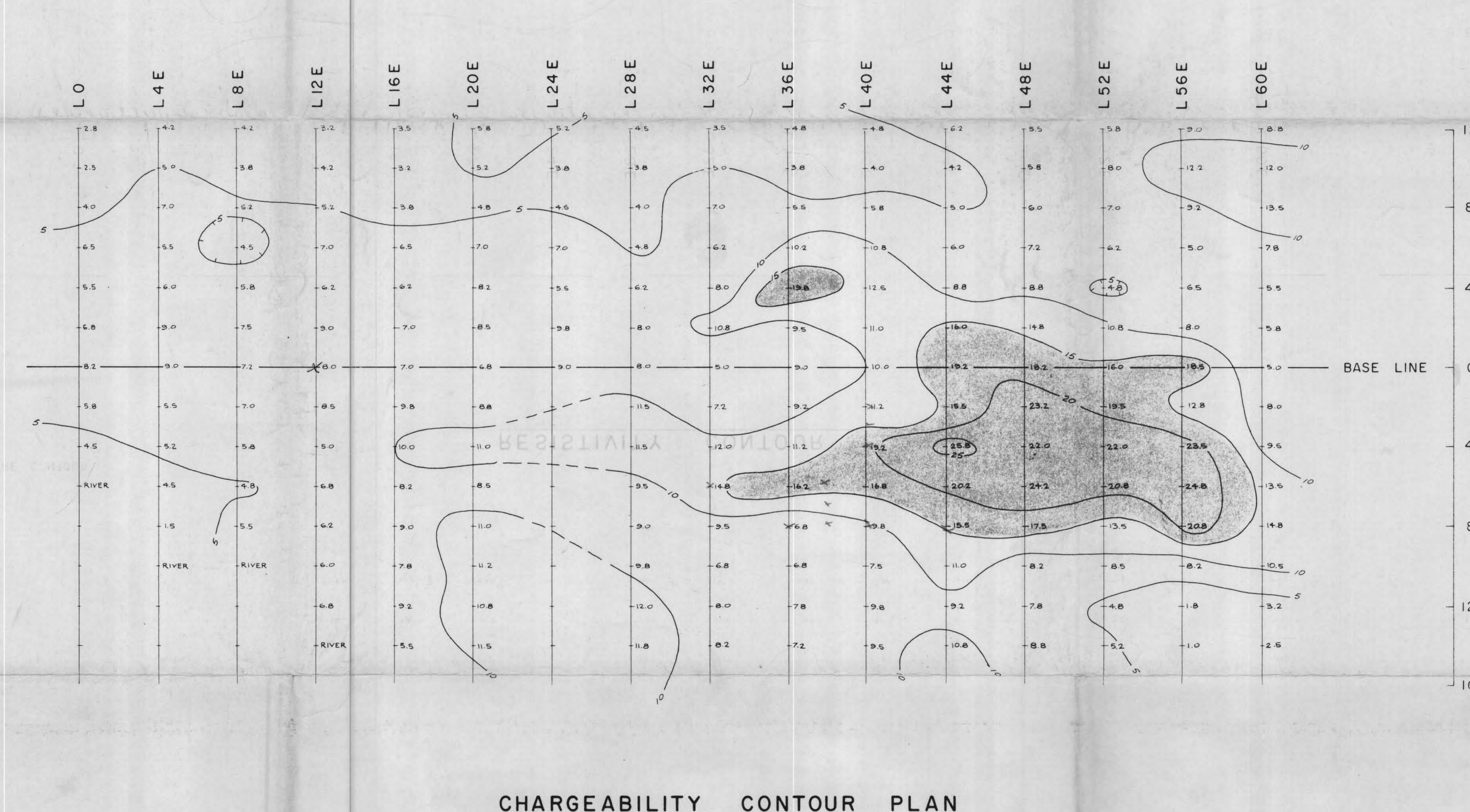


LEGEND:

LINE TRACE WITH RESISTIVITY VALUE IN OHM-METRES

400, 800, 1600 AND 3200 OHM-METRE CONTOURS

RESISTIVITY CONTOUR PLAN



CHARGEABILITY CONTOUR PLAN

LEGEND:

LINE TRACE WITH CHARGEABILITY VALUE IN MILLISECONDS

5, 10, 15, 20 AND 25 MILLISECOND CONTOURS

TO ACCOMPANY A GEOPHYSICAL REPORT
BY J. G. BAIRD DATED NOVEMBER 25, 1968

PLATE 2

CRY LAKE MINERALS LTD.

CASSIAR AREA, BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY

PLAN MAPS

SCALE: 1" = 400'

SURVEY BY SEIGEL ASSOCIATES LIMITED
NOVEMBER, 1968