GEOPHYSICAL REPORT

of the

INDUCED POLARIZATION SURVEY

92I/11E on the

ADERA PROPERTY

DEN CLAIM GROUP

GRANDORA EXPLORATIONS OPTION

4804

92I/11E

Lat. 50°34'N
Long. 121°00'W

KAMLOOPS MINING DIVISION

on behalf of

ACHERON MINES LTD. (N.P.L.)

Claim Name	Record Number	Anniversary
Den 9 & 11	51025 & 51027	August 6
Den 13, 15 & 17	49711, 49713 & 49715	May 3
Den 19 - 36	49864 - 49881	May 10
Den 37	49717	May 3
Den 47 - 52	50353 - 50358	June 4
Den 53 - 60	51997 - 52004	October 1
Den 61 & 62	52310 & 53311	October 18
Den 78 - 80	50242 - 50244	May 28
Den 84 & 85	50828 - 50829	July 14
Ned Fractions 1 - 4	63952 - 63955	May 2
FC Fractions 1 - 4	75139 - 75142	December 17
Lem Fraction	96782	May 10
DN Fractions 1 - 5	80691 - 80695	May 30
Elke Fractions 1 & 2	96783 & 96784	May 10

by

P. P. NIELSEN, B.Sc., GEOPHYSICIST

and

G. C. GUTRATH, B.Sc., P.Eng., GEOLOGIST

Atled Exploration Management Ltd.
Vancouver, B. C.

August 1973

NTS 92I 10 & 11

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INTRODUCTION

During the period from July 14 to July 31, 1973, a detailed, deep penetrating Induced Polarization Survey was executed on the Den Claims, Adera property in the Highland Valley, B. C.

The purpose of the survey was to investigate further a number of small, subtle chargeability features determined from a previous survey whereby an electrode separation of 400 feet was used. The present survey incorporated an instrument of high sensitivity and power capable of greater depth investigations, better noise rejection and higher resolution.

The I.P. survey was executed by Atled Exploration Management Ltd. on behalf of Acheron Mines Ltd. who holds the property under option from Grandora Explorations Ltd.

A total of 15.3 line miles based on first to last readings at the n = 2 electrode spacing was carried out. The total profile length for the various electrode spacings used (n = 1, 2 and 3) was 34.1 line miles.

The crew consisted of an experienced geophysicist-operator and three field assistants who worked out of a tent camp on the property.

LOCATION AND ACCESS

The Adera property is situated to the northwest of and adjacent to the Bethlehem Copper Mine in the Highland Valley. The centre of the claim group is about 2.5 miles north of Quiltanton Lake which is situated between the Lornex and Bethlehem Mines on the Ashcroft-Logan Lake road.

Co-ordinates are 121°00'W longitude and 50°34'N latitude.

Local access is by way of a four-wheel drive gravel road north for about one mile to the centre of the claims from the paved road to the Bethlehem mine.

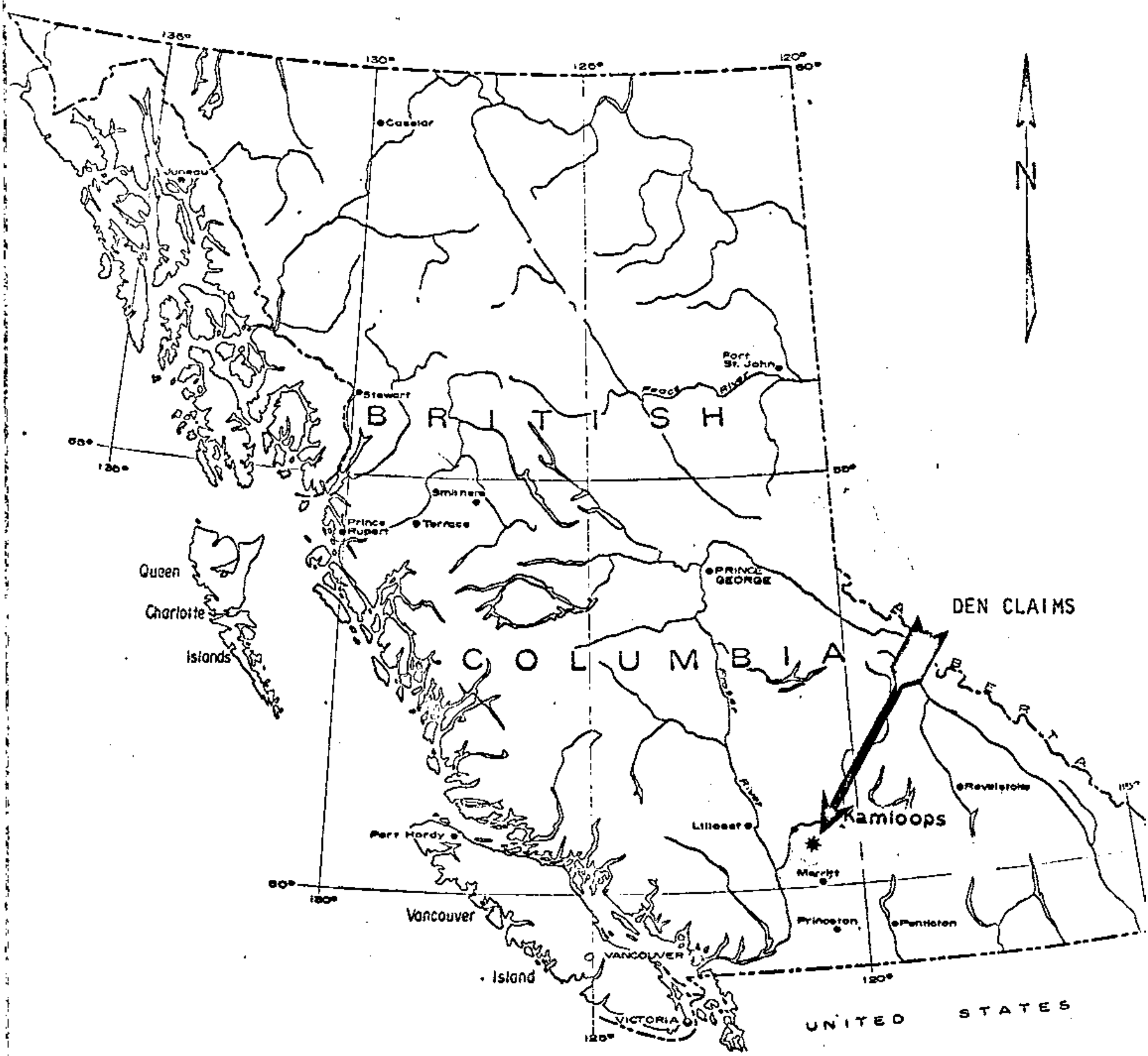
GRID AND GROUND CONDITIONS

The old grid consists of east-west directed lines spaced 400 feet apart and picketed at a 100-foot station interval. A base-line through Station 0+00 runs the length of the grid surveyed, and a tie-line has been installed at Station 40+00W.

This grid was rehabilitated for the present survey using chain-saws to cut out the numerous windfalls. Fresh flagging and blazing was also carried out where required.

The present I.P. survey encountered extremely dry ground conditions over areas of overburden thicknesses varying from nil to up to 200 feet.

To maintain sufficiently low contact resistances, it was necessary to use salt water and aluminum foil for each electrode position along all survey lines. Magneto-telluric interference from solar disturbances resulted in very slow production near the completion of the survey.



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4804 MAP #1

ACHERON MINES LTD. (N.P.L.)
ADERA PROPERTY
HIGHLAND VALLEY, B.C.

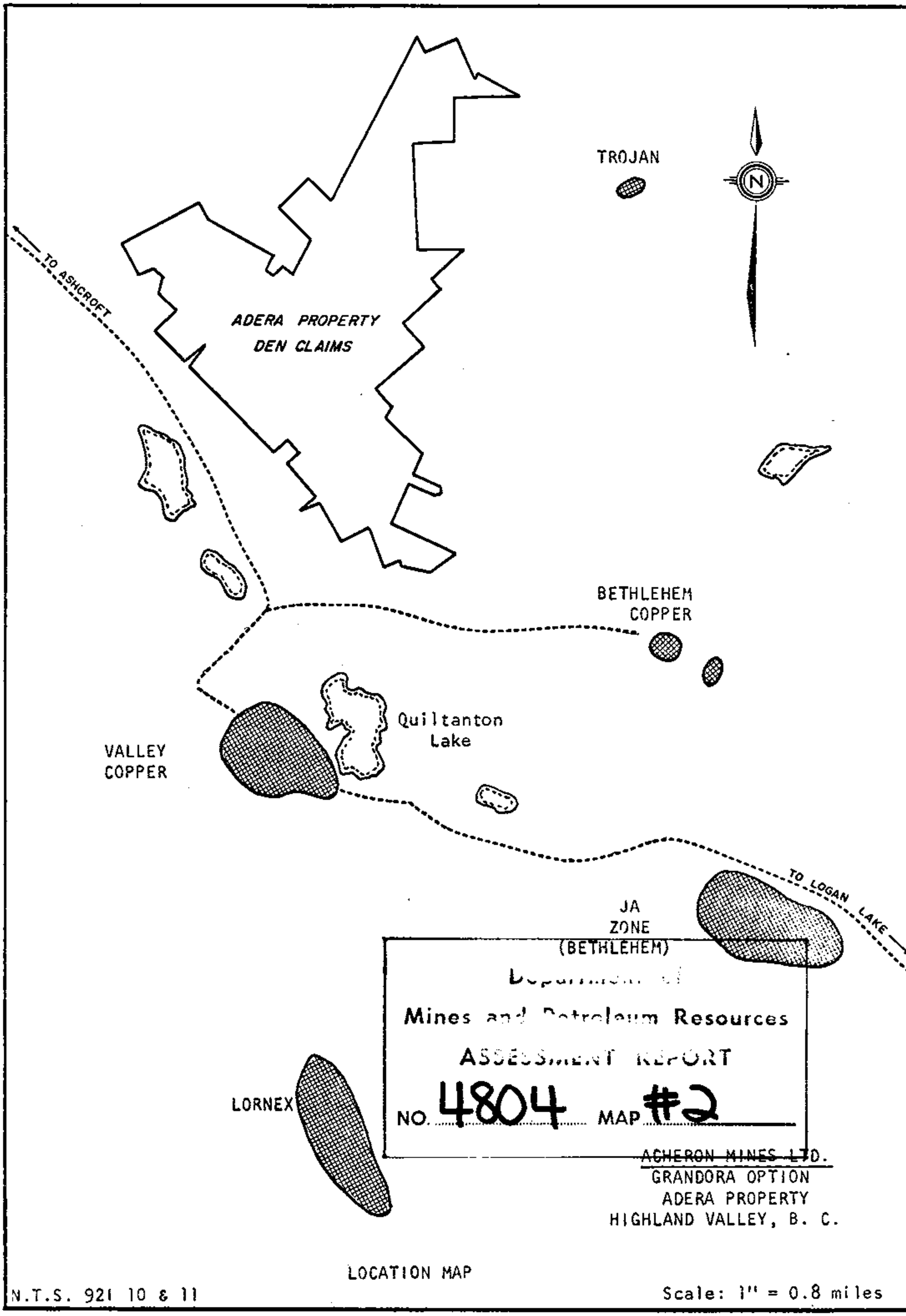
Location Map

ATLED EXPLORATION
MANAGEMENT LTD.

SCALE :

0 100 200

miles



LOCATION MAP

CLAIMS

The Adera property currently held by Grandora Explorations Ltd. (N.P.L.) and under option to Acheron Mines Ltd. (N.P.L.) consists of the following 61 mineral claims.

Claim Name	Record Number	Anniversary Date
Den 9 & 11	51025 & 51027	August 6
Den 13, 15 & 17	49711, 49713 & 49715	May 3
Den 19 - 36	49864 - 49881	May 10
Den 37	49717	May 3
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Den 78 - 80	50242 - 50244	May 28
Den 84 & 85	50828 - 50829	July 14
Ned Fractions 1 - 4	63952 - 63955	May 2
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Lem Fraction	96782	May 10
DN Fractions 1 - 5	80691 - 80695	May 30
Elke Fractions 1 & 2	96783 - 96784	May 10

GEOLOGY

Regional

The property is situated within the Guichon Creek batholith which is the host for a number of "porphyry"-type copper deposits including Bethlehem Copper Ltd. and Lornex Mining Corporation which are presently in production.

Other significant deposits include Valley Copper, Bethlehem's JA zone and Highmont to the south, and the Trojan and Krain deposits to the north and northeast of the Adera property.

The Guichon Creek batholith is a multi-phased granitic body which intrudes Cache Creek volcanic and sedimentary rocks of Mississippian to Permian age on the western flank and Nicola rocks of Karnian age elsewhere. The northern extent of the batholith is not accurately known due mainly to overlying Kamloops andesites and basalts of Tertiary age.

The various phases of the batholith are identified by their field relationships, texture, mineral content, composition and relatively sharp contacts. These phases and structures such as the north-south striking Lornex fault and other cross-faults are believed to be important controls for copper mineralization.

Known mineralization in the camp consists of mainly chalcopyrite, bornite and chalcocite. Little or no pyrite occurs in or near the significant deposits at Highland Valley.

Property (after D. B. Taylor)

The claims are underlain by the Bethlehem and Beaver quartz-diorite phases of the Guichon Creek batholith.

The contact between these two phases is not well defined but generally strikes north-south through the Den 37 claim to the area of Den 29 which appears to be overlain by deep overburden.

Kamloops volcanics cap the north-east section of the property north of Line 76N.

Strong north-south fracturing occurs over the entire property and is thought to be related to the Lornex fault.

Alteration, where observed, is not well developed although isolated chloritization with epidote stringers is widespread. Secondary biotization in fractures in the Beaver quartz-diorite and potash alteration near the Bethlehem contact has been observed.

Mineralization noted consists of widely scattered occurrences of fracture filled bornite with malachite accompanied by kaolin.

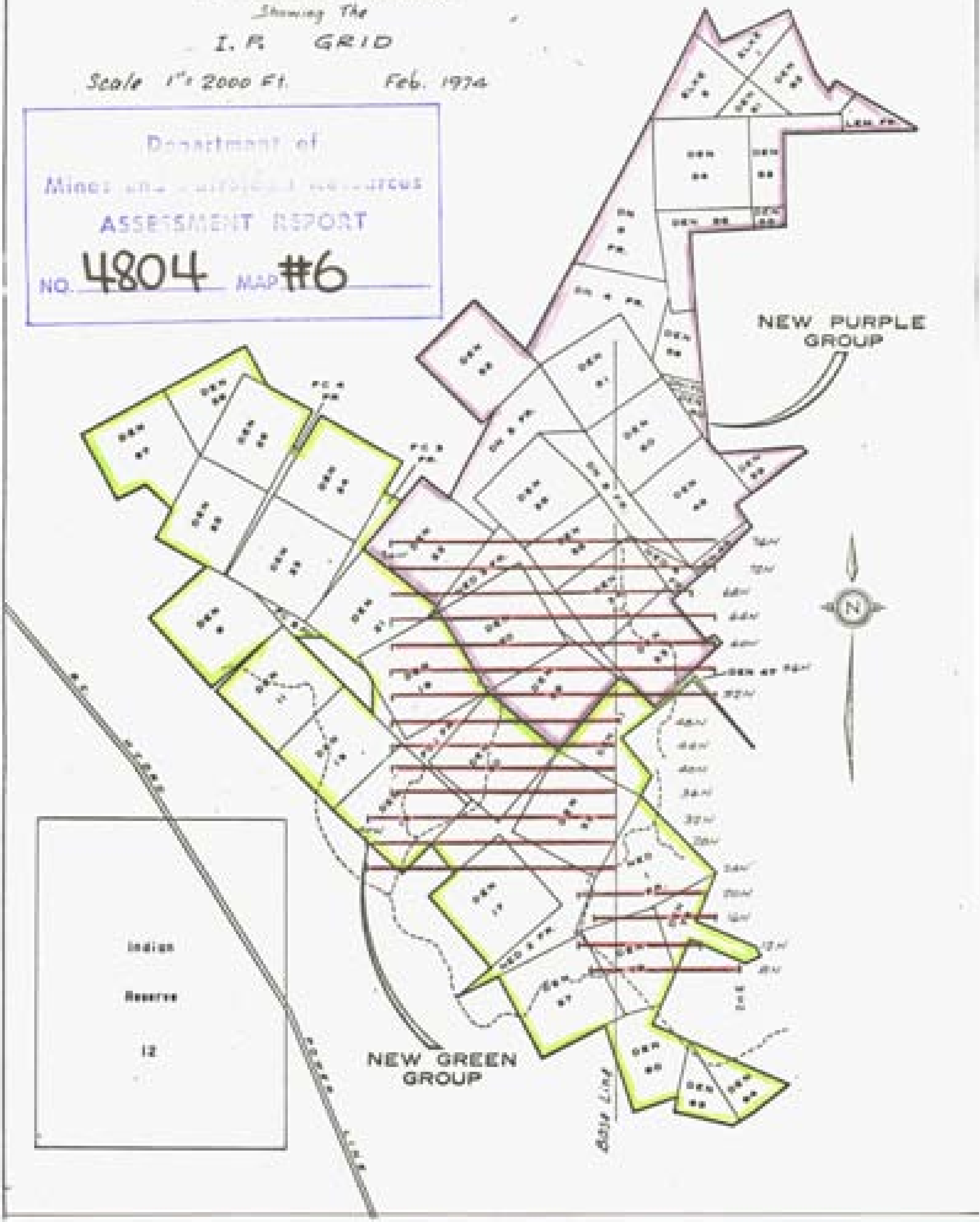
GRANDORA EXPLORATIONS LTD. (NPL)
ADERA PROPERTY – HIGHLAND VALLEY, B.C.
KAMLOOPS MINING DIVISION

CLAIM MAP

Showing The

I. P. GRID

Scale 1" = 2000 Ft.   Feb. 1974



REFERENCES

1. K. E. Northcote. "Geology and Geochronology of the Guichon Creek Batholith." B. C. Department of Mines and Petroleum Resources Bulletin No. 56 (1969).

2. S. Duffell and K. C. McTaggart. "Ashcroft Map-Area." Geological Survey of Canada Memoir 262 (1952).

3. W. E. Cockfield. "Geology and Mineral Deposits of Nicola Map-Area, B. C.." Geological Survey of Canada Memoir 249 (1961).

4. W. A. Finney. "Report on an Induced Polarization Survey--Den Group." Huntec Limited Report #PH779/68 (1968).

5. C. A. Ager and W. J. McMillan. "Gravity Survey of the Guichon Creek Batholith." B. C. Department of Mines and Petroleum Resources. G. E. M. (1971), p. 363.

6. D. R. Taylor. "Geological Report on the Property of Grandora Explorations Ltd." (1972).

Although anomalies are asymmetrical and the anomaly peaks do not always fall directly over the center of the causative source, the advantage of the pole-dipole array more than outweigh this one disadvantage. This array requires only three men on the survey line, has good depth penetration, responds well to both flat-lying and steeply-dipping bodies and maintains good resolution.

The maximum anomaly is obtained for the spacing equal to the depth to the center of an idealized sphere, although spacings of 3/4 to 1 1/2 times the depth give at least 90% of the maximum likely anomaly.

The use of two or more spacings (na) gives a more reliable estimate of depth, attitude and continuity with depth. An accurate estimate of resistivity and polarization of the body cannot be made since the variables of size, conductivity, and polarizability cannot be separated, hence the term "apparent" chargeability is used.

(c) Field Procedure

(i) Electrode Configuration Used

A pole-dipole electrode array was used whereby the current electrode C_1 and the two potential electrodes P_1 and P_2 were moved in a "leap-frog" manner along the survey lines varying the distance between C_1 and the nearest potential electrode, P_1, by factors of 1, 2, (called "n" values) while maintaining the potential electrode separation "a" of 400 feet. Hence, readings were taken with $C_1 - P_1$ separations of 400, 800 and 1,200 feet.

The second current electrode C_2 is fixed at "infinity" (∞) which is a minimum distance of 5a to the nearest station measured.

The station location is halfway between the current electrode C_1 and the nearest potential electrode P_1. All lines were surveyed with C_1 to the east of the potential electrodes as the three men moved along the survey lines.

(ii) Measurements taken in the Field

1. The Primary voltage Vp between the measuring (potential) electrodes during "current on".
2. The current flowing through the current electrodes C_1 and C_2.
3. Four pre-selected gates called M factors (M_1, M_2, M_3 and M_4) using time settings of:
   (a) delay time t_d............ ∓ 240 msecs.
   (b) basic integration time t_p. ∓ 60 msecs.
   (c) total integration time t_t. ∓ 900 msecs.
   (d) basic period t_c.......... ∓ 8 secs.
   -(2 secs. on and 2 secs. off)

(d) Equipment Description and Specifications

(i) Receiver

The Huntec MKIII Receiver is a portable, remote sensing pulse-type instrument incorporating the following features:

- Adjustable timing cycle.
- Up to 56 distinct sample points measured on the decay curve.
- Automatic S.P. buck-out.
- Direct digital read out of Vp and M factors including sign.
- High noise rejection allows operation in Vp levels down to 30 micro volts with 0.1 micro-volt resolutions.
- Greater than 10 megohm input impedance.

Specifications

- Sensitivity: Vp = 10^{-7} to 10^{-6} volts for low noise 1% resolution.

  Vp = 10^{-6} to 10 volts for 0.1% resolution.

  Total range 30 x 10^{-6} volts to 10 volts in 11 ranges.

- Self Potential: MAXIMUM ± 1 volt.
- Power consumption: 0.7 ampere at 12 volts.
- Dimensions: 16" x 9" x 5 3/4".
- Weight: 12.5 lbs. (without battery pack).

(ii) Transmitter - Alternator

The Huntec Pulse type transmitter alternator is a high-powered, 7.5 Kilowatt system utilizing the following:

- Solid state power control and switching mechanism.
- Produces high currents into low resistance loads.
- Accurate and adjustable timing using Crystal Clock.
- Voltage regulator with push-button field energizer.
- Dummy Load.
- 2 cylinder ONAN engine driving a Bendix alternator.

Specifications

- Transmitter

  -Output: 100 to 3,250 volts in 10 steps 16 amps maximum.

  -Cycling Rates: Normally 2 sec. ON, 2 sec. OFF.

  -Dimensions: 21 in. x 17 in. x 17 in.

  -Weight: 75 lbs.

- Alternator

  -Output: 18 K.V.A. 120/208 volts 3 phase 400 Hz. 52 amps/phase.

  -Engine: 2 cylinder, 4 cycle, air-cooled 16.5 H.P. ONAN at 3,600 R.P.M.

  -Alternator: 3,600 R.P.M. direct driven Bendix with sealed bearings and rotating field.

  -Dimensions: 42 in. x 17 in. x 26 in.

  -Weight: 225 lbs.

(e) Data Presentation

1. Calculations

(i) The apparent resistivity ρ_a is calculated by dividing Vp by I and multiplying by a factor appropriate to the electrode array used and the ohm-meter units desired.

(ii) The four M factors were weighted and added to obtain a single apparent chargeability parameter (called M_a) for contouring purposes.

$$M_a \,{}^{t_f}_{t_d} = t_p \, (M_1 + 2M_2 + 4M_3 + 8M_4) \times .01$$

where M_a = milliseconds
t_d = initial delay time
t_f = final time at end of M_4 = $t_d + 15\ t_p$
t_p = integrating time of M_1

2. Profiles ("pseudo-sections")

The Ma and ρ_a readings are plotted in "pseudo-section" for n = 1,2, and 3.

The lateral positions of the values are determined by the location along the survey line of the centre point between the current electrode (C_1) and the nearest potential electrode (P_1). The vertical distance of the values from the line is determined by the distance na between C_1 and P_1 and is related to the depth of penetration for that electrode separation at the station measured.

Chargeabilities are shown below the survey line and the resistivities are shown as mirror images above the line.

The n = 1 readings on Line 24N to Line 76N inclusive are taken from a previous survey executed by Huntec Limited in 1968.

3. Contour Maps

All apparent resitivity and apparent chargeability values for C_1 - P_1 electrode separations of 800 feet (n = 2) have been plotted and contoured on the contour maps at a horizontal scale of 1" = 400 feet.

The reader is cautioned as to the errors inherent within this type of data presentation which include:

(i) Upslope displacement of readings over steep terrain.

(ii) Grid bias or contour elongation due to rectangular sampling interval used.

(iii) "Double peaking" phenomenum in which causative source is located between "highs".

(iv) Some skewness of anomaly peaks due to assymetrical array used.

(v) Topographic or terrain effects in resistivity data.

The Den claims boundary and local roads are also illustrated on the contour maps.

Discussion of Results and Interpretation

General Remarks

An instrument capable of high sensitivity, resolution and power was used to evaluate a few sub-anomalous small responses determined from a previous I.P. survey and to test for deeply buried sulphide deposits which might have missed detection by previous investigations.

In the past, an electrode separation of 400 feet (Three Array) was considered adequate to search for mineable copper deposits in the area. The relatively recent discoveries of the Valley Copper and JA deposits indicate that large porphyry-type deposits overlain by overburden in excess of 600 feet can be economically mined. It is therefore apparent that deeper penetrating (wider electrode spacings) I.P. equipment is necessary to explore for other deposits which might occur in this environment.

It was with this in mind that the present survey was executed using 800 and 1,200-foot electrode spreads in an area of high mineral potential along and adjacent to the northerly extension of the Lornex fault.

Due to the low sulphide content of known deposits in the valley, it was appreciated that chargeabilities of less than two times background would be significant. It was also hoped that the resistivity portion of the survey might yield important information as to the location of the Lornex fault on the property, delineate other structures and assist in overburden thickness estimations.

Discussion of Results and Interpretation (cont.)

Contour Maps

The contour maps indicate in a general way the lateral variations of apparent chargeability and resistivity for the n = 2 electrode spread. For large deposits, a depth investigation of up to 800 feet is therefore attained below each station measured. The 400-foot station interval at this electrode separation and the 400-foot line spacing have ensured adequate overlap of coverage between readings both along and between survey lines.

Apparent Resistivity Values and Contour Map (n = 2)

The apparent resitivity (ρ a) readings vary from a low of 90 ohm metres at Line 52N; Station 12W to a high of 773 ohm metres at Line 32N; Station 0 for a total relief of 663 ohm metres over the grid area.

The contours exhibit a north-south trend with a pronounced ρa low averaging 1,600 feet wide trending through the centre of the grid flanked by higher resistivities to the west and particularly to the east of this main feature.

This low is believed to be the resistivity expression of the Lornex fault. The numerous contour flexures along its flank could indicate cross-faulting.

A comparison of this map with Huntec's resistivity contour map (n =1) shows a somewhat similar pattern although the resistivities of the Huntec coverage are generally of a higher level and the readings more variable, probably chiefly due to the fact that resistivity data is affected to a higher degree by changes in overburden thicknesses, topography, water table level, and, possibly, near surface leaching at the narrower electrode spacings. A difference in contact resistance at the electrodes experienced for the two surveys could also affect the results.

Contouring of the n = 3 ρa readings might also enhance the knowledge of the property.

Apparent Chargeability Values and Contour Maps (n = 2)

The apparent chargeability Ma readings vary from a low of 1.9 milliseconds at Line 76N; Station 32W to a high of 12.9 milliseconds at Line 16N; Station 8E for a total change of 11.0 milliseconds. At this electrode separation, a background of six milliseconds is assigned and all areas over 7.0 milliseconds which are shown hachured are of interest.

The most significant chargeability feature is the large annular-shaped anomaly on the north half of the grid which straddles the elongated ρa low discussed above interpreted as the Lornex fault. This anomaly peaks to over 9.0 milliseconds at four locations which is greater than 1.5 times estimated background response.

The 4.0 milliseconds contour on the Huntec map centred at Line 64N; Station 6E has been confirmed by the deeper present survey. A possible explanation for a lack of higher Ma responses to the west of this small relative high (Huntec survey) is that the overburden thickness appears to increase in this direction which diluted the effects of polarizable material in the bedrock below. This annular Ma anomaly is typical of the I.P. response expected from a small stock or pluton having a pyrite halo and a barren intrusive core. The likelihood of a young pluton occuring here within the Guichon batholith is doubtful although not impossible. The only reasonable alternative theory seems to be that the Ma low in the centre of this Ma ring-shaped anomaly is due to an overburden filled bedrock depression.

The highest Ma readings were encountered on Line 16N where peaks of 12.2 and 12.9 milliseconds were observed. These readings are supported by slightly lower values on adjacent lines. This anomaly is interpreted as being caused by a vertical sheet-like body of polarizable material of very limited width striking along Line 16N. The eastern claims boundary prevented the full delineation of this anomaly. This area was surveyed to test another subtle relative Ma high picked up by the Huntec survey. The feature was confirmed by the present deep-penetrating coverage. This, coupled with a coincident north-south resistivity gradient, makes the feature somewhat less interesting than the main anomaly to the north which exhibits a much better high Ma-low ρ_a correlation.

No information as to the location of the Bethlehem-Beaver phases of the batholith is present in the I.P. data.

Pseudo-Sections

Lines 8N - 20N

Lines 12N and 16N were run to check a small Ma response from the Huntec survey. The best response obtained by the present survey was on Line 16N where a peak of 13.4 milliseconds was obtained at Station 6E (n = 3) which is coincident with a relatively low resistivity of 145 ohm-meters.

Adjacent lines 8N and 20N were surveyed to further delineate this feature. Slightly anomalous Ma's were encountered on these lines resulting in the conclusion that the causative source of these responses lies below and is striking along Line 16N. For these reasons, a more detailed discussion of these sections is of little value.

From the contour maps, this feature is interpreted as a mineralized fault or shear striking east-west along Line 16N.

Line 24N

The Ma portion of this section is uninteresting. The line closes off the Ma anomaly just to the north at the west end of the grid.

The resistivity results indicate a variable near-surface resistive environment with a tendency to lower ρ_a's (less than 200 ohm-meters) at greater depths. The centre of the Lornex fault zone is interpreted intersecting this line at Station 16W. The broadening of low ρ_a to the west (n = 3) is believed caused by a northeasterly striking cross-fault.

Line 28N

This line exhibits a marked similarity to Line 24N although Ma's are of higher amplitude and broader.

The contour map indicates a northeasterly striking body of polarized material whose centre crosses this line at Station 36W. A slightly anomalous Ma response at n = 3 is coincident with this low ρ_a feature.

Line 32N

The above-mentioned northeasterly conductor crosses this line at Station 28W. Although there is some distortion due to the bad angle of survey line relative to conductor strike, it appears as if the causative source is dipping about 45° to the northwest and is quite limited in thickness.

The ρ_a pattern remains the same as on Line 24N and Line 28N.

Line 36N

The lower Ma readings in this section indicate the northeast limit of the above mentioned conductor.

Line 40N

In section the slightly anomalous east dipping Ma feature is not related to the anomaly mentioned on Lines 24N - 36N although it appears to be related on the contour map.

Line 52N

The broad anomalous Ma segment on this line is the southern extremity of the large annular anomaly observed on the contour map and generally lies within the 100 to 400 ohm-meter range of resistivity.

Depth to the top of the causative source is greater than 400 feet.

Line 56N

The two Ma highs on this pseudo-section appear to be the east and west portions of the ring-shaped anomaly as seen in plan. They conform to intermediate resistivities.

Line 60N

The Ma pattern is similar to that on adjacent Line 56N although the amplitude is higher on the east of this line. The anomaly extends further to the east on the n = 3 separation.

The broad low ρ_a feature at n = 3 still persists.

Line 64N

Only one Ma reading is of any significance on this line. The six milliseconds contours still reflect the eastern and western sections of the "doughnut" pattern seen on the contour map.

Line 72N

The anomalous Ma response from Station 2E to 14W is the northern limit of the main anomaly.

Line 76N

The low, flat Ma readings on this line clearly show that the large anomaly is terminated to the north at Line 72N.

CONCLUSIONS AND RECOMMENDATIONS

The present Induced Polarization Survey has confirmed two of the sub-anomalous chargeability features indicated by the 1968 Huntec Survey. These anomalies have been extended at depths greater than 400 feet over significant lateral dimensions.

The chargeability portion of the survey has delineated two target areas. The main anomaly in the north-central grid is an annular shaped feature of about 2,800 feet in diameter exhibiting a low conductive core. This feature is interpreted as representing an overburden-filled bedrock depression whereby the bedrock consists of polarizable material equivalent to approximately 0.5% by volume disseminated chalcopyrite.

The "doughnut" anomaly could occur at the junction of the northern extension of the Lornex fault as suggested by the resistivity data and a northeasterly trending fault.

The depth to the causative source at the peak Ma's along this ring appears to be greater than 400 feet.

The other Ma anomaly occurs centred at Line 16N; Station 8E and is interpreted as a mineralized east-west fault along this line. Its limited width and strike-length and the close proximity to the eastern claim boundary make it a low priority anomaly.

Although the main anomaly suggests a body or bodies of low equivalent sulphide content, the favourable geological setting makes it worthy of a drill program.

Two vertical diamond drill holes are recommended to test the Ma highs. They should be at least 800 feet long and are to be collared at Line 60N; Station 4E and Line 52N; Station 0.

Further drilling, if any, will be contingent upon the results of these two initial drill holes.

Respectfully submitted,

P. P. Nielsen, B.Sc., Geophysicist

G. C. Gutrath, B.Sc., P.Eng., Geologist
Atled Exploration Management Ltd.

August, 1973

APPENDICES

STATEMENT OF AUTHOR'S QUALIFICATIONS

I DO HEREBY STATE THAT:

1. I am the author of this report.

2. I have been actively and responsibly involved in mining exploration using airborne, ground and computer applied geophysics in Western Canada and the United States for the past nine years.

3. I graduated with a B.Sc., degree in Geophysics from the University of British Columbia in 1969.

4. I am presently Manager, Geophysical Division, Atled Exploration Management Ltd., at #420 - 475 Howe Street, Vancouver, B. C.

5. I am a member of the Society of Exploration Geophysicists, the Canadian Institute of Mining and Metallurgy and the B. C. Geophysical Society.

Signed P.P. Nielsen

P. P. Nielsen

Date Aug 28 /73

ENGINEER'S CERTIFICATE

I, GORDON C. GUTRATH, of 3636 Lakedale Avenue, in the Municipality of Burnaby, in the Province of British Columbia, DO HEREBY CERTIFY:-

1. That I am a consulting geologist with a business address of #420-475 Howe Street, Vancouver 1, B. C.
2. That I am a graduate of the University of British Columbia where I obtained my B.Sc. in geological science in 1960.
3. That I am a Registered Professional Engineer in the Geological Section of the Association of Professional Engineers in the Province of British Columbia.
4. That I have practised my profession as a geologist for the past twelve years, and
5. That I have no interest in the property with which this report is concerned, nor do I expect to receive any such interest. I have no interest in the securities of Acheron Mines Ltd. (N.P.L.).

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA G. C. GUTRATH

Gordon C. Gutrath, B.Sc., P.Eng.

DATED at the City of Vancouver, Province of British Columbia, this 28th day of August, 1973.

PERSONNEL

P. P. Nielsen, B.Sc.	Consultant geophysicist and supervisor
A. Scott, B.Sc.	Geophysicist, I.P. operator, and party chief
R. Klansjcek) H. Huckson) D. Klatt)	I.P. crewmen

Declared before me at the *City*

of *Vancouver*, in the

Province of British Columbia this *20*

day of *Dec.* *1973.*

J. B. Talbot

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

Sub - mining Recorder

COSTS

The following are Atled's charges for conducting the I.P. survey on the Den claim group.

Linecutting costs are not included.

1. The Survey	
(a) Production time: men and equipment 13 days @ $325.00	$ 4,225.00
(b) Standby time (due to magnetic storms) 3 days @ $250.00	750.00
2. Food and Accommodation 52 man days @ $12.00	624.00
3. Transportation	
(a) Mobilization-demobilization	450.00
(b) Local (truck rental): 13 days @ $25.00	325.00
4. Administration--report, telephone, etc.	600.00
TOTAL COSTS	$ 6,974.00

Mileage Breakdown

1. Line mileage (based on n = 2 coverage, first to last reading total of all lines)	15.3 line miles
2. Total profile length (n = 1, 2 and 3)	34.1 line miles
3. Cost per mile (n = 2)	$ 455.80
4. Production rate	1.2 miles per day

THE INDUCED POLARIZATION SURVEY

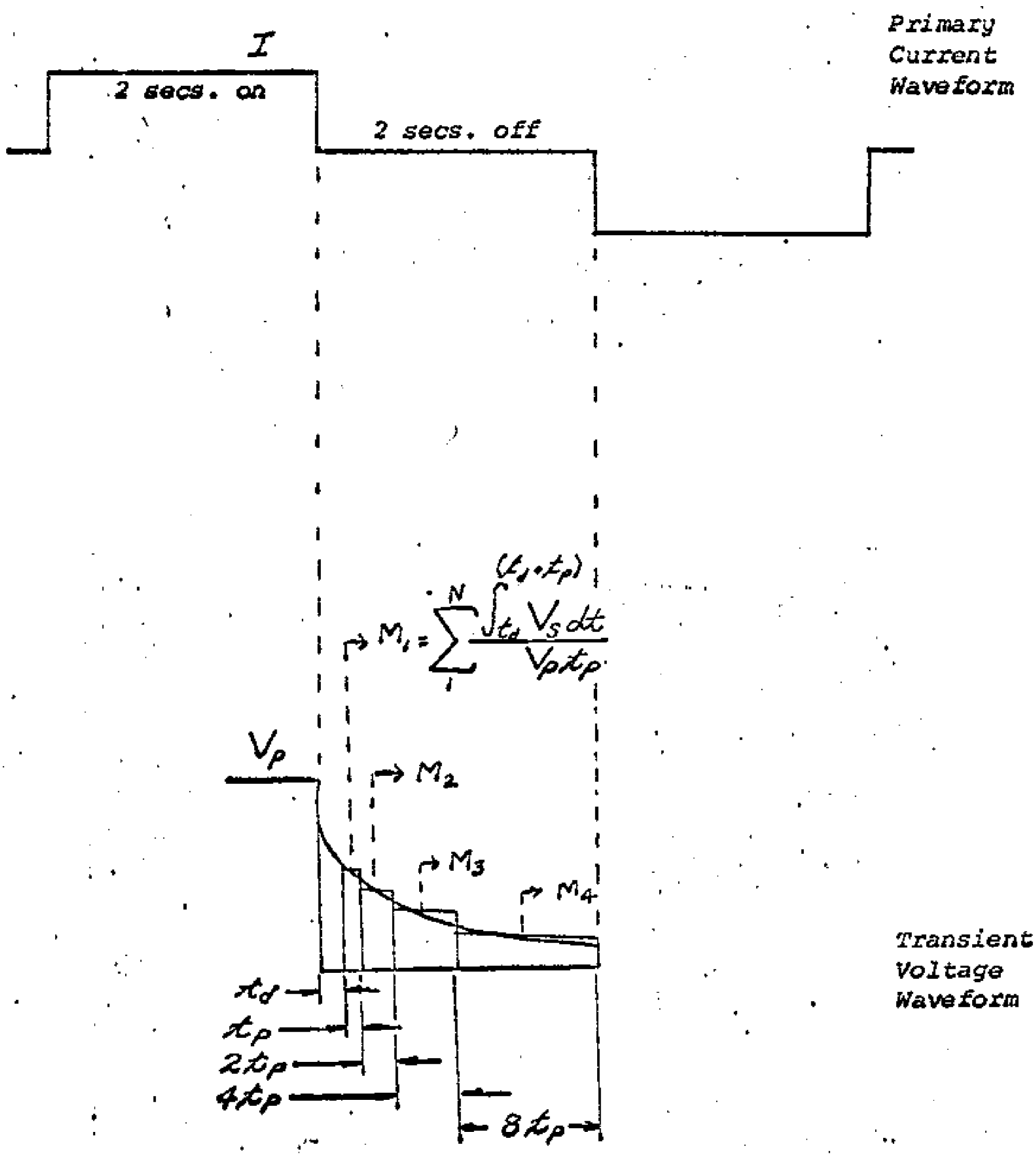
(a) Theory of Method Used

Induced Polarization refers to the polarized distribution of electrical charges throughout a medium to which an electric field has been applied.

When current is passed across an interface between an electrolyte and a metallic conducting body, double layers of charge build up at the interface creating the phenomenum known as "overvoltage" or the "I.P. effect".

This effect can be used for the detection of conducting metallic material such as disseminated sulphides ("porphyry" copper deposits) or massive sulphides containing appreciable amounts of non-conducting sphalerite. Other materials likely to give rise to anomalous responses are pyrite, magnetite, specular hematite, graphite and certain clay-micas such as montmorillonite, vermiculite, saponite and bentonite.

In time-domain (Pulse) I.P., a transmitter injects an alternating square wave signal into the ground at two electrodes C_1 and C_2. The signal seen by the receiver at two other electrodes P_1 and P_2 provides an indication of the apparent chargeability (M_a). By observing the input current (I) and primary "on-time" voltage, (V_p) the apparent resistivity ρ_a is calculated using Ohm's Law and a geometric factor dependent upon the electrode array used and the units (ohm-meters or ohm-feet) desired.


I
2 secs. on
2 secs. off
Primary
Current
Waveform
$M_1 = \sum_{1}^{N} \frac{\int_{t_d}^{(t_d+t_p)} V_s\,dt}{V_p t_p}$
V_p
M_2
M_3
M_4
t_d
t_p
$2t_p$
$4t_p$
$8t_p$
Transient
Voltage
Waveform

The polarization voltages established during the current "on" time decay (discharge) slowly during the current "off" time. The receiver amplifies and integrates the decay curve at four pre-selected positions in time, normalizes these amplitudes with respect to the primary voltage Vp and presents the results as M_1, M_2, M_3, and M_4 readings on digital display for logging.

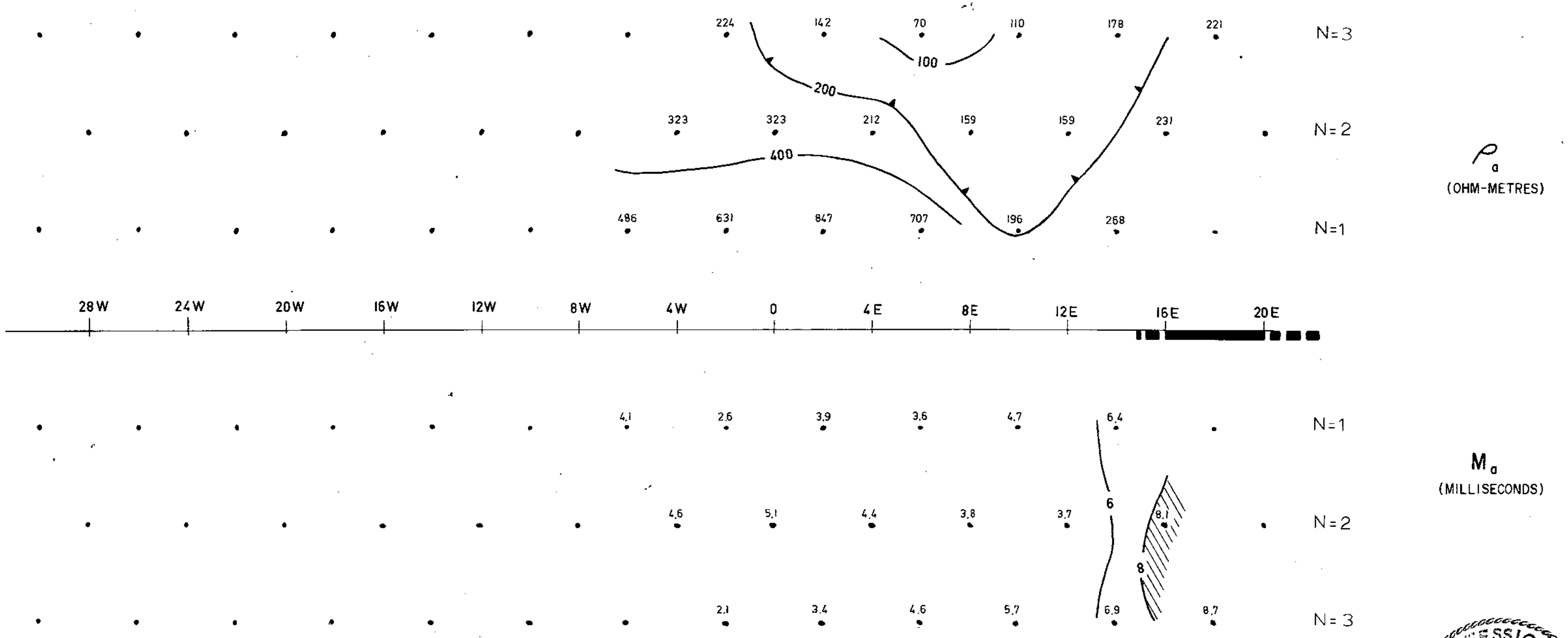
The times at which the decay curve is sampled, are selected by means of a switch making it possible to obtain up to 56 distinct points on the decay curve.

This allows one to obtain the actual decay curve shape and to better estimate the size, depth and type of the causative source.

A further step which can be taken is to factor the decay curve to separate the unwanted electromagnetic transient coupling effects and background effects from the true overvoltage effects. This extends the usefulness of the I.P. method in areas of high overburden conductivity. It also assists the geophysicist in distinguishing between effects of metallic and nonmetallic conductive material, between oxides and sulphides, between large and fine-grained particules, and between massive and disseminated portions of a polarizable body.

(b) Theory of the Pole-Dipole Electrode Configuration

The I. P. response due to a particular distribution of polarizable material is dependent upon the electrode array employed, the geometry of the polarized body and its location relative to the array, and on the resistivity and polarization contrast between the body and surrounding environment.



INDUCED POLARIZATION SURVEY

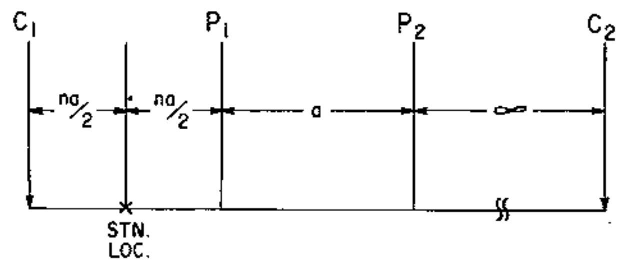
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 8+00N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



a = 400 feet — low ρ_a

anomalous zone — high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

TO ACCOMPANY A REPORT BY:

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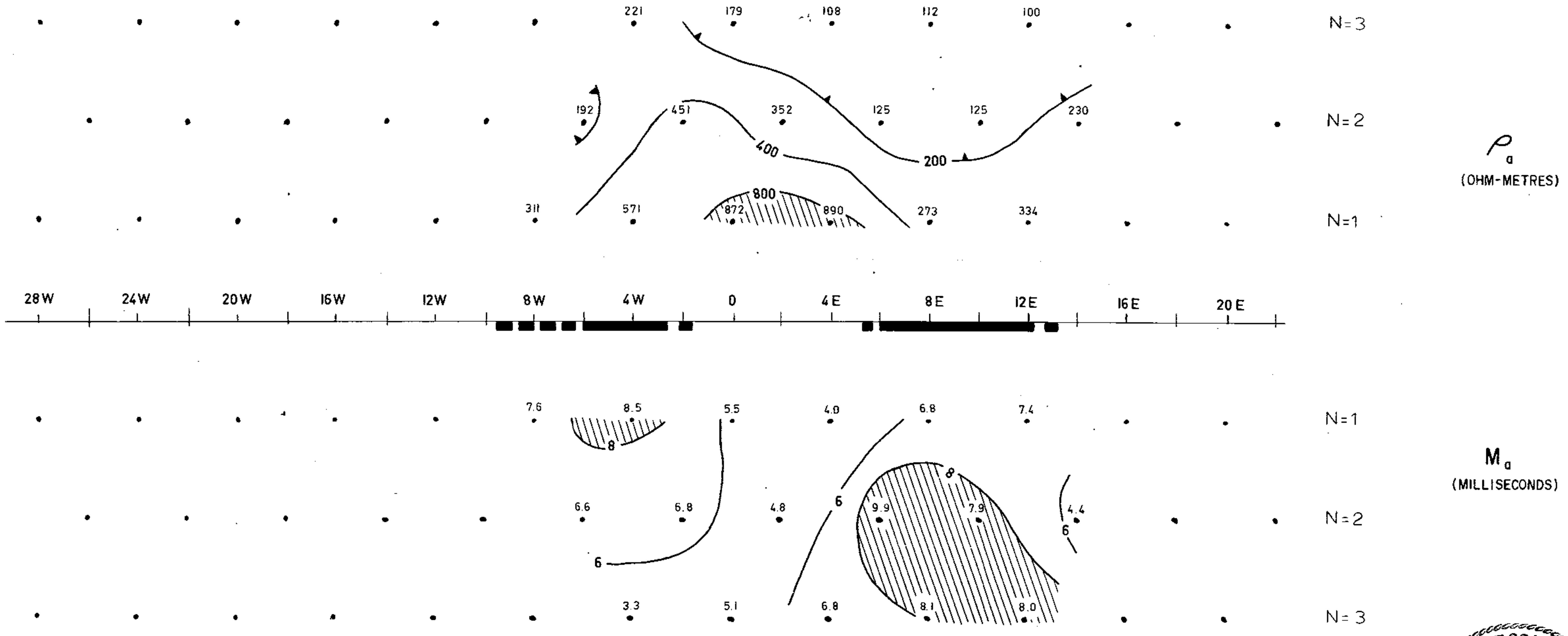
DATE-AUGUST 1973.



4804

PROFESSIONAL ENGINEER
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G. C. GUTHRATH

INDUCED POLARIZATION SURVEY

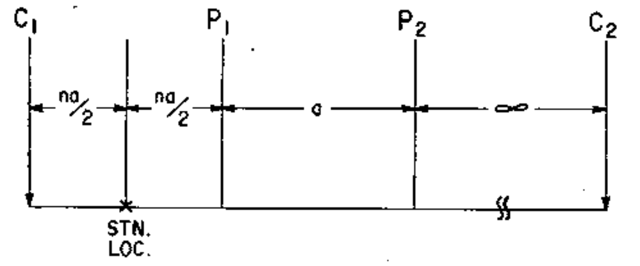
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 12+00N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

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GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & II

TO ACCOMPANY A REPORT BY:

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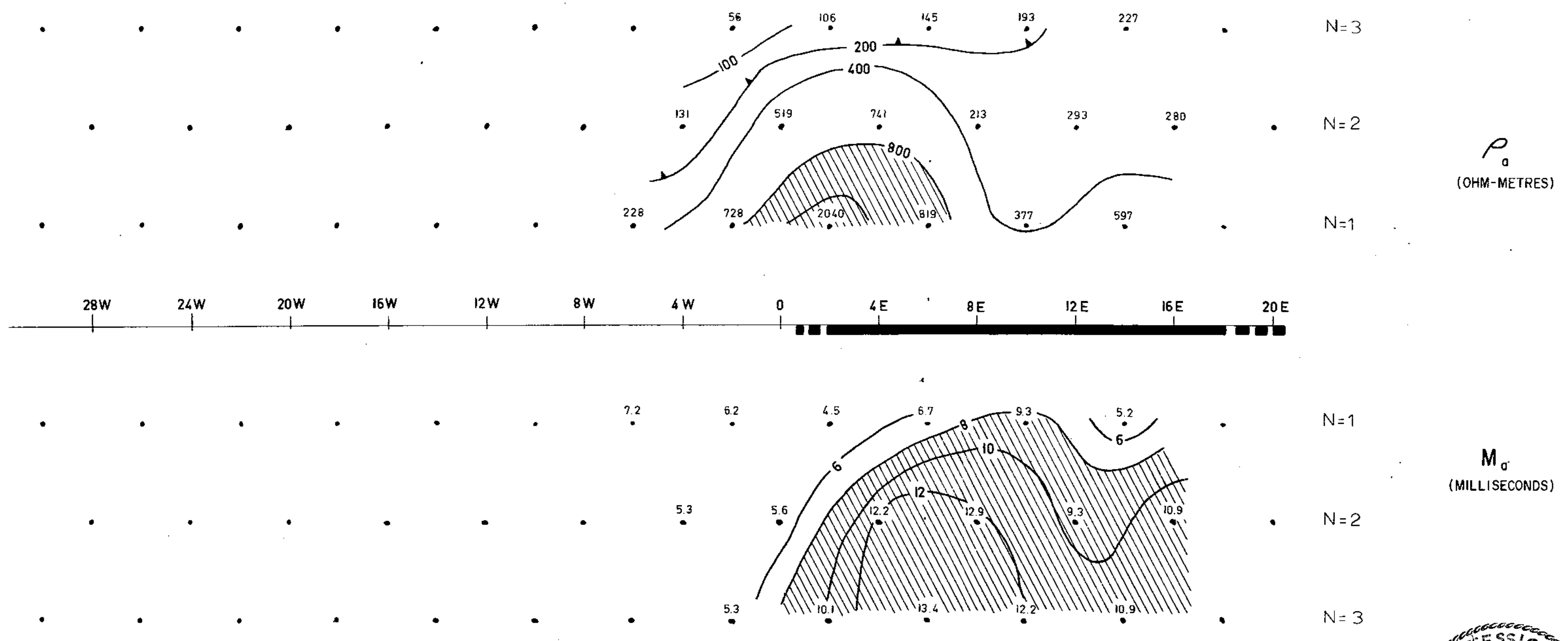

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INDUCED POLARIZATION SURVEY

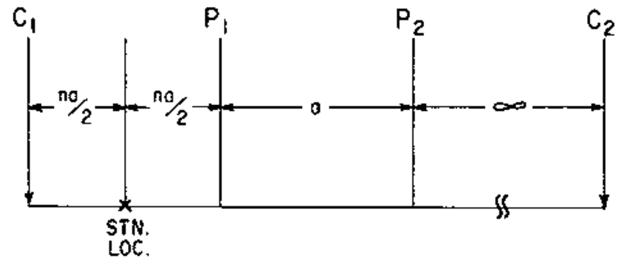
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 16+00 N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA G.C. GUTHRATH

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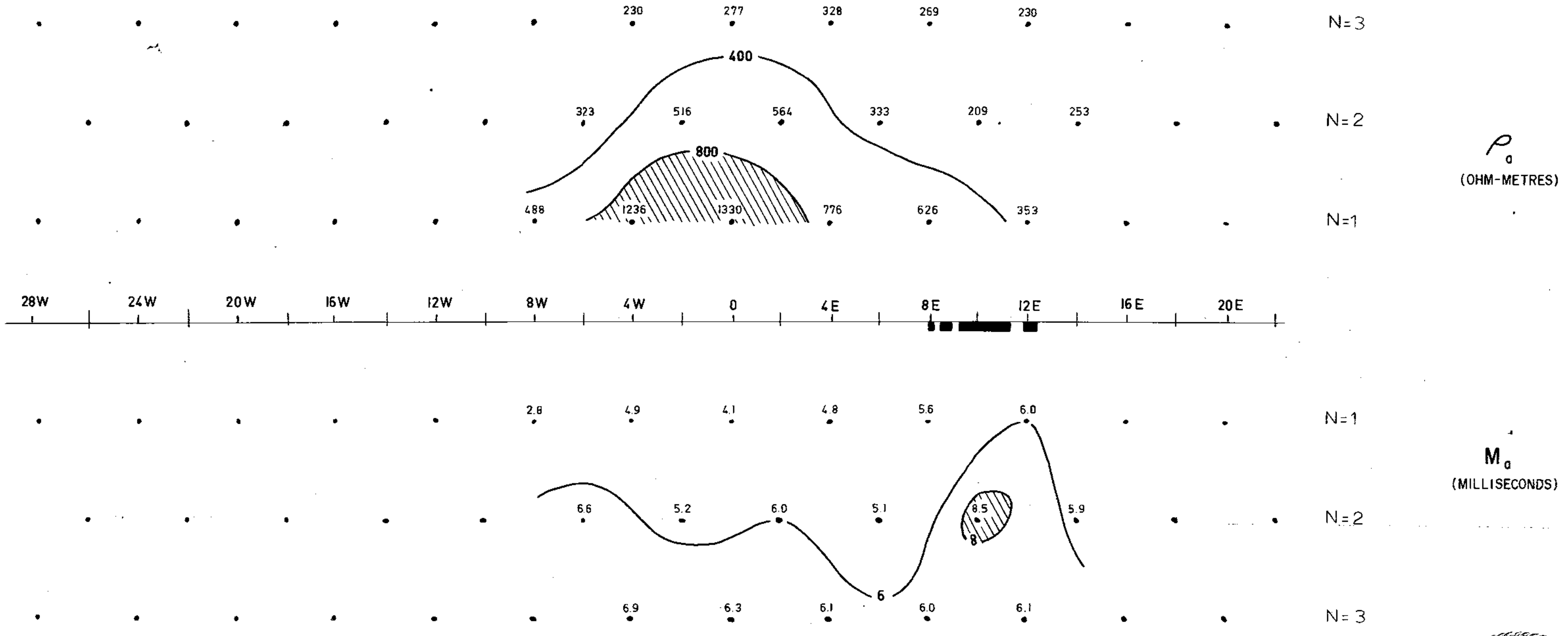

INDUCED POLARIZATION SURVEY

APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 20+00 N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY

C_1 P_1 P_2 C_2

na/2 na/2 a ∞

STN. LOC.

a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10&11

TO ACCOMPANY A REPORT BY:

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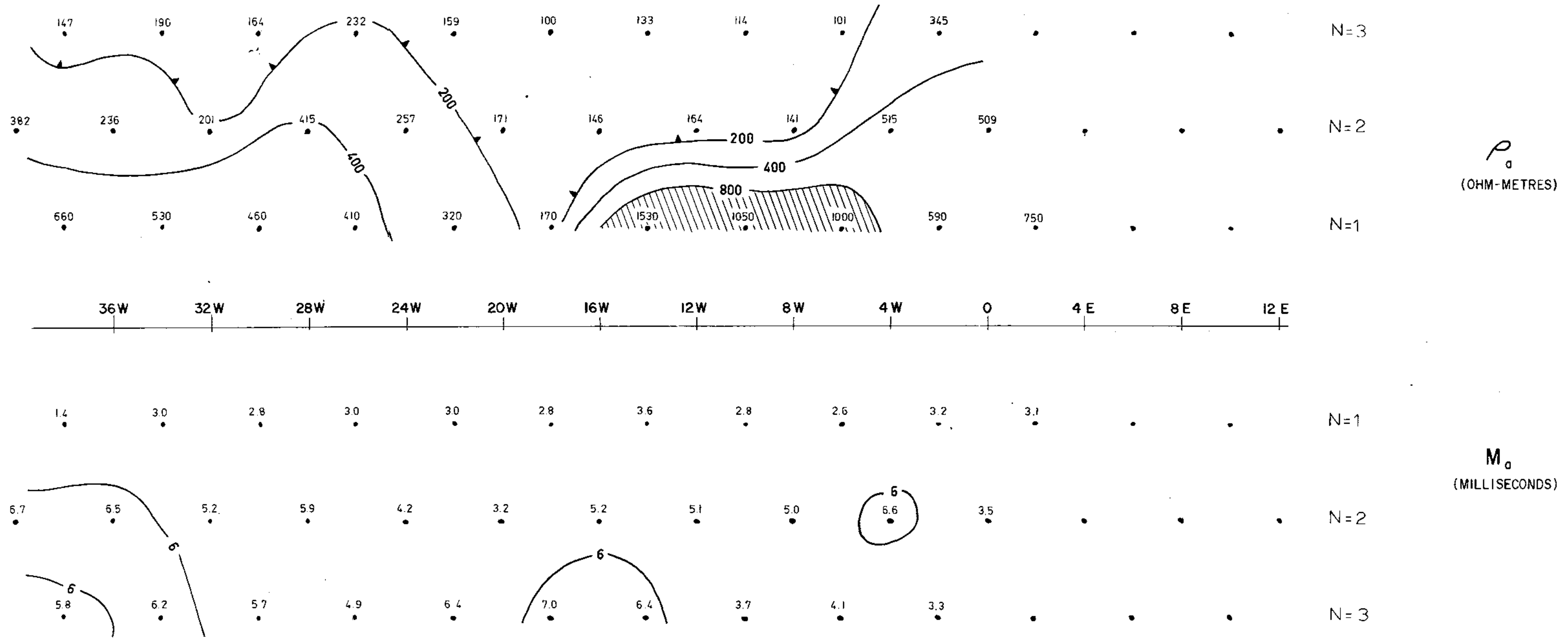

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PROFESSIONAL ENGINEER
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G. C. GUTHRATH

INDUCED POLARIZATION SURVEY

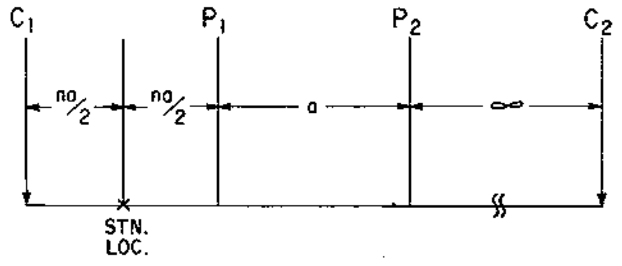
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 24 + 00N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

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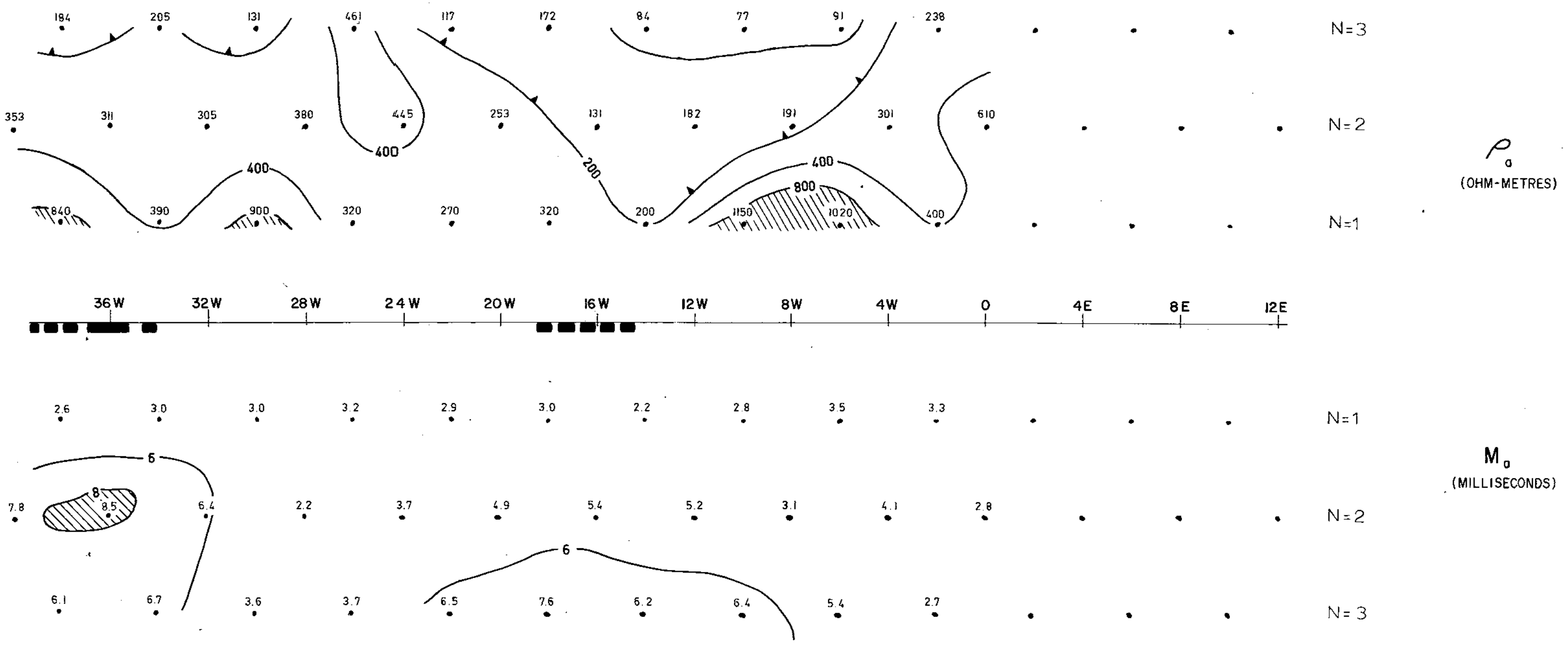

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INDUCED POLARIZATION SURVEY

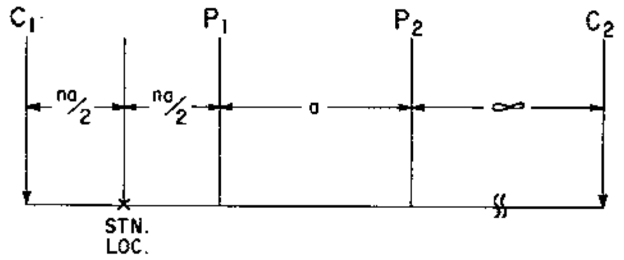
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 28 + 00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

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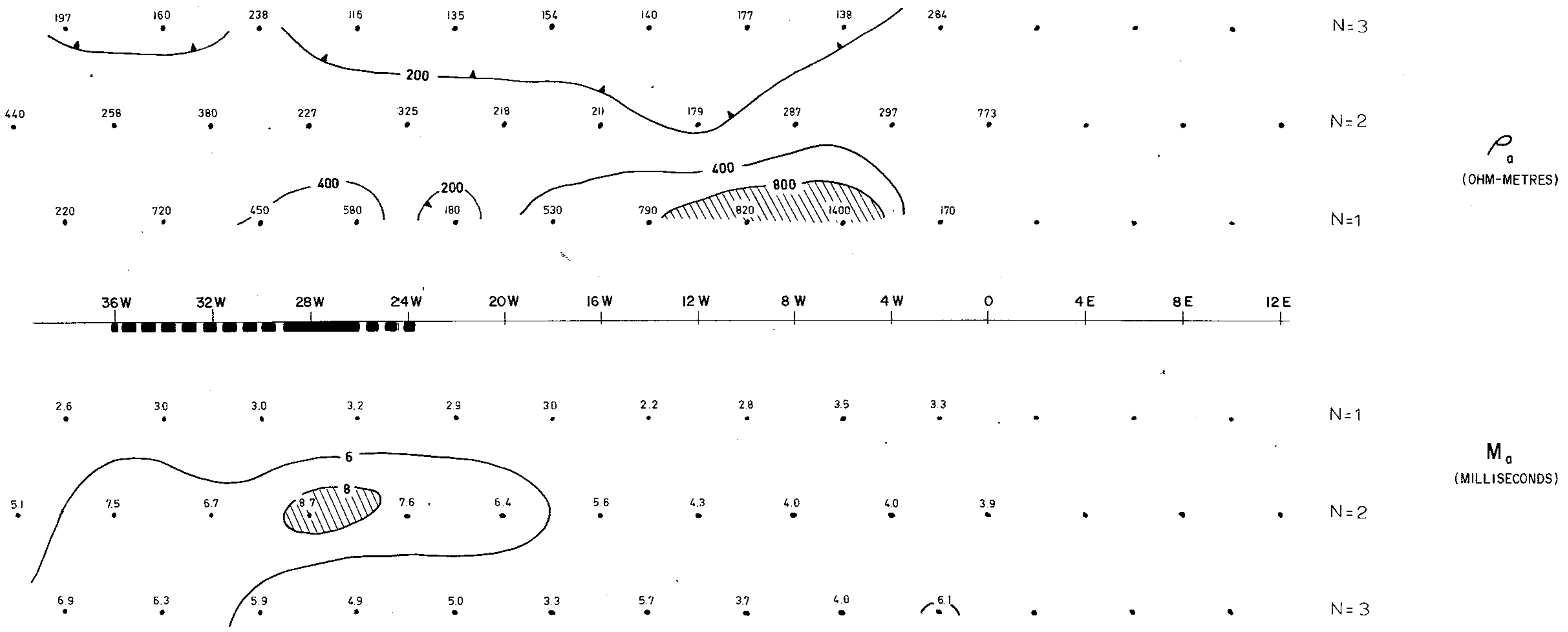

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INDUCED POLARIZATION SURVEY

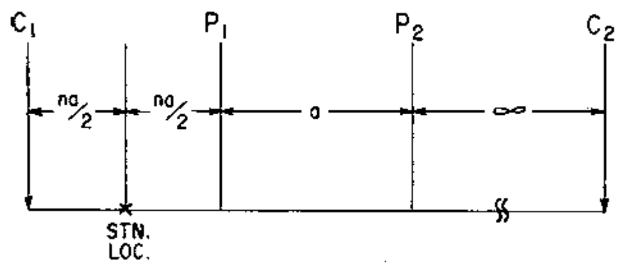
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 32 +00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet — low ρa

anomalous zone — high Ma & ρa

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

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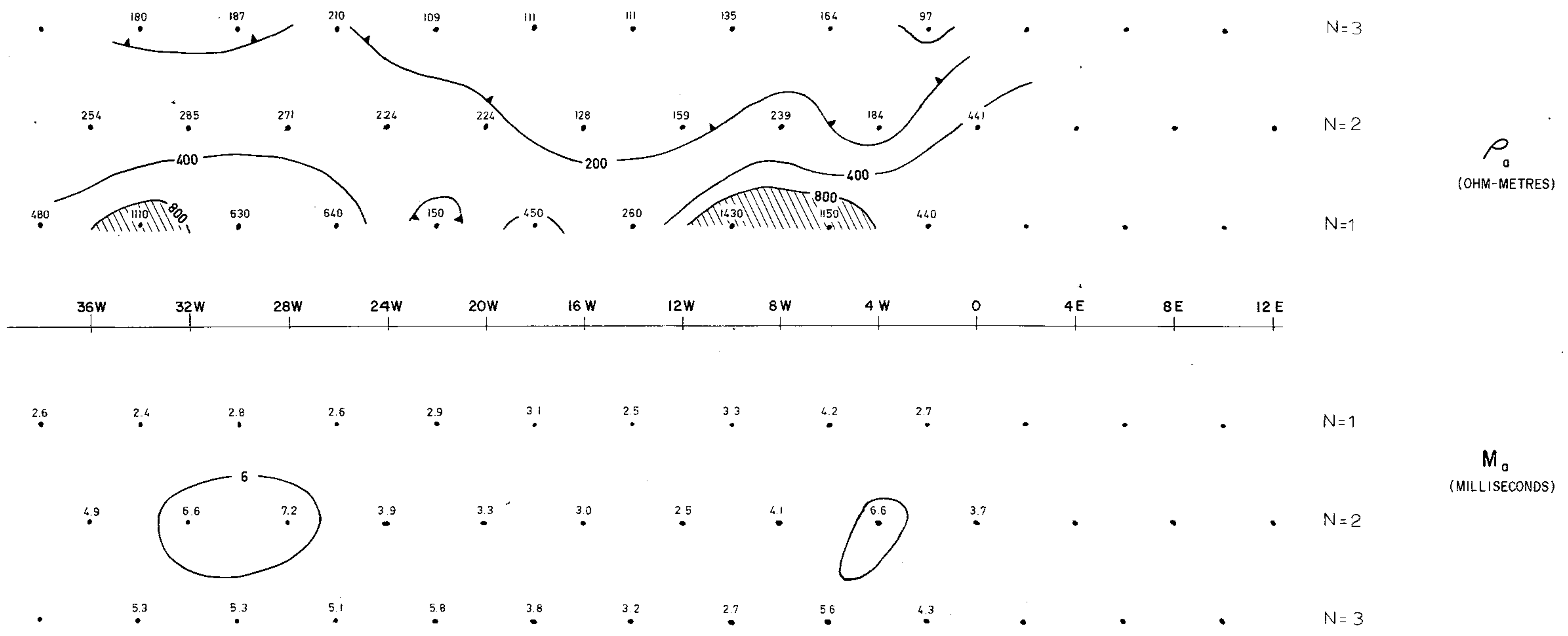

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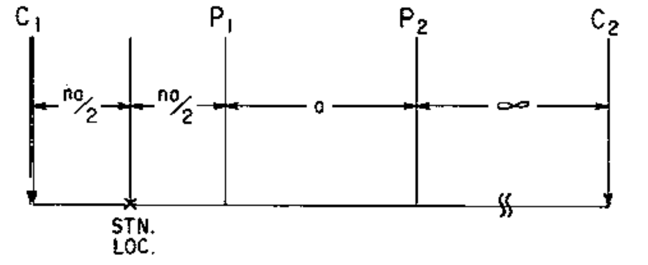
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
G. C. GUTHRATH

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 36+00N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

- low ρ_a

- high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION
ADERA PROPERTY - HIGHLAND VALLEY
DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & II

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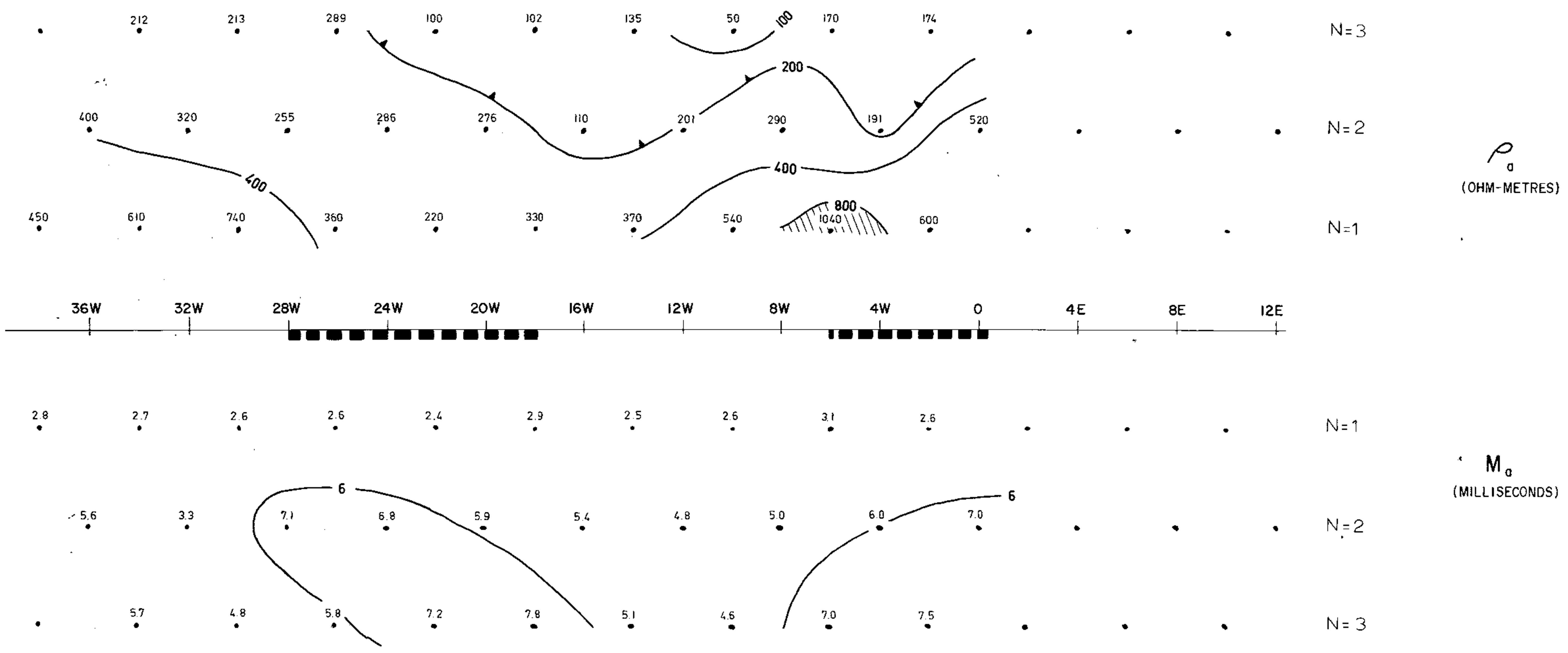

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PROFESSIONAL ENGINEER
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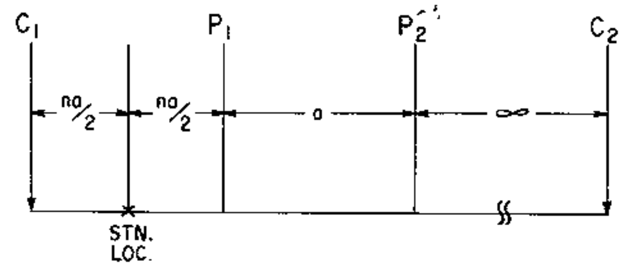
G.C. GUTHRATH

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 40 + 00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

— low ρ_a

— high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)
GRANDORA EXPLORATIONS OPTION
ADERA PROPERTY - HIGHLAND VALLEY
DEN CLAIMS

SCALE IN FEET
0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

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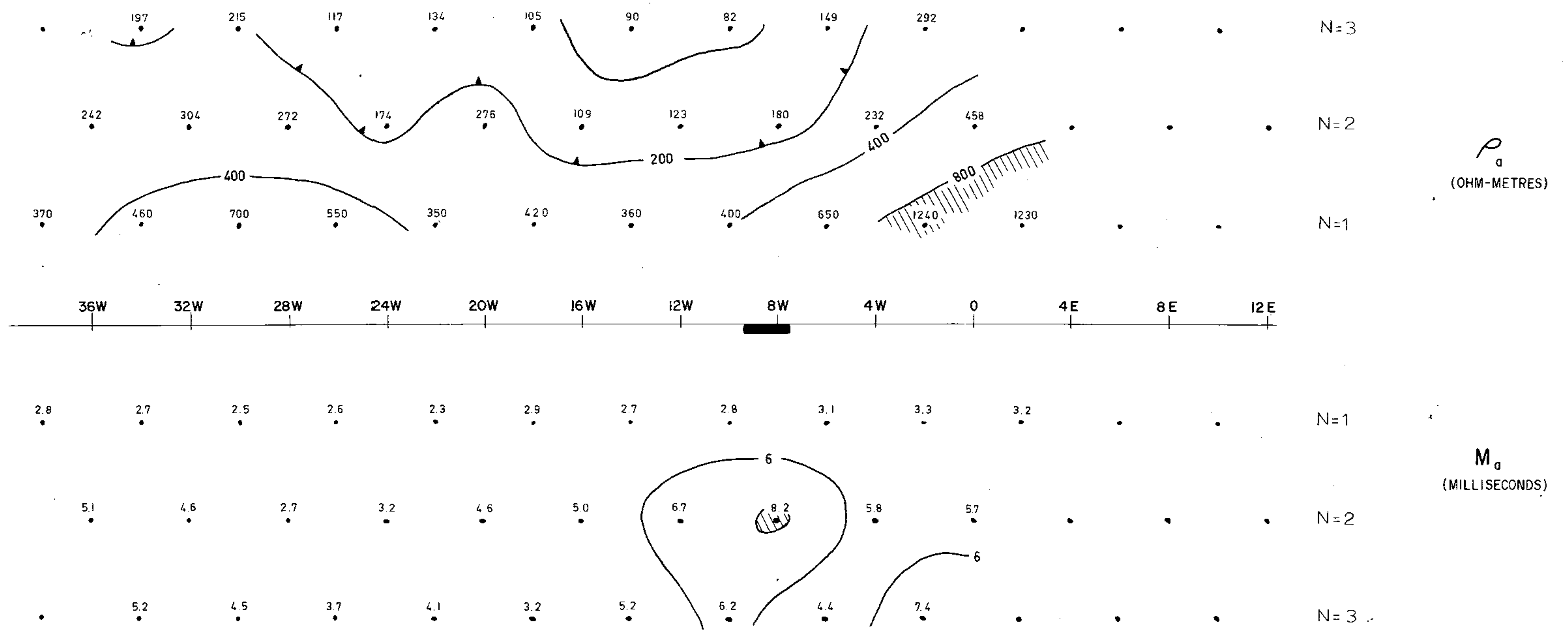

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PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — G. C. GUTRATH

INDUCED POLARIZATION SURVEY

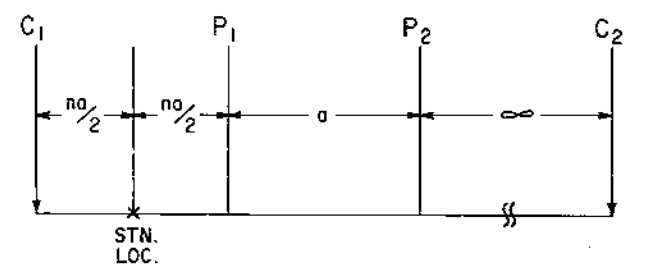
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 44+00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

- low ρ_a

- high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

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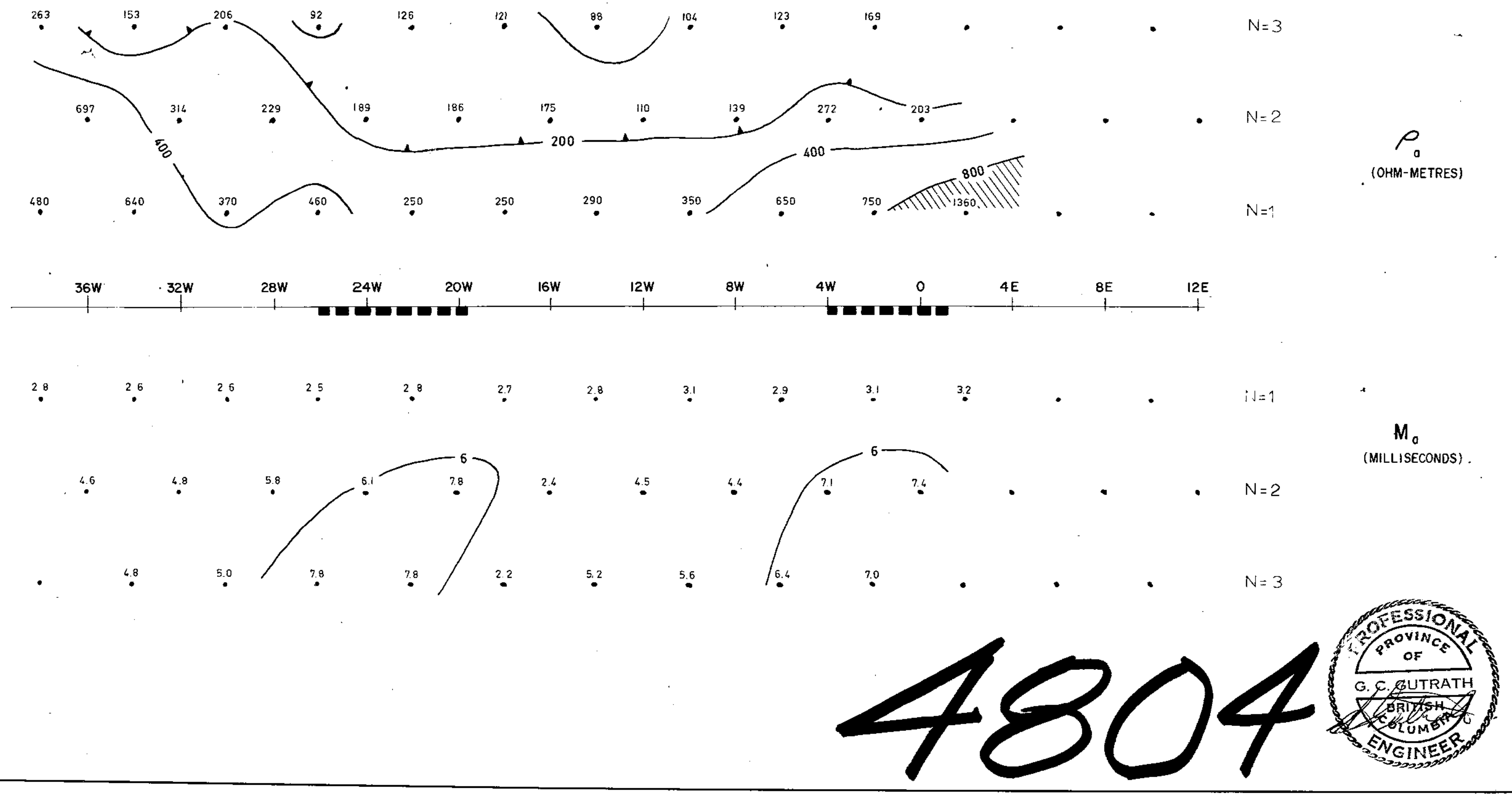


INDUCED POLARIZATION SURVEY

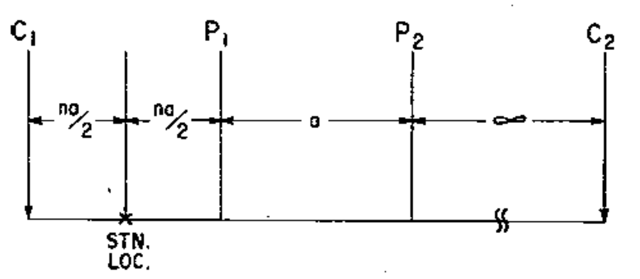
APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 48+00 N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

- low ρ_a

- high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS N.T.S. 92 I/10 & 11

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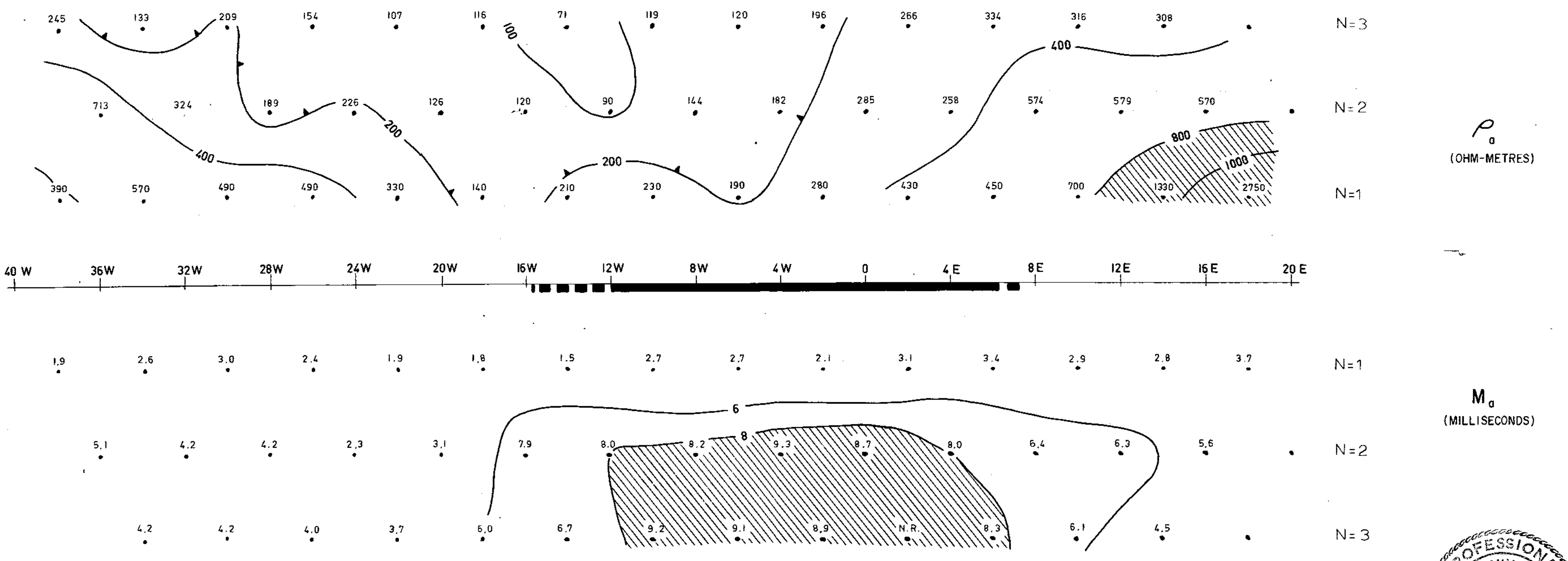

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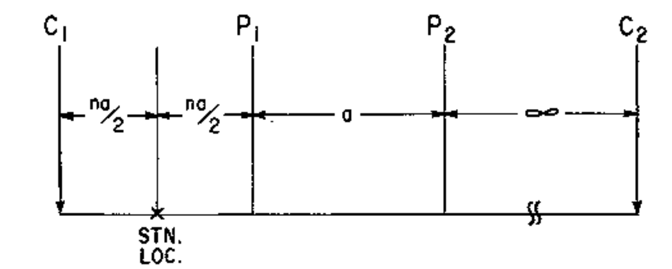
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — G. C. GUTHRATH

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 52 +00N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & II

TO ACCOMPANY A REPORT BY:

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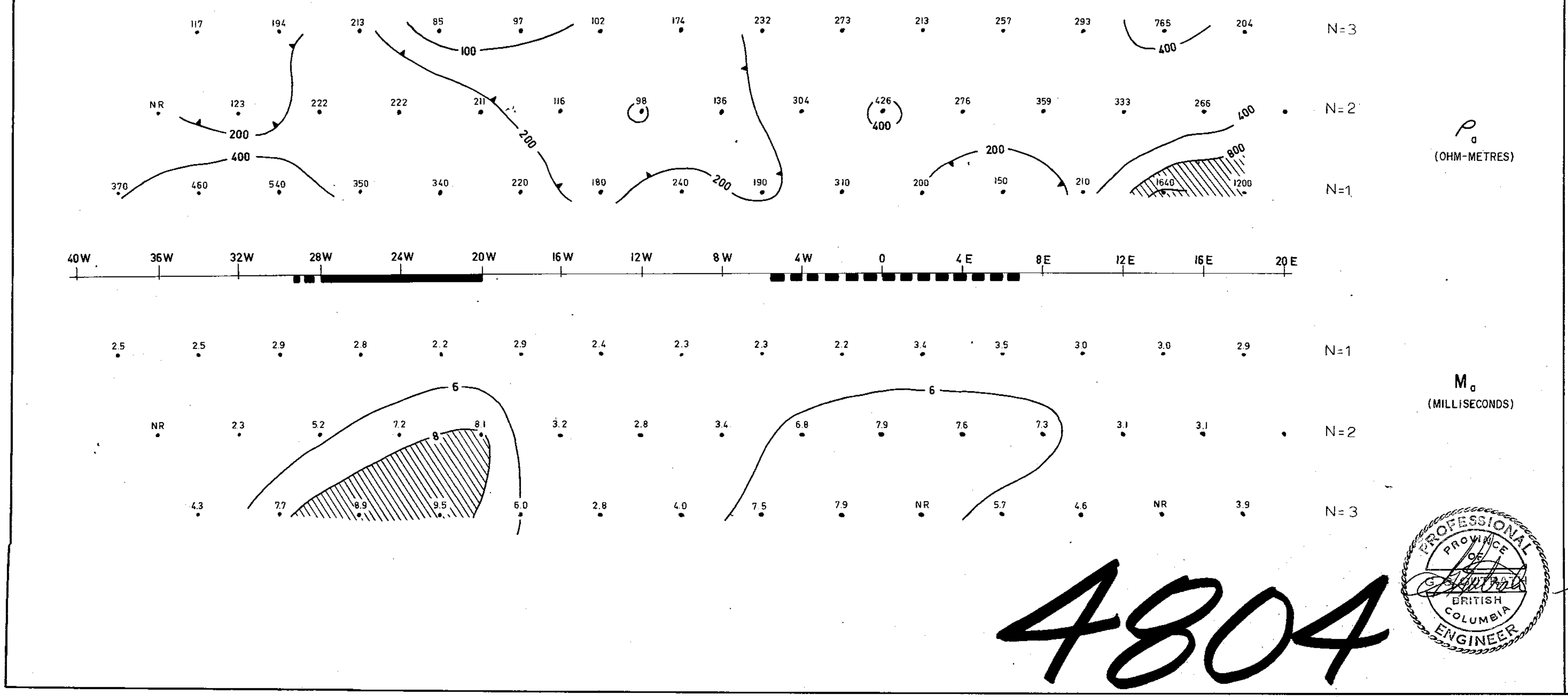

INDUCED POLARIZATION SURVEY

APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 56 +00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY

a = 400 feet

anomalous zone

- low ρa

- high Ma & ρa

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

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GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

MINING DIV. KAMLOOPS N.T.S. 92 I/10 & II

TO ACCOMPANY A REPORT BY:

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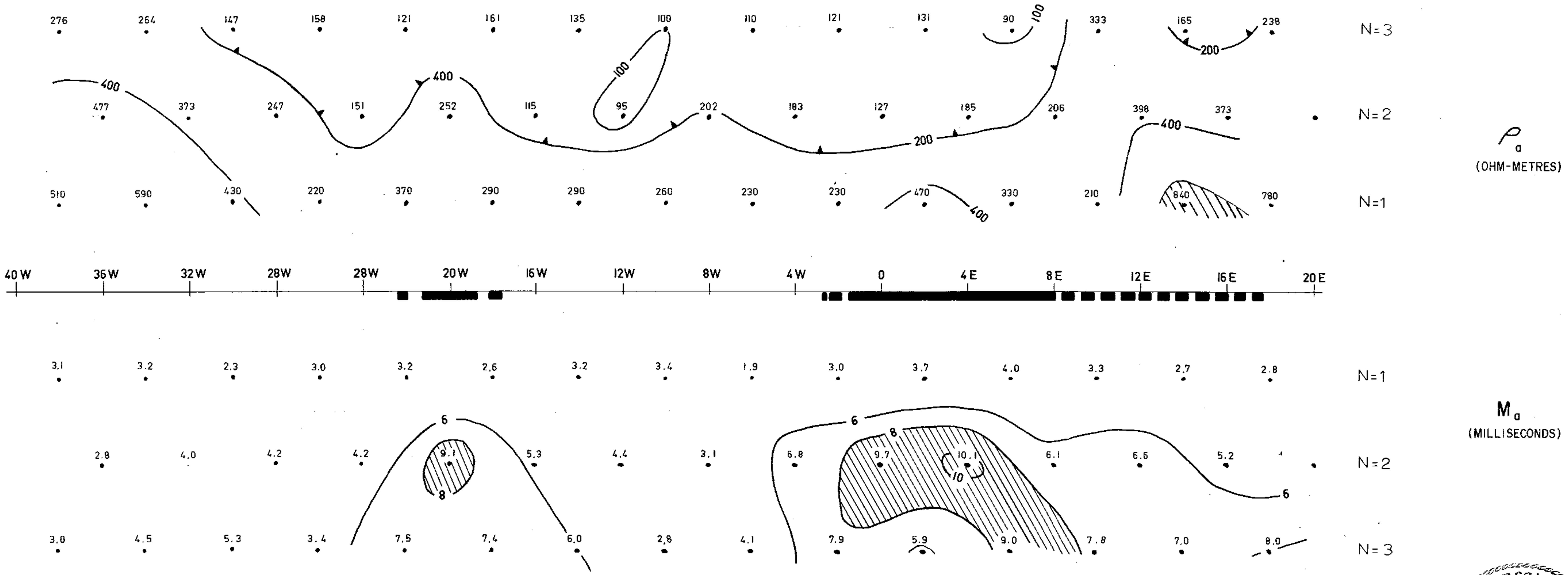
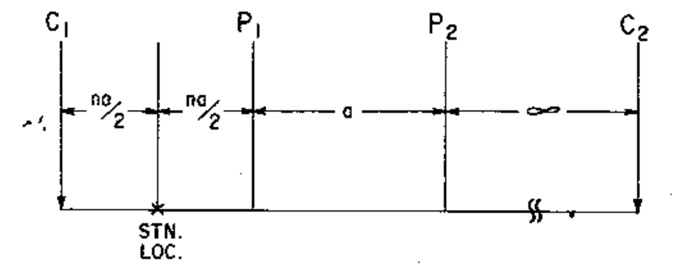


4804

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 60+00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet — low ρ_a

anomalous zone — high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION
ADERA PROPERTY - HIGHLAND VALLEY
DEN CLAIMS

SCALE IN FEET
0

MINING DIV. KAMLOOPS N.T.S. 92 I/10 & 11

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

TO ACCOMPANY A REPORT BY:
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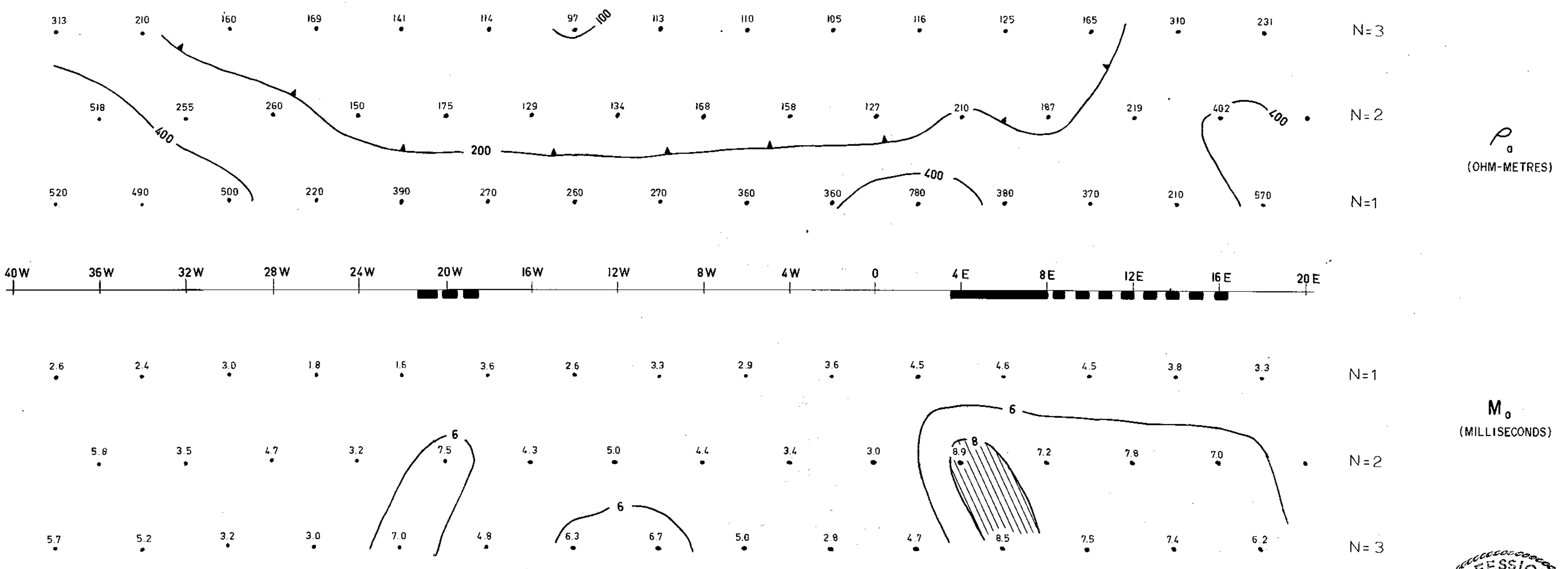
VANCOUVER, B.C.

DRAWN BY- DATE-AUGUST 1973.



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PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — G. C. GUTHRATH

INDUCED POLARIZATION SURVEY

APPARENT RESISTIVITY & CHARGEABILITY

PSEUDO SECTION

LINE: 64 +00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY

C_1 P_1 P_2 C_2 — na/2, na/2, a, ∞ — STN. LOC.

a = 400 feet

anomalous zone

– low ρ_a

– high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

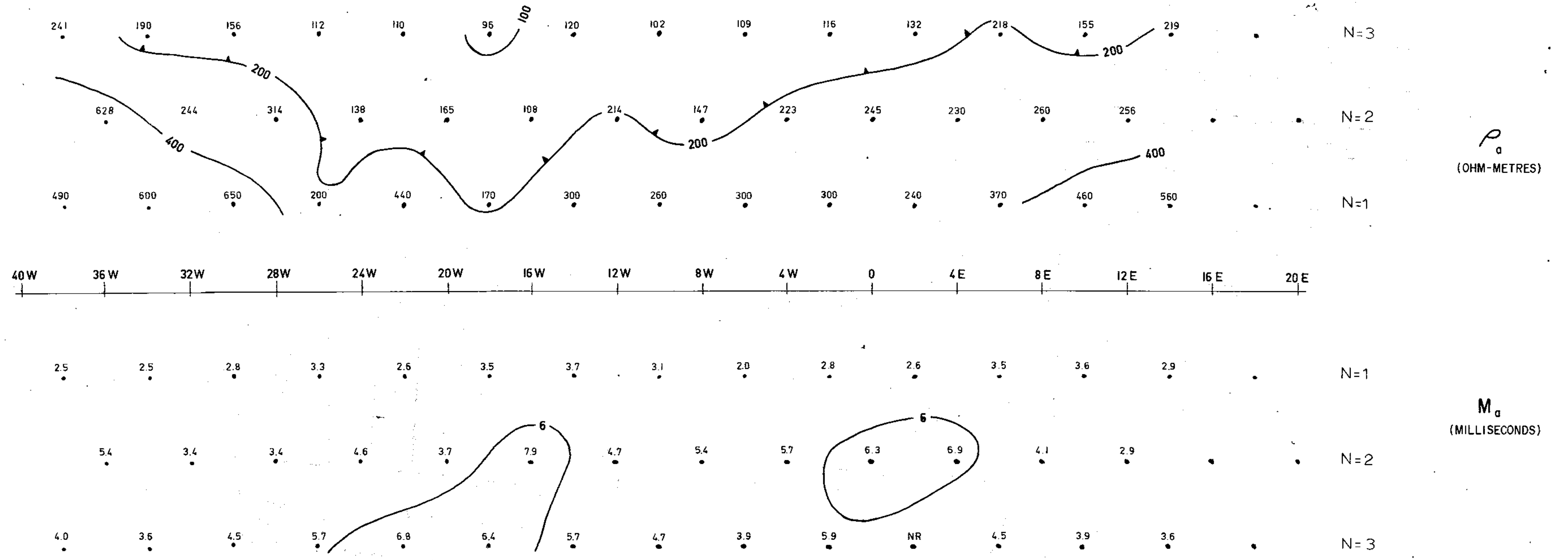
N.T.S. 92 I/10 & 11

TO ACCOMPANY A REPORT BY:

P. P. Nielsen
P. P. NIELSEN, B. Sc., GEOPHYSICIST
G. C. GUTHRATH, B. Sc., P. Eng.
ATLED EXPLORATION MANAGEMENT LTD.
VANCOUVER, B.C.

DRAWN BY-

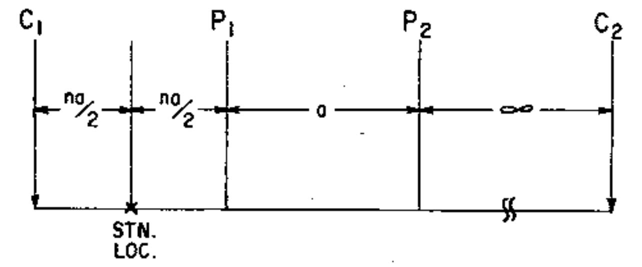
DATE-AUGUST 1973.



INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 68 +00 N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



a = 400 feet — low ρ_a

anomalous zone — high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION
ADERA PROPERTY - HIGHLAND VALLEY
DEN CLAIMS

SCALE IN FEET
0

MINING DIV. KAMLOOPS N.T.S. 92 I/10 & 11

4804

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

TO ACCOMPANY A REPORT BY:
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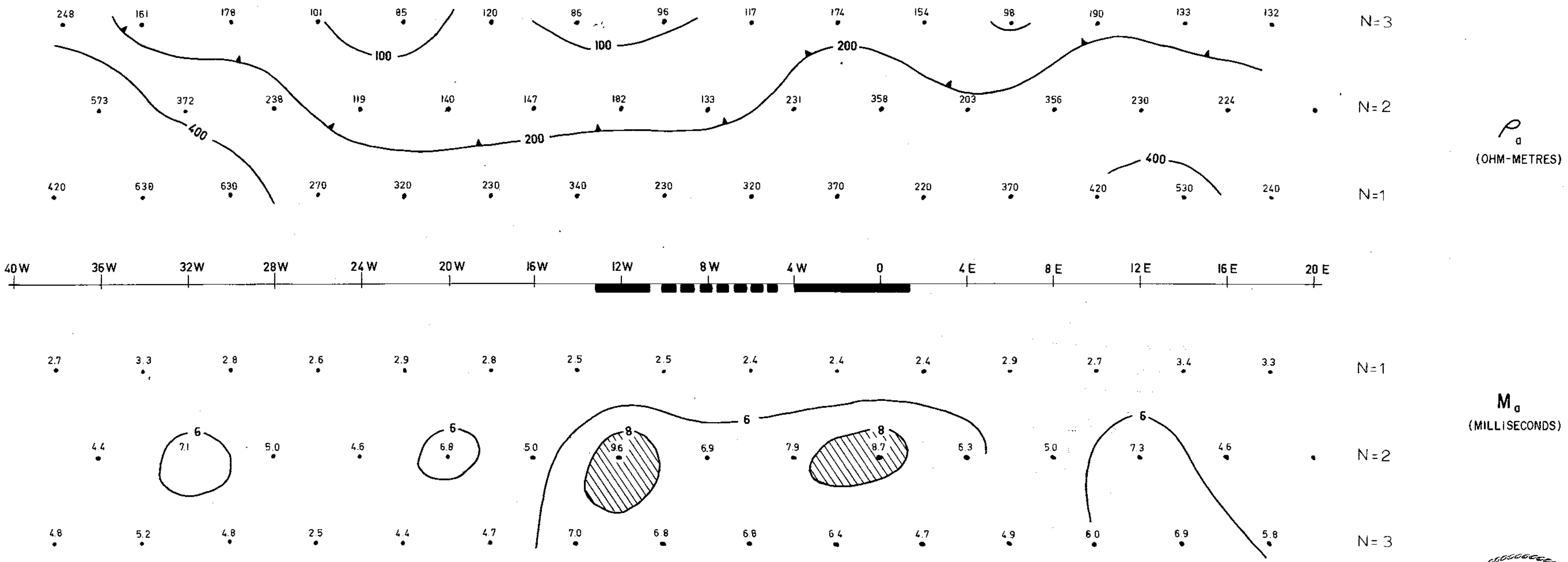
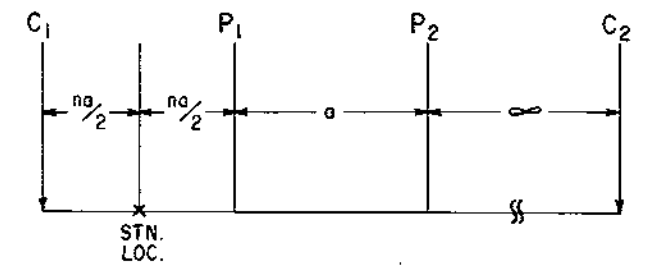


4804

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 72 +00 N

LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

- low ρ_a

- high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION

ADERA PROPERTY - HIGHLAND VALLEY

DEN CLAIMS

SCALE IN FEET

0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & 11

TO ACCOMPANY A REPORT BY:

P. P. Nielsen

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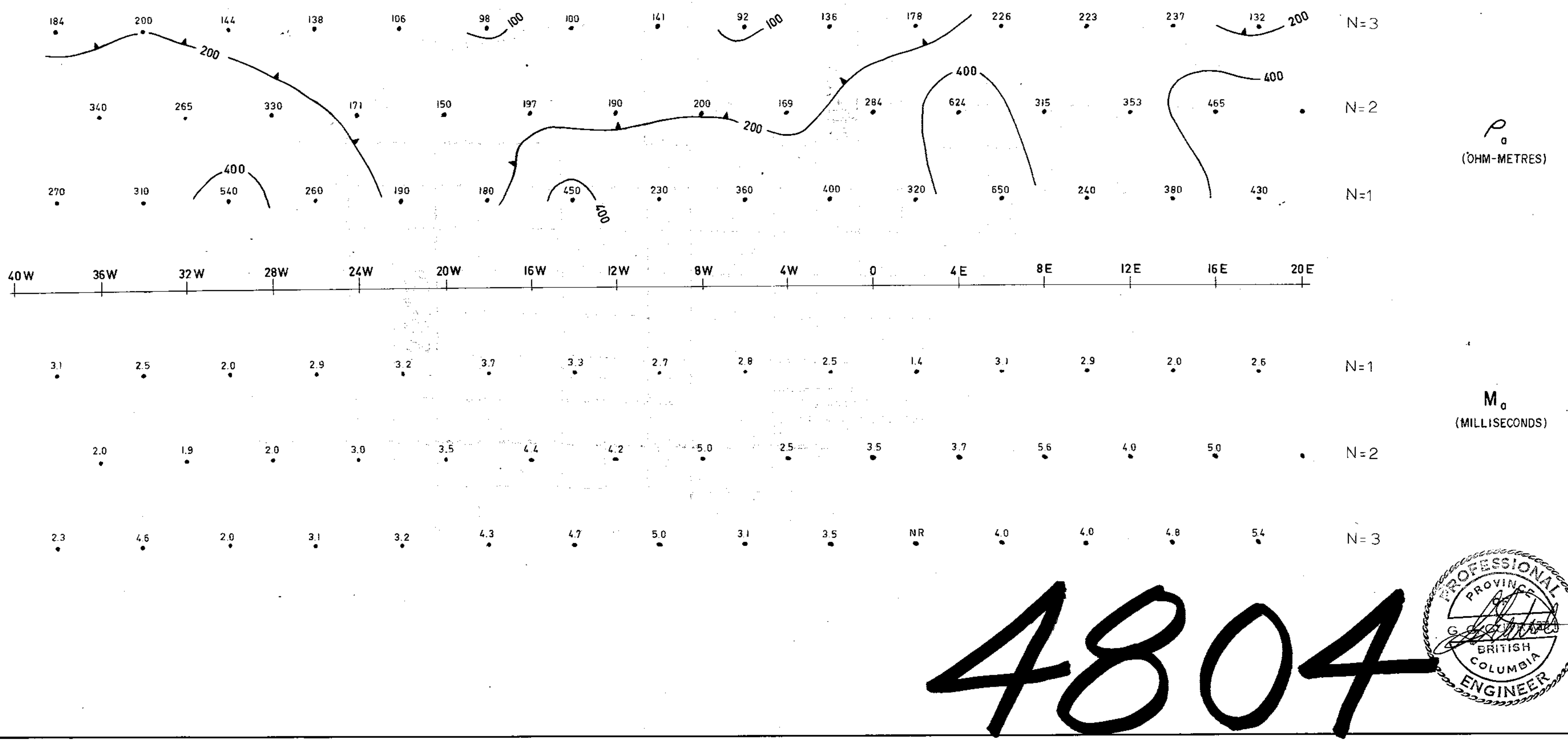
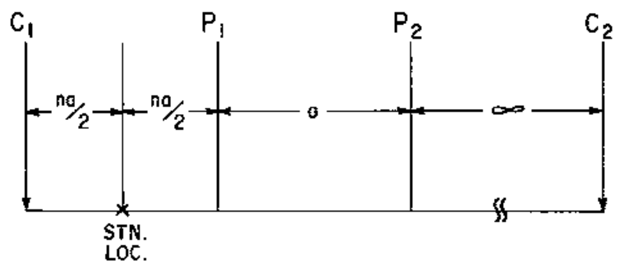
DATE-AUGUST 1973.

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY & CHARGEABILITY
PSEUDO SECTION
LINE: 76 +00 N



LEGEND

POLE - DIPOLE ELECTRODE ARRAY



a = 400 feet

anomalous zone

— low ρ_a

— high M_a & ρ_a

INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

ACHERON MINES LTD. (N.P.L.)
GRANDORA EXPLORATIONS OPTION
ADERA PROPERTY - HIGHLAND VALLEY
DEN CLAIMS

SCALE IN FEET
0

MINING DIV. KAMLOOPS

N.T.S. 92 I/10 & II

TO ACCOMPANY A REPORT BY:
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PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA G. C. GUTHRATH

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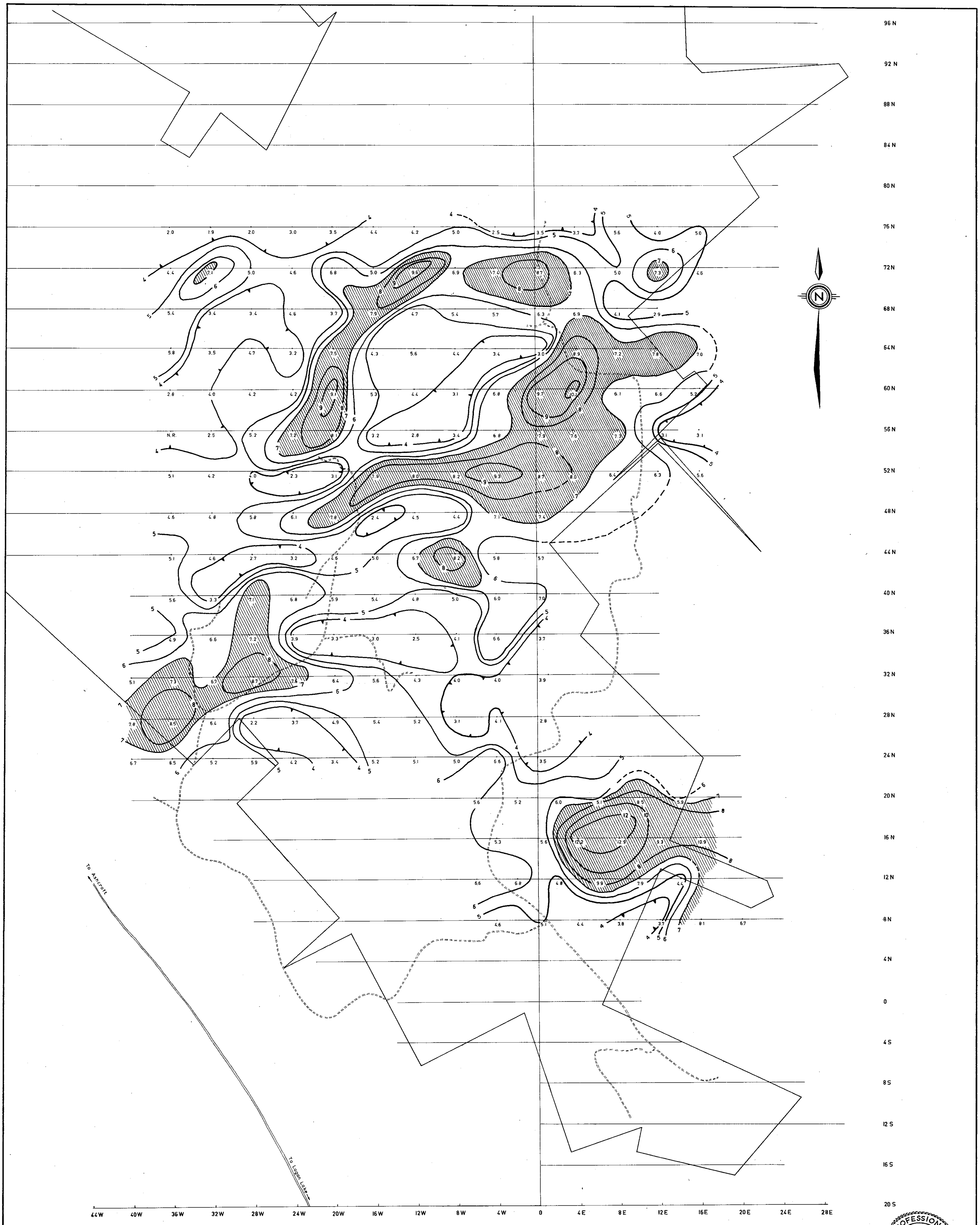
DATE-AUGUST 1973.



-P.P. Nielsen, To accompany report by:
P.P. NIELSEN, B.Sc., Geophysicist &
G.C. GUTRATH, B.Sc., P.Eng. Geologist

4804
M4

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION - DEN CLAIMS
ADERA PROPERTY HIGHLAND VALLEY B.C.

INDUCED POLARIZATION SURVEY APPARENT CHARGEABILITY VALUES & CONTOUR MAP

KAMLOOPS MINING DIVISION

N.T.S. 92 I/10 & 11

ATLED EXPLORATION MANAGEMENT LTD.

VANCOUVER, B.C.

SCALE IN FEET: 400 0 400 800

DATE: AUGUST 1973

DRAWN BY: N.C.L.

LEGEND

HIGH Ma

LOW Ma

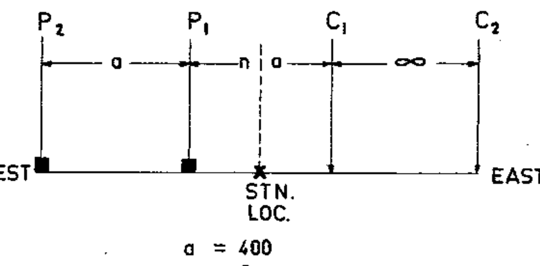
CONTOUR INTERVAL: 1 msec (above 4 msec)

INSTRUMENT PARAMETERS

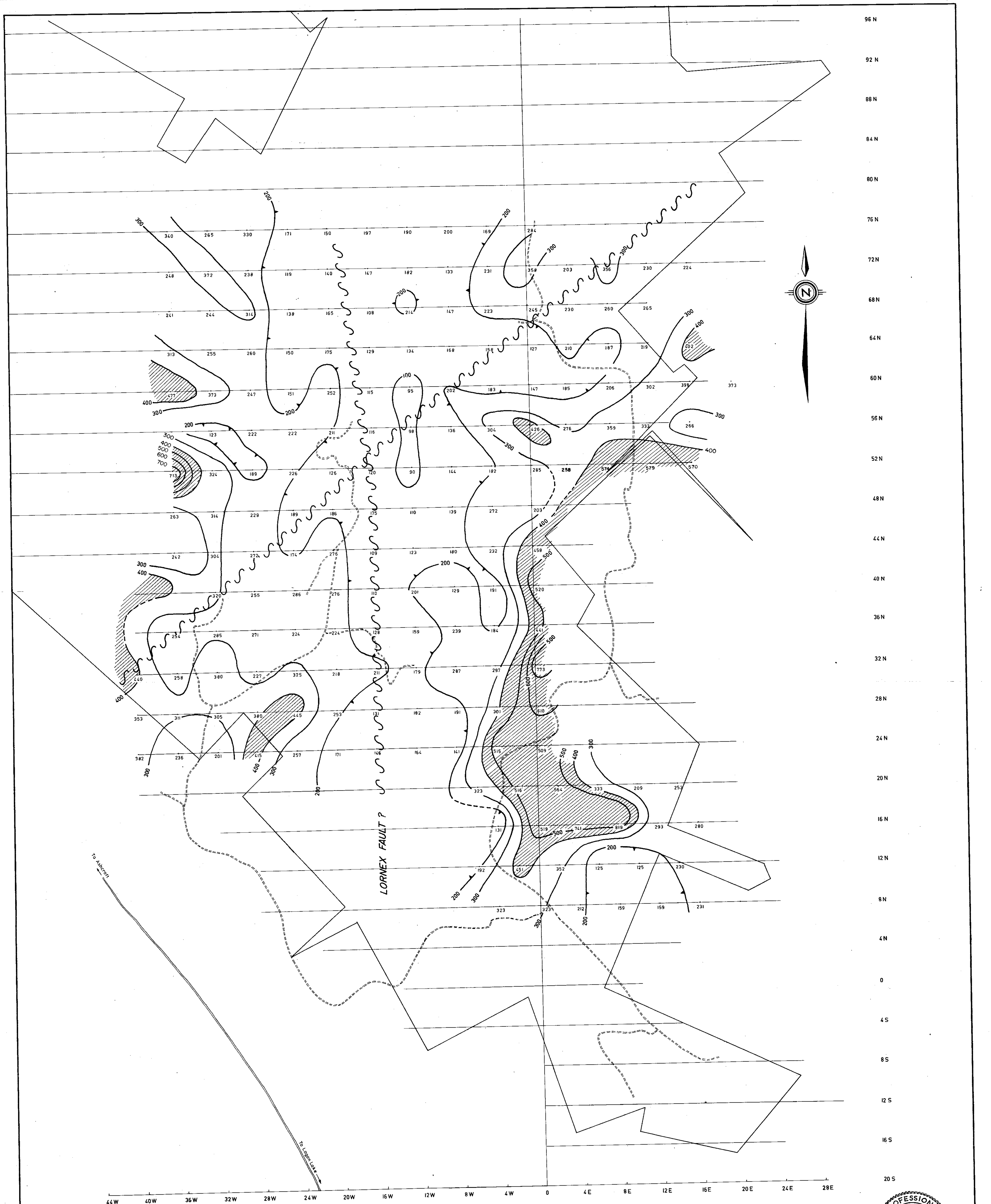
INSTRUMENT USED: HUNTEC MK III R_x WITH 7.5 KW POWER SOURCE

SPECIFICATIONS: TRANSMITTER TIMING: 2 secs. ON & 2 secs. OFF
RECEIVER DELAY TIME: 240 msecs.
INTEGRATING TIME: 900 msecs.

POLE - DIPOLE ELECTRODE ARRAY



a = 400
n = 2



To accompany report by:
P.P. NIELSEN, B.Sc., Geophysicist &
G.C. GUTRATH, B.Sc., P.Eng. Geologist

ACHERON MINES LTD. (N.P.L.)

GRANDORA EXPLORATIONS OPTION - DEN CLAIMS
ADERA PROPERTY HIGHLAND VALLEY B.C.

INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY
VALUES & CONTOUR MAP

KAMLOOPS MINING DIVISION

N.T.S. 92 I/10 & 11

ATLED EXPLORATION MANAGEMENT LTD.
VANCOUVER, B.C.

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4804 MAP #5

SCALE IN FEET: 400 0 400 800

DATE: AUGUST 1973

DRAWN BY:

POLE - DIPOLE ELECTRODE ARRAY

P₂ — a — P₁ — n·a — C₁ — ∞ — C₂
WEST — STN. LOC. — EAST
a = 400
n = 2

LEGEND

HIGH ρ_a (400)
LOW ρ_a (200)
CONTOUR INTERVAL: 100 ohmmeters
INTERPRETED FAULT

INSTRUMENT PARAMETERS

INSTRUMENT USED: HUNTEC MK III R_x WITH 7.5 KW POWER SOURCE

SPECIFICATIONS: TRANSMITTER TIMING: 2 secs. ON & 2 secs. OFF
RECEIVER DELAY TIME: 240 msecs.
INTEGRATING TIME: 900 msecs.