84-#563 - 12676

ASSESSMENT REPORT

GEOPHYSICAL SURVEYS

TP 2, 3, 4, 5 CLAIMS

SIMILKAMEEN MINING DIVISION

NTS: 92H/10E & 7E

49°30'N, 120°37'W

Owner/operator: B.P Exploration Canada Limited.

D. Gamble
July 1984

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LIST OF ILLUSTRATIONS

INTRODUCTION

Work on the TP2, 3, 4, 5 mineral claims was conducted from September 26th through to October 21st, 1983, by Selco, A Division of BP Exploration Canada Limited. The field work consisted of a program of grid preparation followed by ground geophysical surveys that included a Genie Horizontal Loop Electromagnetic (H.L.E.M.) surveys and a Proton Precession Magnetometer surveys. This report contains the results obtained from these surveys.

LOCATION AND ACCESS

The TP2, 3, 4, 5 mineral claims are located approximately 10 kilometers northwest of Princeton B.C. along the north side of the Tulameen River Valley. The property straddles the Tulameen River and highway that links Coalmont to Princeton in South Central B.C. (See Location Map Figure 1).

Access to the property is gained via a series of logging and range roads leading northwards from the Princeton - Coalmont highway within the claim block.

The U.T.M. coordinates for the TP3 and TP4 common L.C.P. are 670700 ME and 5485850 MN.

CLAIM STATISTICS

The TP2, 3, 4, 5 claims lie within the Similkameen Mining Division, NTS 92H/10E and 7E. All the claims are registered in the name of BP Exploration Canada Limited, of Calgary. The names, record numbers, number of units and recorded date are as tabulated:

CLAIM NAME	RECORD NO.	UNITS	RECORD DATE
TP2	1909	20	20.05.83
TP3	1910	20	20.05.83
TP4	1911	18	20.05.83
TP5	1912	18	20.05.83

(See Figure 2 Claim Location Map).

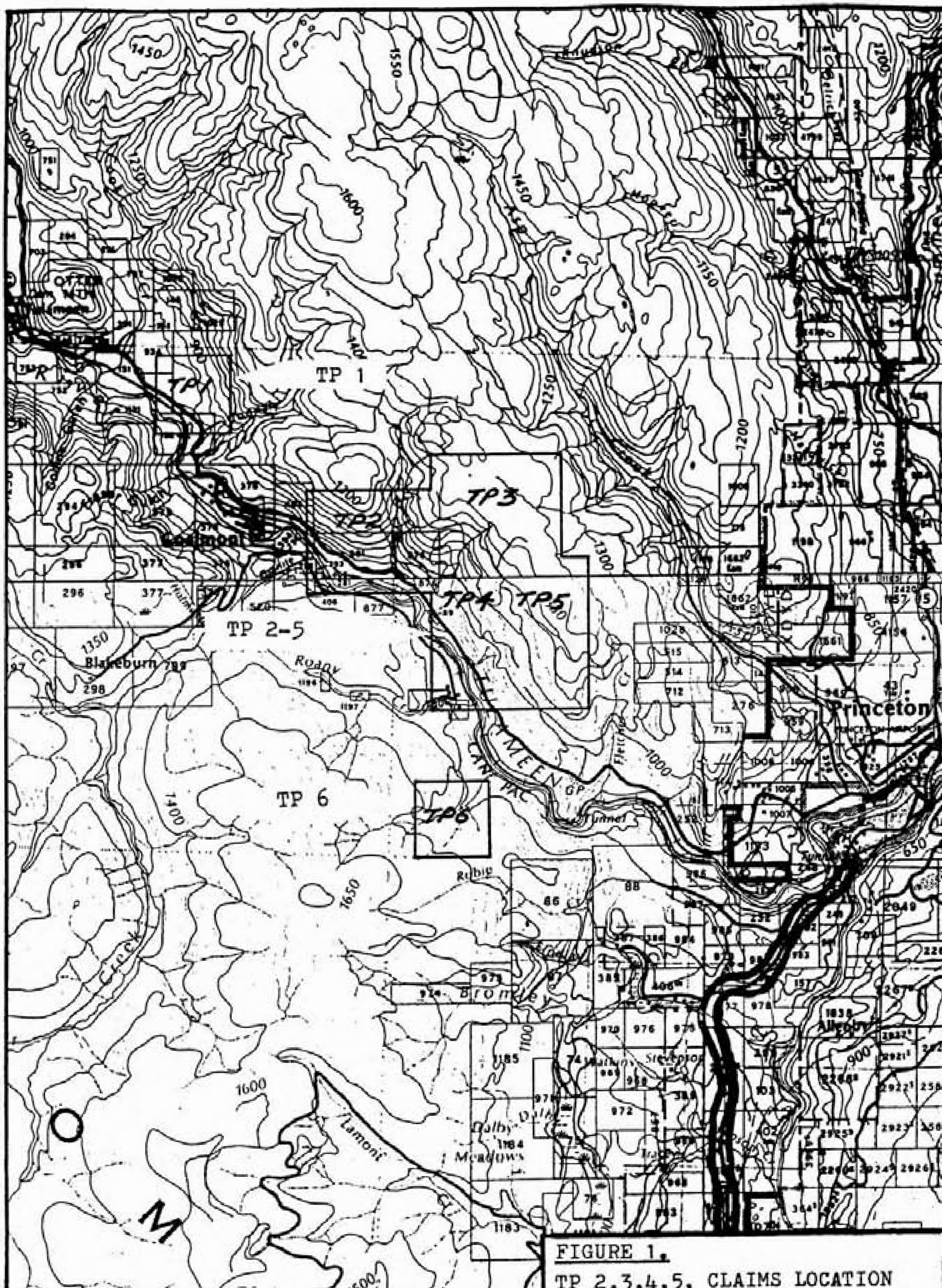

FIGURE 1.
TP 2,3,4,5, CLAIMS LOCATION MAP, 1:100,000 (92H/10E & 7E).

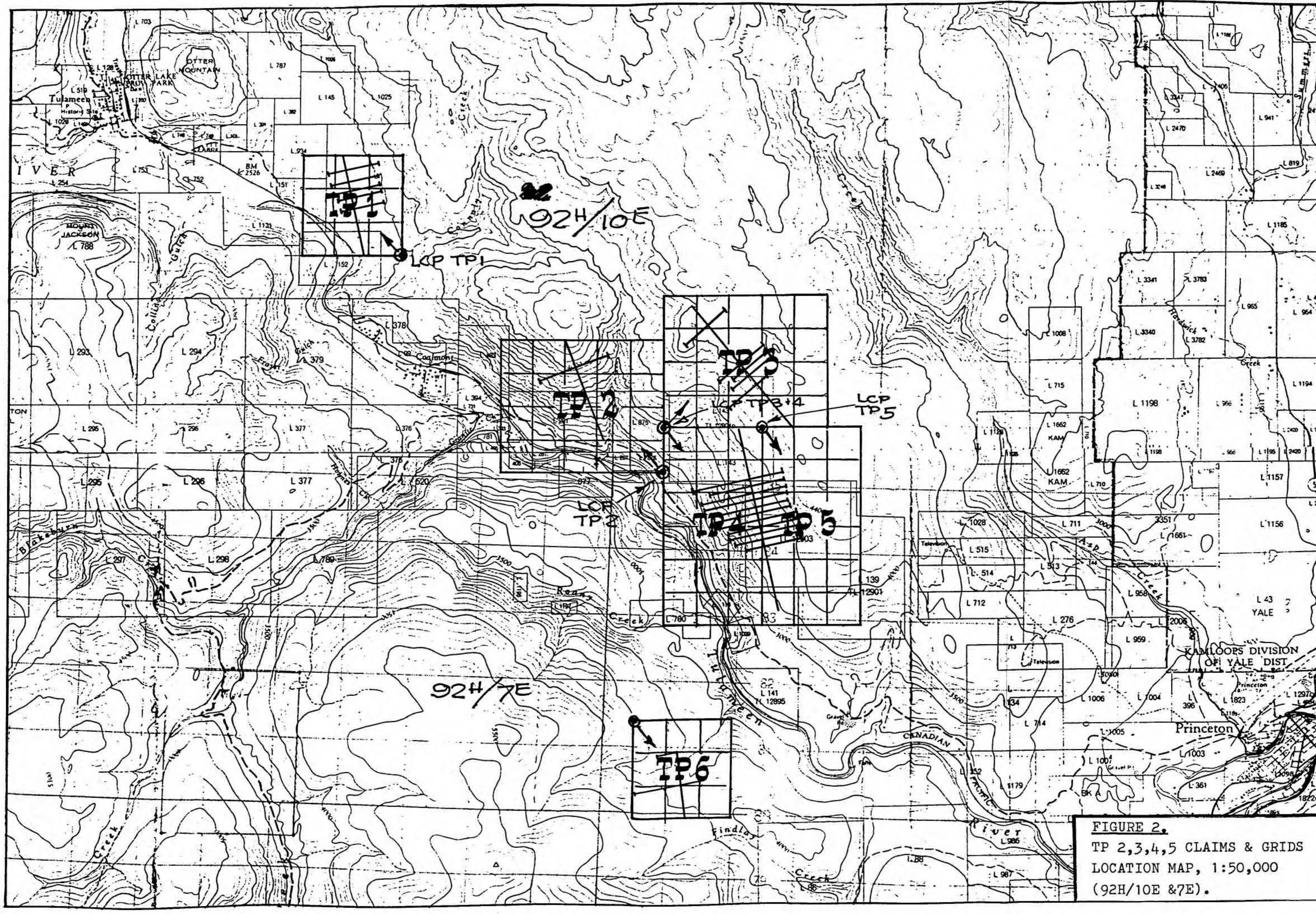

FIGURE 2.

TP 2,3,4,5 CLAIMS & GRIDS

LOCATION MAP, 1:50,000

(92H/10E &7E).

TOPOGRAPHY AND VEGETATION

The TP2-5 property is situated in the Tulameen River Valley and covers part of the valley floor and the top and southwestern slopes of a long linear southeasterly trending ridge. The elevations range from 2,300 feet A.S.L. at the Tulameen River to 4,500 feet A.S.L. at the rige top. The relief is generally moderate to steep with some cliff areas.

Vegetation consists of scattered pine and fir with little underbrush. The area is generally open and dry. Some older growth is found on the edges of small swamps that occur on the terraced slopes of the main ridge. Drainage is excellent for most of the property. A small creek valley flows south into the Tulameen River between TP2 and TP3, 4, 5 claims.

PROCEDURE

Three compass surveyed, flagged and topofil chained grids were established to enable ground geophysical followup coverage over a number of Airborne EM anomalies. A total of 20.5 line kilometres of gridding was prepared on the TP2 grid, on TP3 grid and on the TP4-5 grid.

During the period September 26th to October 21st, 1983, (inclusive), a program of Genie electromagnetics and proton precession magnectics was conducted over the three grids. (See Figure 2 Claim and Grid Location Map). A total of 17 cross lines totalling 16.9 line kilometres of H.L.E.M. surveying and 18.3 line kilometres of magnetometer surveying was completed.

All gridding and ground geophysical surveying was conducted by company personnel.

GEOPHYSICAL SURVEYS INSTRUMENTATION

Proton Precession Magnetometer Survey

The magnetometer survey was carried out utilizing an EDA PPM 350 field and an EDA PPM 375 base station proton precession magnetometer. The system allows diurnal and micropulsation removal by use of synchronous base station and field readings. Corrected, unfiltered data are plotted on each of the base maps.

Genie EM Survey

The Scintrex SE88 Genie Portable Electromagnetic System was used for this survey. The measurement is based on the simultaneous transmission of two preselected, amplitude stablized, well separated frequencies and the comparison of the amplitudes of the two signals at the receiver.

A proportional DC voltage is obtained from each signal, averaged over a selectable time period and the computed result, $(Vs/Vr-1) \times 100$, is displayed in percent on the display.

(See Appendix A for notes on Genie SE88 Theory and Interpretation.)

DISCUSSION OF RESULTS

TP 2 GRID

One line was run to try and locate a 3-channel conductor, 10340SA in an area of favourable geology. An extremely weak anomaly was located at 2+25W.

TP 3 GRID

One discrete conductive unit is present, trending from 10N/2+50E to 12N/2+25E. This likely correlates to airborne anomaly 10200SB as it is not related to the high magnetic anomaly west of the baseline. The magnetic response is very large and erratic and indicates that the unit is likely an intrusive or basic rock. The EM conductor is at a depth of 30 metres, dips approximately 45^{o} west and is poorly conductive (conductivity thickness = 3). A second possible anomaly roughly correlates to the flank of the magnetic high and airborne anomaly 10190NC, and again dips to the west. The best profile here is L10N/1+00W.

TP 4, 5 GRID

This grid is characterized by a large number of extremely weak conductors which effect the high frequency EM and clutter the interpretation picture. Because of the lack of response in the low frequency and the low conductivity obtained on any axis assumed to be a thin dipping body, it becomes apparent that the EM must be treated as reacting to a broad zone of conductivity. This zone trends across the entire grid, is roughly 250 metres wide, and is centered on the baseline. Because there are negative troughs associated with some profiles (18S, 13S, 9S) the depth is limited to about 60 metres if the thickness is 10 seimens. However, airborne conductors (10111NB) are only 5 seimens, so depth is likely less than interpreted. Magnetics parallel this unit and tend to emphasize regional strike.

At least three other conductive zones are apparent, centered at 10S/3+00E, L9S/5+00W and 15S/3+00W. An attempt to interpret 10S/3+00E as a dipping, thin sheet yielded no dip determination, depth of 30m. and conductivity-thickness of 1.5 seimens. L9S/5+00W appears to correlate to a trend with pervasive clay alteration, and 15S/3+00W correlates to a swamp.

None of these areas are valid EM targets. It would be necessary to employ IP to discriminate whether the EM is reacting to alteration processes or to mineralization of a disseminated nature.

RECOMMENDATION AND CONCLUSION

The conductive responses on all three grids are weak and, if of geological interest, must be tested with I.P. to determine the validity before drill testing.

The most favourable anomaly axis on each grid for further testing if warranted are listed in the summary table.

Claim	Line	Station	Dip	Depth
TP 2	1	2+25W	90°E	?
TP 3	10N	2+50E	45°W	30m.
TP 4, 5	10S	3+00E	90°	30m.
TP 4, 5	Baseline Zone			

COST STATEMENT

TP 2, 3, 4, 5. Record #'s 1909, 1910, 1911, 1912. (76 units)

1)	Grid Preparation & Geophysical Surveying	
	September 26th - October 21st, 1983 (26 days) 20.5 line kms. gridding 16.9 line kms. H.L.E.M. Surveying 18.3 line kms. Magnetometer Surveying By Company Personnel. R. Sommerville, D. Flentge 52 man days @ $100.00 per day.	$5,200.00
2)	Equipment Rental	
	26 days @ $100.00 per day.	2,600.00
3)	Room & Board	
	31 days @ $80.00 per day.	2,480.00
4)	Transportation	
	Vehicle rental & operation 31 days @ $50.00 per day.	1,550.00
5)	Supervision & Report Writing	
	5 days @ $250.00 per day. (A. Wynn, D. Gamble)	1,250.00
6)	Drafting, Reproduction, Typing	
	4 days @ $200.00 per day.	800.00
	TOTAL:	$13,880.00

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources
MINERAL RESOURCES BRANCH–TITLES DIVISION

MINERAL ACT

FORM I

NOTICE TO GROUP

Mining Division SIMILKAMEEN Location 4.0 km E. of Coalmont, B.C.

Name of group TP NORTH Map No. 92H/10E

We, the undersigned owners* of the following adjoining claims, desire to group them according to the provisions of the *Mineral Act*:—

NAME OF CLAIM	No. of Units	Record No.	Month of Record	SIGNATURE OF OWNER*	Free Miner Certificate No.
TP 2	20	1909	5	[signature]	265030
TP 3	20	1910	5	[signature]	265030
TP 4	18	1911	5	[signature]	265030
TP 5	18	1912	5	[signature]	265030
				(Agent for BP EXPLORATION CANADA LIMITED 264289)	

* May be signed by agent on behalf of owner.

Province of British Columbia Ministry of Energy, Mines and Petroleum Resources
MINERAL RESOURCES DIVISION – TITLES BRANCH

MINERAL ACT

STATEMENT OF EXPLORATION AND DEVELOPMENT

I, A.P. DAVID GAMBLE (Name) Agent for BP EXPLORATION CANADA LIMITED (Name)

7182 Blackwell Road (Address) — 333 - 5 Avenue S.W. (Address)

Kamloops, B.C. — Calgary, Alberta

V2C 2J3 (Postal Code) 573-3408 (Telephone Number) — T2P 3B6 (Postal Code) 237-1234 (Telephone Number)

Valid subsisting F.M.C. No. 265030 — Valid subsisting F.M.C. No. 264289

STATE THAT

1. I have done, or caused to be done, work on the TP 2, 3, 4, 5 Claim(s)

Record No.(s) 1909, 1910, 1911, 1912.

Situate at 4.0 Km. E. of Coalmont, B.C in the Similkameen Mining Division,

to the value of at least $13,880.00 dollars. Work was done from the 26th day of September 19 83, to the 21st day of October 19 83.

2. The following work was done in the 12 months in which such work is required to be done: YES

(COMPLETE APPROPRIATE SECTION(S) A, B, C, D, FOLLOWING)

A. PHYSICAL (Trenches, open cuts, adits, pits, shafts, reclamation, and construction of roads and trails)

(Give details as required by section 13 of regulations.)

	COST
TOTAL PHYSICAL	

I wish to apply $ .... of physical work to the claims listed below.

(State number of years to be applied to each claim, its month of record, and identify each claim by name and record no.)

B. PROSPECTING (Details in report submitted as per section 9 of regulations.)
(The itemized cost statement must be part of the report.)

COST

I wish to apply $ .... of this prospecting work to the claims listed below.

(State number of years to be applied to each claim, its month of record, and identify each claim by name and record no.)

(For C and D sections, please turn over.)

Province of British Columbia Ministry of Energy, Mines and Petroleum Resources
MINERAL RESOURCES DIVISION – TITLES BRANCH

MINERAL ACT

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(Give details as required by section 13 of regulations.)

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	COST

I wish to apply $ .... of this prospecting work to the claims listed below.

(State number of years to be applied to each claim, its month of record, and identify each claim by name and record no.)

(For C and D sections, please turn over.)

o

CERTIFICATE OF AUTHOR

I, Alan Wynne, of 8573 Ebor Terrace, Sidney, British Columbia hereby certify that:

1. I am a geophysicist residing at the above address.
2. I am a graduate of the Univeristy of British Columbia with a B.Sc. in Geology/Geophysics (1976).
3. I have practised my profession for more than eight years.
4. I supervised and interpreted the geophysical work described herein.
5. I hold no interest, direct or indirect, in the claims which are the subject of this report.

Respectfully submitted,

A. Wynne
Geophysicist

Vancouver, B.C.
June, 1984

CERTIFICATE OF AUTHOR

I, Dave Gamble, of 7182 Blackwell Road, Kamloops, British Columbia, hereby certify that:

1. I am a geologist residing at the above address.

2. I am a graduate of the University of Ottawa with an Honours B.Sc. degree in Geology (1973) and have completed two years graduate studies leading to a M.Sc. at Laurentian University.

3. I have practised my profession for more than 7 years.

4. I supervised the survey work on the TP2, 3, 4, 5 claims and interpreted the results of the survey described herein.

5. I hold no interest, direct or indirect, in the TP2, 3, 4, 5 claims which are the subject of this report.

Respectfully submitted,

A.P.D. Gamble
Project Geologist

Kamloops, B.C.
July 1984.

CERTIFICATE OF AUTHOR

I, Hugh Squair of 4287 Staulo Crescent, Vancouver, British Columbia, hereby certify that:

1. I am a geologist residing at the above address.

2. I am a graduate of the University of Saskatchewan and London with B.A. 1959 and Phd. 1965, degrees in Geology and Mining Geology and have practiced my profession for eighteen years.

3. I am registered as a member of the Association of Professional Engineers of the Province of Ontario.

4. I directed the geophysical work carried out on the TP2, 3, 4, 5 Claims by Mr. A.P.D. Gamble and attest that the values presented and their spatial relationships to each other are correct within reasonable limits of error.

5. I hold no interest direct or indirect in the TP2 3, 4, 5 Claim Group which is the subject of this report.

Respectfully submitted,

H. Squair

REGISTERED PROFESSIONAL ENGINEER H. SQUAIR PROVINCE OF ONTARIO

Vancouver, B.C.
July 1984

APPENDIX A

NOTES ON THE THEORY, PRESENTATION AND INTERPRETATION OF DATA FOR THE GENIE SE-88 PORTABLE ELECTROMAGNETIC SYSTEM. (SOURCE OF INFORMATION - SCINTREX OPERATION MANUAL AND INTERPRETATION MANUAL.

1. Introduction

The SE-88 Portable Electromagnetic System is designed mainly for use in mineral prospecting for massive sulphide ore bodies. It may also be used for the detection of faults or shear zones and to give information about subsurface conductivity for geological mapping, sand and gravel or ground water exploration. The SE-88 has been dubbed the "GENIE", an acronym for GEometry Normalized In-Phase Electromagnetic system.

Advantages of the GENIE

All previous portable electromagnetic systems, whether making in-and-out-of-phase (Slingram), tilt angle or amplitude measurements, are sensitive to the relative geometry of the transmitter and receiver coils. Small errors in orientation or separation of these coils introduce appreciable noise which degraded useful sensitivity and thereby the effective depth of exploration. While it is possible to reduce these errors by taking great care in making the measurements, production rates may be affected appreciably. These coil geometry errors are especially troublesome when surveys are to be made in topographically rugged and/or forested areas where the operators cannot see each other or measure distances accurately.

The GENIE, designed for rapid two person operation, minimizes geometrically derived errors. The measurement is based on the simultaneous transmission of two preselected, well separated frequencies and the comparison of the amplitudes of the two signals at the receiver. The two transmitted frequencies are picked up by a single receiving coil, amplified and noise filtered. A proportional DC voltage (V_{signal} for the higher frequency, $V_{reference}$ for the lower frequency) is obtained from each signal, averaged over a selectable time period and then the computed result ($V_{signal}/V_{reference} - 1$) x 100 is displayed in percent on the digital display with a resolution of 0.1%. Under most field conditions the system, whose sensitivity and repeatability are basically only limited by atmospheric noise, can detect amplitude ratio changes to better than 0.5 percent. Useful measurements may be made to a transmitter-receiver separation of 200 m.

Test surveys have been conducted with this system over known subsurface conductors in a variety of geological environments and climatic conditions. Compared with other portable electromagnetic systems, similar anomaly amplitudes have been observed in all cases, but the noise levels are invariably lower in the GENIE profiles, resulting in an enhanced signal-to-noise ratio. The time required to measure a low noise profile with the new system is significantly less than with standard horizontal loop (Slingram) equipment. The presence of known bedrock conductors beneath as much as 85 m of overburden has been clearly indicated by the GENIE.

A comprehensive program of model studies has been carried out on the University of Toronto electromagnetic modelling facility to provide the basis for interpretation of GENIE results.

For more theoretical information...

Further information about the SE-88 is available in a 1981 Society of Exploration Geophysicists (SEG) paper given by Scintrex and Esso Minerals Canada Limited entitled, "A Novel Geometry Invariant Portable Ground Electromagnetic Reconnaissance System" by Doborzynski, Rentsch, Rudniski, Brcic and LaFleche.

3. QUANTITATIVE INTERPRETATION

3.1 Recommended Dataset

Thus far, we have examined the nature of the response to be expected from selected conductor models. A familiarity with these profiles will, in a qualitative or semi-quantitative sense, permit the user to interpret the gross features of subsurface conductors that he may encounter. From the most rudimentary of data, e.g. obtained in routine profiling for one frequency pair and one coil spacing, he will be able to quickly determine the location and dip direction of conductors. He may differentiate thin, plate-like bodies from thick, "spherical" type bodies.

Quantitative interpretation of the various conductor parameters of potential interest, however, require a wider data set, preferably involving a range of frequency pairs and coil spacings. Whereas it is not always practical to repeat all profiles at all frequencies and coil spacings, the following field procedure would suffice where quantitative interpretation is desired:

a) Select the coil spacing which is to be used as standard for traversing all lines (see Appendix E). Select the frequency pair to be used for this coverage, viz: the lowest reference frequency that the ambient noise permits us to use at the coil spacing selected, and the highest signal frequency that the geologic noise (conducting overburden) permits us to use at this coil spacing. Traverse all lines accordingly with a station interval not exceeding the coil spacing.

b) When a conductor is found, perhaps on more than one line, its intersection (usually the strongest) on one line will be selected for detailed investigation for quantitative interpretation purposes.

   This intersection will be traversed at coil spacing of 50, 100, 150 and 200 m, using one frequency pair (usually the original discovery traverse frequency). Shorter spacings may also be used if the overburden is less than 10 m. Station intervals on each spacing should not exceed the spacing value, e.g. 25 m stations for 25 m coil separation.

   Select one spacing which yields a substantial conductor response and repeat the traverse across the conductor intersection with it, using the reference frequency of 112.5 Hz and all three signal frequencies.

The data thus obtained over the conductor intersection will provide us with the material necessary for the quantitative interpretation of its parameters.

The profiles of Appendix A for dipping plate bodies are not directly suited to quantitative interpretation, so that a different set of curves, viz: parametric response curves, have been computed and drawn for this purpose. These curves are indexed and shown in Appendix D.

It should be noted that the dataset as specified may not be achievable in all cases. Data of consistent accuracy, for example, may be difficult to achieve in certain environments at large coil separations. The recommended dataset should therefore be thought of as that required for a number of interpretations, the average of which is one's best estimate of dip, depth and conductance. It is, however, possible to arrive at estimates of these parameters with a lesser requirement (see Section 4). Under optimum conditions, for example, it is possible to arrive at reasonable estimates of dip, depth and conductance given no more than traverses at two frequency pairs for a fixed coiled separation. Frequency pair and coil separation selections would in this case need to be those combinations best suited to the inversion problem at hand.

3.2 Dipping Plate Conductor

3.2.1 Determination of Dip

The direction of dip of a tabular conductor may normally be determined from the observation that one positive flanking peak is larger than the other. If so, the higher peak will be on the hanging wall side (down dip side) of the conductor. This disparity in positive peak values is more readily seen at larger values of h/L, i.e. $h > 0.25$ L. For smaller values (e.g. $h/L = 0.125$, Figure 9D) the disparity is less pronounced. For this reason we will assume that we will only use coil separations $L < 4h$ for dip interpretation purposes, i.e. normally coil separations which are the smallest to yield substantial responses.

Figures 44A, 44B and 44C are employed for dip determination purposes. Having selected the value of L to be used, one calculates the ratio of positive peak values for all three signal frequencies employed using the large peak value as numerator.

It is important to use the empirical local ratio level as zero level for the peak determination. This local level is usually offset, in the positive sense, due to overburden conduction (see later) and, exceptionally, there may be a small instrumental offset level as well. In any case, one should not assume that the instrumental zero is the true geophysical zero level against which the local bedrock conductor anomaly is determined.

The three peak ratios are then plotted, on the same linear scale as Figures 44, on a vertical line on a transparent sheet. This sheet is overlain on Figures 44A, B and C and shifted horizontally on each until the best fit for all three data points is obtained. This procedure will normally determine the dip to within ±15°.

Ostensibly the same determination of dip will also yield a value of h/L, although this is not regarded as being a reliable way of so doing. A preferred mechanism for so doing will be discussed below.

One possible region of ambiguity of determination of dip is for 30° dip and h/L of 0.3, for which nearly the same set of peak ratios at all frequencies may be observed as for 45° dip and h/L of 0.5. This ambiguity may be resolved readily by repeating this procedure using a different value of L.

3.2.2 Determination of Depth

The determination of depth to a dipping conductor is a rather complex matter if attempted in full generality, for the response curves are a function of conductor size, dip, conductance and depth, as well as the coil spacing and the frequencies employed. We have, however, found it possible to simplify the procedure by employing a technique which is sufficiently accurate for practical purposes. In any event, no simple model fully predicts the response to be expected from the complex geometry and conductivity distribution of real earth situations.

The model selected is that which has been used extensively in these model studies, viz: a tabular body, 400 m in strike extent and 200 m in dip extent.

It has been noted that the form of variation of peak (negative) response for this body with coil separation is primarily a function of the depth of the body below surface and only, to a much lesser extent, of its dip and conductance, or of the frequencies employed. Thus, if we plot the variation of peak response against coil separation (50 to 200 m) on a log-log basis for each frequency pair employed, we can overlay it on the family of curves shown in Figure 45. By translation of the field data parallel to the horizontal axes of the Figure 45, the best fit may be obtained using the proper value of dip obtained above. The value of coil separation for which L/h = 1 (in Figure 45) then determines h.

It will be noted that there is a slight variation in the response curves for different values of dip. Thus, representative curves are given for dips of 30°, 45°, 60° and 90° so that the most appropriate curve may be employed.

This procedure may be done separately for all frequency pairs which yield adequate responses. A test of validity of the depth value so determined is the measure of agreement between the various depth estimates obtained using the different frequency pairs, if such measurements have been made.

3.2.3 Determination of Conductance

Having determined h, we may now determine the conductance of the body. In order to do so expeditiously we employ another simplification. We note that if we plot the variation of peak response for any value of L against the σtL parameter, we find that the response curves are very similar in shape (although differing in amplitude) for dipping tabular bodies, regardless of their dip (between 30° and 90°) and that they vary little with h/L ratio. If one determines the GENIE response at all three signal frequencies (R_H, R_M and R_L) for the reference frequency of 112.5 Hz, we may then normalize the responses at the two lower frequencies (R_M and R_L) by that at the 3037.5 Hz (R_H). This gives us two ratios of responses at different frequencies. Let us call

R_M/R_H = ratio of responses at 1012.5/112.5 and 3037.5/112.5 Hz

and R_L/R_H = ratio of responses at 337.5/112.5 and 3037.5/112.5 Hz

The mean theoretical values of these parameters (for various values of dip, etc.) have been plotted, on a linear basis, against one another on Figure 46. Two curves showing the variation of R_M/R_H vs. R_L/R_H have been presented. Figure 46A shows the curve for a very shallow conductor, (h/L = 0.125), whereas 46B shows it for a deeper conductor (h/L = 0.3125). For each curve the values of σtL corresponding to various points on the curve are shown.

The procedure to determine σt for a dipping conducting tabular body is therefore as follows:

1) Calculate h/L as per instructions in previous section using all spacings employed, for each frequency pair.

2) Select a coil spacing L which gives a substantial response (i.e. good signal/noise ratio).

3) Determine the peak (negative) values of the GENIE response over the conductor at all three signal frequencies R_H (3037.5 Hz) R_M (1012.5 Hz) and R_L (337.5 Hz) for that value of L.

4) Calculate ratios of R_M/R_H and R_L/R_H.

5) Plot these two ratios against one another on an overlay of Figure 46 and to the same scale. Use Figure 46A if $h/L < 0.25$ and 46B if $h/L > 0.25$. The point so determined should lie close to the curve. Interpolate between the adjacent values of σtL on either side of the nearest point on the curve. This will provide an estimate of the appropriate value of σtL.

6) Divide this value by L (metres) to determine the appropriate value of the conductance σt (Siemens).

7) If the point (in 5) does not lie near the theoretical curve, then either the plate model used is not appropriate to the actual conductor, or there is an error in the working. For example, the effect of conducting overburden on the "zero level" of the measurement near the conductor may not have been adequately taken into account.

   Theoretically, the value of either R_M/R_H or R_L/R_H individually may be used singly to determine σtL, through the use of Figure 46. However, by using both ratios simultaneously one obtains a measure of the reliability of the procedure. It should also be pointed out that for $R_L/R_H < 0.1$, the curvature of the curves suggest that only R_M/R_H should be relied upon to determine σtL. Similarly, for $R_M/R_H >$ 0.9, only R_L/R_H should be relied upon.

8) Repeat the above for different values of L to obtain other estimated of σt and therefore an indication of its validity.

3.2.4 Determination of Location and Thickness

It has been earlier indicated that the portion of the negative peak on any profile very closely denotes the vertical projection of the upper edge of the conductor. This is true even for conductors dipping as flatly as 30°. For such flatly dipping bodies there is a slight shift of the peak towards the hanging wall side of the conductor (i.e. down dip) but this displacement will not exceed about 25% of the coil separation used, even in the extreme. Thus, if one wishes to investigate a dipping conductor by drilling, the drillhole should extend into the footwall side of the conductor at least 25% of the coil spacing (on which the conductor was determined).

As has been indicated above, the zero crossings on either side of the negative peak marking a thin plate conductor are separated by the coil spacing. When the conductor increases in width, or is composed of a series of parallel conductors over a width which is greater than about 25% of the coil spacing, the zero crossings will appreciably increase in separation, in fact, by the width of the conductor zone.

Thus, to determine the conductor width, we measure the separation of the zero crossings and subtract the coil spacing.

3.2.5 Strike Direction

As has been indicated above, the response profiles are little affected by the strike of a conductor relative to the profile between at least 90° and 45°. Thus, the strike of a conductor is best established from connecting the conductor indications on adjacent lines. In fact, in a regular grid survey, if a conductor appears in one line only it will be wise to run intermediate lines in order to obtain at least one flanking intersection and thus determine a strike direction.

3.3 Spherical Conductor

Quantitative Interpretation diagrams for a spherical conductor are not available at this time. The reader is referred back to section 2.2.2 for a qualitative appraisal of responses where the conductor is thought to be best modelled by a spherical source.

3.4 Horizontally Stratified Earth

Determination of resistivity for the homogeneous earth model and conductance for the horizontal thin sheet at surface may be made directly from figures 38 and 39. In such cases, only one reading at one coil separation is theoretically required. More confidence in the interpretation may be gained by a wider suite of measurements. Readings taken at a variety of coil separations (geometric sounding) or frequency pairs (frequency sounding) would serve, when plotted over the response curves shown to determine appropriateness of the model chosen and confidence in the resistivity or conductance estimates determined.

For the horizontal thin sheet at depth or overburden conductors of variable thickness, a full set of sounding curves would be required. The current presentation is not in a form which can be used directly in a sounding experiment. All of the information required to do a geometric sounding is however presented.

4. INTERPRETATION EXAMPLES

4.1 Near Surface Dipping Conductor

The results of a GENIE survey over one line are shown in Figure 71. The conductors consist of semi-massive sulphides in two zones marked A and B. Overburden cover in the area is minor.

From the field profiles we can pick off the necessary amplitudes.

Frequency Pair	Left Pos. Peak (%)	Right Pos. Peak (%)	Ratio Pos. Peaks	Negative Peak (%)
337.5/112.5	+1.4	+2.6	1.86	-13.0
1012.5/112.5	+3.3	+5.7	1.73	-22.7
3037.5/112.5	+5.4	+9.0	1.67	-33.2

Dip Determination: The only reasonable fit to the master curves (Figures 44A, 44B, 44C) is for a body dipping 60° to the east with an h/L ratio approximately 0.13.

Depth Determination: Using the negative peak amplitude at the 3037.5/112.5, Figure 45 suggests an L/h ratio of 6.0 (assuming a dip of 60°). Given that the coil separation used was 50 m, a depth of burial of 8.3 meters is interpreted. It should be noted that it is based upon data gained for a single coil separation.

Conductance Determination: The necessary ratios for Figure 46A are R_M/R_H and R_L/R_H. Using the negative peak amplitudes, we get $R_M/R_H = 0.68$ and $R_L/R_H = 0.39$. The inferred conductance x coil separation product (from Figure 46A) is 2000 (using R_M/R_H) and 4000 (using R_L/R_H). If the average σtL product is used, the source has an interpreted conductance of (3000/50) = 60 Siemens.

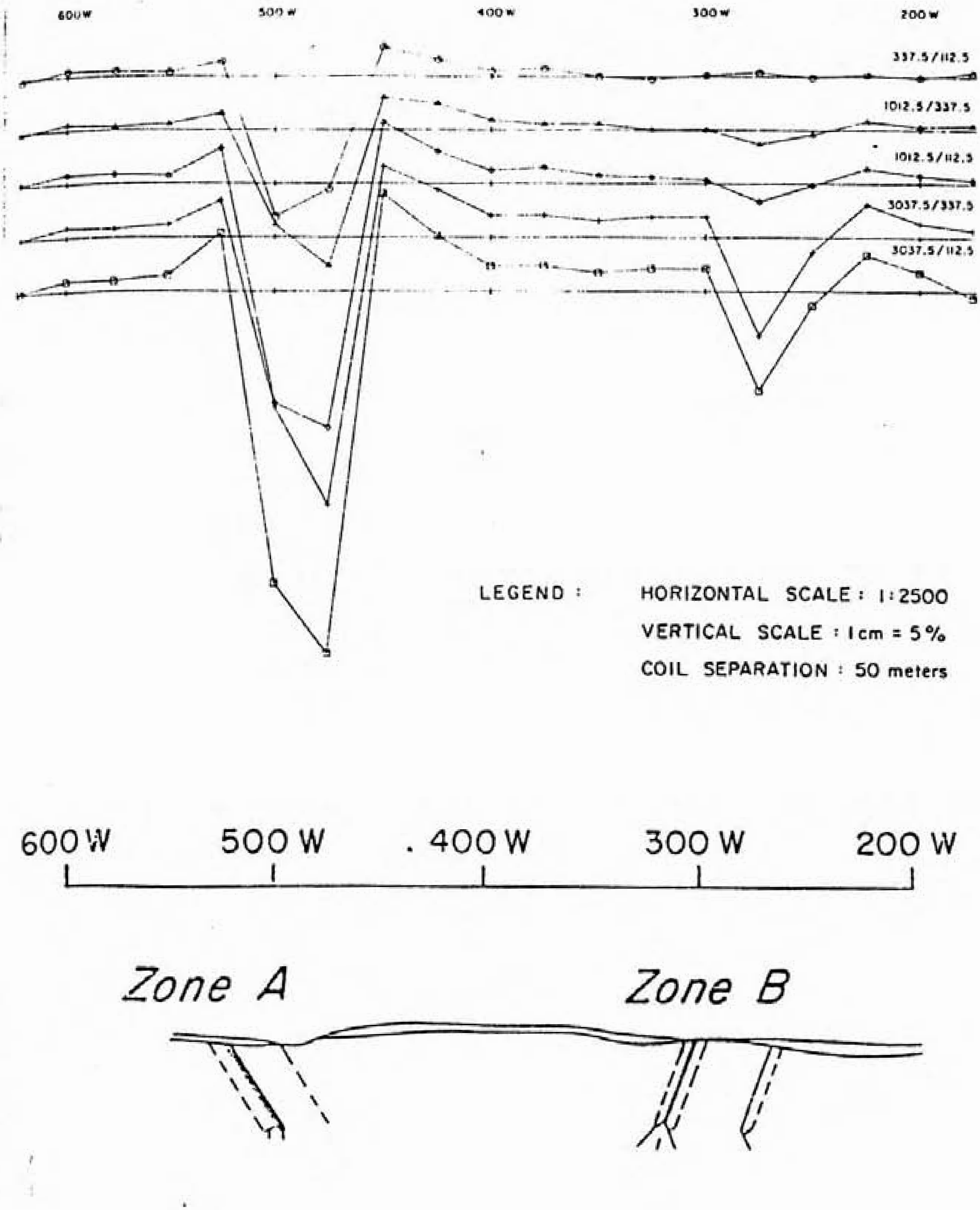
Comparing actual and interpreted source parameters in table form,

	Actual	Interpreted
Dip	50-60°	60°
Depth	2-4 m	8.3 m
Conductance	50 Siemens	60 Siemens

It should be noted that estimates of conductance varies widely. 50 Siemens is used to represent an average of the measured values.

In this test case, the interpreted source parameters are quite close to those as measured by other means. The fit is optimum due primarily to a judicious selection of coil separation over a target which is near surface, isolated and closely approximated by a dipping plate.

Figure T1 : SE - 88 GENIE PROFILE



.4.2 Conductor at Depth

The conductor in this case is a near vertical graphitic argillite under approximately 85 meters of resistive overburden. The GENIE profiles are given in Figure T2. The interpretation is attempted with the minimum dataset required (1012.5/112.5 and 3037.5/112.5 at one coil separation).

From the field profiles, we can pick off the necessary amplitudes.

Frequency Pair	Left Pos. Peak (%)	Right Pos. Peak (%)	Ratio Pos. Peaks	Negative Peak (%)
1012.5/112.5	+1.7	+6.8	4.0	-8.0
3037.5/112.5	+5.8	+17.2	3.0	-12.4

Dip Determination: A reasonable fit to the master curves (Figures 44A, 44B, 44C) is found for a body dipping at 30° (h/L = 0.18).

Depth Determination: Figure 45 suggests L/h = 2.6 (Dip = 30°). This gives an apparent depth of burial of (150/2.6=) 58 meters.

Conductance Determination: Given a R_M/R_H ratio of (-8.0/-12.4=) 0.64, we interpret a $\sigma t L$ value of 1300 and a conductance of (1300/150=) 8 Siemens.

Although the conductance value could be considered as reasonable, the dip and depth are not. The conductor is a broad near vertical source at 85 meters sub-surface. The breadth of the conductor will cause some difficulties. The asymmetry of the profiles suggests interference from a conductor (conductive overburden?) to the right of the main zone at 500S. A shorter coil separation might isolate the response due to the main conductor.

4.3 Conductor at Depth Under Conductive Overburden

The field profiles (Figurd T3) was gained over a known EM target. Drilling has shown the target to be a series of steeply dipping graphitic bands of a total breadth of approximately 50 meters, under 42 meters of conductive overburden.

Both GENIE profiles show a consistent offset due to the conductive overburden. From the profiles, positive offsets of 4% (1012.5/112.5) and 17% (3037.5/112.5) are seen.

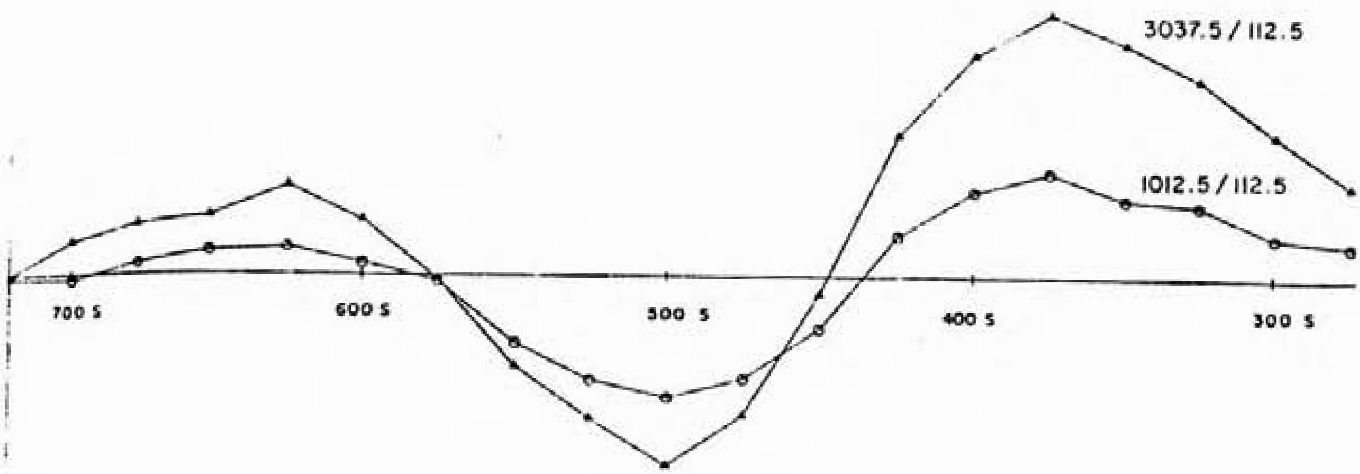
Figures 42 and 43 may be used in an attempt to interpret conductivity and thickness of an overburden layer. In essence, one is looking for a solution which gives the response levels seen at both frequency pairs. Using Figure 42, we draw a line parallel to the x-axis and intersecting the y-axis at 4%. At each point

Figure T2 : SE - 88 GENIE PROFILE

LEGEND : HORIZONTAL SCALE : 1:2500

VERTICAL SCALE : 1cm = 5%

COIL SEPARATION : 150 meters



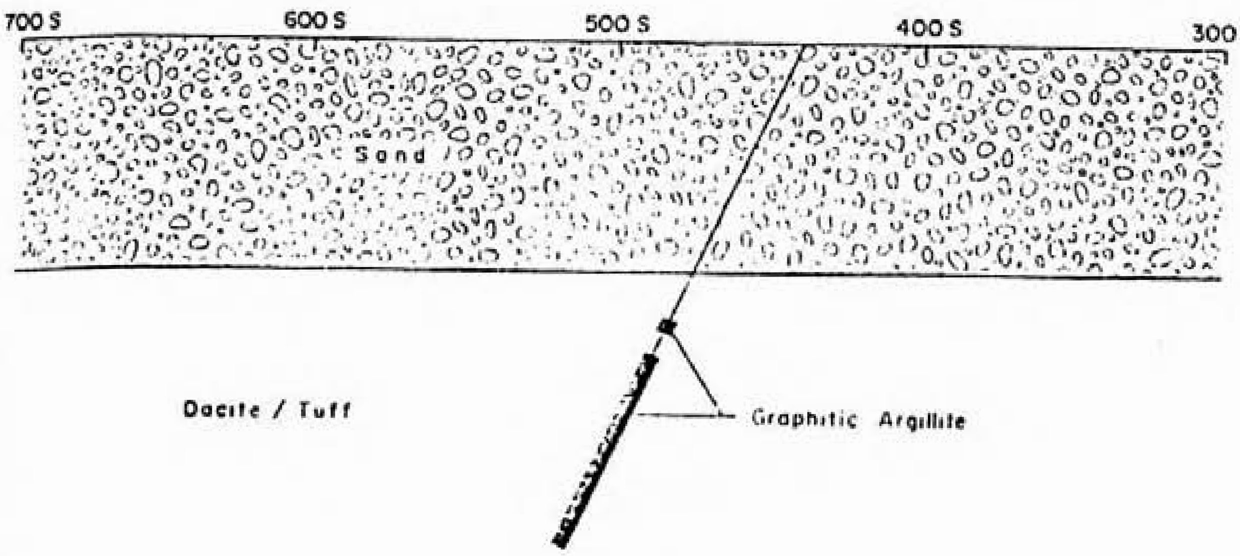


Figure T3 : SE - 88 GENIE PROFILE

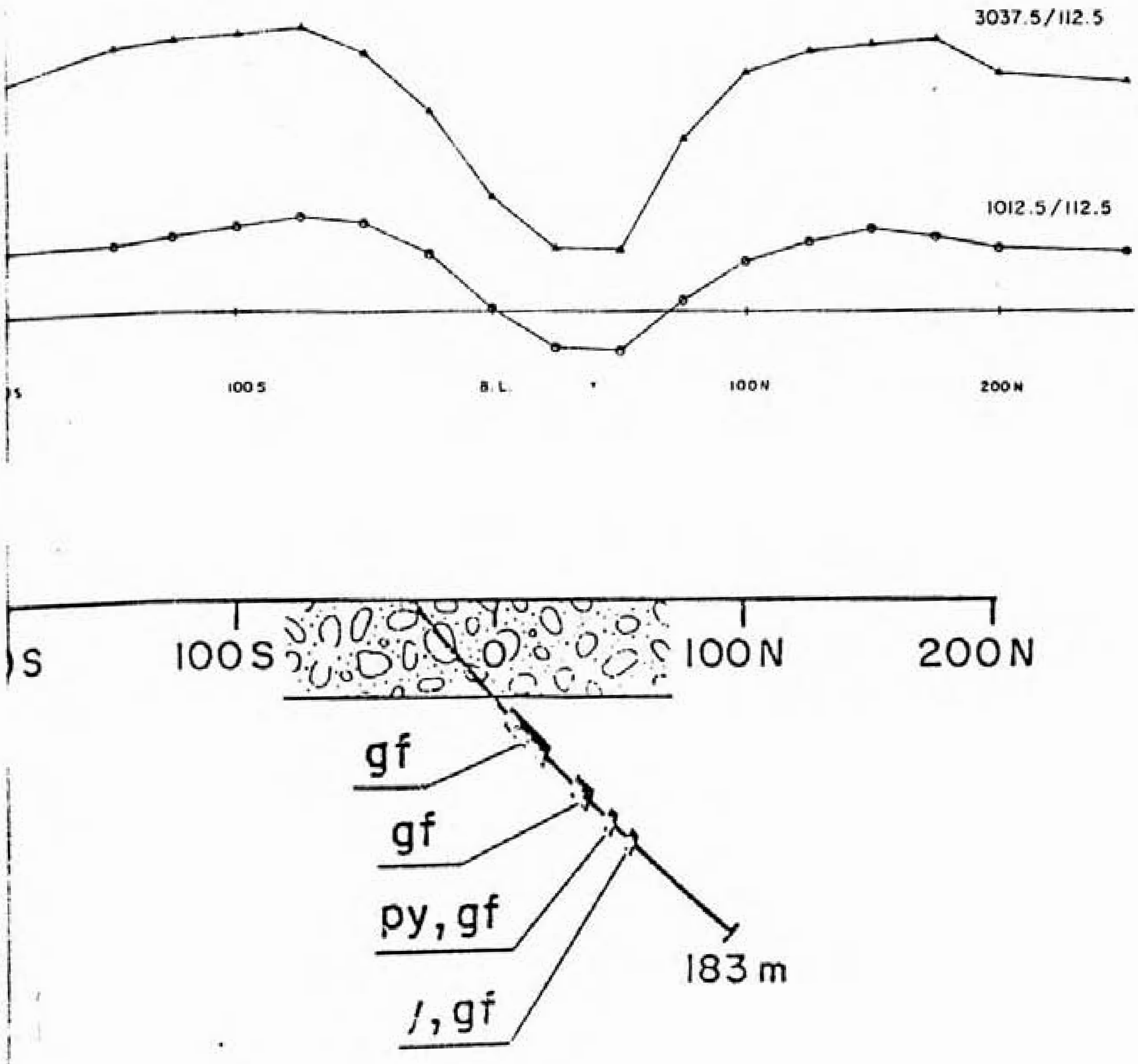
LEGEND : HORIZONTAL SCALE : 1:2500

VERTICAL SCALE : 1 cm = 5%

COIL SEPARATION : 100 meters

gf - graphytic argillite

py - pyritic argillite



where this line intercepts the h/L curves, a vertical line is drawn. This same line (for the correct solution) should go through a similar intercept in Figure 43. This exercise shows good agreement for the solutions (h/L = 0.5, σL^2 = 130) and (h/L = 0.25, σL^2 = 250). The agreements for (h/L = 2.0, σL^2 = 67), (h/L = 0.125, σL^2 = 480) and (h/L = 0.0625, σL^2 = 1000) are almost as good. Although there is some preference for h/L of approximately 0.375 and a σL^2 of approximately 190, it is clear that only σhL is reasonably well determined at 62.5.

Using our preferred estimates, an overburden layer of 37.5 meters thickness and a conductivity of 0.019 Siemens or a resistivity of 52 ohm-meters is interpreted. Drilling established the overburden as being 42 meters thick.

Although the interpreted value of thickness was reasonably close to the actual value, the procedure is not recommended. The instabilities in the inversion could best be overcome by data at more frequencies or coil separations or both. Given the limited range of frequencies, geometric soundings are expected to be the better approach in most cases.

Subtracting the responses due to a conductive layer, the anomaly has the following diagnostic amplitudes.

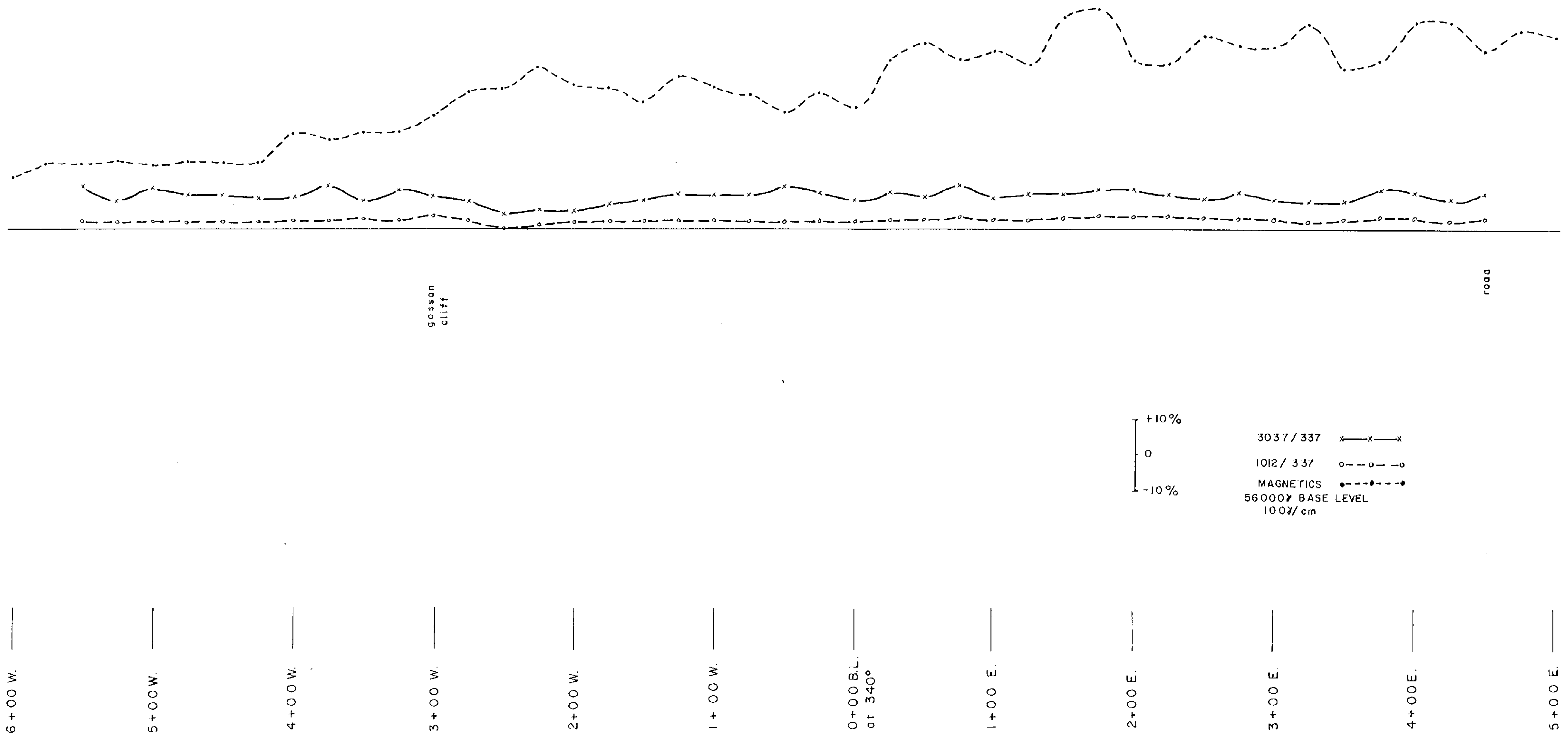
Frequency Pair	Left Pos. Peak (%)	Right Pos. Peak (%)	Ratio	Negative Peak (%)
1012.5/112.5	+3.4	+2.4	1.5	-7.0
3037.5/112.5	+5.4	+4.0	1.3	-12.5

Dip Determination: There is no obvious fit of the ratios of positive peaks to curves shown in Figures 44A, 44B and 44C. There is some preference for a dip of 60 degrees or greater. The positive peak amplitudes are not large, however, and their ratio consequently unstable. In the absence of evidence to the contrary, a dip of 90° is assumed.

Depth Determination: Figure 45 suggests an L/h of 3.05 (Dip = 90°) or 2.95 (Dip = 60°). Assuming an average L/h of 3.0, the interpreted depth of burial is (100/3=) 33 meters.

Conductance Determination: The ratio of negative peak amplitudes (R_M/R_H) is 0.55. From Figure 46B, a σtL value of 900 is suggested. This gives an interpreted conductance of 9 Siemens.

Given the thick layer of conductive cover and the banded nature of the conductor, the interpretation scheme has yielded at least reasonable estimates of the primary model parameters.



0 100 200 metres
Scale 1:2500

SELCO INC. EXPLORATION WESTERN CANADA

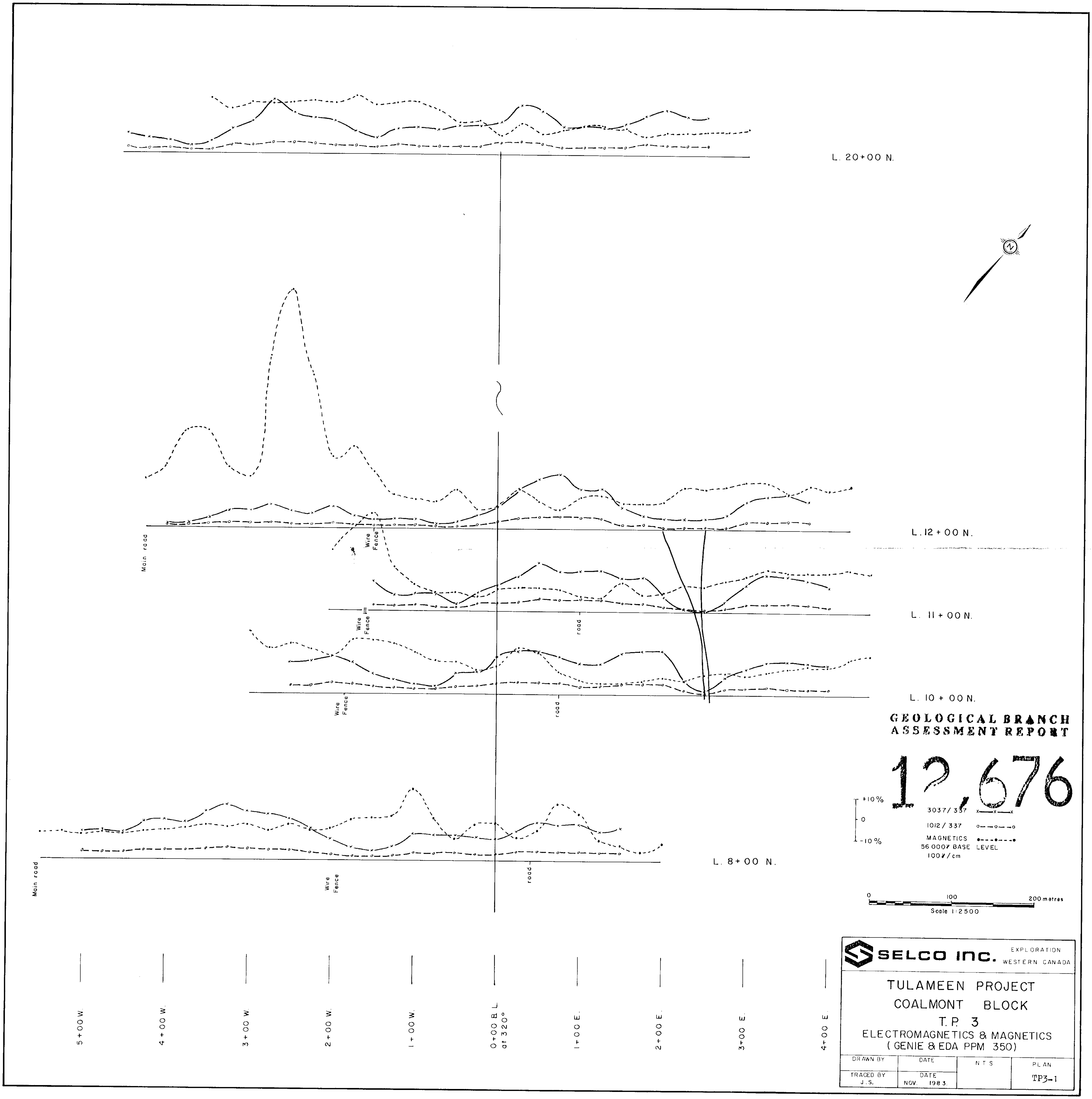
TULAMEEN PROJECT

COALMONT BLOCK

T.P. 2

ELECTROMAGNETICS & MAGNETICS
(GENIE & PPM 350)

DRAWN BY	DATE	N.T.S.	PLAN
TRACED BY J.S.	DATE NOV. 1983		TP2-1



L. 20+00 N.
L. 12+00 N.
L. 11+00 N.
L. 10+00 N.
L. 8+00 N.
Main road
Wire Fence
road
GEOLOGICAL BRANCH
ASSESSMENT REPORT
12,676
+10%
0
-10%
3037/337
1012/337
MAGNETICS
56 000γ BASE LEVEL
100γ/cm
0
100
200 metres
Scale 1:2500
5+00 W.
4+00 W.
3+00 W.
2+00 W.
1+00 W.
0+00 B.L. at 320°
1+00 E.
2+00 E.
3+00 E.
4+00 E.
SELCO INC.
EXPLORATION
WESTERN CANADA
TULAMEEN PROJECT
COALMONT BLOCK
T.P. 3
ELECTROMAGNETICS & MAGNETICS
(GENIE & EDA PPM 350)
DRAWN BY
DATE
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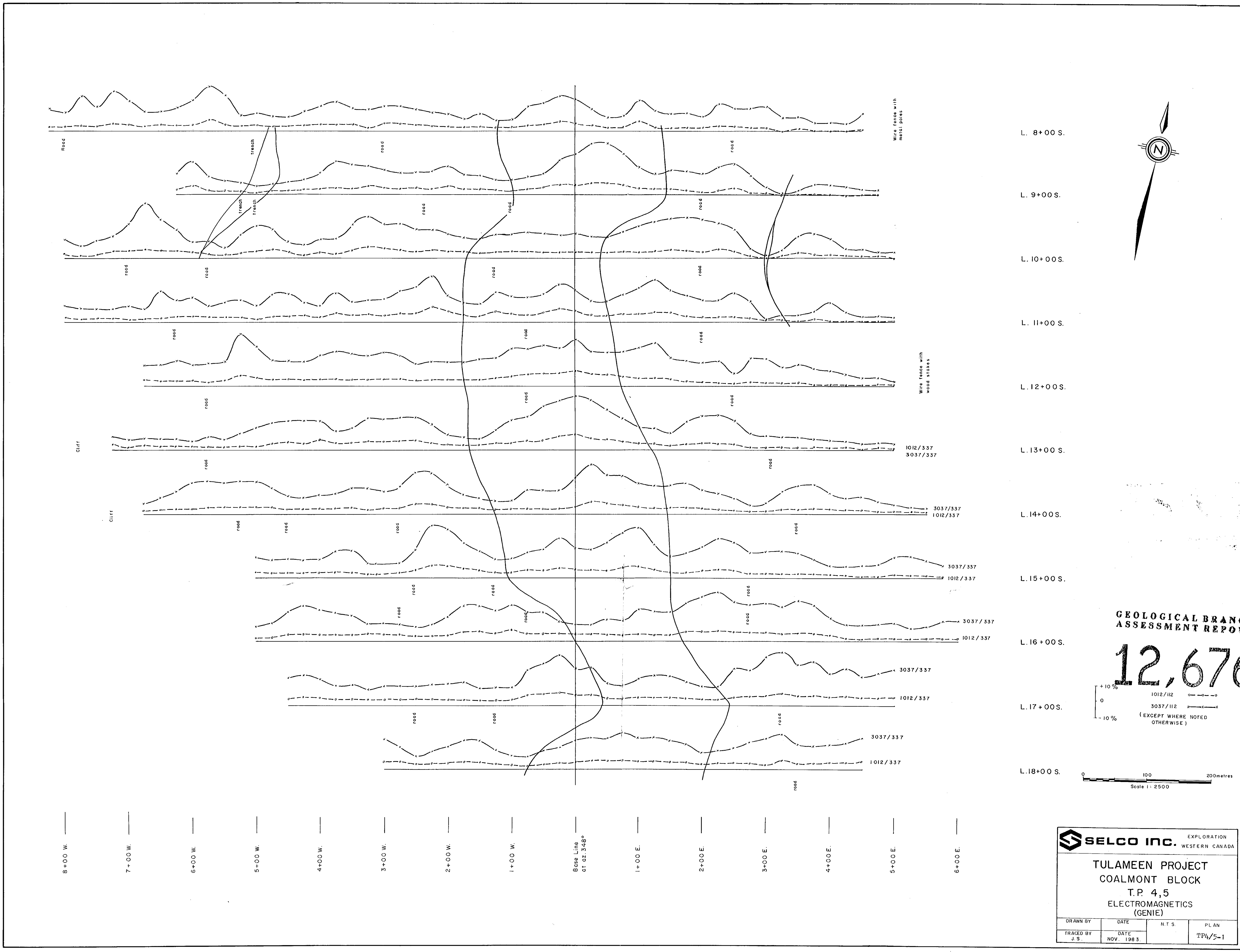
PLAN
TRACED BY
J.S.
DATE
NOV. 1983.
TP3-1



SELCO INC. EXPLORATION WESTERN CANADA

TULAMEEN PROJECT
COALMONT BLOCK
T.P. 4,5
ELECTROMAGNETICS
(GENIE)

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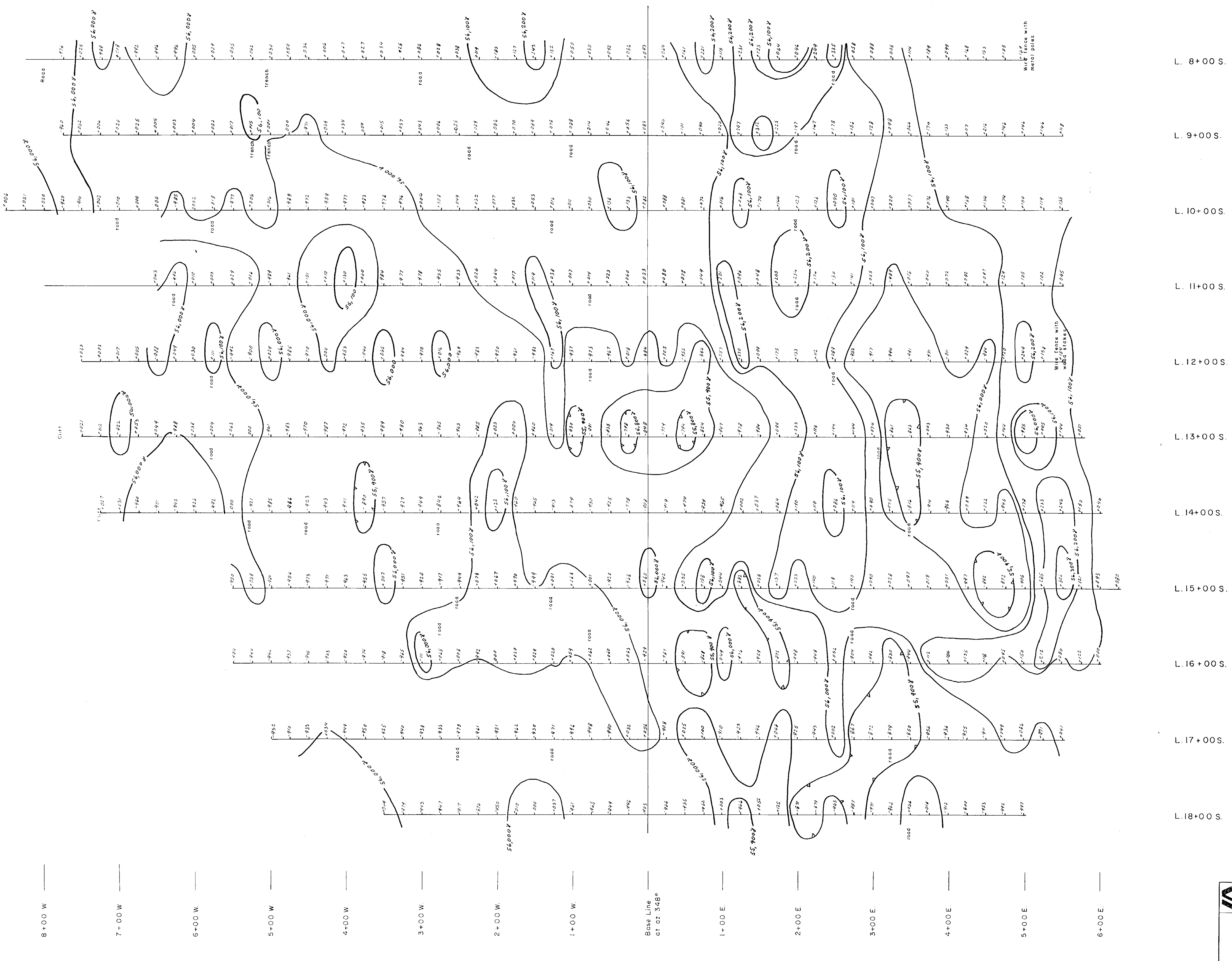
TRACED BY J.S.	DATE NOV. 1983.		TP4/5-1



GEOLOGICAL BRANCH
ASSESSMENT REPORT

12,676

Contour interval 100 GAMMAS
Base level 56,000 GAMMAS

0 100 200 metres
Scale 1:2500

SELCO INC. EXPLORATION WESTERN CANADA

TULAMEEN PROJECT
COALMONT BLOCK
T.P. 4,5
MAGNETICS (LEDA PPM 350)

DRAWN BY	DATE	N.T.S.	PLAN
TRACED BY J.S.	DATE NOV 1983		TP4/5-2