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EXPLORATION LICENCE 34/86 - GLADSTONE

ANNUAL REPORT : YEAR 1

29th January, 1987 - 28th January, 1988

<b>MINES</b>	
Ref.	<b>EL34/86</b>
	<b>-4 JAN 1988</b>
Ref.	
Officer	Initials
<b>LETTER</b>	
<b>23.12.87</b>	
<b>REFERS.</b>	

VOLUME 1 (OF 3)

88-2762  
Vol 1/3

K. C. MORRISON

J. K. DAVIDSON

23rd December, 1987.

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Note: Filed in vertiplan at 88-2762-

- a) Reproducible sepias of each of the five 1:25,000 maps contained in App 2
- b) Three sepias at 1:50,000 of the total magnetic field, magnetic vertical gradient and total radiometric count
- c) Coloured 1:25,000 maps of the total magnetic field, magnetic vertical gradient & total radiometric count.

ENCLOSURE

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Records until transfer to O/F  
Format for tape attached  
at back.

#### TENEMENT INFORMATION

EL 34/86 is a 97 km<sup>2</sup> tenement in the Gladstone area, NE Tasmania (Fig. 1). The licence was granted on the 26th January, 1987 for a licence year covering the period 29th January, 1987 to 28th January, 1988.

The licence is owned 100% by Placeco Australia Pty. Ltd. On 6th January, 1987 Placeco entered an agreement with Bass Strait Oil and Gas (Holdings) N.L. whereby Bass acquired from Placeco a first right of refusal to enter into a joint venture to explore EL 34/86. On 11th February, 1987 this option was exercised. Bass can earn a 20% interest in the licence by expending \$75 000 on exploration prior to 28th January, 1988 and can earn an additional 30% interest in the licence by expending a further \$200 000 on exploration within the licence area before 28th January, 1990.

Twelve current Mineral Leases are wholly or partially enclosed by EL 34/86. These tenements are shown on the 1:25 000 base map in Appendix 1.

#### EXPLORATION PHILOSOPHY AND OBJECTIVES

The primary objective is to explore for open cuttable gold and silver mineralisation in quartz veins, stockworks and in the country rock. Such mineralisation is known to exist around previously worked areas, and may also exist as blind virgin deposits beneath the surficial cover. The exploration philosophy and method in this area is based on the fact that the several known gold occurrences are adjacent to or covered by a veneer of Quaternary sand and that airborne geophysics and satellite photography have potential to sense structural trends extending from known mineralisation, under this surficial cover. Correct analysis of the structural leads gained from these data should detect mineralised ground as there is a clear structural influence in the location of known deposits.

#### SUMMARY OF WORK COMPLETED IN YEAR 1

A detailed regional magnetic and radiometric survey was flown over the EL. This survey resolved some structural trends within the Mathinna Group metasediments and the Devonian granitoids and defined boundaries of some of the rock units in the survey area. Significant variation in the magnetic properties of the Mathinna Group was demonstrated. A data base of magnetic and radiometric properties and structural trends over areas of known gold mineralisation has been established. This work will continue in EL 34/86 and other tenements held by Placeco Australia Pty. Ltd. over the Mathinna Group gold province.

A grid encompassing the old Portland mine was chosen for the testing of various exploration methods. Magnetic, self potential and resistivity surveys, supported by magnetic susceptibility measurements of rocks on the mine dump, suggested that at least magnetics and self potential respond to changes in lithology and perhaps quartz-hosted mineralisation. There is evidence that lithological layering and/or structural linears in the rock also produce responses. A soil survey of the upper B

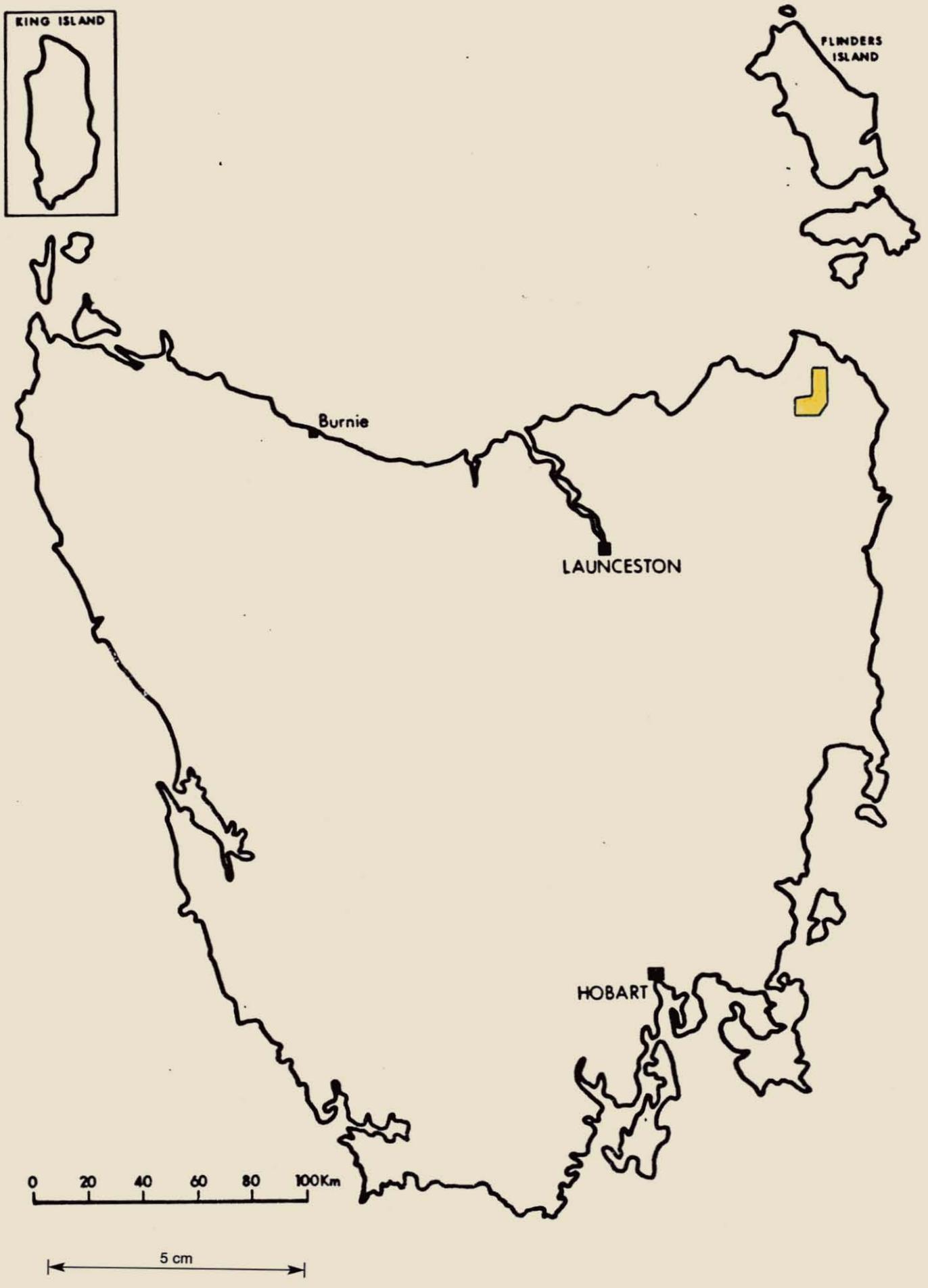


Figure 1. EL 34/86 Location map.

horizon over the same grid as the geophysics produce a strong arsenic anomaly and moderate lead, zinc and gold anomalies and no significant anomalies for copper and silver.

The data obtained from the Portland mine surveys will be correlated with the results obtained from a series of trenches to be excavated into bedrock during Year 2.

Selected samples of ore-bearing quartz from the Portland mine, and the Bluebell mine further north, were sectioned and examined by reflected light microscopy. Arsenic, iron, copper, lead and zinc sulphides, plus gold were identified. There is textural evidence for at least two episodes of mineral deposition and a third, weathering event which has apparently mobilised and redeposited some of the gold.

#### REGIONAL SURVEYS

During the period 18th June, 1987 an airborne magnetic and radiometric survey was flown over the EL by geophysical contractors Austirex International Ltd. A total of 1606 line km was flown at a mean terrain clearance of 60 metres. EW lines were spaced at 125 metres, and NS tie lines spaced at 1000 metres. The survey recorded magnetic field readings at a sensitivity of 0.1 nano Teslas at a 0.2 second reading interval and gamma radiation at energy levels corresponding to Uranium-238, Thorium-232 and Potassium-40. The survey base station was located at the St Helens' airstrip from which the survey was flown.

The Austirex logistics report, together with a data acquisition report by geophysical consultant Dr D. E. Leaman, is enclosed as Appendix 2.

The principal aim of the survey was to seek evidence that the known ore-bodies in the area have a lithological and/or structural signature which can be recognised by detailed high resolution surveys such as the ones flown. An additional aim was to resolve some of the structural geology problems of the area as clearly the origin, and possibly the present day distribution, of quartz vein gold deposits in NE Tasmania is at least partly structurally controlled. A large proportion of El 34/86, and other gold-prospective parts of NE Tasmania, is covered by Quaternary sand and any regional technique which can demonstrate a geological control of mineralisation has a potential for discovering blind ore bodies.

Preliminary results of the survey, with some interpretation, are covered in detail in Appendix 2. The Appendix includes magnetic profiles and maps of the flight path, magnetic profiles, total magnetic field contours, magnetic gradient contours and total count radiometric contours. The main preliminary findings and conclusions from this survey to date are as follows:-

- 1) Within the Mathinna Group there are clearly recognisable relatively magnetic and relatively non magnetic units. The magnetic properties and their contrasts persist through areas of thermal metamorphic aureoles and appear to reflect either inherent differences in lithology, within the Mathinna Group, or variations in regional metamorphism and its effect on magnetism.
- 2) The magnetic response of both the Devonian granites and granodiorites is bland and shows a surprising lack of magnetic contrast between the two lithologies. The Devonian dolerites are reverse magnetised and generate surprisingly low responses. Within the granitic bodies there are several linear, anomalously high magnetic features which are discordant to the pluton margins. The origin of these features has not yet been explained.
- 3) Several linear trends are evident in the magnetic field. The general grain of the more magnetic Mathinna Beds is a little E of N, whereas there is a more NE trending texture within the granodiorites. In some granites W of the area, there is probably a NW trending grain. In the central part of the area there is clear evidence of structural dislocation and the relative dating of the sequence of events may prove to be the key to understanding the origin of the mineralisation. The magnetic data also suggests that the Mathinna Group rocks may be tightly folded.
- 4) Several of the major radiometric features reflect drainage systems. The most obvious of these follows a portion of the Musselroe River
- 5) Radiometrics proved more effective than magnetics for mapping pluton boundaries and for differentiating granites from granodiorites.
- 6) Several trends are recognised within the radiometrics, the most prominent being a string of radiometric highs trending WNW through the approximate location of the Portland mine.
- 7) There is no immediate discernable response pattern or signature for the mineralised areas, either within the more magnetic part of the Mathinna Beds (eg. Portland mine) or within the metamorphic halo around the Mt Cameron granites (eg. Fly By Night Creek mines ). It is possible, but not yet properly tested, that the magnetics and radiometrics can identify structures which control mineralisation. The Portland mine is located on a subsidiary NW magnetic trend and may also be associated with the WNW radiometric trend. The Bluebell and Great Musselroe reefs lie in magnetic low areas and may be locally close to E-W divergences as at Portland. There are radiometric anomalies associated with Bluebell and Musselroe but more work is required to understand the relationships. The mines in the Gladstone area lie in a region where both magnetics and radiometrics are near background once the effects of buildings in Gladstone have been removed.

### SPECIFIC SURVEYS

In order to relate the regional geophysics to the geology of mineralised zones it was decided to systematically treat one of the old mining areas to several exploration methods and thereby define the local response from a known ore body. The old Portland mine, located some 7 km NE of Gladstone, was worked intermittently between approximately 1880 and 1910 and, according to the old reports, the ore body was contained in a single vein. Substantial workings, comprising a 65m deep main shaft, three main drives and a number of winzes and sublevel stopes, were excavated. At the main site a large mullock heap and tailings, apparently produced by some form of chemical leaching, are clearly visible today so the fact that Portland was demonstrably a significant occurrence of mineralisation, as well as being located on flat homogeneous terrain, made it an ideal site for a detailed prospect scale study.

A 25m grid with a 400m base line and 200m cross lines was pegged over the site. The grid has a base line orientation of N-S magnetic and the cross lines trend E-W magnetic (Fig. 2 and Appendix 3). Magnetic, self potential and resistivity surveys and a soil geochemistry survey have been completed on the grid. A series of excavator trenches to bedrock, with continuous mapping, sampling and assaying, is planned during Year 2 to complete Stage 1 of the Portland study.

#### 1. PORTLAND GEOPHYSICS

The results of the magnetics, self potential and resistivity surveys at Portland are described in detail in a report by Dr D. Leaman, enclosed as Appendix 4. A summary of the procedure and findings follows:-

##### a) Magnetism

The survey was conducted by two people using a proton magnetometer (Fig. 3), at 2.5m intervals along the grid base line and lines 150, 200, 225, 250, 274, 300 and 350 N. Adjustments were made for loop closure discrepancies and for diurnal variation. Magnetic susceptibility measurements were made on the various lithologies exposed on the mullock dump and these data were compared to the response from the magnetometer survey.

The Mathinna Group around the Portland mine is slightly and variably magnetic, adequately so to map magnetic units and trends. The general orientation of mappable trends and the local magnetic contrast correlates well with the pattern produced by the airborne survey over the Portland area. There is a possible correlation between local spike anomalies and quartz veins, these spikes trend NW. The reliability of this association will be demonstrated by the proposed trenching programme.

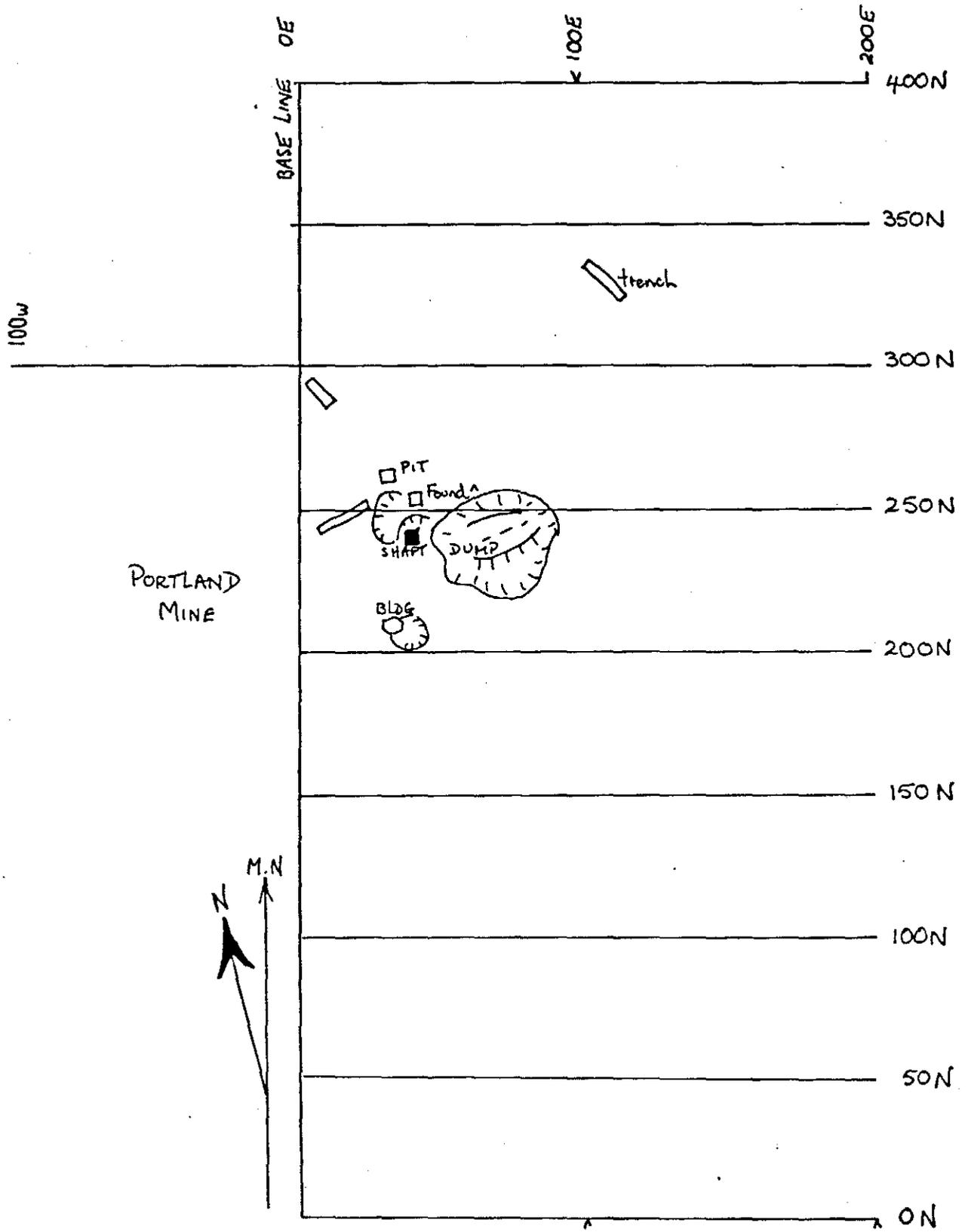


Figure 2. Portland mine grid.

In some cases at least, the magnetic spikes coincide with ferruginous hard pan layers in the soil profile. These were encountered in test holes dug on magnetic spike anomaly sites and by augering during the soil survey. At this stage it is not clear whether these hard pans in turn coincide with features in the underlying bedrock (and therefore possibly coincide with quartz veins).



Figure 3. Photograph of magnetometer survey, old Portland mine.

b) Self Potential

SP readings were taken at 10m intervals on the base line, on cross lines 150, 200, 250, 300, 350 and 400 N and along several traverses parallel to the base line. All values were referred to a fixed base point in approximately the centre of the grid. The total variation in response ranged over 40 millivolts. A contour map of self potential voltages (Fig. 26 in Appendix 4) shows a NW trend consistent in general with the magnetics. In detail the positive SP responses are offset from the more positive magnetic responses. Although SP appears to be less diagnostic of patterns in the Mathinna Group than does the magnetics, there is evidence that voltage cells may be generated along linear zones which may represent fractures or veins.

c) Resistivity

Four lines were traversed using a gradient array with a current electrode separation of 400m and a potential electrode separation

of 20m. The lines traversed were 175, 200, 225 and 275 N. The array was designed to ensure an effective penetration of at least 25m and typical resistivities encountered were of the order of 170 ohm.m (equivalent to about 40m penetration). Average water table depth is interpreted to be about 30cm.

The resistivity proved to be more ambiguous than the other methods. However, a crude inverse relationship with the magnetic data is suggested. A general increase in resistivity towards the old mine was recorded. This may reflect a zone of silification of the country rock adjacent to the main quartz vein, or it may be indicating lithological change within the Mathinna Beds. The overall pattern of results indicates that the more magnetic mudstones are more conductive than the sandstones and siltstones.



Figure 4. Photograph of resistivity survey, old Portland mine.

## 2. PORTLAND SOIL SURVEY

A soil sampling survey was conducted on the Portland grid to record the concentration and dispersion of precious and possible indicator metals about a known ore body. Aufer samples (Fig. 5) were taken every 25m on all lines producing a total of 151 samples.

The top 30-40cm was sampled and bagged. The soil was usually a bleached sandy loam, but in places the samples were enriched in black clay and organic matter or ferruginous cement. Test holes dug on the sites of magnetic spike anomalies exposed a deep soil profile and indicated that the samples taken in the soil survey were probably from the "upper B horizon" of a podzolic profile.



Figure 5. Photograph of soil survey, old Portland mine.

The bagged and labelled samples were packed and sent to Analabs, Burnie for analysis. The samples were dried, crushed, split and assayed for Cu, Pb, Zn, Ag, As and Au using the following methods.

Element	Assay Method	Detection Limit
Cu	Perchloric acid digestion - A.A.S.	1 ppm
Pb	Perchloric acid digestion - A.A.S.	1 ppm
Zn	Perchloric acid digestion - A.A.S.	1 ppm
Ag	Perchloric acid digestion - A.A.S.	0.1 ppm
As	Vapour generation - A.A.S.	1 ppm
Au	Fire assay fusion - A.A.S.	0.008ppm
Au	Aqua regia - A.A.S.	0.01 ppm

The contour maps of the soil geochemistry, together with the assay data sheets are enclosed as Appendix 5.

The contour map shows that arsenic proved to be a strong and clear indicator of mineralisation. This is consistent with the fact that arsenopyrite is the most abundant ore mineral at Portland and, according to the literature, at probably all other gold mines in the Mathinna Group gold province. Arsenic values in the soil at Portland ranged from one to 690ppm with  $\leq 10$ ppm appearing to represent background. The contour map shows a fairly symmetrical distribution of values about a centre located some 50m NW of the old shaft. The symmetry is moderately distorted by lobes containing values in the range of 20-70ppm, extending NE, E and SE from the main anomaly.

In addition to the main anomaly over the old workings, there are two discrete zones of elevated arsenic values to the south. These zones are elongated N-S and encompass values ranging from 10-30ppm

The trenching programme will be designed to discover whether the anomalies represent dispersion halos from underlying mineralised rock,

- a) of varying grade,
- b) comprising a number of units,
- or c) whether they are fragments of a single original dispersion halo which has been dissected by geomorphic processes.

The lead contour map shows a similar but less striking pattern to that of arsenic. Lead values range from  $\leq 1$  to 94ppm, with an anomaly centered some 20m NW of the old shaft. If values of  $\leq 20$ ppm are taken as anomalous then the contours indicate an arrow-shaped anomalous zone with the "barbs" of the arrow trending NE and SE from the centre. This is similar to the NE and SE extension from the principal arsenic high.

Zinc values range from 4 to 94ppm and the contour map shows an anomaly centre located some 60m NE of the shaft. There is less of an abrupt boundary between background and anomaly than is the case with arsenic and lead. However, a central area containing values 40ppm trends NNE over the old workings. Subtle anomalies again occur as discrete zones S of the main anomaly but are offset N off the two southerly arsenic anomalies. There is also a prominent anomaly on the southern margin of the grid.

Gold values range from 0.008 to 0.11ppm for the several fire assay checks. Again an anomalous zone, defined by values up to 0.05ppm, sits over the workings. The trend of the gold anomaly is NW-SE with hints of lobes to the NE and SE.

Silver and copper show no discrete soil anomalies with the values ranging from  $\leq 0.1$  to 0.8ppm for silver and from 1 to 25ppm for copper. Both elements are slightly and consistently higher in the northern half of the grid and, to that extent, coincide with the main anomalous area of the other elements. Also, silver is very slightly raised over the area of the southern arsenic anomalies.

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In summary, the soil chemistry of arsenic in particular and lead, zinc and gold to a lesser degree, proved to be a clear indicator of underlying mineralisation at Portland. Slight differences in the locations of anomaly centres may be due to the differences in mobility of the metals. It is interesting to speculate that the anomalous northern half of the soil sampling grid coincides with a total count radiometric high (see Appendix 3) This might be more than coincidence as both exploration methods are "seeing" the top 50cm of section. This coincidence will be checked in Year 2 as it could provide a direct link between the regional and small scale exploration.

### 3. ORE PETROGRAPHY

Hand-picked specimens of mineralised vein quartz were collected from dumps at the Bluebell and Portland mines and submitted to the petrology laboratory, Geology Department, University of Tasmania for microscopic examination. Two reports on the description of these samples are enclosed as Appendix 6.

The rocks were sawn into slabs, soaked in Araldite to inhibit crumbling, then polished. The polished sections were examined by reflected light microscopy.

Arsenopyrite is by far the most common mineral and ranges in form from pristine euhedral to deeply corroded skeletal. Other sulphides combined, account for 10% of the area covered by arsenopyrite. The other sulphide minerals recognised, in no clear order of abundance, were galena, sphalerite, pyrite, covellite, chalcopyrite and bornite.

Gold occurs in several associations. In the Portland sample, gold was seen as discrete 0.1mm rounded grains within and close to the boundaries of euhedral galena. It also occurs in association with iron hydroxides in weathered cavities within arsenopyrite grains. In the samples from the Bluebell mine gold in bornite composite grains were recognised in very small (0.05mm) ovoid bodies within quartz grains. Similar bodies appear as exsolution grains in the arsenopyrite.

Texturally, there appear to be two cycles of sulphide and gold mineralisation. In addition, gold and iron hydroxides have been deposited during weathering under oxidising conditions.

### CONCLUSIONS AND RECOMMENDATIONS

1. Airborne magnetics and radiometrics have indicated some important structural trends within the Mathinna Group and the granitic rocks. Units of significantly differing magnetic properties exist within the Mathinna Group, independent of the thermal metamorphism halos around the granites. As yet no direct relationship between known ore bodies and radiometrics has been established. However, there are subtle linear

features trending close to the Portland and Bluebell mines which may prove to be related to structures controlling mineralisation.

2. The detailed ground geophysical surveys at the old Portland mine reproduced the general trends seen on the original data. No direct responses were confirmed from the Portland mineralisation, however, magnetics and self potential produced patterns which may be due to fracturing or weathering mineralisation associated with quartz veins.

3. The soil chemistry of arsenic in particular, and of zinc, lead and gold to lesser degrees, is a clear indicator of underlying mineralisation at Portland. If the arsenic dispersion halo at Portland is typical of others in the region then this method will be a successful exploration tool.

4. A series of trenches into bedrock on the Portland grid is required to complete the study and allow more definitive interpretation of data from the other Portland surveys.

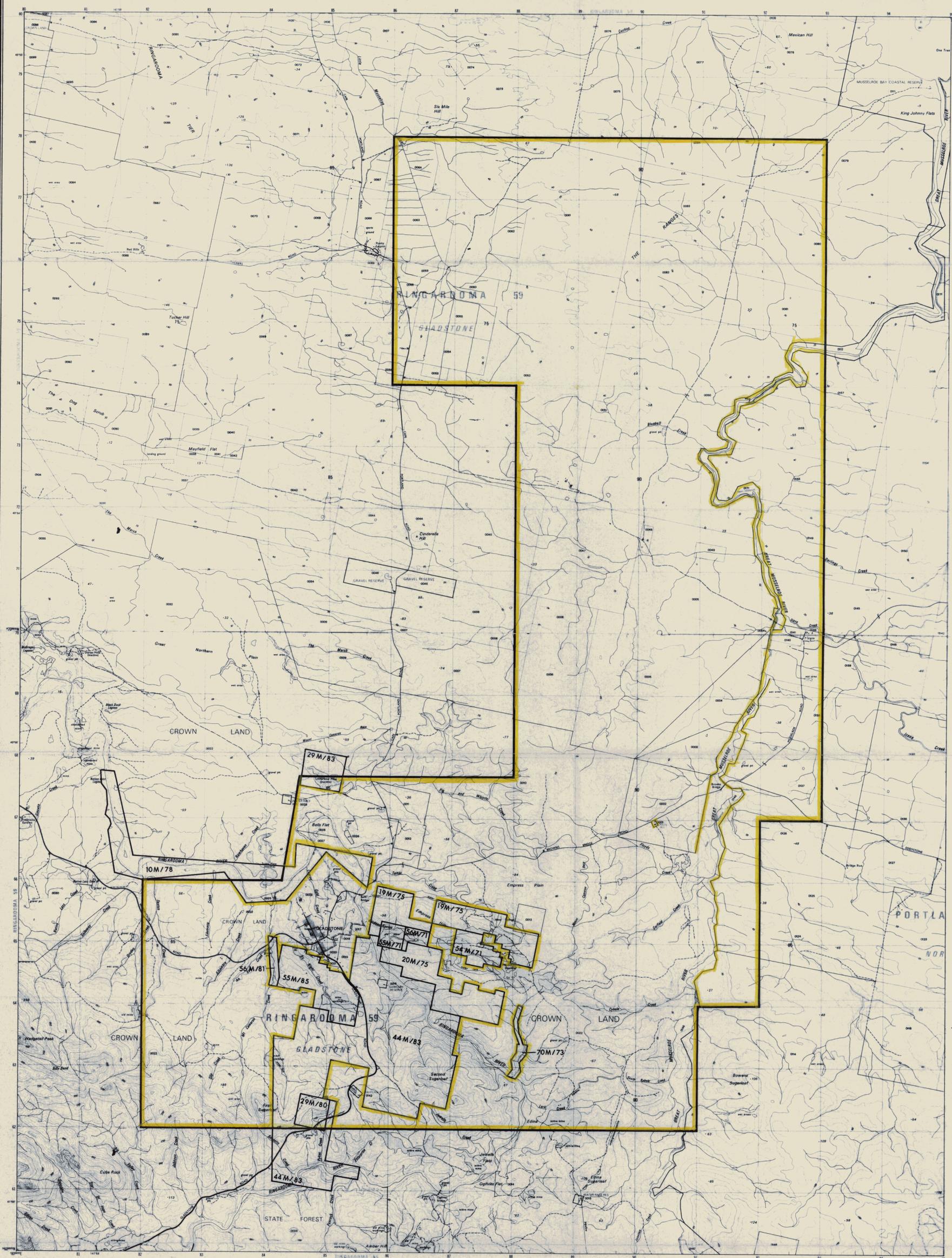
#### PROPOSED FUTURE EXPLORATION

Early in Year 2, Stage 1 of the Portland study will be completed by excavating several trenches along grid lines and continuously mapping, assaying and measuring geophysical properties of the bedrock.

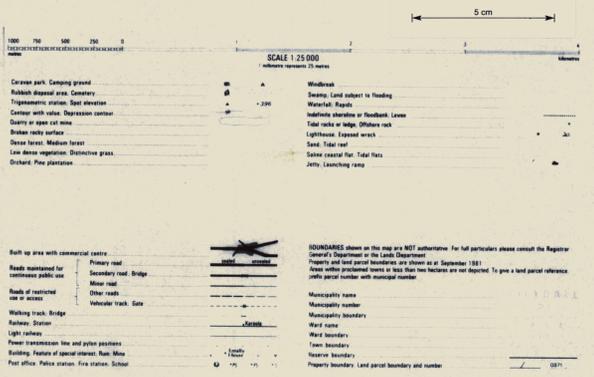
These data will confirm the location of the quartz veins and show the distribution of the different host rock lithologies, and most importantly the distribution of mineralisation in the rocks. At the completion of Stage 1 the usefulness of the geophysical and geochemical techniques already tested at Portland can be critically evaluated. This information is also important to the application of the airborne magnetics and radiometrics as a regional tool for focussing on prospect sized targets.

The aeromagnetic and radiometric data will be studied further from a structural view point and a detailed analysis is anticipated late in 1988 after interfacing with the Mines Department personnel familiar with the better Mathinna Groups structural outcrops.

The other major project in Year 2 is to thoroughly sample areas of reported stockwork systems and mineralised country rock adjacent to the major mineralised quartz veins. This is in the line with the Company's major aims at Gladstone which is to explore for potentially open cuttable gold mineralisation.

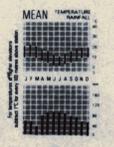


**LEGEND**



**MINING LEASES — EL 34/86**

ML No.	Owner	Address	Mineral	Area (ha)
26M/62 (now 56M/81)	R.M. McCLELLAN	C/- BENNETT & WISE, 143 HAMPDEN RD, HOBART, TAS. 7000	ALLUVIAL TIN	8
54M/71	R.C. LAWRY	81 CECILEA ST, ST. HELENS, TAS. 7216	ALLUVIAL TIN	32
55M/71	C.W. HODGETTS	P.O. BOX 34, LAUNCESTON, TAS. 7250	ALLUVIAL TIN	17
56M/71	C.W. HODGETTS	P.O. BOX 34, LAUNCESTON, TAS. 7250	ALLUVIAL TIN	12
70M/73	R. J. MOORE	GLADSTONE, TAS. 7254	ALLUVIAL TIN	11
19M/75	B.M.I. MINING PTY LTD	P.O. BOX 42, WENTWORTHVILLE, N. S. W. 2145	ALLUVIAL TIN & ASSOCIATED MINERALS	123
20M/75	B.M.I. MINING PTY LTD	P.O. BOX 42, WENTWORTHVILLE, N. S. W. 2145	ALLUVIAL TIN & ASSOCIATED MINERALS	100
10M/78	TRIAKO MINES NL and BUKU MINERALS NL	3rd FLOOR, 86 MURRAY ST, HOBART, TAS. 7000	ALLUVIAL TIN	205
29M/80	TRIAKO MINES NL and BUKA MINERALS NL	3rd FLOOR, 86 MURRAY ST, HOBART, TAS. 7000	ALLUVIAL TIN	25
29M/83	AUSTRALIAN ANGLO- AMERICAN PROSPECTING PTY LTD	121 KING STREET MELBOURNE, VIC. 3000	ALLUVIAL TIN	30
44M/83	SANTOS LTD	P.O. BOX 2319 ADELAIDE, S. AUST. 5001	ALLUVIAL MINERALS	637
55M/85	HELLYER MINING & EXPLORATION PTY LTD	P.O. BOX 2319 ADELAIDE, S. AUST. 5001	ALLUVIAL TIN AND GOLD	94
<b>TOTAL</b>				<b>1294</b>



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87-2762

**PETRECON AUSTRALIA PTY. LTD.**

**PLACECO AUSTRALIA PTY LTD**

<b>EL 34/86 AND ADJOINING MINERAL LEASES (COMPETITOR)</b>		No.	34/86-1
		DATE	SEPT. 1987
		COMPILED	W.C.C.
		DRAWN	J.M.T.

TO ACCOMPANY: YEAR 1 ANNUAL REPORT — *Appendix 1*

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827018

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## ACQUISITION REPORT

AIRBORNE GEOPHYSICAL SURVEYS  
EL 34/86 GLADSTONE

for  
PLACECO AUSTRALIA PTY LTD

by  
DR. D.E. LEAMAN

September 1987

GLADMAG1

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FIGURES

1. Location map showing licence area
2. Analog records, line 110
3. Analog records, line 137
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6. Northern region: geology and aeromagnetics
7. Southern region: geology and aeromagnetics
8. Northern region: geology and radiometrics
9. Southern region: geology and radiometrics

MAPS (in pockets)

1. Flight path recovery map 1:25000
2. Stacked magnetic profiles 1:25000
3. Total field magnetic contours 1:25000
4. Vertical magnetic gradient contours 1:25000
5. Total count radiometric contours 1:25000

## SUMMARY

A detailed high resolution magnetic and radiometric survey of EL 34/86 in the Gladstone area north-east of Mt Cameron in far NE Tasmania has clearly resolved lithologic and structure continuity within the Mathinna Beds. The survey has demonstrated unambiguously that the Mathinna Beds can be separated into at least two categories magnetically - one of which contains distinctively magnetic lithologies - and that the local granites are internally structured and certainly not chemically or physically homogeneous.

Materials which might be expected to possess notable magnetic contrasts, e.g., Devonian dolerite, or to lack them, e.g., Quaternary deposits, display contrary responses.

Magnetic responses from the Mathinna Beds can be wholly explained by observed susceptibilities, probably induced by local metamorphic effects from exposed or concealed granitoid bodies, but the most significant results related to structural dislocation within members of the rock suite as well as across the entire unit. Appraisal and interpretation of the relationships and structural evolution implied will be reported separately but there can be little doubt that this survey marks the start of a quantum leap in the understanding of NE Tasmania in general and the Mathinna Beds in particular. For the first time intra formational structural texture, unit relationships and continuity have been displayed on a semi-regional scale in an area of little or no outcrop.

Although the preliminary study reported here has not resolved or accounted for all issues it seems likely that mineralisation is structurally controlled (whether tin or precious metals).

Appraisal of the magnetic data has been assisted by use of derivative methods since the variations in the magnetic field are generally subtle. Radiometric data add an important perspective enabling production of more refined geological maps.

Location of gold or silver mineralisation within the Mathinna Beds host rocks is the principal object of exploration in this area.

## INTRODUCTION

EL 34/86, Gladstone, is located in far NE Tasmania. The township of Gladstone is situated in the SW corner of the licence area (Figure 1).

In an endeavour to develop a technology for the evaluation of large areas and potentially deep mineralisation a high resolution magnetic survey was suggested by Leaman Geophysics. No survey with the proposed specifications had been attempted previously in Tasmania and the nature of the results could not be predicted. It was argued that the magnetic method essentially yields structural and lithological information and as quartz vein systems and mineralisation are presumably structurally controlled any magnetic response pattern could be useful - especially in the complex, highly disrupted and little understood Mathinna Beds. Any technique which could define structures and units within these very poorly exposed rocks must be prized.

Could magnetics be such a method? Its cheapness and ability to cover large areas are well known. But were usable contrasts present? Would old prospective areas be anomalous? Limited data collected by the writer nearly twenty years ago (first published in Leaman, 1973) suggested that the magnetic susceptibility of the Mathinna Beds is very low but non zero and may even contrast with various granitic rocks. How these observations would translate under survey conditions was not known. But, in view of these subtle indications, a very tight specification was prepared in order to provide a valid test of the method. The response around old old mining areas could not be predicted.

Apart from magnetics, only the gravity and seismic methods can be considered regional, structural tools. Neither of these methods could be expected to provide at low cost any detailed definition of the Mathinna Beds. Any structural use of the seismic method in such an area must be suspect but the gravity method may add important detail about granitic margins. Dolerite dykes, of presumed Devonian age, have been associated with many gold-producing areas. It was felt that any definition of these might offer clues to structural control.

Thus Placeco Australia Pty Ltd decided to risk its budget for the licence area in order to assess the simplest, direct method. Success would mean that other licence areas could be appraised similarly and rapidly.

This report outlines the specifications, observations and preliminary implications of the results. A complete interpretation of this survey will be reported separately.

The results presented include radiometric data. Acquisition of this data was not originally specified but it was fortunately (and accidentally) observed by the contractor. When analog records were supplied for review it became evident that this data might be of considerable interest. Recovery was requested.

## SPECIFICATION AND ACQUISITION DETAILS

Given the limited knowledge of rock properties and general view of the lithologies it was anticipated before the survey that responses would be subtle, perhaps very subtle. Any mineralisation response was also likely to be delicate and only observable within small areas should it be recognisable. Thus maintenance of very high resolution and close line spacings would be critical to any survey.

The area is of very low relief and a mean terrain clearance of 60 m was specified at 125 m line spacings. This was feasible in this area and, when coupled with a suitable magnetometer, would ensure high resolution. It was felt that experience might show that such close line spacings might not be needed but the initial survey could not presume this. A magnetometer with better than 0.5 nT resolution was required. Complete acquisition details as recorded by the contractor are provided in Appendix 1.

Although derivative treatments were not requested with the primary specification, since it was not known if there would be any usable responses, the contractor was subsequently asked to produce maps of the first vertical derivative (Map 4). Three procedures were evaluated and the optimum results assessed by Austirex and Leaman Geophysics prior to contouring. The aim was provision of profiles with minimal noise.

Radiometric data acquisition was also not specified originally, as noted in the Introduction, since the Mathinna Beds were the primary target. This data was, however, observed and subsequently recovered (refer to Appendix 1).

In order to assess comparative responses of Mathinna Beds east and west of the Musselroe River, the thermally metamorphosed zone mapped by Baillie (1984) and evaluate the effect of Devonian dolerite dykes a survey extension was flown, as a test strip, to the east of the licence area. The main survey and its extension were flown with identical line and tie line specifications.

All maps were to be presented at the highest possible resolution commensurate with the instrumentation used. In practice contour intervals of 2 nT, .01 nT/m and 50 counts per second have been used for maps of magnetic field, magnetic gradient and total count radiometrics.

## DISCUSSION OF RESULTS

The results of the survey have been presented in the form of five maps comprising flight path recovery (map 1), magnetic profiles (map 2), magnetic field (map 3), vertical magnetic gradient (map 4) and total count radiometrics (map 5).

This discussion does not constitute an interpretation of this data but is intended to provide an outline of issues which must be reviewed by, or included in, a comprehensive interpretation. All references to the geology of the area relate to the Eddystone map sheet (Baillie, 1984) or Groves et al (1977).

There are several reasons for the separation of acquisition details and comprehensive interpretation for this survey. The survey yielded impressive results and far more character, in terms of magnetic and radiometric response, than had been anticipated. It is also clear from cursory inspection that a complex structural texture and history is reflected in the distortions and disruptions of the lithological units so clearly outlined. These results may have important ramifications for further exploration and regional assessment which, in view of the nature of the results, will not be understood so soon after acquisition. This also reflects the original application and specification represented by this survey. As shown below the survey has raised a large number of geological issues, most of which can not be immediately explained by existing mapping or knowledge, and many imply a need for further field work and research.

The following notes outline response patterns and related geological issues as directly recognised. Each may form the basis for extended review. Refer to Figures 6 to 9.

- 1 The Mathinna Beds, or at least part of them, are usefully magnetic. Discrete units can be recognised and traced for up to 10 km. Test profile calculation shows that responses are consistent with the work of Leaman (1987) at the Portland Mine (see Figure 1). The magnetic field reflects changes between mudstone and siltstone/fine sandstone units bearing typical magnetic contrasts of no more than 0.00007 cgs and more usually 0.00004 cgs.
- 2 The magnetic properties of the Mathinna Beds persist through the mapped metamorphic halo north of Mt Cameron and Second Sugarloaf south of Gladstone, west of the northern end of the Gardens Pluton (granodiorite in the valley of the Musselroe River) and east of the Mt William Sheet and Ansons Bay Pluton but do not extend into the contact zone of the Rushy Lagoon or Mussel Roe Plutons. See Groves et al (1977) and Figures 4 and 5 for nomenclature.
- 3 The Mathinna Beds between the Mt William Sheet and the Musselroe River are relatively non magnetic. As it is not immediately obvious that this difference in character is due to greater burial of magnetic units, as represented in the

area between Gladstone and the Rushy Lagoon Pluton, a primary difference in overall composition, or some combination of these some review of wavelengths and amplitudes has been undertaken along representative profiles. This type of analysis, based on a relatively small sample of the second response class, is typically difficult. This proved to be the case here but some limits can be placed on the options listed. Comparative continuation analysis was relatively compelling in this case even though it is difficult to be certain that equivalent sections are being compared. No continuation could yield a match and any continuation over 250 m led to inappropriate amplitude - frequency relationships. There can be no doubt that these responses represent two distinct suites within the so-called Mathinna Beds. These may be due to, or represent, different levels of metamorphism or relative nearness of granitic rocks but not a single process or original unit.

The recognition of two suites raises the issue of relationship. Are they contemporaneous, overthrust, unconformable or dislocated parts of a normal trough sequence?

- 4 The magnetic character of the granites is variable, anomalous and not anticipated. Consider:
- a) At Second Sugarloaf, south of Gladstone, a narrow anomalous band of magnetic material occurs within the granite, transects mapped boundaries and is ultimately terminated by the presence of porphyritic muscovite adamellite. This material, including its contact zones, is non magnetic. See also west end of Rushy Lagoon Pluton.
  - b) A similar but more substantial magnetic feature extends across the margin of the Mt William Sheet into the Mathinna Beds (598500 mE, 5474000 mN).
  - c) Within the eastern part of the Rushy Lagoon Pluton (592000 mE, 5477000 mN) the magnetic texture is comparable with that of the magnetic Mathinna Beds. The effect is destroyed within a few hundred metres of the margin of the intrusion. The similar loss of character within the Mathinna Beds to the south of this same contact raises the possibility that the highest temperatures associated with this intrusion, and perhaps most complete digestion of country rock - if any occurred, was in this narrow E-W band at about 5475000 mN. Observations at the Portland Mine showed that intensely metamorphosed rocks were virtually non magnetic (Leaman, 1987).  
These comments would imply that relics of the intruded rocks remain within this pluton and that the observations noted in a) and b) similarly represent some preservation of original lithology and structure texture prior to intrusion.  
If high temperatures destroy the Mathinna contrast, where it exists, then only parts of the Rushy Lagoon Pluton and the porphyritic adamellite at Gladstone were able to achieve this result. The preservation of any texture implies intrusion by absorption or heterogeneous composition. The feature at the margin of the Mt William Sheet poses major problems for the second alternative at that site.
  - d) The magnetic character of the granodiorite is relatively

bland and yet its indicated susceptibility (see Leaman, 1973) is relatively high. It may be that these early results reflect a sampling bias from the Bridport area where much absorption and inclusion of country rocks may be observed. There is no obvious texture within the granodiorite of the Gardens Pluton in the SE of the licence area although there are some small features. The orientation of these is not consistent with any other patterns and all character extends into the contact zone.

All these observations show that there is much yet to be understood about the shape of the intrusions, their total volume, thermal history, uniformity of composition and alteration.

- 5 Granite boundary geometric effects may be implied near Gladstone and near the southern boundary of the Rushy Lagoon Pluton. No such effect can be determined in association with the granodiorite.
- 6 Many small spike or concentric features can be observed in the magnetic field contour map. The amplitude of these features is rarely more than 15 or 20 nT. Several are clustered around the township of Gladstone. Each appears to be correlated with a building with substantial metal roof area. Some other such features have been noted within the survey area and all correlate with large sheds or silos (e.g., near Rushy Lagoon; 589900 mE, 5472400 mN; Icena; 589500 mE, 5471800 mN). No isolated, small point response should be immediately accepted as geological in origin unless an air photo correlation inspection is made even though such sources are irregularly scattered and rare.
- 7 Devonian dolerites generate slightly negative, low amplitude responses. Several mapped dykes can be correlated and traced in the north east extension of the survey. No remanence data are available for these rocks but the measured susceptibilities range from 0.00002 to 0.00008 cgs. The response indicates a reversed remanent magnetisation at least double this. The resultant magnetisation of these rocks could approach 0.0001 cgs. Such a value is relatively low for rocks of this composition and may reflect a glassy, altered constitution. The effective contrast is equivalent to the more magnetic Mathinna Beds.
- 8 Jurassic dolerite intrusions have little significance in the area surveyed but the anomalies are relatively strong reflecting the much higher magnetic contrast possessed by this material. Normal magnetisation is implied. No estimate of effective contrast has been made; it would probably be unrepresentative since only the glassy intrusion base would be assessed.
- 9 Tertiary basalts exert little obvious control on the magnetic field wherever mapped. This might suggest decomposition or glass responses or, more probably in view of item 10, limited volume of material.

- 10 The magnetic field response pattern is most distinctive and erratic in the region of the recent alluvial and wind-blown cover near Rushy Lagoon west and south of the Rushy Lagoon Pluton. Magnetic profiles (map 2) illustrate the irregular character of the field. The responses tend to suggest a stream pattern and perhaps old valley systems. Baillie (1984) has recorded several metres of basalt in several shallow holes along this trend beneath the alluvial cover. Eroded, thin basalt remnants in an old valley system could well account for the observations. The basalt exposure at about 589000 mE, 5472000 mN appears to mark the southern limit of this material and associated valley system. Examination of the profiles also shows that the basalt-valley pattern is superimposed on the more subtle magnetic Mathinna Beds response and that this extends north to about 5474000 mN beyond the Recent cover.
- 11 There is no immediately discernible response pattern or signature for the mineralised areas, either within the magnetic Mathinna Beds (such as Portland) or near Gladstone within the metamorphosed halo of the Mt Cameron granites. There is, however, need for much closer study of the local responses and this comment is not definitive at this stage (see also Leaman, 1987).
- 12 Many trends and linears are evident in the magnetic field. The general grain of the magnetic Mathinna Beds is a little east of north, within the granodiorite there is a more NE texture and within the granites west of the Ringarooma or Musselroe Rivers there are suggestions of a NW texture. The most striking features, however, are in the centre of the surveyed area. Two of the more obvious, from 586000 mE, 5473000 mN to 592000 mE, 5469500 mN and 586000 mE, 5472000 mN to 588500 mE, 5469500 mN, show that major disruption has occurred within the sequence. Many units lack continuity across these features but the pattern can be matched if lateral offsets are made along these lineaments. The second described, with a more NW orientation, is much shorter and apparently terminated near the southern northing quoted. Thus there appears to be a lack of area-wide continuity for several disruptive features. The first-mentioned trend, with a general WNW orientation, has many analogues across the survey including the termination of the magnetic character immediately north of Gladstone. The lineament patterns which may be discerned on inspection suggest a complex movement history. This deduction may be supported by close examination of the magnetic texture within more magnetic units of the Mathinna Beds. There is clear evidence of imbrication, detachment and extension with some suggestion of drag extension (eg. near 588300 mE, 5469500 mN). Review of the magnetic profiles in association with the magnetic contours also suggests that the body of the Mathinna Beds is tightly folded. Many magnetic features divide from a point source in a consistent way and this is indicative of plunging folds planed by the present land surface (e.g., 588000 mE, 5466000 mN).

- 13 The magnetic profiles (map 2) stress the contrast limitations for each lithology. The response patterns for the granites, granodiorite and less magnetic Mathinna Beds may be contrasted with the more magnetic Mathinna Beds. It may also be noted that there is no systematic change in properties within or toward the metamorphic halo of any intrusion. Only the margins described under item 2 are exceptional.
- 14 The vertical magnetic gradient stresses divisions not apparent in the magnetic field. All features enhanced by the derivative treatment are observable in retrospect in the magnetic field. Nothing new is added by the treatment, rather the emphasis of the presentation leads to differing perspectives. The derivatives stress -
- a) The extent and distinction of the more magnetic Mathinna Beds response and especially the abruptness of the southern and eastern limits of this regime.
  - b) The precise location of unit boundaries and the disruptive internal trends (see also 12). The positions of the NW termination near Gladstone and the E-W termination near the Rushy Lagoon Pluton are marked.
  - c) The presence of pronounced E-W features near 5469000 and 5470000 mN. These are far less apparent in the magnetic field.
  - d) The internal imbrication indicated in many units and the knotty boundary character with many minor apparent breaks.
  - e) The absence of anomaly in the region of the contact zone for the Rushy Lagoon Pluton, much of the less magnetic Mathinna Beds east of the Musselroe River, the Mt William and Ansons granites and the granite at Mt Cameron.
- 15 Radiometric responses of the granites are far from consistent.
- a) Within the Rushy Lagoon Pluton and the Mt William sheet there is an abnormal zone trending approximately E-W (a little south of east). This feature does not have a direct magnetic analogue although it is possible to draw a parallel magnetic lineament some hundreds of metres to the north. This zone was mapped distinctively and shown to have unusual foliation character (Baillie, 1984).
  - b) The total count responses for the Ansons Bay Pluton, the Rushy Lagoon Pluton and Mt William Sheet are quite distinct. The northern part of the Mt William Sheet is comparable radiometrically to the bulk of the Rushy Lagoon Pluton but the remainder of this sheet is of lower contrast.
  - c) The responses from the Rushy Lagoon and Cameron granites are comparable. No radiometric distinction is apparent within the Mt Cameron block in the manner of the geological mapping.
  - d) There is no significant response from granodiorite.
- 16 Several important radiometric features reflect drainage systems. The most obvious of these follows the course of the Musselroe River and its immediate tributaries near their confluence with it. It is clear that the sediment producing this effect has passed down, and been concentrated in, the

valley but is not locally derived. Similar small scale derivation and anomaly can be seen along Fly by Night Creek toward the Ringarooma River and Scotia Mine (584000 mE, 5465000 mN approx).

It may be noted that the Quaternary magnetic features noted under item 10 have a sympathetic radiometric response. The areas mapped as Tertiary-covered yield a subdued response which may reflect either blanketing effects or different source regimes for the sediment and shallow cover. Overlay of maps 4 and 5 stress this correlation..

17 The Mathinna Beds south of the approximate northing of the Portland Mine are relatively radioactive and contrast with comparable lithologies to the north as well as to the less magnetic units to the east. Indeed, the total response of this southern belt of Mathinna Beds is comparable to that of the Mt William Sheet south of the feature noted under item 15. Review of proportions of Potassium, Uranium and Thorium within this belt indicates that Uranium is generally low or absent while its proportion is much higher where the total count level is lower. The ratios within the granitic rocks are much more variable. Many parts of the Mathinna Beds, whether within the southern anomalous region or not, lie at or near background levels. It is not clear why some parts of the sedimentary sequence should exhibit relatively high values and why these variations should be zonal.

18 Trend patterns are generally less obvious in the radiometric plots than in the magnetics but several dominant features trending slightly north of west can be recognised. The contact zone for the Rushy Lagoon Pluton displays a similar orientation which might not be suspected from inspection of either the magnetic or geologic maps. There is a marked divergence within this contact zone from west to east. Similar trends are persistent and evident north of 5469500 mN but few are apparent south of this northing. The WNW trend system transects the northern granitic bodies (see item 15) and possibly the north face of Mt Cameron.

19 Mines within the Mathinna Beds outside contact alteration zones do not present obvious geophysical signatures at this level of inspection. The Portland Mine is located on a subsidiary NW trend which may represent a fold closure diversion from the primary strike trend. A small radiometric response may also be associated. The Bluebell and Great Musselroe Reef lie in magnetic low areas and may, on the basis of profiles, be locally close to NW local divergences. In these respects both are similar to the Portland Mine. Neither, however, can be associated with radiometric responses. If there is any trend pattern or lineament alignment which, after restoration of obvious dislocations, is common to these sites it will not be simply discerned. The mines of the Gladstone area (gold) lie in a region where both sets of observations are near background and the magnetics have been largely obscured by roofing anomalies. No comments can yet be offered for this area.

CONCLUSIONS

The detailed magnetic and aeromagnetic survey of EL 34/86, Gladstone, has certainly fulfilled the objectives set; the results have considerable structural and mapping potential. A full appraisal of the structural implications may lead to some direct exploration application and understanding but this remains to be established. Mineralised sites are small in area and not well understood. Surveys of this type may ultimately provide the understanding of setting required to find sites which are deeply buried or undiscovered late last century.

It is not likely, in this complex environment, that detailed interpretation or appraisal will be easy and a considerable interpretation research endeavour may be required before the full worth of this survey is realised.

Although a complete interpretation has yet to be provided sufficient issues of general and specific significance have been exposed, even at the level of little more than initial inspection, to justify this survey and more general use of the methods in NE Tasmania.

Important observations include:-

- 1 Parts of the Mathinna Beds are sufficiently magnetic to express structuring on various scales.
- 2 Local granites are not simple bodies. Magnetic and radiometric data show that sections of these bodies retain apparently relict textures. Some review of intrusion mechanisms, and compositional and textural issues is clearly required.
- 3 Thermal metamorphism rarely influences magnetic properties. This conclusion reflects available mapping and inferences from the data. It is probable that the magnetic character observed was generated by moderate regional metamorphism or placement of intrusion beneath the area studied. The roof of the influencing intrusion is not exposed and it has been inferred that the two Mathinna "characters" reflect distance from this roof. Where thermal metamorphism is extreme, close to boundaries or hot intrusives, the magnetic properties are destroyed. Indurated rocks are much less magnetic.
- 4 NW, WNW and E-W structuring is important and contrasts with a general strike grain approximately N-S.
- 5 Devonian dolerites are negatively magnetised and of low contrast.
- 6 Some recent sediments may occupy small Tertiary gullies which contain remnants of basalt flows.
- 7 Radiometric data suggest that the magnetic Mathinna Beds possess two Uranium distributions.
- 8 Much radioactive material is concentrated in recent sediment along the valley of the Musselroe River.

## RECOMMENDATIONS

- 1 The discussion and conclusions given above have raised several issues worthy of further examination. These include:-
  - a) Provision of a detailed interpretation. This should include some assessment of fold systems, fault/shear off set patterns and reconstruction of structural history.
  - b) Assessment of granite forms, depth relationships, and placement of the granodiorite within the intrusion sequence.
  - c) Evaluation of enigmas.
  - d) Detailed review of local characteristics within a few hundred metres of each mineralised site including those within the intense contact zone north of Mt Cameron.
- 2 Further surveys are justified but no expansion of specifications can be advised. Much of the character in the data sets would be lost at an elevation in excess of 100 to 120 m and the structural definition within units, or around prospect sites, would be lost were the line spacing to exceed 150 m. No variation in type and resolution of instrument can be contemplated.

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For Placeco Australia by Leaman Geophysics, August.

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Report submitted on behalf of  
Leaman Geophysics  
by

*D. Leaman*

Dr. D.E. Leaman, B.Sc., Ph.D  
M.Aus.I.M.M., M.M.I.C.A.

26 Sept 87

## APPENDIX

## CONTRACTOR SUPPLIED ACQUISITION REPORT

(Samples of analog records as observed have been presented in Figures 2, 3, 4 and 5. These illustrate the varied character of the data sets within the survey area and also show the nature of responses near the sites of the known gold mineralisation)

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PLACECO AUSTRALIA PTY LTD  
LOGISTICS REPORT

OF

AIRBORNE GEOPHYSICAL SURVEY  
GLADSTONE AREA, TASMANIA

BY

AUSTIREX INTERNATIONAL LIMITED

## CONTENTS

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A. SURVEY DETAILS OF DATA ACQUISITION

1. Area

EL 34/86, Gladstone, Location - The Great Musselroe River, within 1:250,000 map sheet K55-4.

2. General survey description

Flight line direction	- 090 - 270 degrees
Flight line spacing	- 125 metres
Tie line direction	- 180 - 360 degrees
Tie line spacing	- 1000 metres
Total line distance	- 1606 kilometres
Mean terrain clearance	- 60 metres
Nominal flying speed	- 203 kilometres/hour

3. Photography and Navigation

Navigation was visual, assisted by Doppler, from black and white 1:10,000 scale photography. Control was obtained from topographic maps.

4. Flight path recovery

Flight path recovery was carried out using visual recovery from the tracking film on a duplicate set of photographs provided for navigation.

The average distance between recovered points was no greater than 0.5 kilometres along traverse lines and tie lines where sufficient photographic detail was present.

5. Airborne Magnetometer

Readings of the magnetic field were recorded at a sensitivity of 0.1 nanoTeslas at a 0.2 second reading interval.

6. Base station magnetometer

The base station magnetometer was sited at St. Helens airport. The magnetometer recorded to a sensitivity of 0.25 nanoTeslas at an interval of 10 seconds. The sensor was placed in a low gradient area beyond the influence of any cultural interference. The noise envelope was less than 2.5 nanoTeslas peak to peak. No data was accepted where-in the departure of the diurnal field exceeded 5 nanoTeslas in 5 minutes and for flight lines 10 nanoTeslas in 5 minutes.

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7. Spectrometer

A differential gamma-ray spectrometer was used to measure the energy windows encompassing the standard gamma radiation windows for Tl-208, Bi-214, K-40 and total count.

The NaI(Tl) detector volume was 1024 cubic inches (16.78 litres).

8. Altimeter

Terrain clearance was recorded by a radio-altimeter with a sensitivity of 0.1 metres and an operating range from ground level to 2000 feet (0 - 610 metres).

9. Time base

All airborne magnetometer readings were acquired on a constant time basis of 0.2 seconds, all other parameters were recorded at a constant time bases of 0.8 seconds.

10. Analogue recording

A multi-channel recorder was used to record four channels of radiometric data, altimeter and coarse and fine scale magnetic data. Full scale deflections were suitably chosen and the fiducials marked on each chart.

11. Digital recording

For each 0.8 second acquisition interval the following was recorded on magnetic tape:-

- Fiducial number
- Time
- Altitude
- Magnetometer readings (four)
- Radiometric channels
- Flight and line numbers.

12. Acquisition System

The acquisition system records all data required onto a magnetic tape in ASCII format. All data was transferred to tape in blocks of ten fiducials.

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## B. SYSTEM CALIBRATIONS AND CHECKS

1. System calibration

The aircraft system checks comprise the following:-

1. Magnetometer heading and manoeuvre compensation.
2. System parallax calibration.
3. Test lines were flown prior to and after each day's production to ensure system repeatability.

2. Data acquisition checks

The checks performed on the data acquisition system involve a read after write check on the tape.

On receipt of data from the field, statistics of each variable are computed, as well as each production line is profiled and the results checked for data integrity.

3. Correction coefficients

## 3.1. Analogue stripping

The following stripping coefficients are applied to the data prior to presentation on the analogues.

Thorium/Uranium	0.3
Thorium/potassium	0.5
Uranium/potassium	0.7

## 3.2. Digital stripping

The following coefficients are to be used for stripping the digital data:-

Thorium/uranium	0.251
Thorium/potassium	0.448
Uranium/potassium	0.834
Uranium/thorium	0.050

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## 3.3. Aircraft background and cosmic correction

These coefficients were determined from high altitude flights. The aircraft background is to be removed before stripping.

	Aircraft Background	Cosmic Correction	Correlation Coefficient
Total count	222.51	2.482	0.996
Potassium	17.86	0.130	0.968
Uranium	7.57	0.121	0.977
Thorium	3.85	0.138	0.995

## 3.4. Altitude Attenuation

Total count	0.005407
Potassium	0.007884
Uranium	0.002545
Thorium	0.006460

## 3.5 Spectral windows

	Channel		Energy (MeV)	
	from	to	from	to
Total count	2	254	0.321	2.995
Potassium	101	120	1.368	1.579
Uranium	128	147	1.653	1.853
Thorium	198	236	2.393	2.805
Cosmic	255	255	2.995	6.000

## 3.6 Magnetometer and Spectrometer Parallax

The system parallax is - 2.0 fiducials

## C. OPERATIONAL STATISTICS

1. Operating Base

The operating Base was St. Helens, Tasmania. The diurnal station was sited at the airstrip

2. Operating Field crew

Pilot	- W. Kuech
Navigator	- P. McAuliffe
Technician	-
Data Technician	- A. Noack
Manager	- W. Kuechn

3. Aircraft

Type	- Cessna 206
Registration	- VH-CPZ

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4.Flight Summary

Production flights number - 6  
 Survey commencement - 18 June 1987  
 Survey finish - 23 June 1987  
 Duration - 6 days  
 Total kilometres - 1806

## D. INSTRUMENT TECHNICAL SPECIFICATIONS

1. Airborne Magnetometer

Type - Scintrex V 2321 alkali vapour  
 Resolution - 0.04 nanoTeslas  
 Operating range - 17,000 - 95,000 nanoTeslas  
 Mounting - Tail stinger

2. Altimeter

Type - Collins Alt-50 radio altimeter  
 Resolution - 0.1 metres  
 Range - 0 - 610 metres

3. Ground Magnetometer

Type - Geometrics G856 proton precession  
 Resolution - 0.25 nanoTeslas  
 Sampling interval - 10 second  
 Recording interval - 20 second  
 Recording unit - MFE 450

4. Navigation

Doppler type - Decca model 71  
 Compass type - Sperry GM9 gyro compass  
 Navigation aids - Decca Tans 9447D computer  
 Tracking camera - Vinten 16mm single frame  
 Camera lens - 5.9mm wide angle

5. Data Acquisition system

System type - Hewlett Packard 9825  
 Digital output - DC-100 cassett  
 Analogue output - Watanabe, eight channel recorder

6. Spectrometer

Type	- Geometrics GR800/900D
Crystals	- Geometrics DET 1024 Thallium activated Sodium Iodide
Crystal volume	- 16.78 litres
Resolution	- less than 12% FWHM on Cs137 peak at 0.662 MeV.
Spectral range	- 0.3 - 6.0 MeV.
Channels	- 256
System deadtime	- 8 microseconds per total count

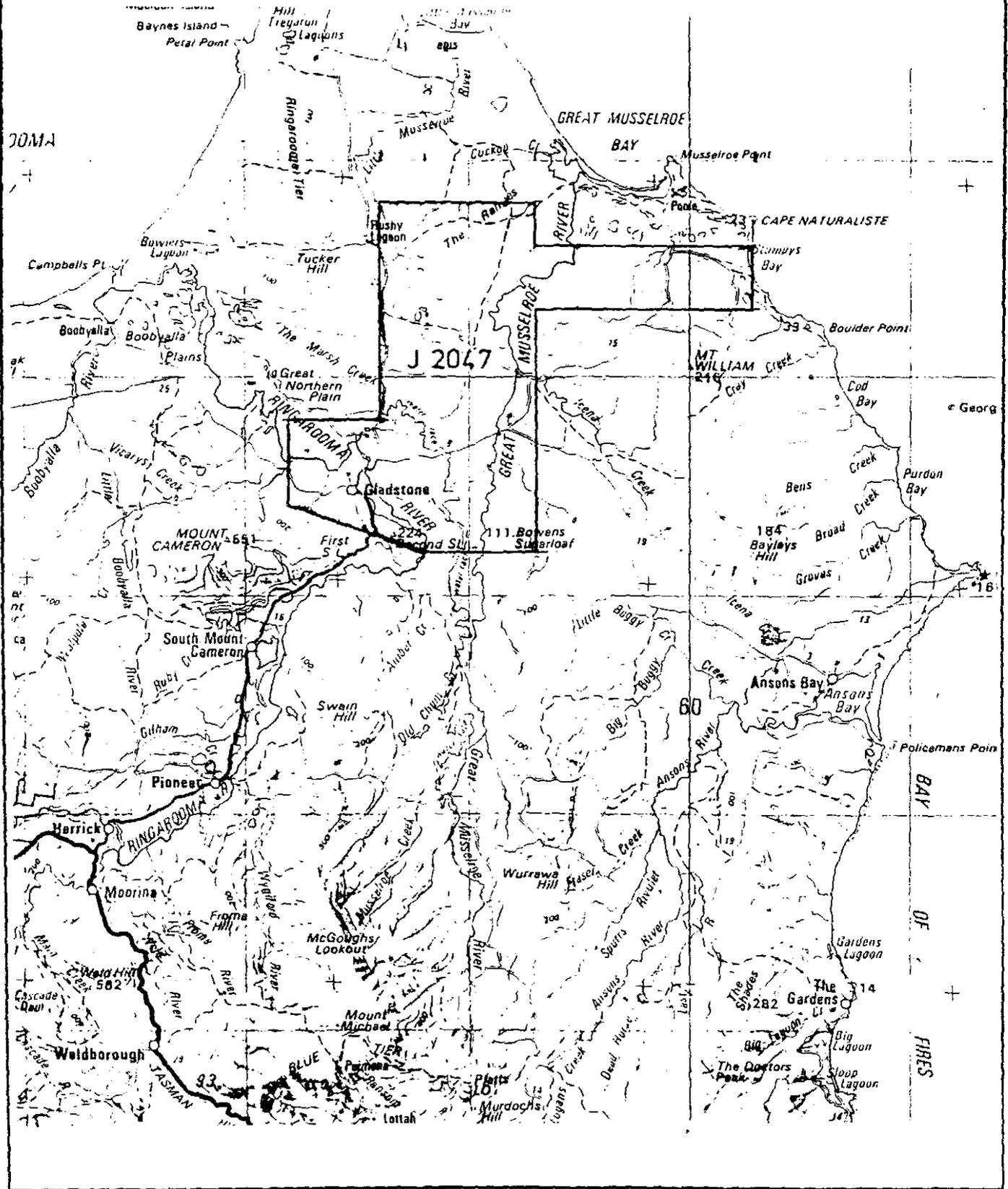
## E. GEOPHYSICAL DATA PROCESSED

1. Flight path map at 1:25,000 scale
2. Total magnetic intensity maps at 1:25,000 and 1:50,000 scales.
3. Stacked magnetic profiles at 1:25,000 horizontal scale and 20nT/cm vertical scale.
4. Vertical magnetic gradient contour map at 1:25,000 scale with contour interval at .01nT/m.
5. Total count radiometric contour as a preliminary map.
6. Located data tapes at 1600 BPI.

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<b>AUSTIREX INTERNATIONAL LTD.</b>  JOB No. 2047	<b>LOCALITY</b> THE GREAT MUSSELROE RIVER, TAS	
	<b>AREA</b> EL 34/86, GLADSTONE	
	<b>PLAN F SHOWS</b> SURVEY AREA FOR PLACECO AUSTRALIA PTY LTD.	
		<b>DATE</b> 6/87

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Cape Portland

Mussel Roe Bay

Mussel Rock

INGAROOMA BAY

Cape Naturaliste

Bluebell

Portland

Tamahawk Is.

Stumpys Bay

Stumpys Rock

Boulder Point

Coblar Rocks

Leprona Rocks

George R.

Cod Bay

Purdon Bay

GLADSTONE

MT. CAMERON 550

ENDURANCE

South Mt. Cameron

Pioneer Dam

PIONEER

Pioneer

Harrick

Bay of Fires

The Gardens

Sloop Reef

Binnalong Bay

Skeleton Bay

Elepho Grants

Grants

Priory

GEORGE

ST. HELENS

EL 34/86  
GLADSTONE  
LICENCE  
AREA  
Placeco Australia

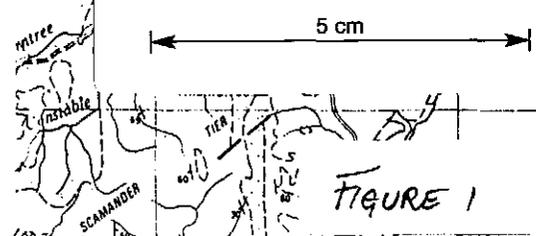


FIGURE 1

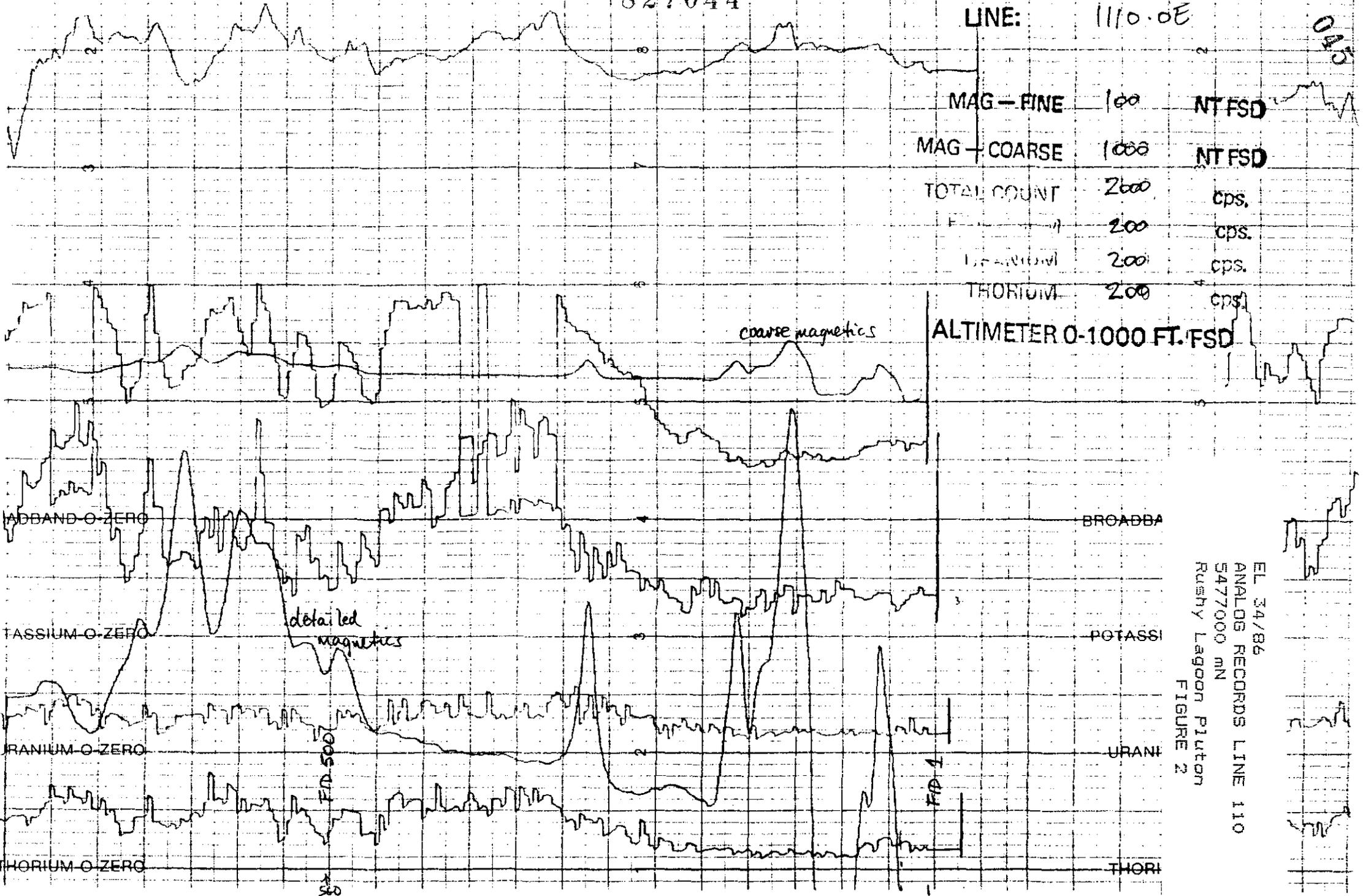
827044

AREA: GLADSTONE

LINE: 1110.0E

MAG - FINE	100	NT FSD
MAG - COARSE	1000	NT FSD
TOTAL COUNT	2000	cps.
Uranium	200	cps.
Potassium	200	cps.
THORIUM	200	cps.

ALTIMETER 0-1000 FT. FSD



EL 34/86  
 ANALOG RECORDS LINE 110  
 5477000 MN  
 Rushy Lagoon Piton  
 FIGURE 2

LINE: 1137.0E

0.58

MAG - FINE

NT FSD

MAG - COARSE

NT FSD

2000

cps.

200

cps.

200

cps.

200

cps.

ALTIMETER 0-1000 FT. FSD

Mags detail

Mags compressed

BROADBAND 0 ZERO

POTASSIUM 0 ZERO

URANIUM 0 ZERO

THORIUM 0 ZERO

MUSSELROE REEF

BLUEBELL

FD 6500

FD 6161

16500

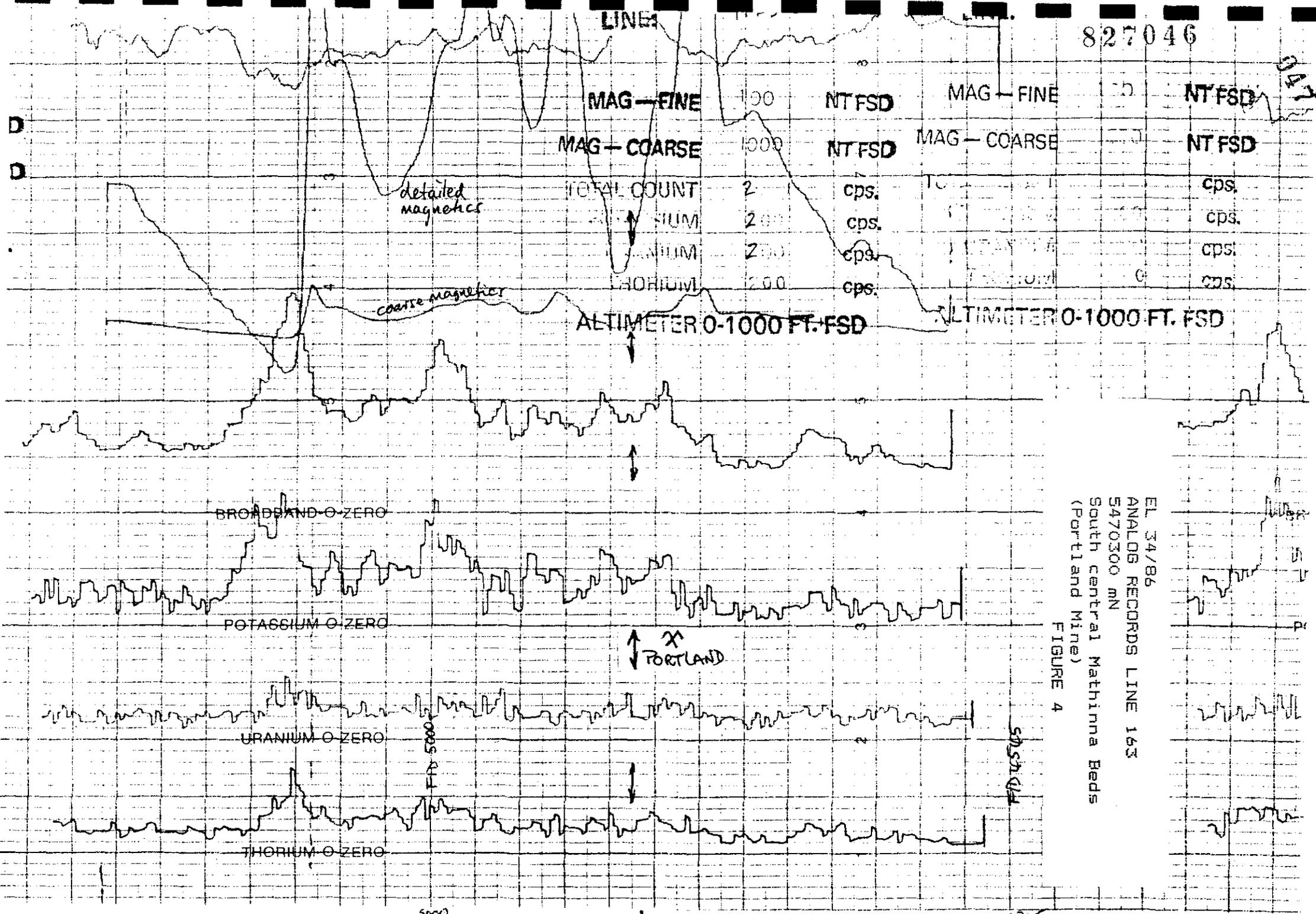
6161

EL 34/95  
ANALOG RECORDS LINE 137  
5473600 MN  
Northern Mathina Beds section  
(Bluebell and Great Musselroe reef)  
FIGURE 3

827045

827046

047

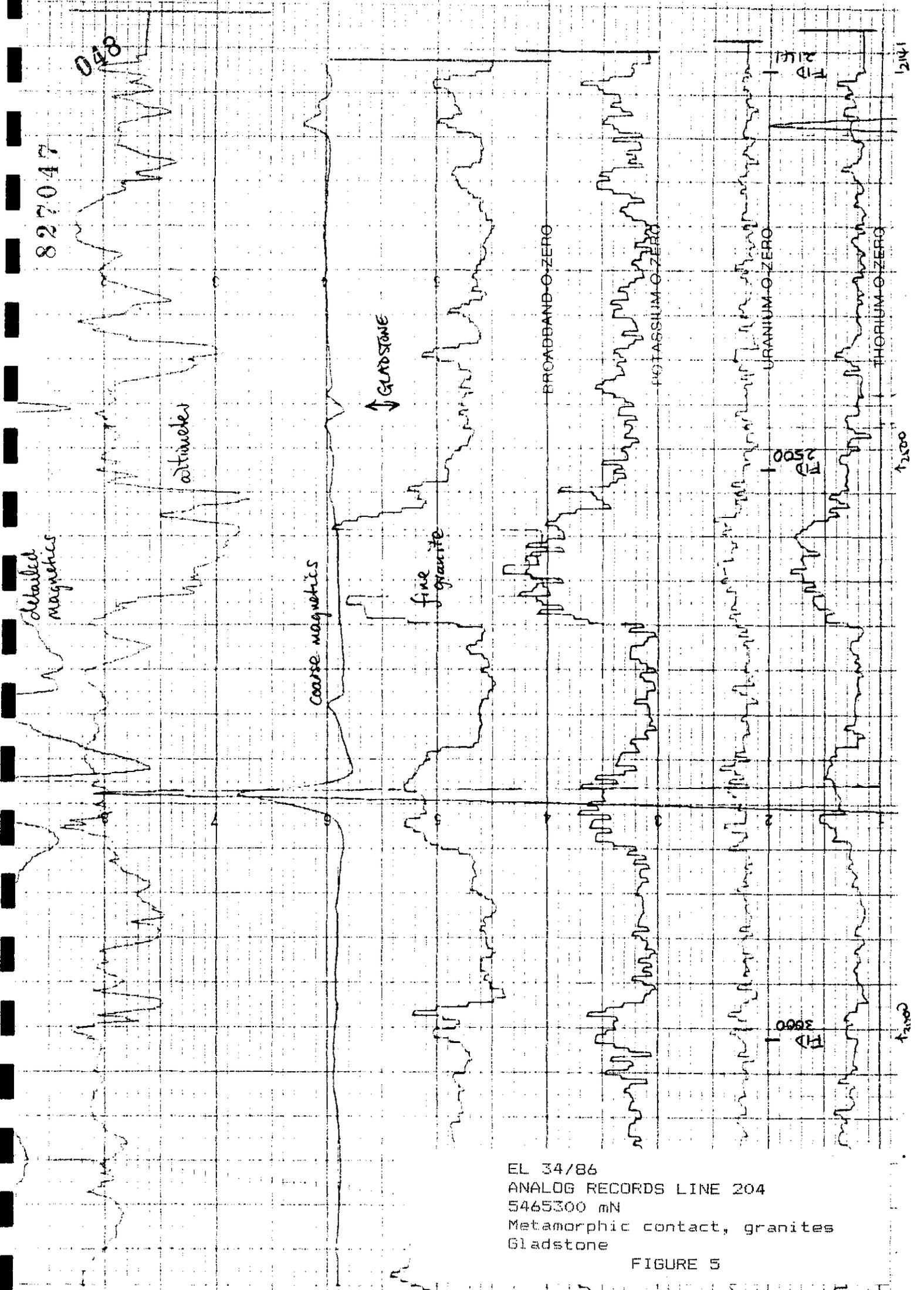


EL 34/86  
 ANALOG RECORDS LINE 163  
 5470300 MN  
 South central Mathinna Beds  
 (Portland Mine)

FIGURE 4

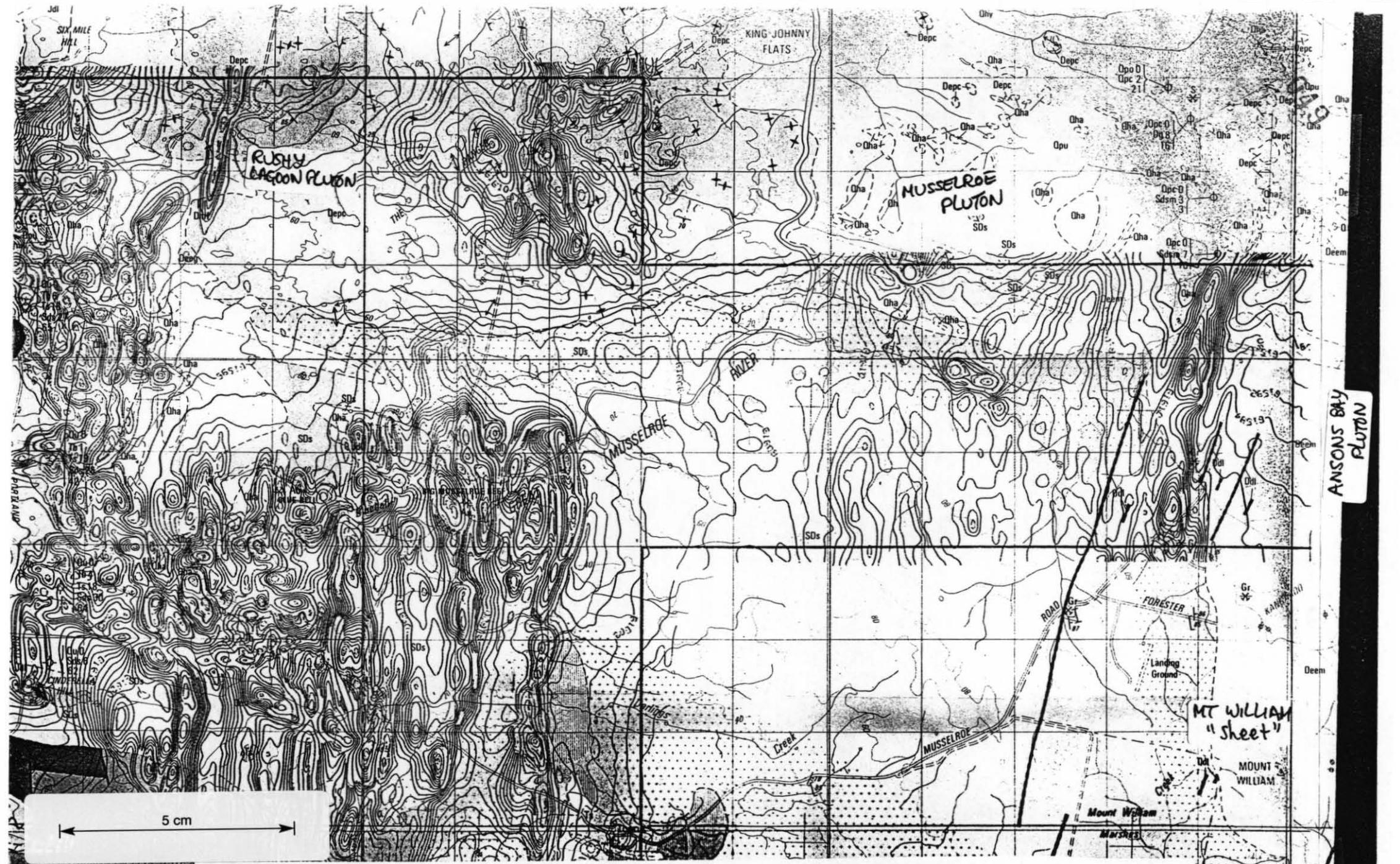
5000

5000



EL 34/86  
 ANALOG RECORDS LINE 204  
 5465300 mN  
 Metamorphic contact, granites  
 Gladstone

FIGURE 5

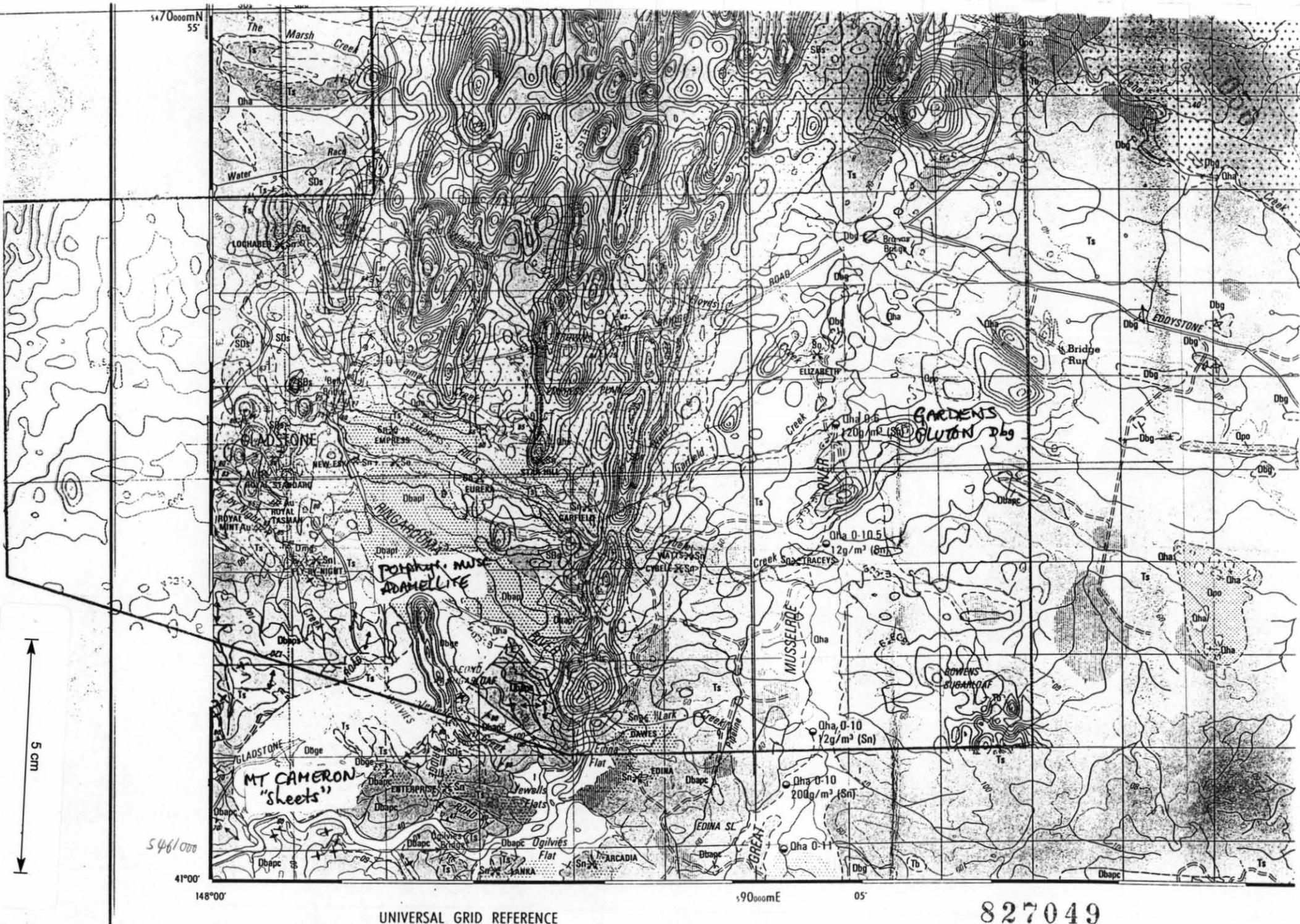


EL 34/86 NORTHERN REGION: GEOLOGY AND AEROMAGNETICS  
 (Geology from Baillie, 1984)

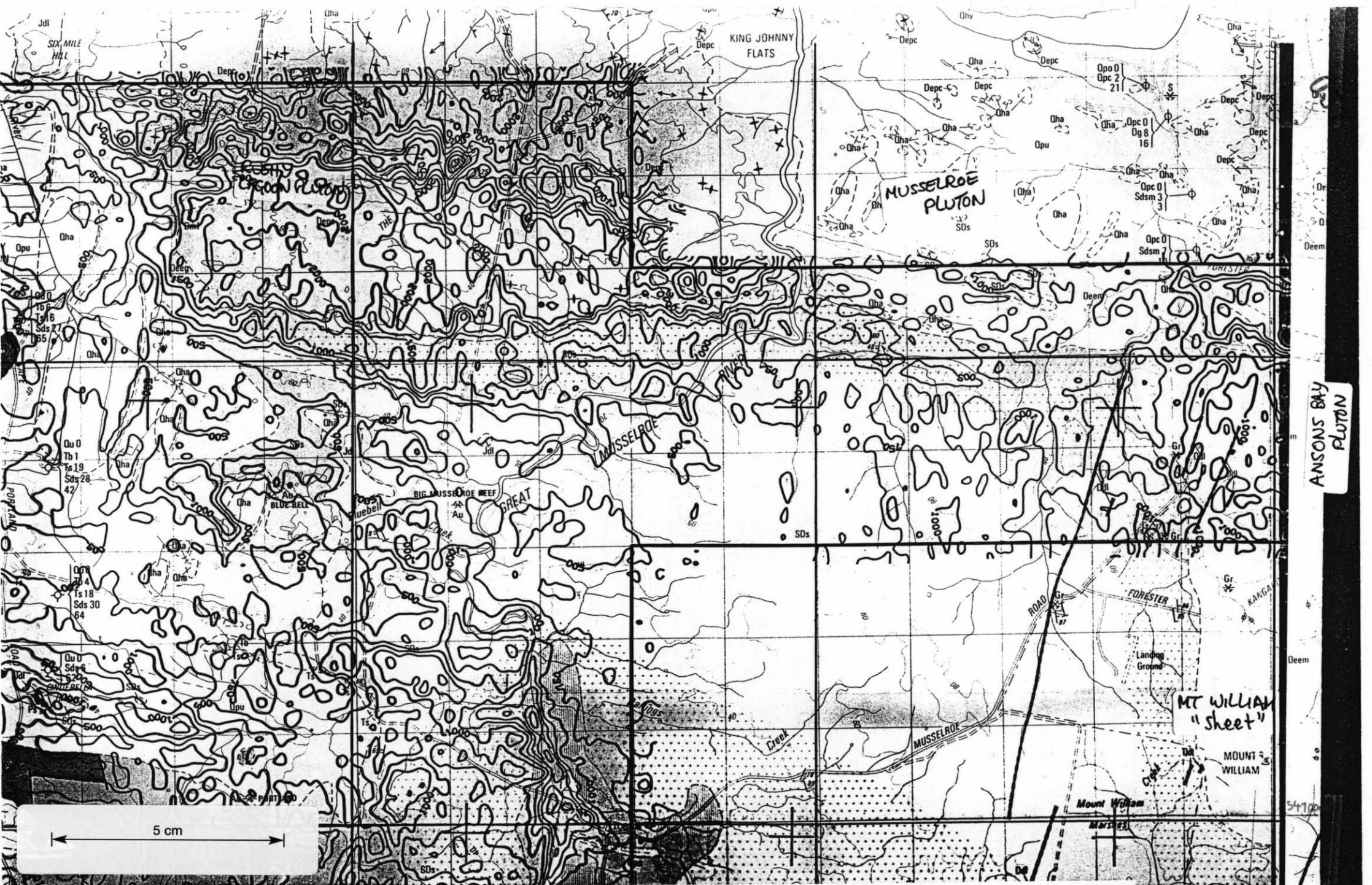
FIGURE 6

827048

EL 34/86 SOUTHERN REGION: GEOLOGY AND AEROMAGNETICS (Geology from Baillie, 1984) FIGURE 7



827049



EL 34/86 NORTHERN REGION: GEOLOGY AND RADIOMETRICS **FIGURE 8**  
 (Geology from Baillie, 1984) **827050**



KB:GPS2:2047:LIST:MT1:MTL1:FILE0

Located Data Tape Format

EL 34/86 - Gladstone

Lines are not separated by an end of file mark.

End of tape is indicated by two consecutive file marks.

Record length 134 bytes.

Block size 4020 bytes.

### RECORD FORMAT

Format	Undefined	Variable
I5	99999	Line
I3	999	Flight
I6	999999	Date
F8.2	99999	Time
I6	99999	Fiducial
I1	see below	Recovery flag
I7	999999	Easting - metres
I8	9999999	Northing - metres
F9.2	99999	Raw magnetic intensity
F9.2	99999	Diurnal
F9.2	99999	IGRF
I1	see below	Final magnetic intensity flag
F9.2	99999	Final magnetic intensity
I4	999	Radar altitude
I5	99999	Raw total count
I5	9999	Raw potassium
I5	9999	Raw uranium
I5	9999	Raw thorium
I5	9999	Raw cosmic
I1	see below	Corrected total count flag
I5	99999	Corrected total count
I1	see below	Corrected potassium flag
I5	9999	Corrected potassium
I1	see below	Corrected uranium flag
I5	9999	Corrected uranium
I1	see below	Corrected thorium flag
I5	9999	Corrected thorium

### NOTES

Final magnetic intensity corrections :

IGRF model 1985 removed - base value 61700 nanoTeslas.

Diurnal correction applied - base value 61700 nanoTeslas.

System parallax of 3.0 fiducials removed.

Final radiometric corrections :

Altitude corrections applied - coefficients: Total count - .00650.

Potassium - .00750.

Uranium - .00550.

Thorium - .00550.

Stripping corrections applied - alpha = 0.2290.

beta = 0.4260.

gamma = 0.7240.

delta = 0.0530.

System parallax of 3.00 fiducials removed.

Cosmic channel not recorded in aircraft.

Data used in processing is flagged as follows:

Recovery flag

:K0:GPS2:2047:LIST:MT1:MT1\_1.FILE0

- 0 Not used.
- 1 Used.
- 2 Recovery point.

Final variable flags

- 0 Not used.
- 1 Used.

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Incorporated in Tasmania

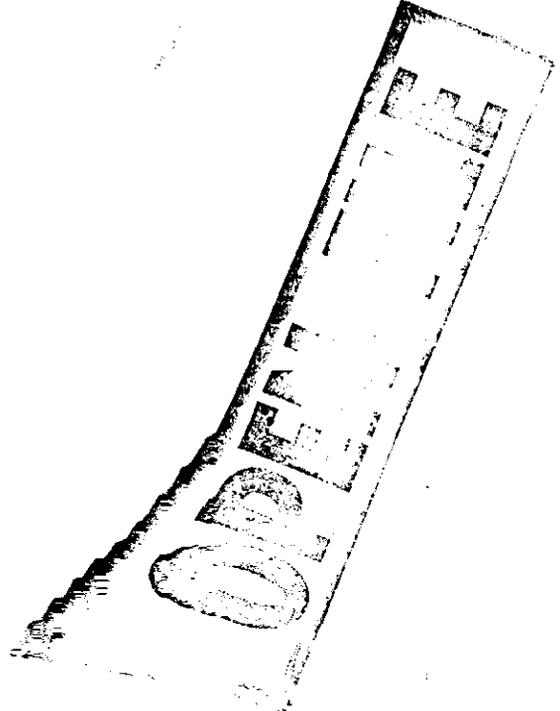
11 Midland Highway  
Brighton TAS 7030 AUSTRALIA  
Ph: 61-02-681222  
Facs: 61-02-681349  
Tlx: AA 33427

EXPLORATION LICENCE 34/86 - GLADSTONE

ANNUAL REPORT : YEAR 1

29th January, 1987 - 28th January, 1988

VOLUME 2(OF 3)



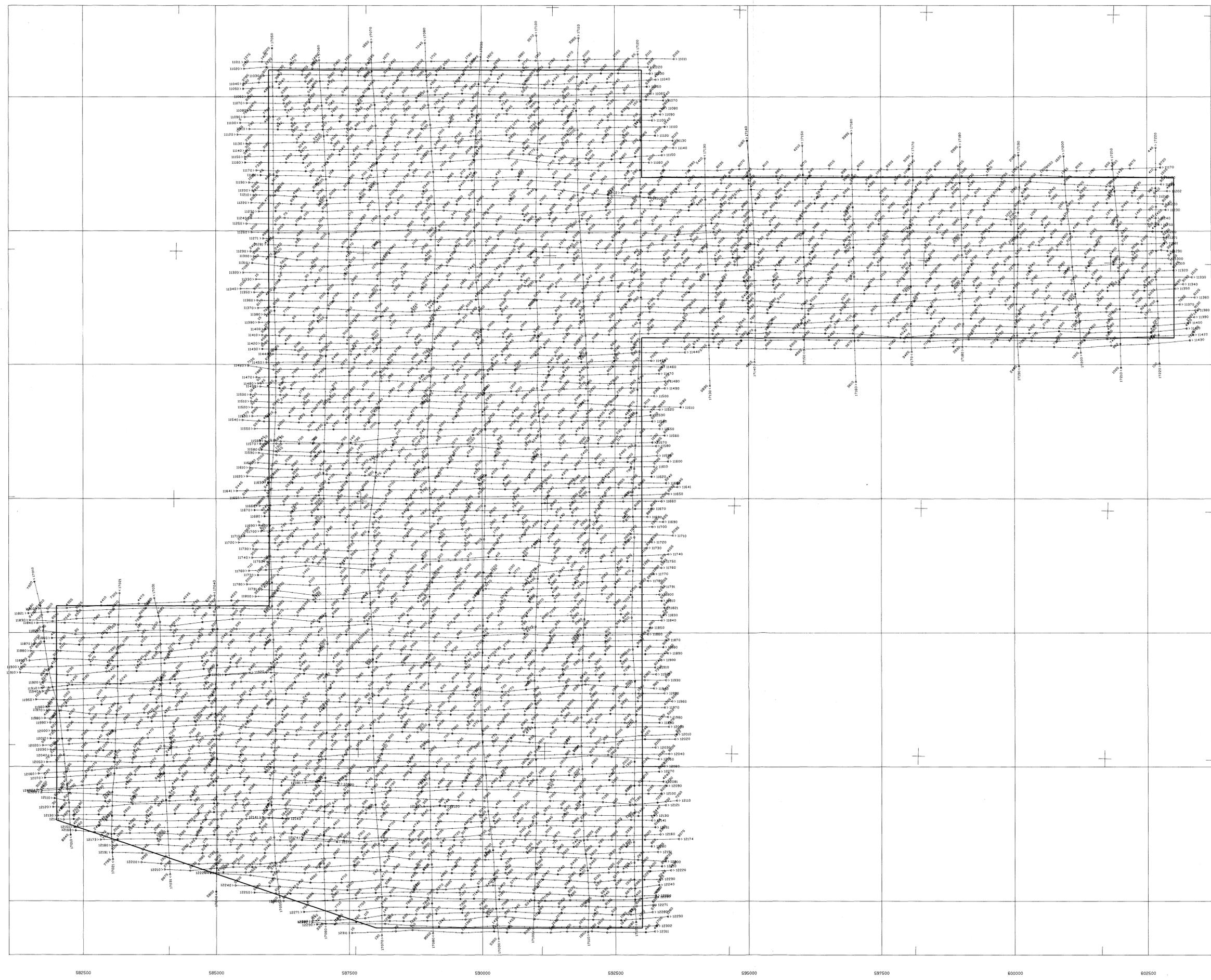
MINES  
EL 34/86  
23.12.87  
LETTER  
23.12.87  
REFERS

K. C. MORRISON

J. K. DAVIDSON

23rd December, 1987.

*Vol. 2/3*



**SURVEY SPECIFICATIONS**

**AIRCRAFT**  
VH-CFZ CESSNA 560C STATIONER II  
**MAGNETOMETER**  
SPLIT BEAM Cesium SONTREX V201  
RESOLUTION 0.04 nanoTesla  
CYCLE RATE 0.2 seconds  
SAMPLE INTERVAL 31 metres  
**SPECTROMETER**  
GEOMETRES EXPLORANUM GR800B  
VOLUME 16.78 litres  
CYCLE RATE 0.8 seconds  
SAMPLE INTERVAL 44 metres  
**DATA RECORDING**  
8 CHANNEL WITTRANBE MC 6700 CHART RECORDER  
HEWLETT PACKARD 9895 COMPUTER  
RECORDING SYSTEM  
**FLIGHT LINE SPACING**  
TRAVELER LINES 125 metres  
TIE LINES 1000 metres  
**FLIGHT LINE DIRECTION**  
TRAVELER LINES 290 - 270 degrees  
TIE LINES 000 - 180 degrees  
**SURVEY HEIGHT**  
60 metres - MEAN TERRAIN CLEARANCE  
**NAVIGATION**  
VISUAL FROM PLANNED FLIGHT STRIPS  
FLIGHT PATH RECOVERY  
ONTO R.M.G. CONTROLLED RECOVERY PHOTOS

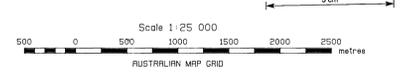
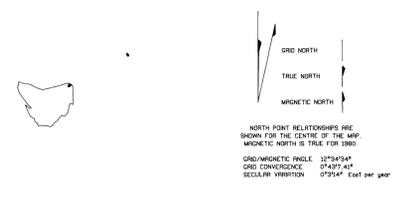
**FLIGHT PATH RECOVERY MAP**

**LEGEND**  
+ Recovery point  
- 20 fiducial interval

**ADJACENT SHEETS**

8416	8516	8616
8418	8518	8618
8414	8514	8614
8415	8515	8615

B8-2762



SURVEY SPECIFICATIONS

**AIRCRAFT**  
 VH-CFZ CESSNA 440B STATIONER II  
**MAGNETOMETER**  
 SPLIT BEAM CESMA SCINTREX V201  
 RESOLUTION 0.04 nanoTesla  
 CYCLE RATE 0.2 seconds  
**SAMPLE INTERVAL** 15 metres  
**SPECTROMETER**  
 GEOMETRACS EXPLORANUM GR8008  
 VOLUME 15.78 litres  
 CYCLE RATE 0.8 seconds  
**SAMPLE INTERVAL** 4.4 metres  
**DATA REDUCTION**  
 S CHANNEL WATNABE MC 6700 CHART RECORDER  
 HEWLETT PACKARD 9825 COMPUTER  
 REODITH DIGITAL ACQUISITION SYSTEM  
**FLIGHT LINE SPACING**  
 TRAVERSE LINES 125 metres  
 TIE LINES 1000 metres  
**FLIGHT LINE DIRECTION**  
 TRAVERSE LINES 090 - 270 degrees  
 TIE LINES 090 - 180 degrees  
**SURVEY HEIGHT**  
 60 metres - MEAN TERRAIN CLEARANCE  
**NAVIGATION**  
 VISUAL FROM PLANNED FLIGHT STOPS  
 FLIGHT PATH RECOVERY  
 ONTO R.M.C. CONTROLLED RECOVERY PHOTOS

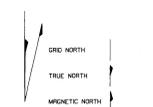
STACKED MAGNETIC PROFILES

**DATA PROCESSING**  
 REGIONAL FIELD THE EFFECT OF THE SCF MODEL  
 1985 HAS BEEN REMOVED  
 PROFILE BASE 61800 nanoTesla  
 VERTICAL SCALE 20 nanoTesla/cm  
 PARALLEL CORRECTION 3.00 Heloise

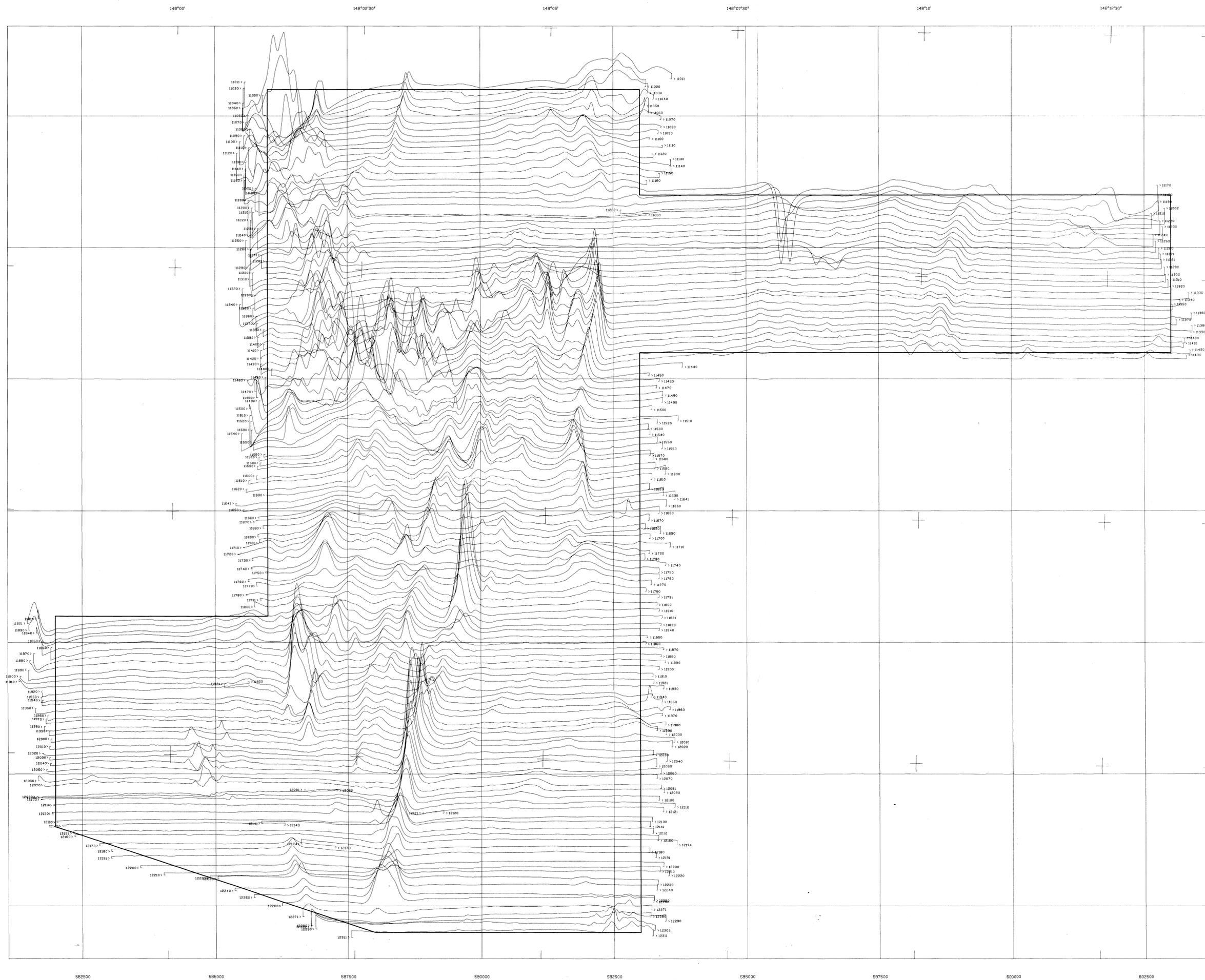
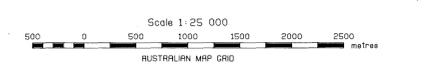
ADJACENT SHEETS

B416 II-NW	B516 III-NW	B616 IV-NW
B415 II-SW	B515 III-SW	B615 IV-SW
B415 I-NE	B515 IV-NW	B615 IV-NE

88-2762



NORTH POINT RELATIONSHIPS ARE SHOWN FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS TRUE FOR 1980.  
 GRID/MAGNETIC ANGLE 10°34'34"  
 GRID CONVERGENCE 0°43'41"  
 SCALE IN VERTICES 0.994 East per 100m



AIRBORNE GEOPHYSICAL SURVEY

EL 34/86

TASMANIA

PLACECO AUSTRALIA PTY LTD.

Surveyed and compiled by AUSTRIX INTERNATIONAL LIMITED

June - August 1987  
austrix

SURVEY SPECIFICATIONS

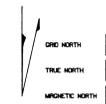
**AIRCRAFT**  
 VH-CPZ CESSNA 200C STATIONARY II  
**MAGNETOMETER**  
 SPLIT BEAM CESM SCINTREX V201  
 RESOLUTION 0.04 nanoTesla  
 CYCLE RATE 0.2 seconds  
**SAMPLE INTERVAL** 31 metres  
**SPECTROMETER**  
 GEOMETRICAL EXPLORAM GRABOOL  
 VOLUME 18.70 litres  
 CYCLE RATE 0.8 seconds  
**SAMPLE INTERVAL** 44 metres  
**DATA ACQUISITION**  
 8 CHANNEL WATTANABE MC 8700 CHART RECORDER  
 HEWLETT PACKARD 9845 COMPUTER  
 RENKORATH DIGITAL ACQUISITION SYSTEM  
**FLIGHT LINE SPACING**  
 TRANSVERSE LINES 325 metres  
 TE LINES 1000 metres  
**FLIGHT LINE DIRECTION**  
 TRANSVERSE LINES 000 - 270 degrees  
 TE LINES 000 - 180 degrees  
**SURVEY HEIGHT**  
 80 metres - MEAN TERRAIN CLEARANCE  
**NAVIGATION**  
 VISUAL FROM PLANNED FLIGHT STRIPS  
 FLIGHT PATH RECOVERY  
 ONTO R.M.C. CONTROLLED RECOVERY PHOTOS

TOTAL FIELD MAGNETIC CONTOUR MAP

**DATA PROCESSING**  
 REGIONAL FIELD THE EFFECT OF THE GRF MODEL  
 1985 HAS BEEN REMOVED  
 GRID CELL SIZE 40 metres  
 CONTOUR INTERVAL 2 nanoTesla  
 PARALLAX CORRECTION 3.00 Folds

ADJACENT SHEETS

8418	8518	8618
II-NE	II-NW	II-SE
8418	8518	8618
I-NE	I-NW	I-SE
8415	8515	8615
I-NE	IV-NW	IV-NE



NORTH POINT RELATIONSHIPS ARE SHOWN FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS TRUE FOR 1980.  
 GRID ARCADE ANGLE 12°34'54"  
 GRID CONFORMANCE 0°45'41"  
 DECLINATION VARIATION 0°25'41" East per year



88-2762

**SURVEY SPECIFICATIONS**

**AIRCRAFT**  
 VU-CFZ CESSNA 441Q STATIONER I  
**MAGNETOMETER**  
 SPLIT BEAM CESUM SCENTREX V200  
 RESOLUTION 0.04 nanoTesla  
 CYCLE RATE 0.2 seconds  
 SAMPLE INTERVAL 31 metres

**SPECTROMETER**  
 GEOMETRIS EXPLORANUM GR800B  
 VOLUME 16.78 litres  
 CYCLE RATE 0.8 seconds  
 SAMPLE INTERVAL 44 metres

**DATA ACQUISITION**  
 8 CHANNEL WITANABE MC 6700 CHART RECORDER  
 HEWLETT PACKARD 9855 COMPUTER  
 HERODATA DIGITAL ACQUISITION SYSTEM

**FLIGHT LINE SPACING**  
 TRAVERSE LINES 125 metres  
 TIE LINES 1000 metres

**FLIGHT LINE DIRECTION**  
 TRAVERSE LINES 090 - 270 degrees  
 TIE LINES 000 - 180 degrees

**SURVEY HEIGHT**  
 60 metres - MEAN TERRAIN CLEARANCE

**NAVIGATION**  
 VISUAL FROM PLANNED FLIGHT STRIPS  
 FLIGHT PATH RECOVERY  
 ONTO A.M.C. CONTROLLED RECOVERY PHOTOS

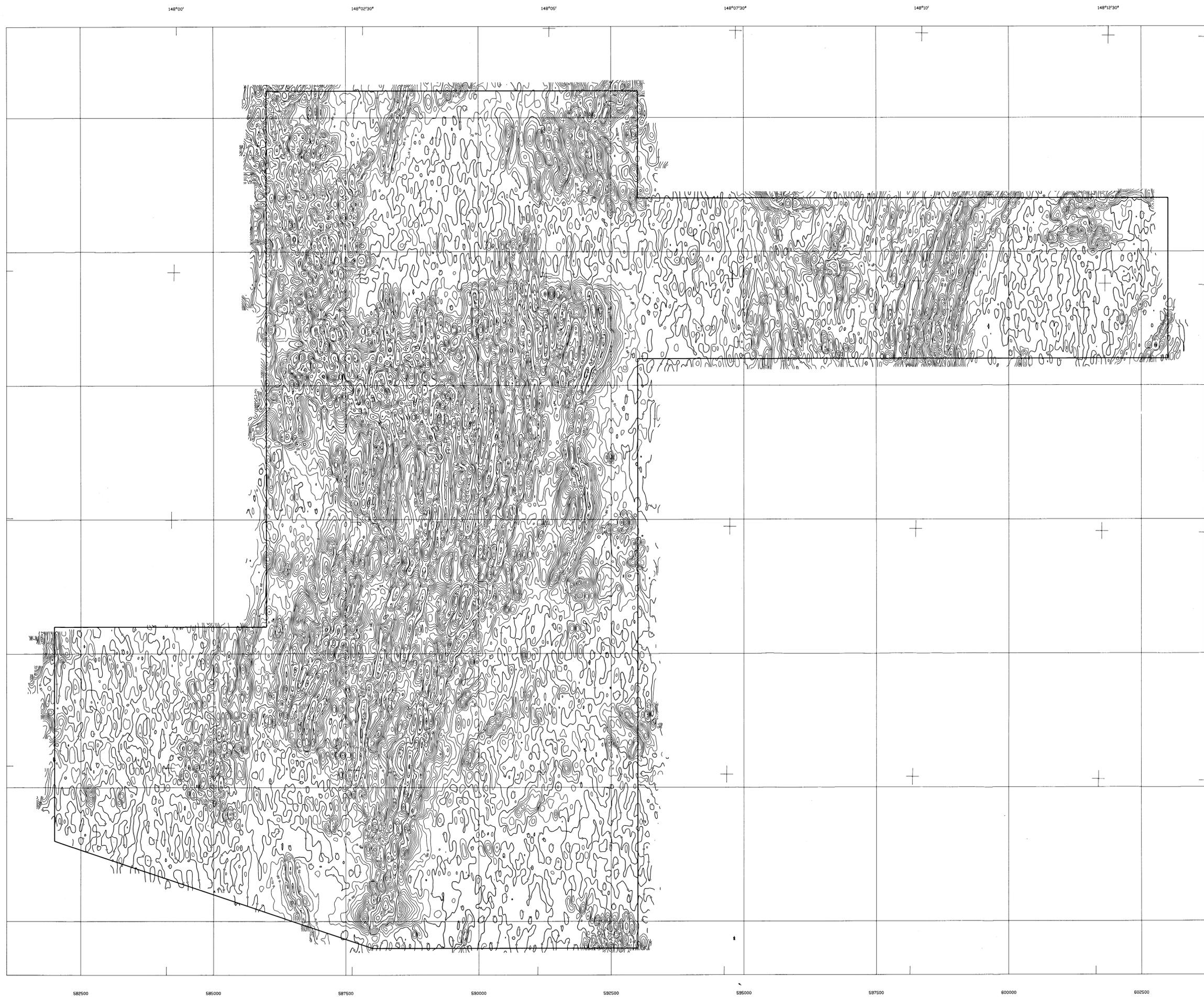
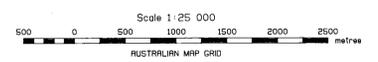
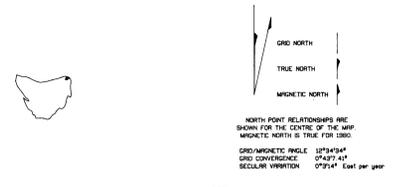
**VERTICAL MAGNETIC GRADIENT CONTOUR MAP**

**DATA PROCESSING**  
 GRID CELL SIZE 40 metres  
 CONTOUR INTERVAL 0.1 nanoTesla per metre  
 PARALLAX CORRECTION 3.00 fidscales

88-2762

**ADJACENT SHEETS**

8416 II-N	8516 II-SW	8616 II-E
8418 II-S	8518 II-SW	8618 II-SE
8415 I-NE	8515 IV-NW	8515 IV-NE



827059  
**AIRBORNE GEOPHYSICAL SURVEY**  
**EL 34/86**  
**TASMANIA**  
**PLACECO AUSTRALIA PTY LTD.**  
Surveyed and compiled by PLUSTREX INTERNATIONAL LIMITED  
 JUNE - AUGUST 1987  
**oubitrex**

**SURVEY SPECIFICATIONS**

**AIRCRAFT**  
 VH-OPZ CESSNA 205G STATIONER 8  
**MAGNETOMETER**  
 SPLIT BEAM CESLUM SCINTREX V201  
 RESOLUTION 0.24 nanoTesla  
 CYCLE RATE 0.2 seconds  
 SAMPLE INTERVAL 11 metres  
**SPECTROMETER**  
 GEOMETRIC CALORIMETER GR5008  
 VOLUME 15.78 litres  
 CYCLE RATE 0.8 seconds  
 SAMPLE INTERVAL 44 metres  
**DATA ACQUISITION**  
 8 CHANNEL WITWARR MC 8700 CHART RECORDER  
 HEWLETT PACKARD 8625 COMPUTER  
 MICROVITA DATA ACQUISITION SYSTEM  
**FLIGHT LINE SPACING**  
 TRAVERSE LINES 120 metres  
 TIE LINES 1000 metres  
**FLIGHT LINE DIRECTION**  
 TRAVERSE LINES 090 - 270 degrees  
 TIE LINES 000 - 180 degrees  
**SURVEY HEIGHT**  
 80 metres - MEAN TERRAIN CLEARANCE  
**NAVIGATION**  
 VISUAL FROM PLANNED FLIGHT STRIPS  
 FLIGHT PATH RECOVERY  
 ONTO R.M.G. CONTROLLED RECOVERY PHOTOS

**TOTAL COUNT CONTOUR MAP**

**DATA PROCESSING**  
 GRID CELL SIZE 40 metres  
 COUNT RATE INTERVAL 50 counts per second  
 PARALLAX CORRECTION 3.00 microunits

88-2762

**ADJACENT SHEETS**

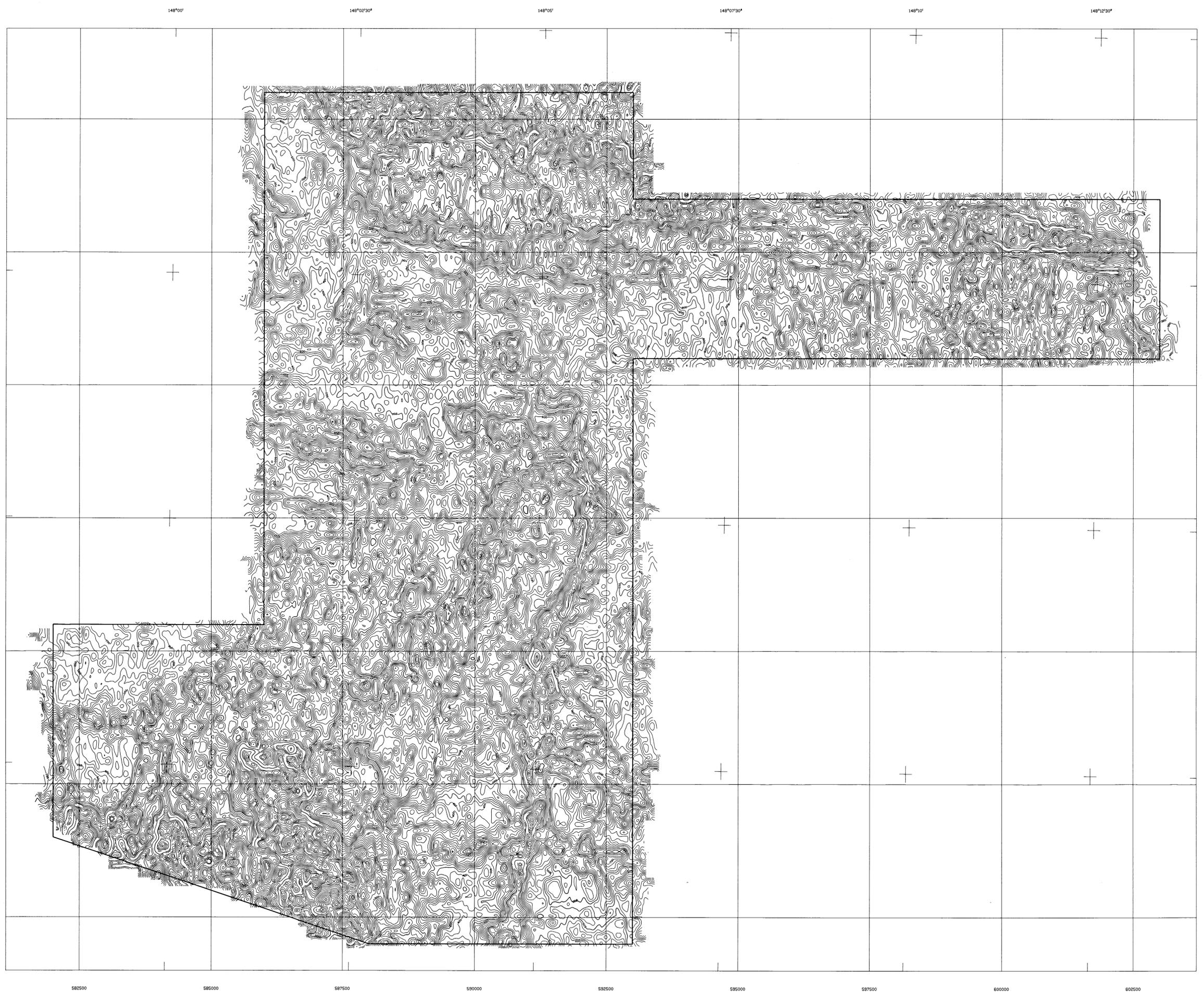
8410 II-N	8516 II-SW	8516 II-NE
8410 II-S	8516 II-SW	8516 II-SE
8415 I-NE	8515 IV-NW	8515 IV-NE



NORTH POINT RELATIONSHIPS ARE SHOWN FOR THE CENTRE OF THE MAP.  
 MAGNETIC NORTH IS TRUE FOR 1980.  
 GRID/MAGNETIC ANGLE 12°34'34"  
 GRID CONVERGENCE 0°42'47.47"  
 SCALAR VARIATION 0°14' East per year



Scale 1:25 000  
 AUSTRALIAN MAP GRID 6250



6250

827060

**PLACECO AUSTRALIA PTY LTD**

Incorporated in Tasmania

11 Midland Highway  
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Tlx: AA 33427

EXPLORATION LICENCE 34/86 - GLADSTONE

ANNUAL REPORT : YEAR 1

29th January, 1987 - 28th January, 1988

VOLUME 3 (OF 3)

MINES  
EL34/86  
LETTER  
23. 12. 87  
REFERS

88-2762  
Vol. 3/3

K. C. MORRISON

J. K. DAVIDSON

23rd December, 1987.

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057

# LEAMAN GEOPHYSICS

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TELEPHONE: (002) 47 8849

827063

REPORT ON TRIAL SURVEY  
PORTLAND MINE

for  
PLACECO AUSTRALIA PTY LTD

by  
Dr. D.E. Leaman

August 1987

PORTLND1

SUMMARY

A trial survey around the Portland Mine north of Gladstone in NE Tasmania using magnetic, self potential and resistivity methods has suggested that all three techniques respond to changes in lithology and perhaps quartz-related mineralisation. It is not yet clear how substantive the correlation may be.

The magnetic survey, supported by susceptibility measurements, has demonstrated that the Mathinna Beds host unit is slightly and variably magnetic. The variation is sufficient to map gross unit or structural changes. Spike anomalies appear to be related to localised iron oxide concentrations in the soil or upper weathered zone and perhaps reflect significant fracture circulation. A direct relationship between such zones and quartz venation is inferred. In the region immediately west of the mine there is an unambiguous correlation between magnetic spikes and quartz-bearing zones. Definition depends on high density observation coverage.

Self potential anomalies are small but tend to correlate with magnetically spiky zones suggesting an association with abrupt rock mass changes involving silica.

Magnetic and self potential results imply a northwest strike for structures and fracture systems (probably including quartz) and this may be contrasted against an apparent regional north-south trend for the host rocks.

Resistivity profiles are more ambiguous and the issues raised are unresolved. There is a broad inverse correlation with the magnetics enabling suggestions to be made concerning lithology. Sandy siltstones are less magnetic and more resistive than the dark mudstones. It is less certain whether the local induration of some fine sandstones about the mineralised veins has been resolved.

Further use of these methods is certainly justified - especially magnetics and self potential - on the basis of these trials, but only the magnetics is likely to prove a stand alone tool in this environment. The supporting value of self potential is evident but the value of resistivity or other electrical methods has yet to be established. It is conceivable that such methods may permit separation of indurated or altered rock volumes and allow some rating of vein systems which may be prove to be ubiquitous upon detailed magnetic survey.

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Self potential	.	...	...	.....	4
Resistivity	.	...	...	.....	5
DISCUSSION	...	...	...	...	..... 6
CONCLUSIONS	.	...	...	...	..... 8
RECOMMENDATIONS		...	...	...	..... 9
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6. SP profile 150N
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10. Resistivity 200N
11. Magnetics 225N
12. Resistivity 225N
13. Magnetics 250N
14. SP profile 250N
15. Magnetics 275N
16. Resistivity 275N
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## INTRODUCTION

The Portland Mine is located 7 kilometres NE of Gladstone at approximately 588 800 mE, 5470 300 mN. It is situated in flat-lying country which has been partly developed for agriculture. The evidence of mining in the early part of this century and the latter part of the last century remains; several trenches, a tailings dump, several sand slurry piles, some timber frame foundations and, until recently, a shaft.

The mine was worked for gold. It appears that free gold in quartz was recovered but gold combined in sulphides (galena, sphalerite and arsenopyrite) was not. These minerals can be seen in quartz fragments.

Placeco Australia Pty Ltd is exploring the region around Gladstone and assessing its gold potential. The critical exploration problem for gold seekers in NE Tasmania is how to do this effectively. Geophysics has been little applied to this problem and structural understanding of the host rocks is made virtually impossible by their poor outcrop. Leaman (1974) trialled several methods on the Lefroy goldfield and showed that it was possible to trace vein systems with thermal and piezoelectric methods in some situations. Self potential methods also appeared useful but resistivity results were inconclusive. The overall results were encouraging but have never been tested with more extensive surveys either by explorers or researchers.

The absence of topographic, vegetation and cultural problems about the Portland Mine, and its ease of access, led to its selection for a geophysical test survey. The survey was organised with two objectives; to evaluate several methods and obtain either some indication of response from a mineralised locality or a structural outline. Success with the latter would mean that general structural evaluation might be possible irrespective of the exposure of the host rocks.

Simple, direct and inexpensive methods were chosen since there was little point in attempting sophisticated approaches in the absence of adequate tests of any methods. Self potential and resistivity methods had been shown previously to yield results (Leaman, 1974) but magnetics had not. This was ascribed to use of fluxgate rather than proton magnetometry. Magnetics was added to the programme in order to evaluate variations in Mathinna Beds and assess its value in airborne use.

A grid was laid out with a N-S base line and E-W grid lines in order to facilitate a soil sampling programme. Various lines were used for the geophysical tests but a large scale systematic coverage was not attempted. The grid and its relationship to the Portland Mine is shown in Figure 1.

## SURVEY RESULTS

## MAGNETICS

Observations were made with a proton magnetometer at 2.5 m intervals along the base line and lines 150, 200, 225, 250, 275, 300 and 350N. Loops were closed and adjusted. Since work was spread over several days diurnal ties and corrections were also made. The data, as presented in Table 1, is fully corrected for these factors. Observations were found reproducible within 2 nT.

Profiles for the lines, or part lines, observed are presented in Figures 2, 5, 8, 11, 13, 15, 17 and 19. These are summarised in Figure 22. The profiles illustrate several important features; the Mathinna Beds are not blandly non magnetic, there are both local and regional anomalies, and there are extremely spiky local responses. Profiles along the base line and 250N (Figures 2 and 13) show that there are features with wavelengths in excess of 150 m while line 350N (Figure 19) demonstrates features with a wavelength of 50 to 100m. All lines show isolated or grouped spike anomalies with wavelengths of 5 to 20 m and very high amplitude compared to the other features. The observational noise, or surface noise, envelope is about 3 nT wide and easily removed.

Profile 225N (Figure 11) is exceptional and some of the response can be directly related to iron objects near the old shaft. This is not the case elsewhere and even on this line most of the effect is geological.

The slightly subdued spikes on line 250N (at 108E in Figure 13) were tested by excavation. Susceptibility measurements showed that iron oxide concentrations at the base of the grey top soil horizon at about 200 mm were distinctly magnetic and could well account for part of the responses. No quartz was found at this location although the excavation was limited. Near the intersection of lines 225N and 250N and the base line quartz is evident in the soil and in weathered rock at depths of less than 200 mm. Stronger spikes may be observed on these lines at this location (Figures 2, 11, 13) and the association seems definitive even though the quartz itself does not contribute to the response.

A contoured map of the magnetic field has been produced by smoothing the noise evident in the profiles and removing the spikes (see Figure 25). The subtlety of the gross responses is evident in this plot since the contour interval is only double the noise envelope. A distinct NW trend is evident. The locations of the various spike anomalies have also been shown in this diagram. They have been given some NW extension, partly as a reflection of gross trends and partly because this trend can be demonstrated in several places where the grid is adequately confined. Comparison of Figures 1 and 25 show that there is a marked correlation with old trenches, and their alignment, and the features of the magnetic field. Many sourcing features may

have been more obvious in 1890.

Susceptibility measurements were made of more than 100 samples from the mine dump, various soil profiles and isolated rock fragments within the soil.

These measurements confirmed a range of magnetic properties for the Mathinna Beds host units. White/buff micaceous siltstones and fine sandstones generally yielded values less than 0.0001 SI while the indurated grey quartzites were even less magnetic. The blue grey mudstones and shales contrasted significantly with a range of values up to 0.0006 SI with typical values of 0.0003 or 0.0004 SI. It should be noted that there is considerable overlap within the lower ranges, probably as a function of weathering. Some extreme contrasts may also exist within the soil profile. Where reddish iron-stained B horizons are present values of 0.0004 SI were observed. These effects tend to be localised and restricted to thin bands within the soil profile.

Note that all magnetic profiles have been plotted using a base level of 61535 nT and this value should be added to the diagrams. The edges of real data are marked by near vertical lines to this base level.

## SELF POTENTIAL

The profiles shown in Figures 3, 4, 6, 9, 14, 18 and 20 and summarised in Figure 21 were derived from observations at 10 m intervals along various grid lines. The coverage is not exhaustive. All values were referred to a fixed base point at 250N, 100E in the centre of the grid a little east of the mine. Few obvious patterns are recognisable in Figure 21, although Figure 3 is more suggestive, perhaps reflecting the orientation of the traverses.

All responses are subtle with a total range of 40 mV. This may reflect the saturation conditions at the site during the survey. All results were reproducible within 2 to 4 mV and were corrected by loop closure tests between sessions. The results tabulated in Table 2 are corrected for day and loop variations.

An attempt to contour the potentials (Figure 26) does, however, show a NW trend pattern with positive responses offset from the more positive magnetic responses (see Figure 25). The strong point anomalies, major negative gradients and comparable features correlate with many magnetically spiky zones. It will also be noted that the pattern and overall character in the region of the Portland Mines is distinctive. It is not clear how much this change from the regional character evident in the east of the surveyed area reflects the geology and how much the development of the mine.

The horizontal line segment on the left side of some plots represents the zero level for the particular data set.

## RESISTIVITY

Four lines were traversed in ideal electrical conditions; 175N, 200N, 225N and 275N. The results are presented in Figures 7, 10, 12 and 16 with a summation in Figure 23. A Schlumberger sounding was also observed along the base line with centre point at 200N (Figure 24). A gradient array was used for the traverses with a current electrode separation of 400 m and a potential electrode separation of 20 m.

The profiles do not extend the full length of some lines and the negative tail on the left end of several plots represents no data.

The profile along 275N is exceptional, as comparison shows in Figure 23. Other lines show peak responses in the vicinity of the mine. The abrupt spike on line 200N may reflect geological conditions - i.e., induration, or electrode placement in the tailings dump, and should not be stressed in any interpretation at this stage. No other electrode problems were experienced or suspected within the survey.

Typical resistivity values were of the order of 170 ohm-m and represent a Schlumberger penetration of 150 m or a depth equivalent of perhaps 40 m. The array was designed to ensure an effective penetration of at least 25 m in order to assess rock conditions at the depth mined.

The sounding (Figure 24) was used to check that the array size would prove adequate for the objective stated. It has also been interpreted to suggest a surface resistivity of 300 ohm-m and a relatively thin weathering profile. The water table was high at the time of survey and does not appear to greatly affect the sounding. A change in resistivity to lower values is inferred at about 300 mm and this is probably the water table. Resistivities of 40 and 25 ohm-m are evident to depths of 600 mm and 3 m respectively. From 3 to 30 m the resistivity is of the order of 140 ohm-m, as evident on much of profile 275N, and probably reflects either extended weathering or a change in lithology. Below 30 m the resistivity exceeds 280 ohm-m. These results show that the traverses have tested only the upper 30 m of section. Further soundings east of the base line would be required to confirm the apparent abnormality of lines 175, 200 and 225 N.

The plots of traverse resistivities should be adjusted by a base value of 110 ohm-m. Peak values on line 200N are thus of the order of 200 ohm-m. The base shift was applied to allow expansion of the profile scale.

## DISCUSSION

Several possible associations have been alluded to in the presentation of the results. These include the clear implication that magnetic spikes can be correlated with quartz-bearing zones and the relationship between potential cells and such features. There is also a possibility that increased resistivity reflects induration, mineralisation or pronounced quartz veining although the resistivity association is less obvious and certainly more ambiguous (below).

Although records describing the Portland Mine are sparse and not detailed Twelvetrees (1915) notes that drives headed at 320 degrees. This is consistent with shaft position, tailings pile, probable location of original outcrops on a small rise west of the shaft, and long trenches (see Figure 1). Mineralised quartz can be observed in the soil and weathered rock of this area near the shaft and the spikiness of the magnetics is unambiguously associated with it (see line 250N, Figure 13). In the region immediately west of the shaft the NW trend can be confirmed from these observations since many grid positions are close together. The gross and fine trends observable in the present, rather limited magnetic data are wholly consistent with about 320 degrees magnetic and it must be presumed that the magnetics has resolved the grain of mineralisation, quartz or fracture system controlling these. This trend has been marked on the direction arrows of Figure 25.

One profile was modelled in order to assess the contribution of lithology to the observed magnetic field. The result is shown in Figure 28. The small broad scale variations in the magnetic field can be wholly accounted for using the observed susceptibilities and it is clear that only very small parts of the section are wholly non magnetic and that these are restricted to the western end - an extension of the siliceous zone in the mine, using 320 degrees. The other lithologies alternate with thicknesses of 50 to 100 metres at least and establish the broad trend along this profile. The profile has been modified and may be compared with Figure 17. The reference profile used in the structural model was derived from the observed profile by continuation to a height of 5 m above ground level. This was done to remove some of the extreme spikiness and provide some integration of the spiky zone. The process does not modify in any significant way the general background character of the profile.

The continued spiky zone has also been modelled using contrast values implied by measurements from the soil zone around quartz veins. It is clear that these very local concentrations of iron oxides can, in association with the gross lithologic changes, account for all observed features. The quartz itself does not contribute to the result other, perhaps, that to aid fracturing and water passage. If this is the case then the magnetic method is able not only to suggest general litho-structure texture within the Mathinna Beds as a whole but also to identify those narrow zones in which quartz or intense fracturing is present.

There are few definitive correlations between magnetic features and SP anomalies when seen in profile form but the plan relationship is persuasive. The voltage cells can be related to the fracture systems implied in the magnetic data based on the anchoring correlation near the mine. Additionally the SP voltage cells are dominant near the mine. The voltage cells can be related to the quartz-bearing fracture systems and this correlation is suggested on lines 200N and 250N but not unambiguously. Leaman (1974) noted the same problems and the ghosted association and also recorded that low self potentials are associated with veins. This would appear to be the case at Portland Mine presuming the magnetic spikes do indeed reflect these features universally.

As at Lefroy (Leaman, 1974), the resistivity method is less conclusive and more ambiguous. The array used here has permitted a deeper view and there is a crude inverse relationship with the magnetic data in gross terms. There is no certain detailed relationship which could reflect vein systems although, as noted above, the increase in resistivity near the mine may reflect the local induration or increase in quartz content. The pattern is confused by the change in overall lithology eastward and no specific conclusions can be drawn on the basis of the present data.

The overall pattern of results indicates that the more magnetic blue-grey mudstones are more conductive than the silty or sandy units but as magnetic spikes and some voltage cells are to be found independently of gross lithologic change this information does not appear particularly useful in an exploration sense. Comparison of Figures 22 and 23 does suggest, however, that most fracture/vein systems are in the more competent sandy or indurated units. It is not clear whether this association is incidental, controlling or generic.

Several diagrams have been included where the profiles have been superimposed; magnetics (Figure 22), SP (21), resistivity (23). This style of presentation stresses any abnormalities. Inspection shows that lines 250 and 350 are distinctive if the distracting effects of the spikes is ignored. Other major vein systems are implied. 275N also has unusual resistivity responses. SP anomalies are much less systematic when seen in E-W profiles but the distinctiveness of the mine area is evident in the N-S profiles observed (Figure 4). A comparable feature can be seen at 100E on 150N and this turns out to be the spiky anomalous region magnetically.

The magnetic data have also been assessed for regional resolution given the range of properties now established within the Mathinna Beds. The results of continuation tests are shown in Figure 27. Line 300N was selected for this test. The data was continued to heights of 5, 20 and 60 m above ground. The Figure allows some comparative estimation of the depth of anomalies observed on other lines and shows how spikes may integrate into a single feature at depths of 5 or 10 m. The test also shows that only broad scale unit changes will be mapped at a height of 60 m as might be used in an aerial survey. This line does not include these.

## CONCLUSIONS

This test survey essentially supports the early work of Leaman (1974) in respect of self potential and resistivity applications to gold or quartz exploration in NE Tasmania. It significantly extends it in respect of magnetics. This is important since the magnetic method is perhaps the simplest, cheapest, most reliable and most reproducible of all geophysical methods.

Although the test surveys were of limited scope several important conclusions can be drawn. The implication of the association and result may be the subject of argument but the evidence of direct correlation cannot be ignored.

The materials of the region are subtly and variably magnetic and it is possible to map units and trends by magnetic methods. Although the precise origin of the association is unclear the method is also able to locate quartz-bearing zones. These induce some weathering transfer changes and sizeable spike anomalies. Continuation tests show that changes induced by lithologic changes could be mapped by aerial methods at a height of approximately 60 m. No evidence of vein accumulations would be retained at this height and aerial methods must be used to identify abnormal trends.

Self potential methods are less valuable but do offer good supporting evidence for any magnetically derived inference. Voltage cells appear to be generated along major fracture or vein systems.

The results of resistivity traversing are not conclusive but it may be that this method has also integrated the effect of an accumulation of quartz veins or induration about some of them.

No method has responded, or appeared to respond, to the mineralisation directly. Responses are structurally or lithologically controlled.

The present test survey has demonstrated a need for data redundancy in any future survey. SP and ground magnetics should be based on a 10 to 15 m grid with observations at 5 and 2 m respectively wherever first order traversing at separation not greater than the 25 to 50 m grid or 2 and 10 m spacings used here.

The results are encouraging and consistent with earlier work and there is no reason why the Mathinna Beds should not be usefully explored with these very simple methods.

## RECOMMENDATIONS

1. Some of the conclusions of this study can be tested and reviewed by trenching. This should be done. It may then be possible to appraise the relative merit of the resistivity results and the origin of the SP and magnetic responses.
2. Should the results be supported by trenching, and a particular method coupling then seen to be viable, then extensive surveys within areas of known mineralisation or beyond them can be considered. They should be specified with redundancy of observation as suggested in Conclusions.
3. Detailed surveys should emphasize magnetics since it is clear that this method might well stand alone for both structural-stratigraphic and direct vein exploration applications. It can clearly function in the first mentioned application although the latter should be established after test trenching.
4. Aeromagnetic surveys are feasible in these rock types and should be considered for regional exploration.

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Tech. Rep. Dep. Mines Tasm., 17, p. 79
- Twelvetrees, W.H., 1915. The Gladstone Mineral District.  
Bull. geol. Surv. Tasm., 25.

070

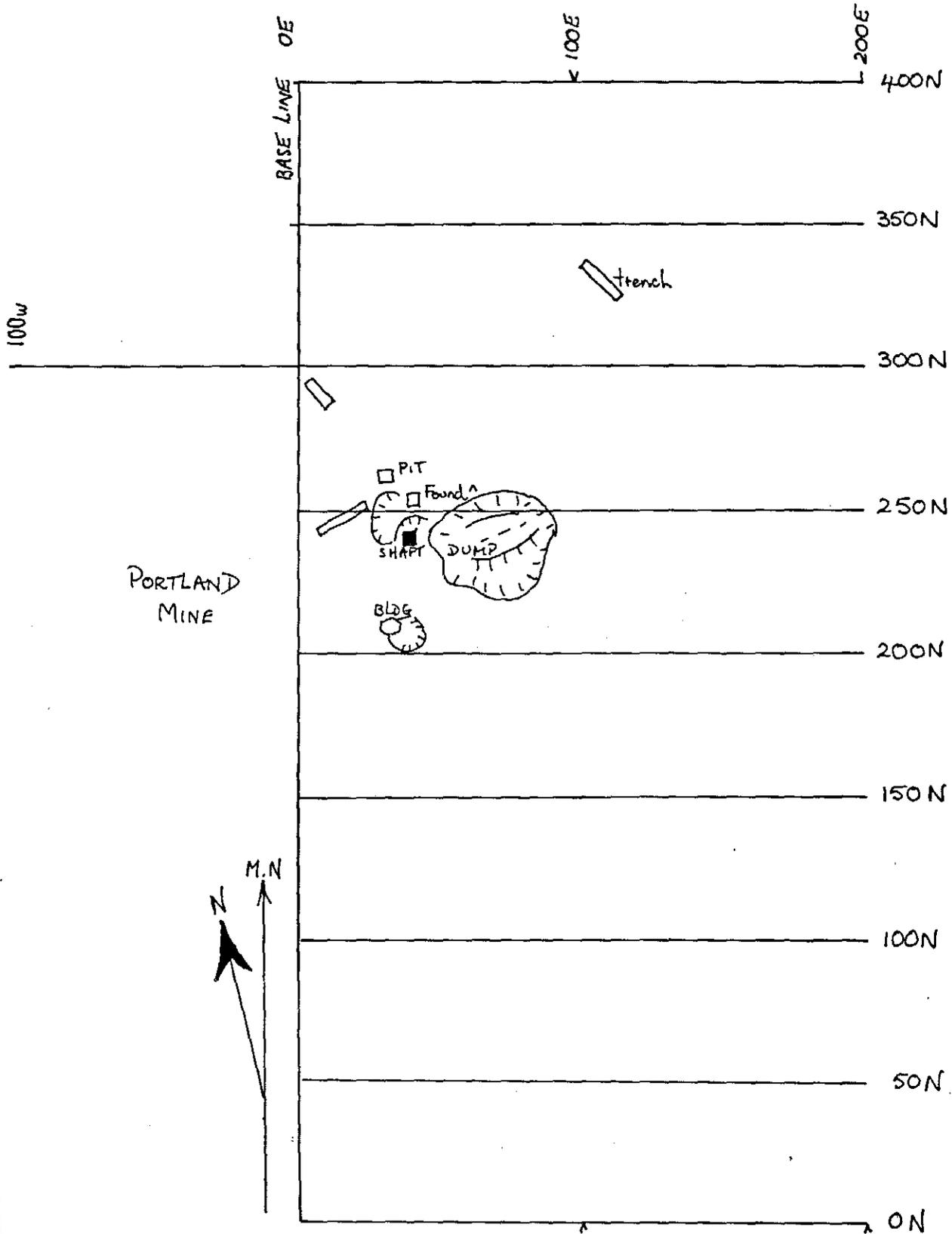


FIGURE 1

GRID AND LOCATION MAP

071

B:PLNG00E PORTLAND MINE MAGNETICS BASE LINE

ZERO SHIFT : 0

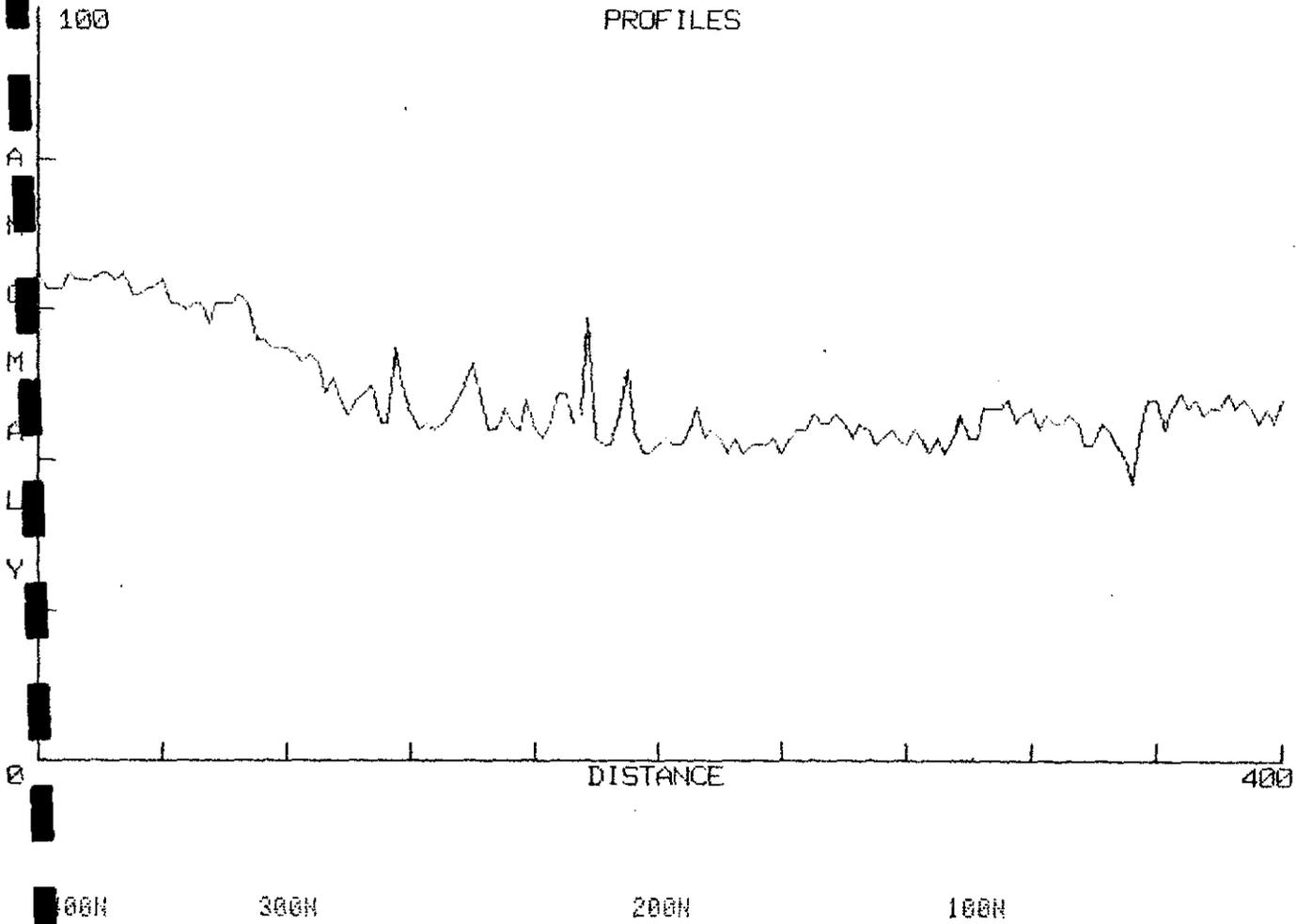


FIGURE : 2

PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE BASE LINE

072

B:PLSPGGE PORTLAND MINE SP BASELINE 100-400N

PRO SHIFT : 19

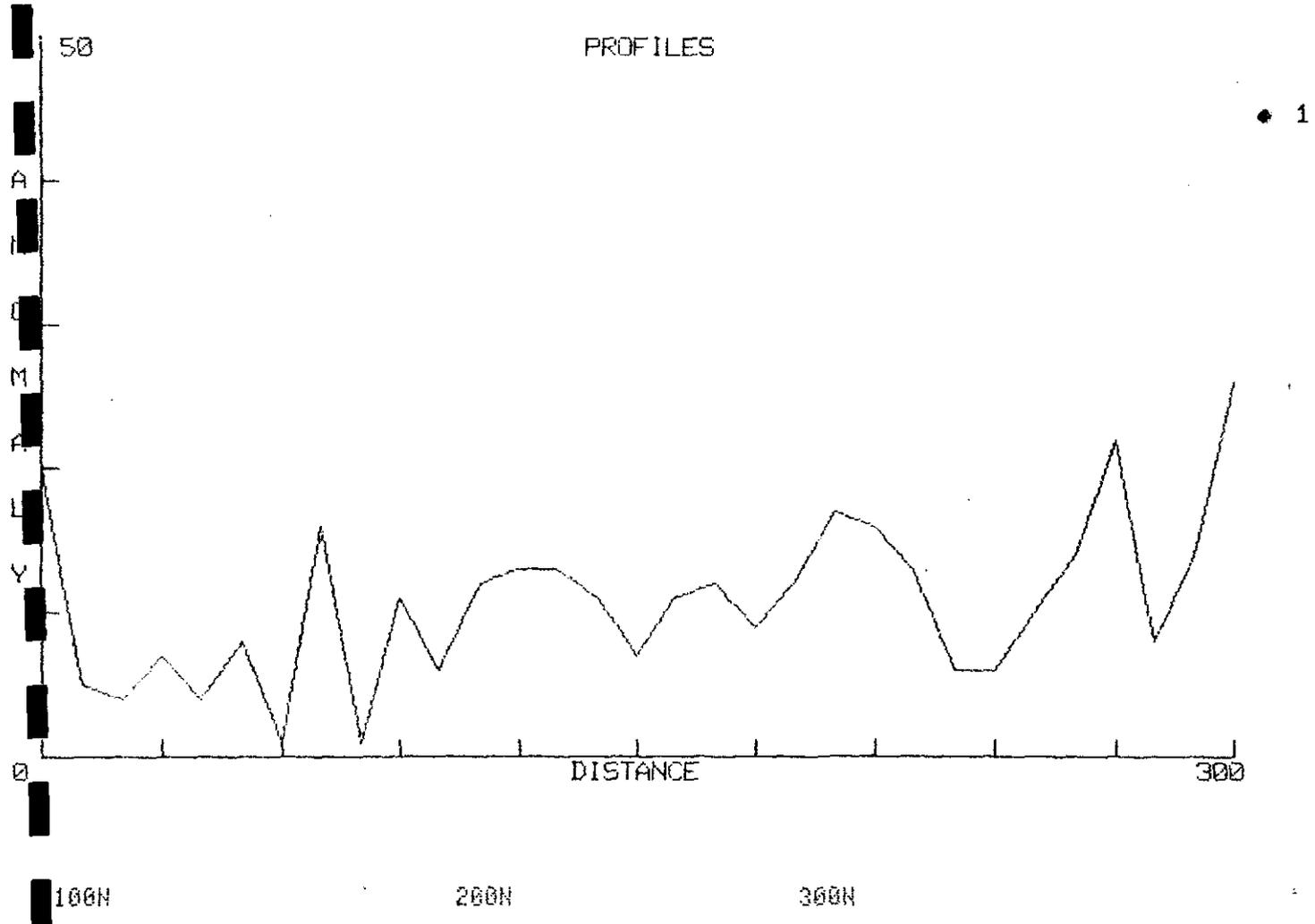


FIGURE : 3

PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILE BASE LINE

073

827079

1 B:PLSP00E PORTLAND MINE SP BASELINE 100-400N  
2 B:PLSP50E PORTLAND MINE SP 50E 100-400N  
3 B:PLSP100E PORTLAND MINE SP 100E 100-400N

ERG SHIFT : 24

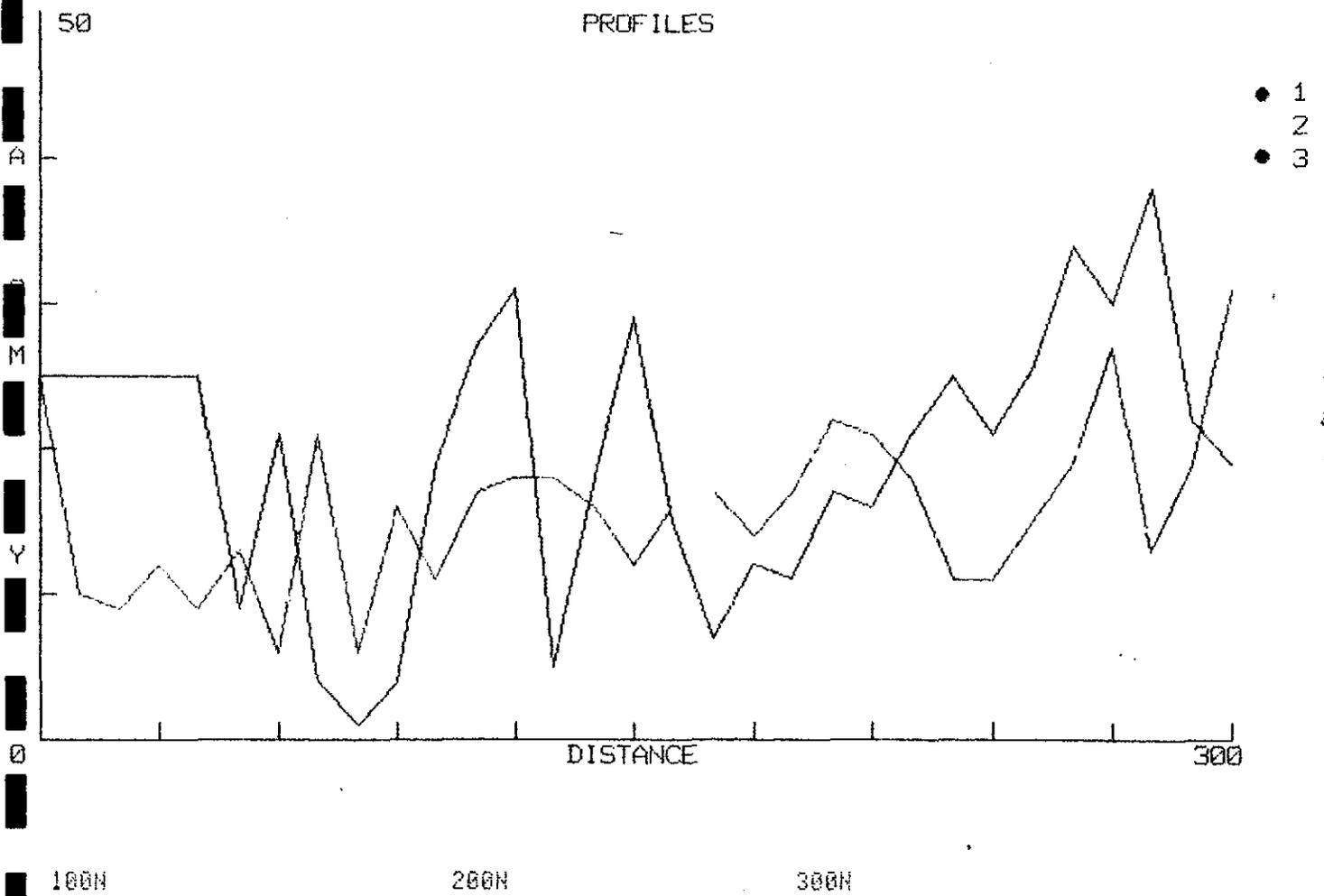


FIGURE : 4

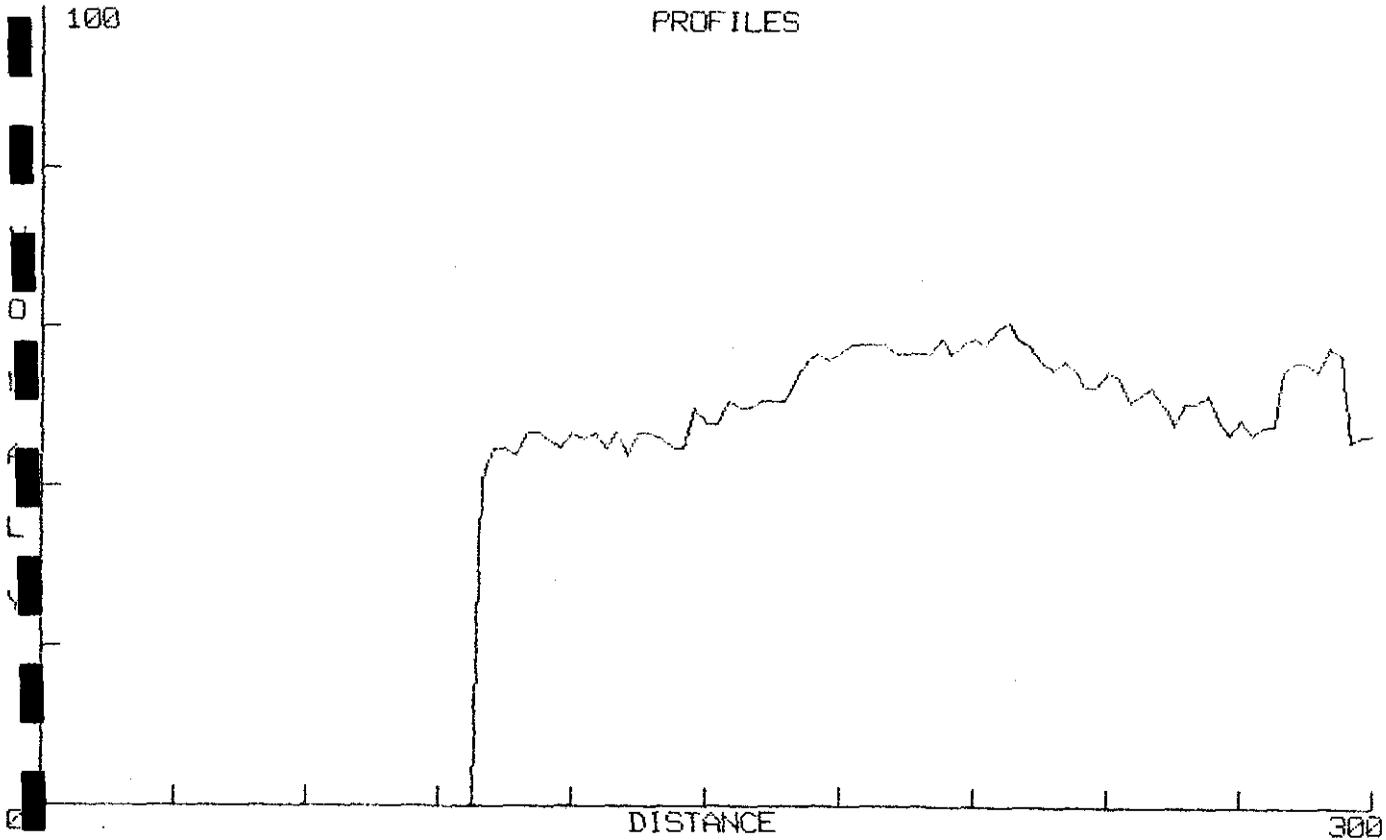
PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILES 0 50 100 E

074

827080

B:PLNG150N PORTLAND MINE MAGNETICS 150N

ZERO SHIFT : 0



100W

0E

100E

FIGURE : 5

PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE LINE 150N

075

B:PLSP150N PORTLAND MINE SP LINE 150N

PERO SHIFT : 22

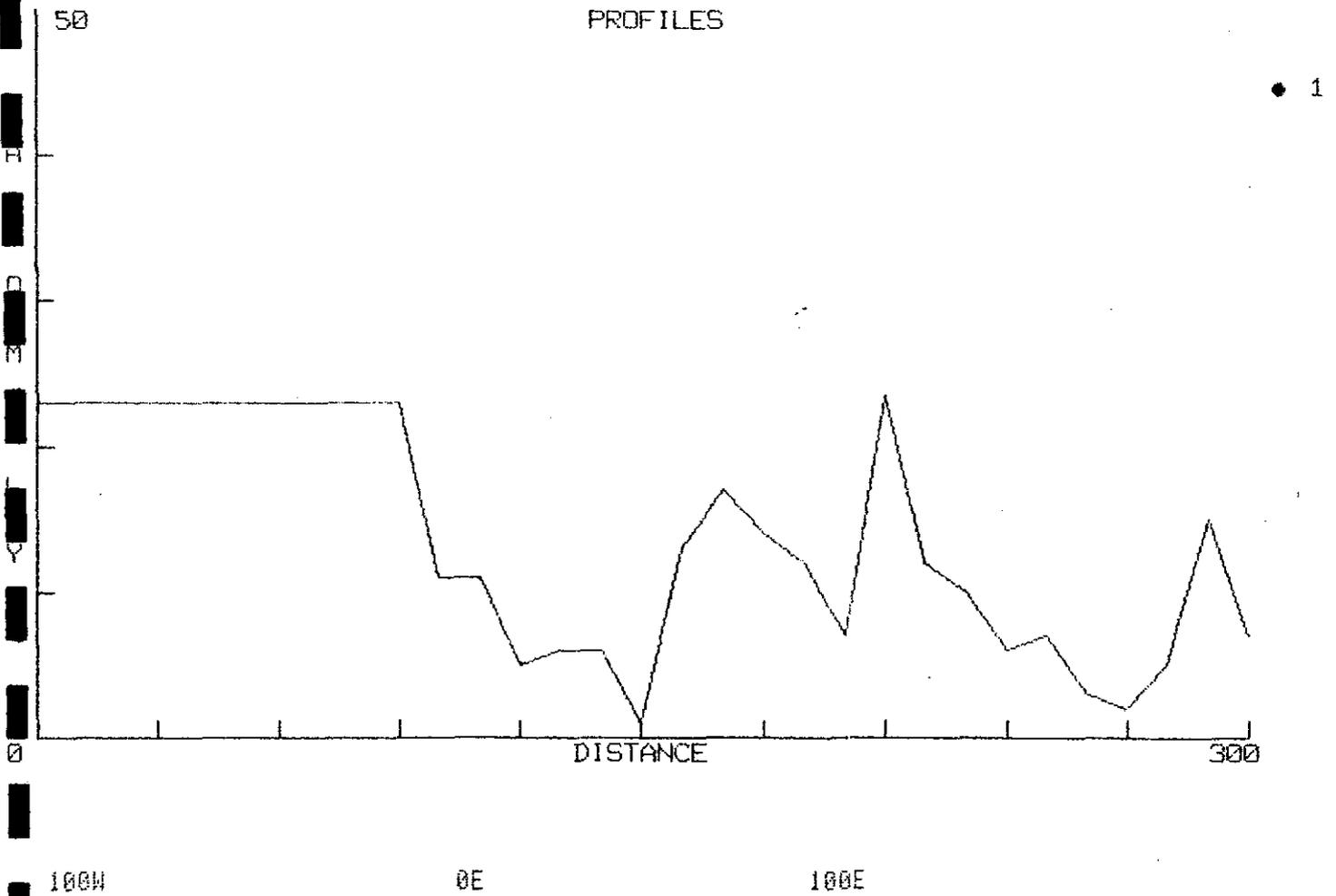


FIGURE : 6

PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILE 150N

076

B:PLRE175N PORTLAND MINE RESISTIVITY 175N

ZERO SHIFT : 0

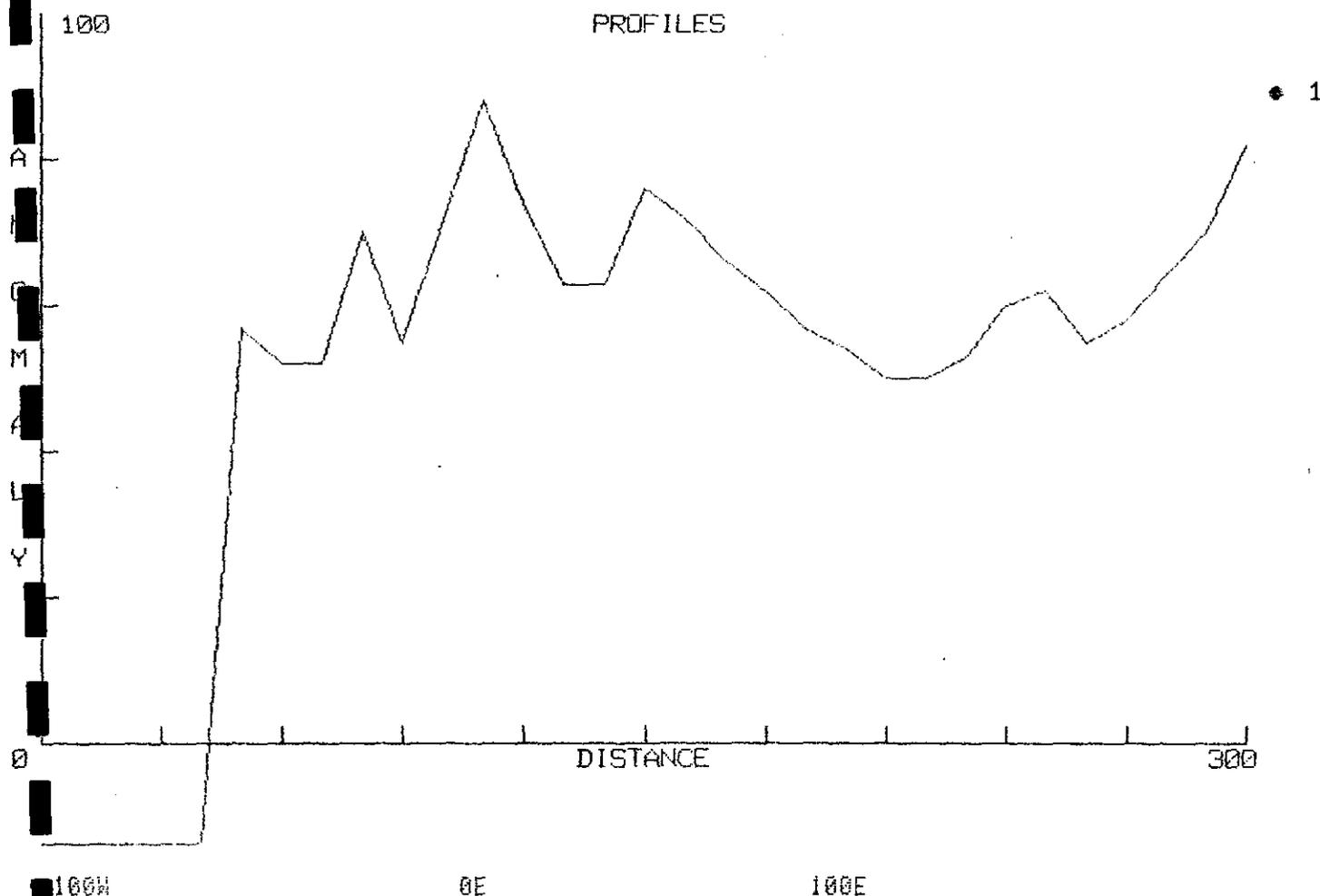


FIGURE : 7

PORTLAND MINE TEST SURVEY  
RESISTIVITY PROFILE GRADIENT ARRAY 175N

077

827083

B:PLNG200N FORTLAND MINE MAGNETICS 200N

ZERO SHIFT : 0

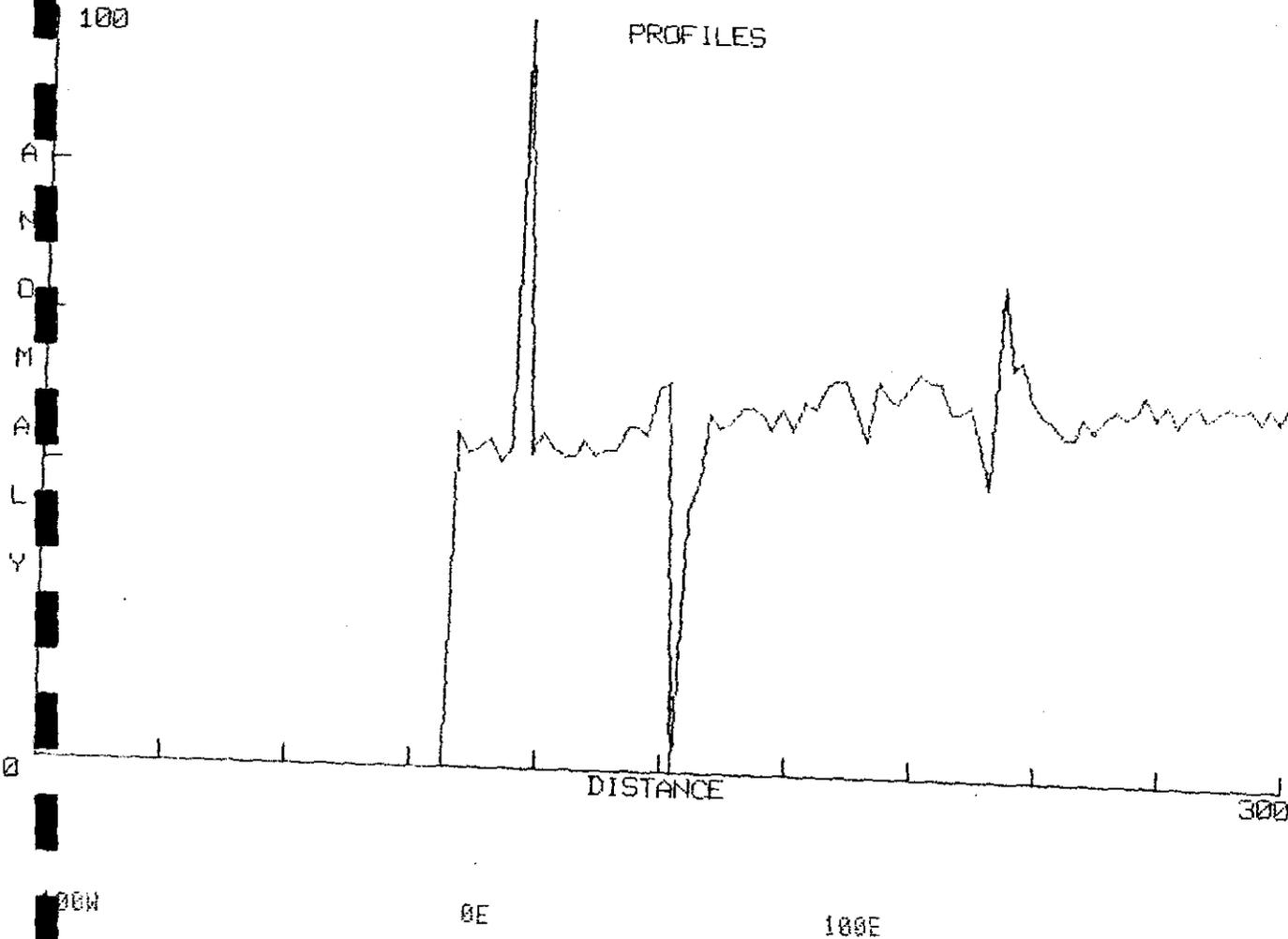


FIGURE : 8

ORLAND MINE TEST SURVEY  
MAGNETIC PROFILE 200N

078

827084

1 B:PLSP200N PORTLAND MINE SP LINE 200N  
ZERO SHIFT : 16

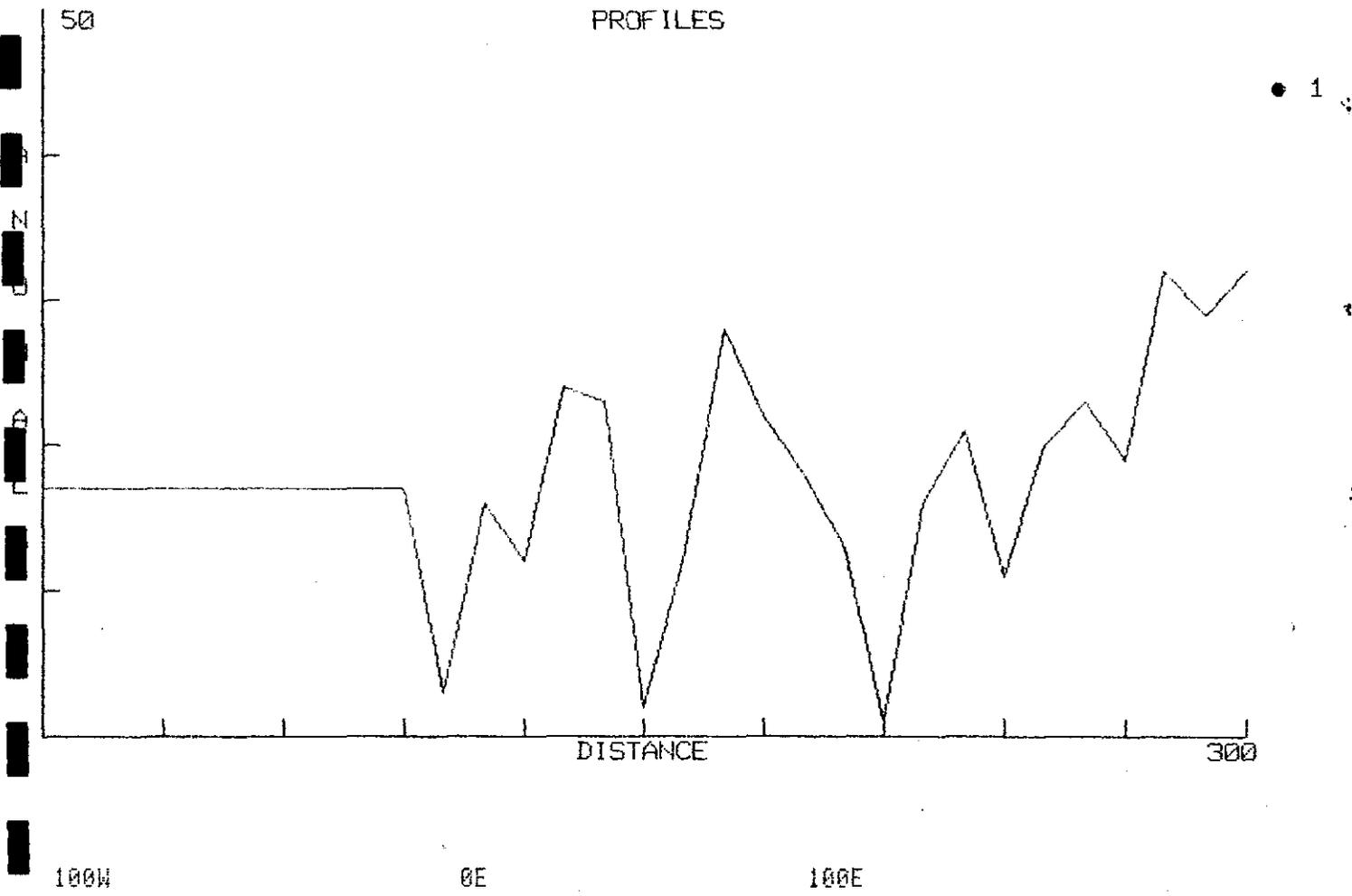


FIGURE : 9

PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILE 200N

079

B:PLRE200N PORTLAND MINE RESISTIVITY 200N

ZERO SHIFT : 0

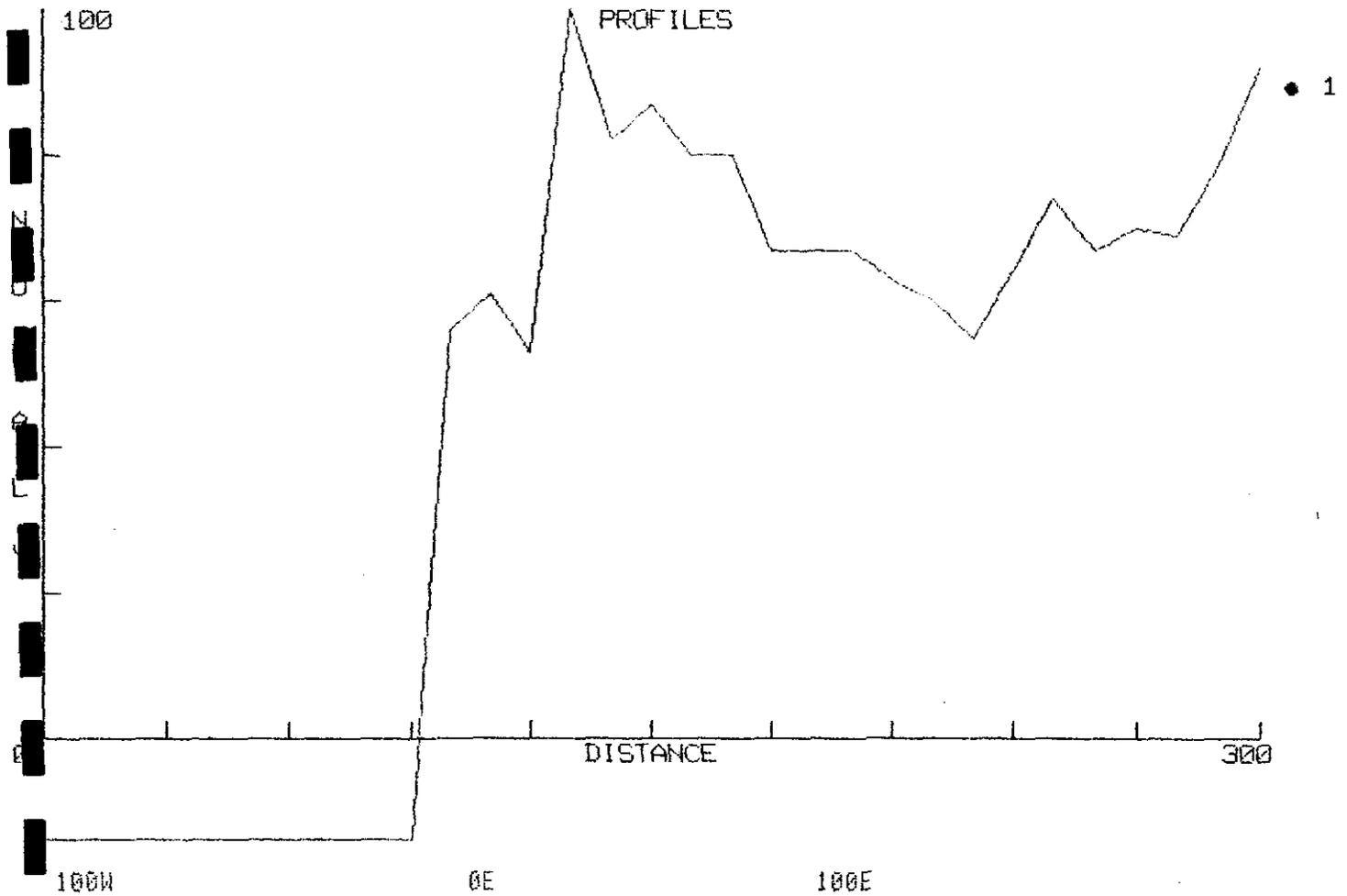


FIGURE : 10

PORTLAND MINE TEST SURVEY  
RESISTIVITY PROFILE 200N

827086

080

1  
B-PLMG225N PORTLAND MINE MAGNETICS LINE 225N  
ZERO SHIFT : 0

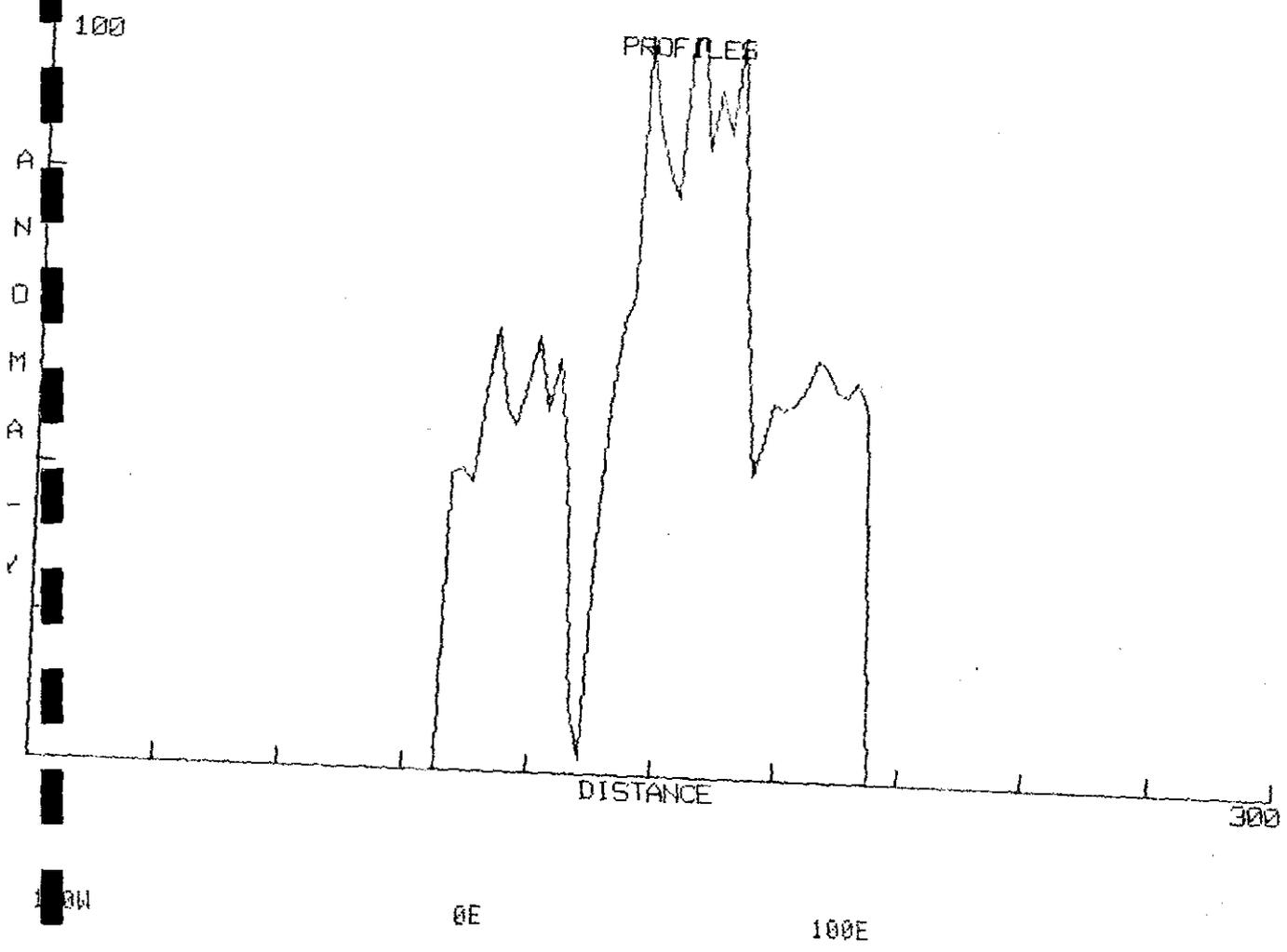


FIGURE : 11

PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE 225N

081

827087

1 B:PLRE225N PORTLAND MINE RESISTIVITY 225N  
ZERO SHIFT : 0

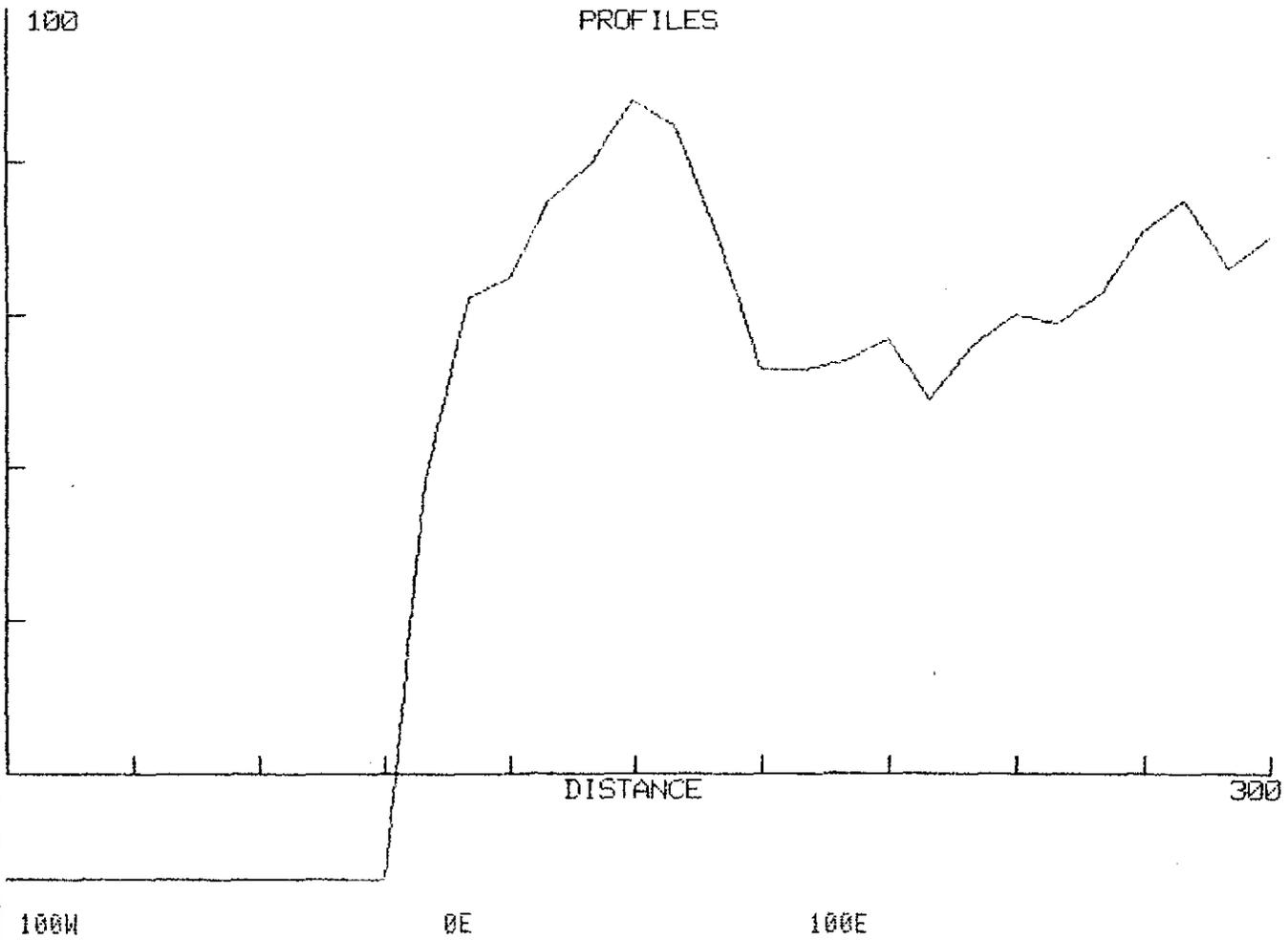


FIGURE : 12

PORTLAND MINE TEST SURVEY  
RESISTIVITY PROFILE 225N

082

827088

1 B:PLMG25GN PORTLAND MINE MAGNETICS 25GN  
ZERO SHIFT : 0

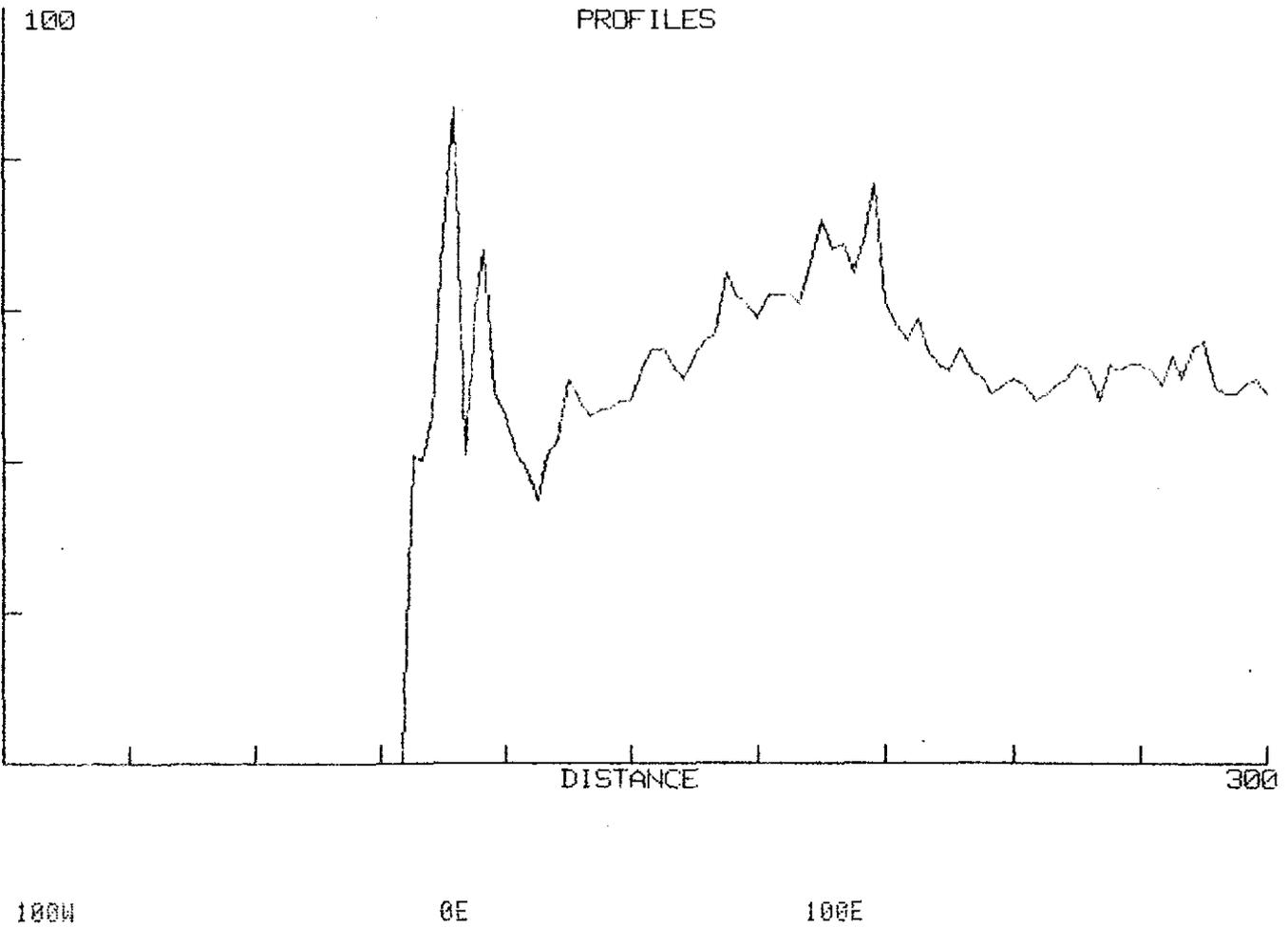


FIGURE : 13

PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE 25GN

083

827089

1 B:PLSP250N PORTLAND MINE SP LINE 250N  
ZERO SHIFT : 15

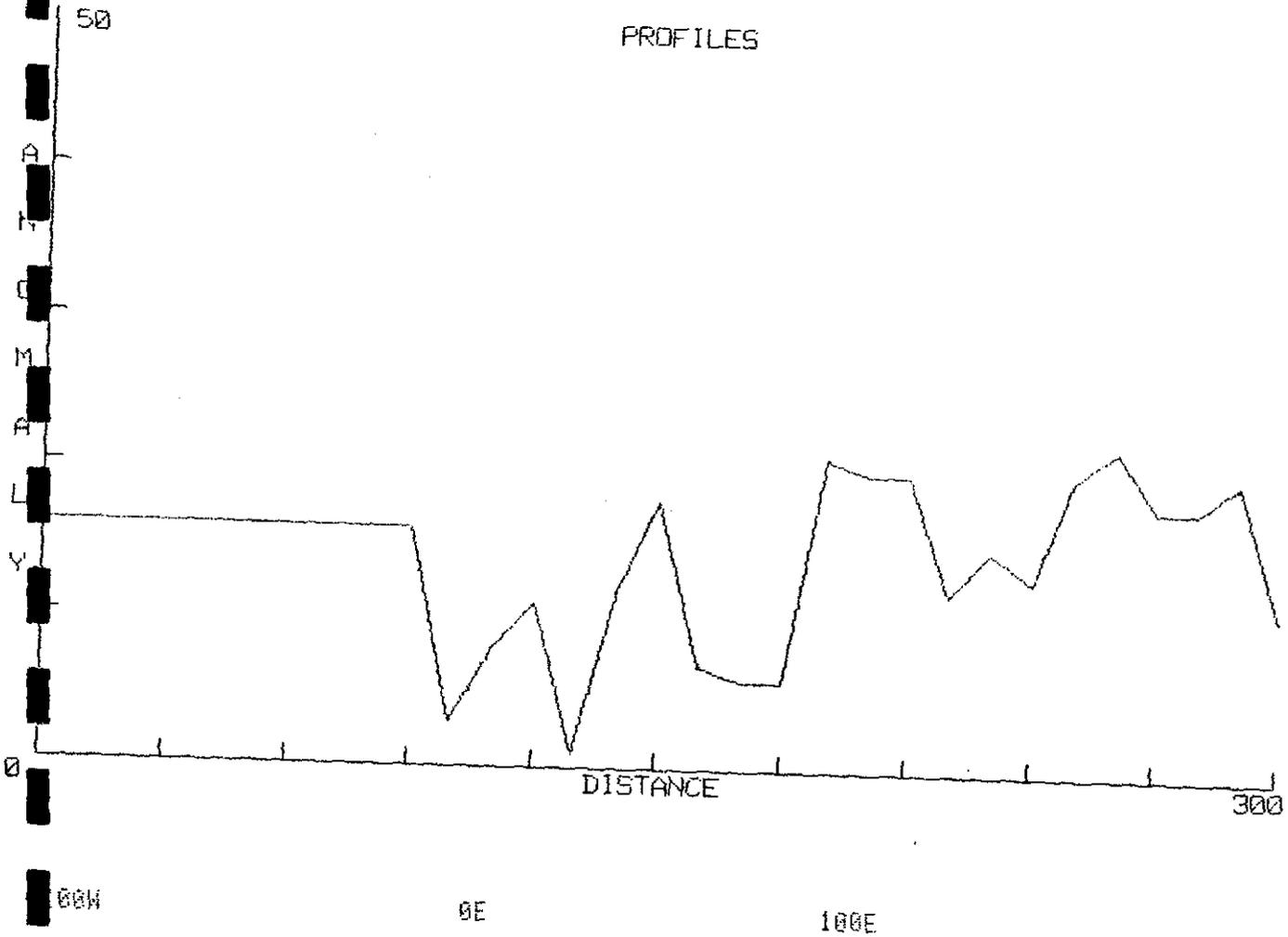


FIGURE : 14

PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILE 250N

084

827090

B:PLNG275N PORTLAND MINE MAGNETICS LINE 275N

ZERO SHIFT : 0

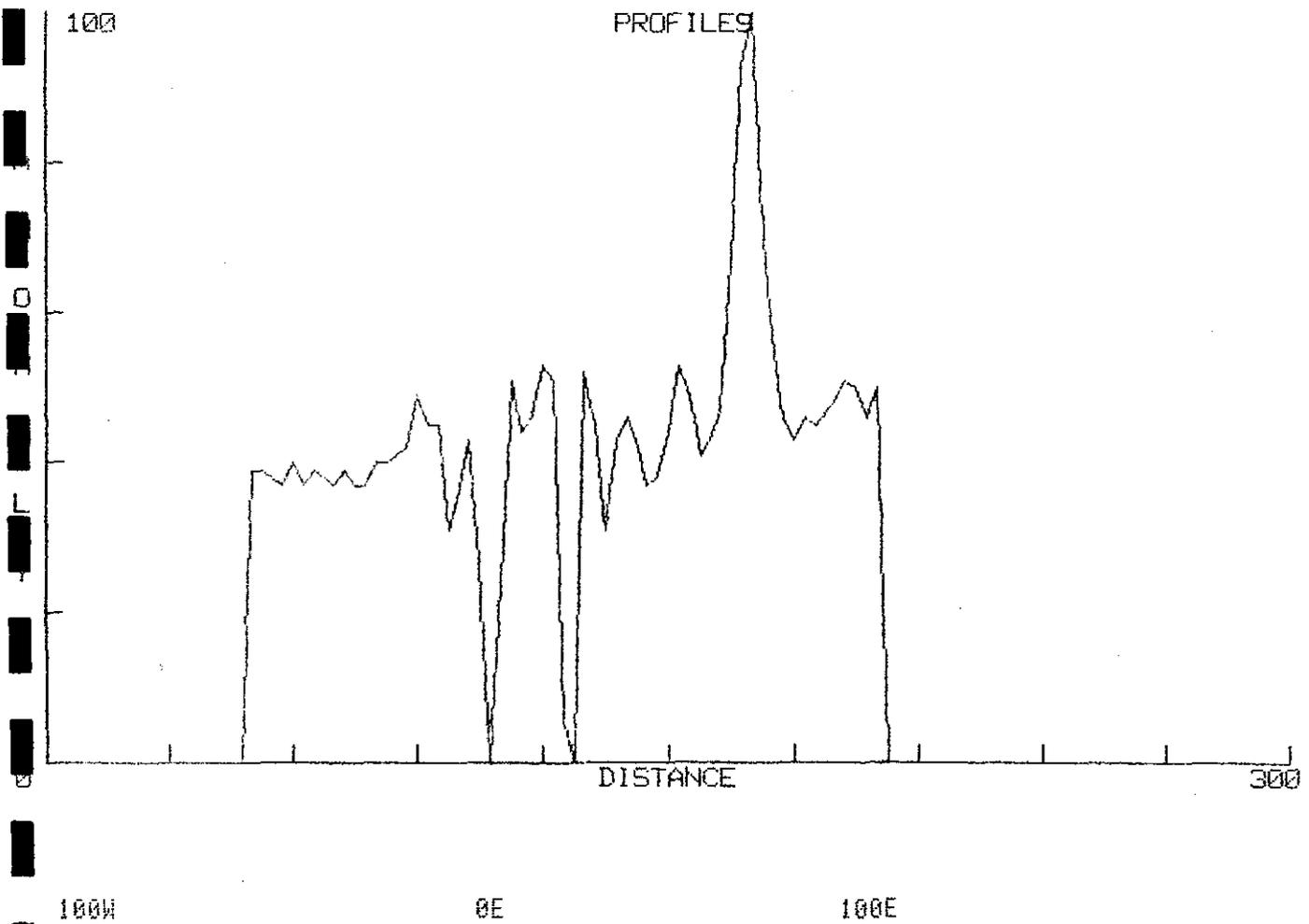


FIGURE : 15

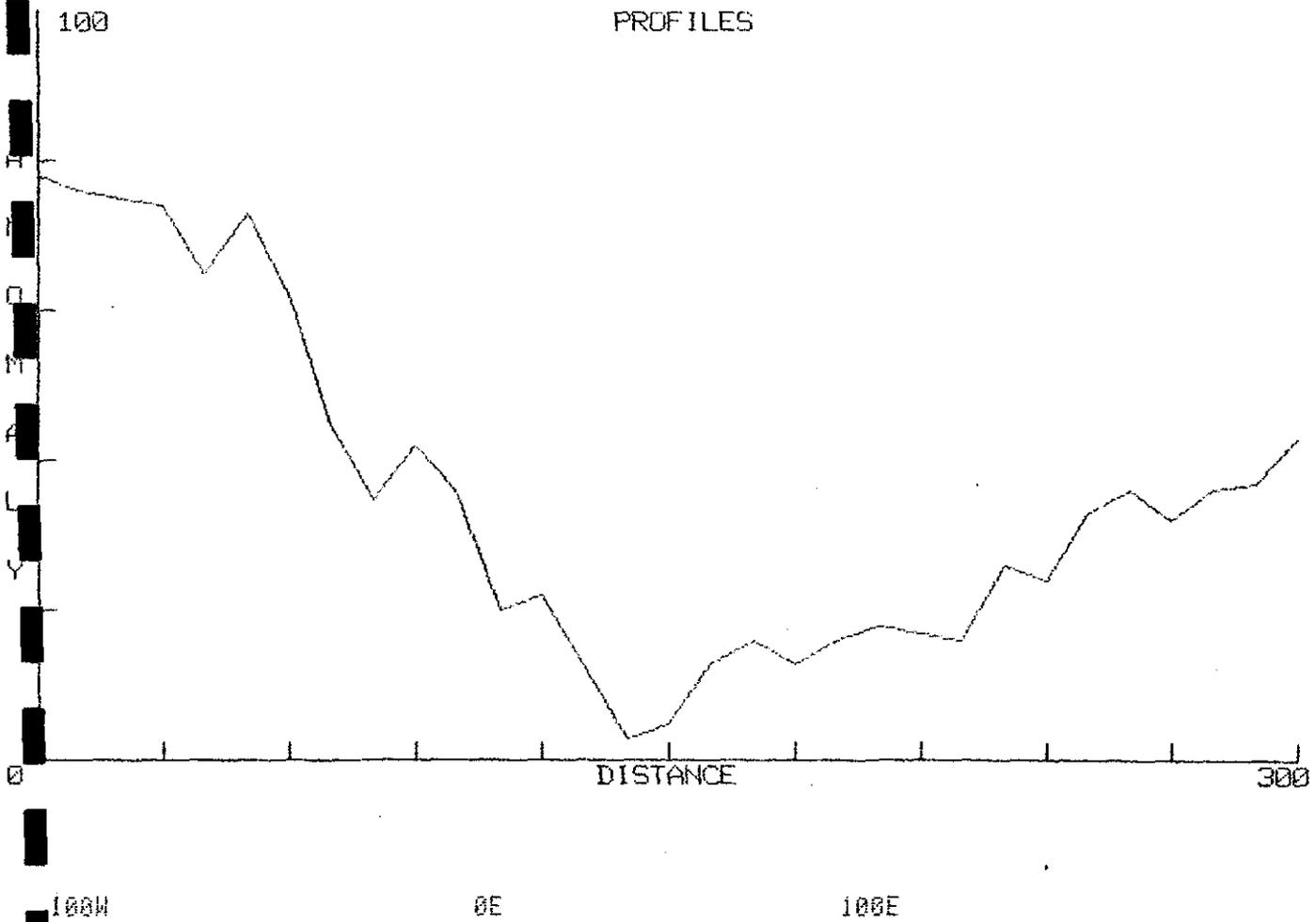
PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE 275N

085

827091

B:PLRE275N PORTLAND MINE RESISTIVITY 275N

ZERO SHIFT : 0



• 1

FIGURE : 16

PORTLAND MINE TEST SURVEY  
RESISTIVITY PROFILE 275N

086

827092

B-PLMG300N PORTLAND MINE MAGNETICS LINE 300N

ROAD SHIFT : 0

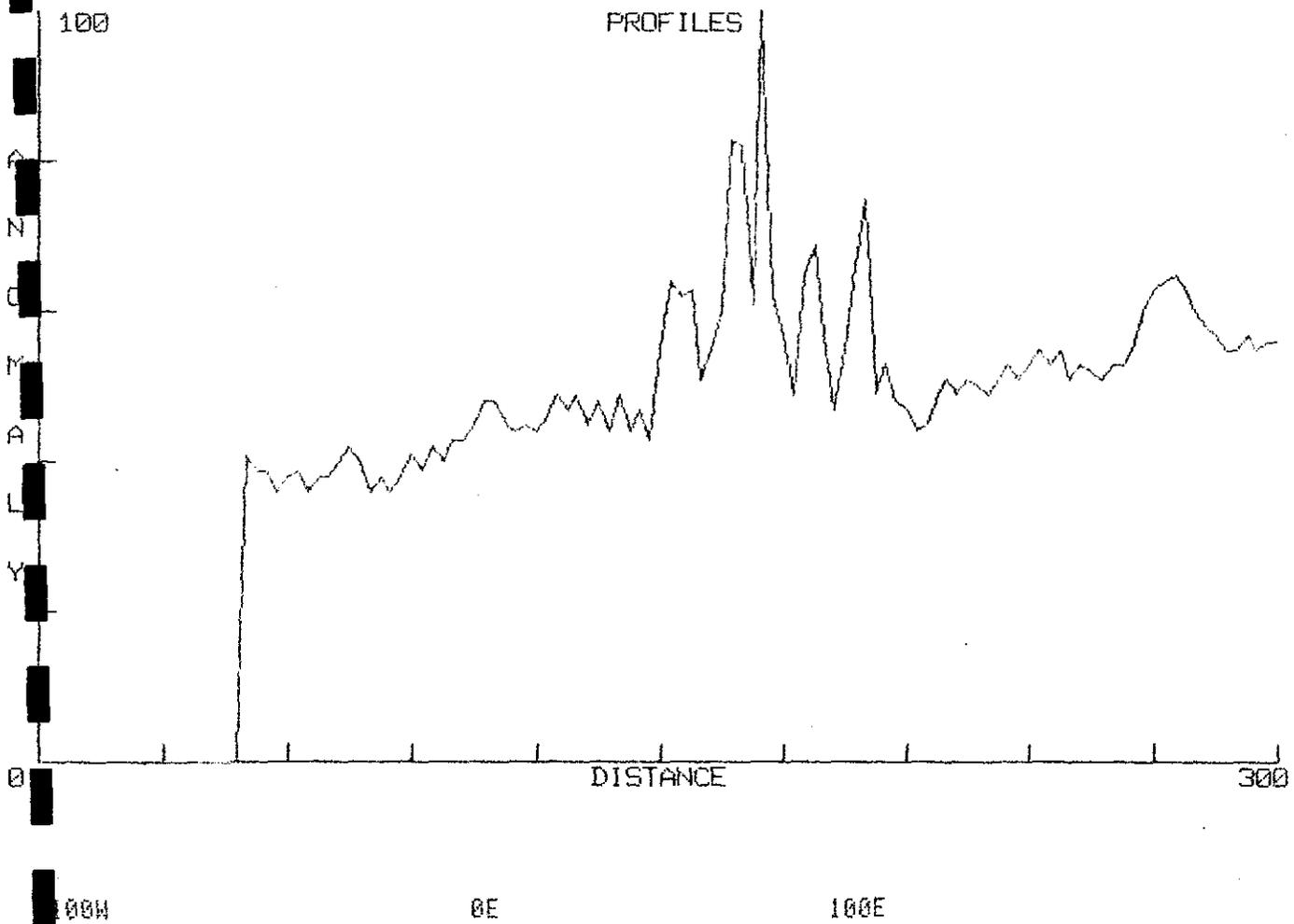


FIGURE : 17

PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE 300N

087

827093

B:PLSP300N PORTLAND MINE SP LINE 300N

ZERO SHIFT : 25

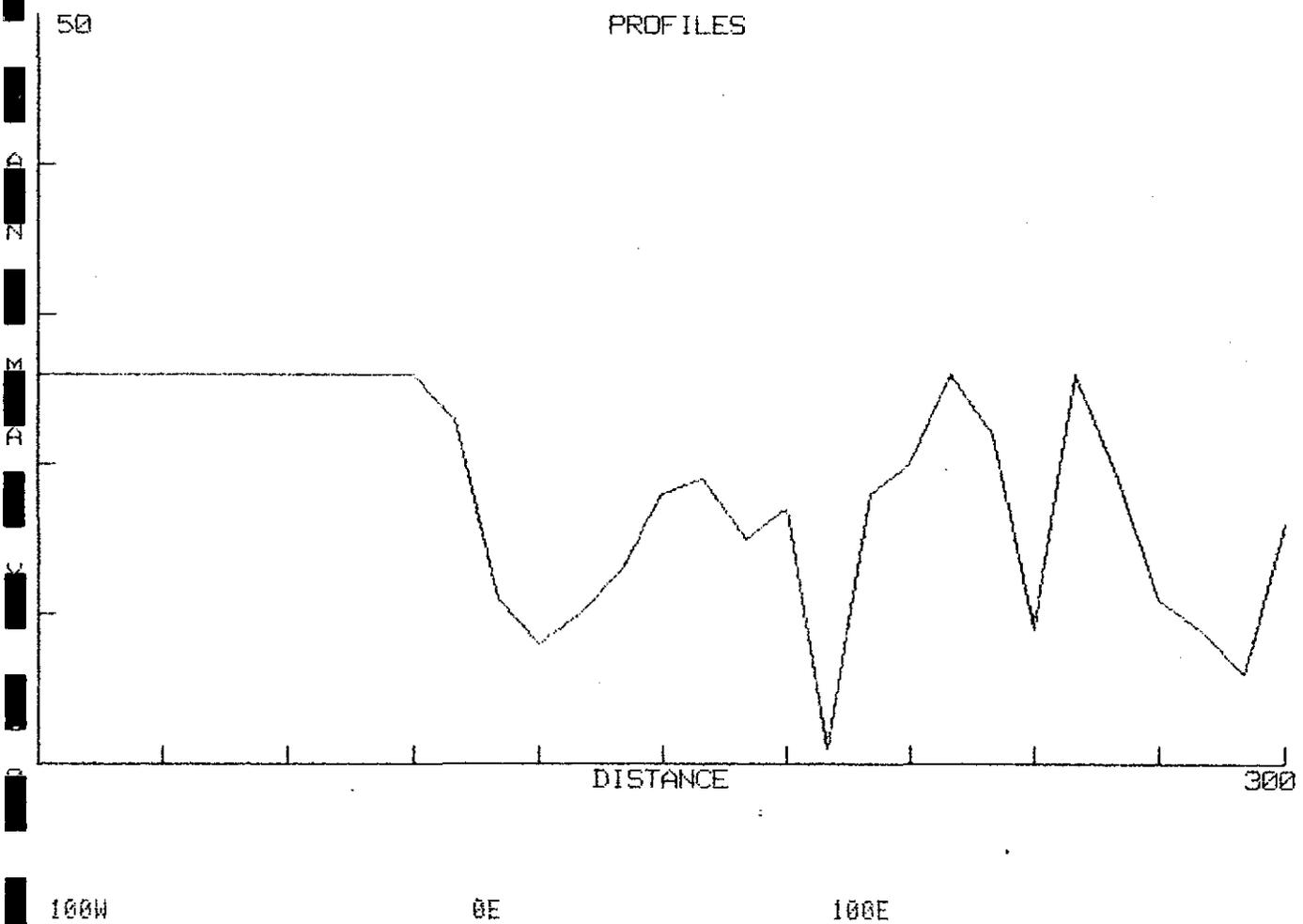


FIGURE : 18

PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILE 300N

088

827094

B PLMG350N PORTLAND MINE MAGNETICS LINE 350N

RO SHIFT : 0

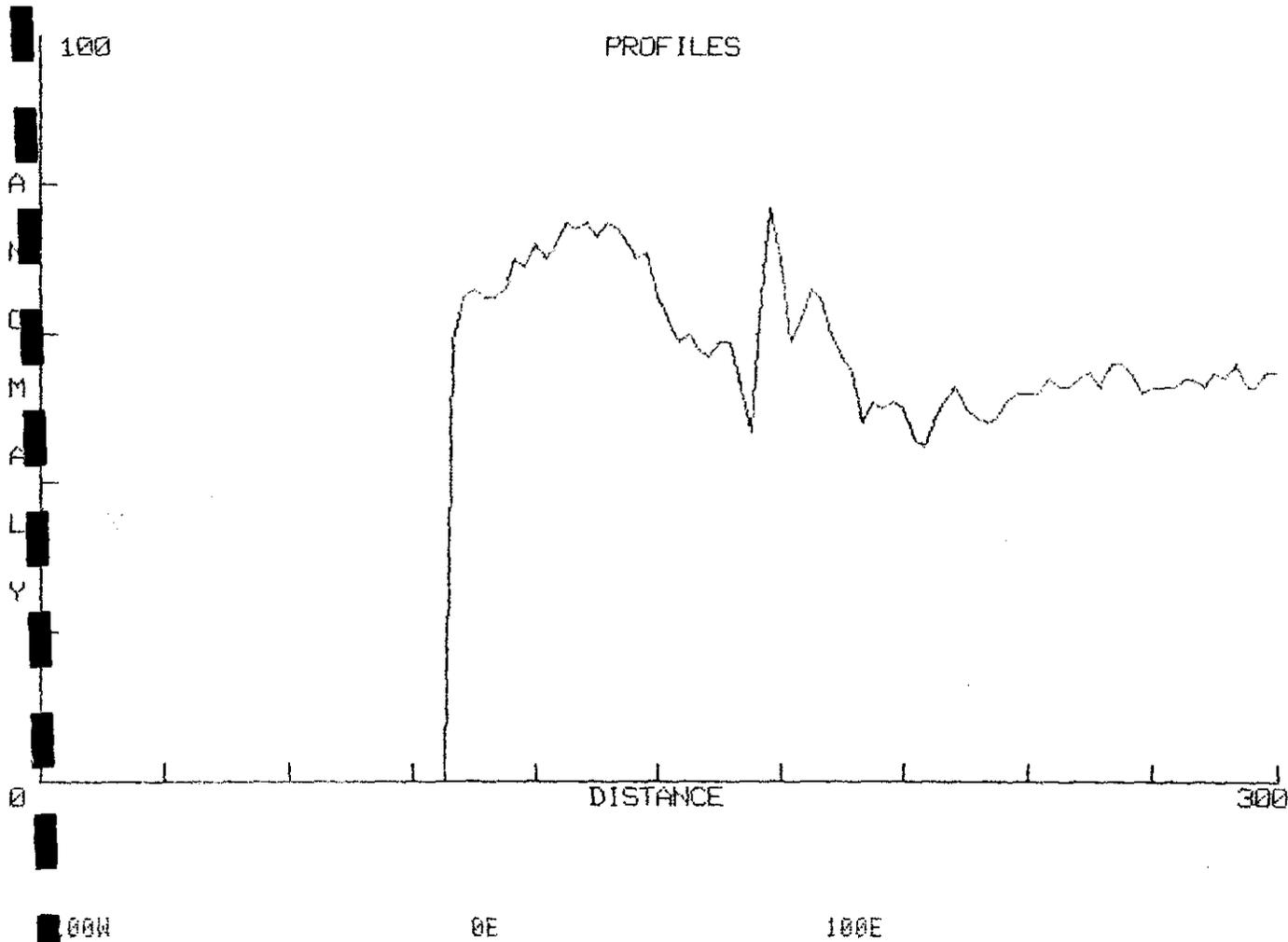


FIGURE : 19

PORTLAND MINE TEST SURVEY  
MAGNETIC PROFILE 350N

089

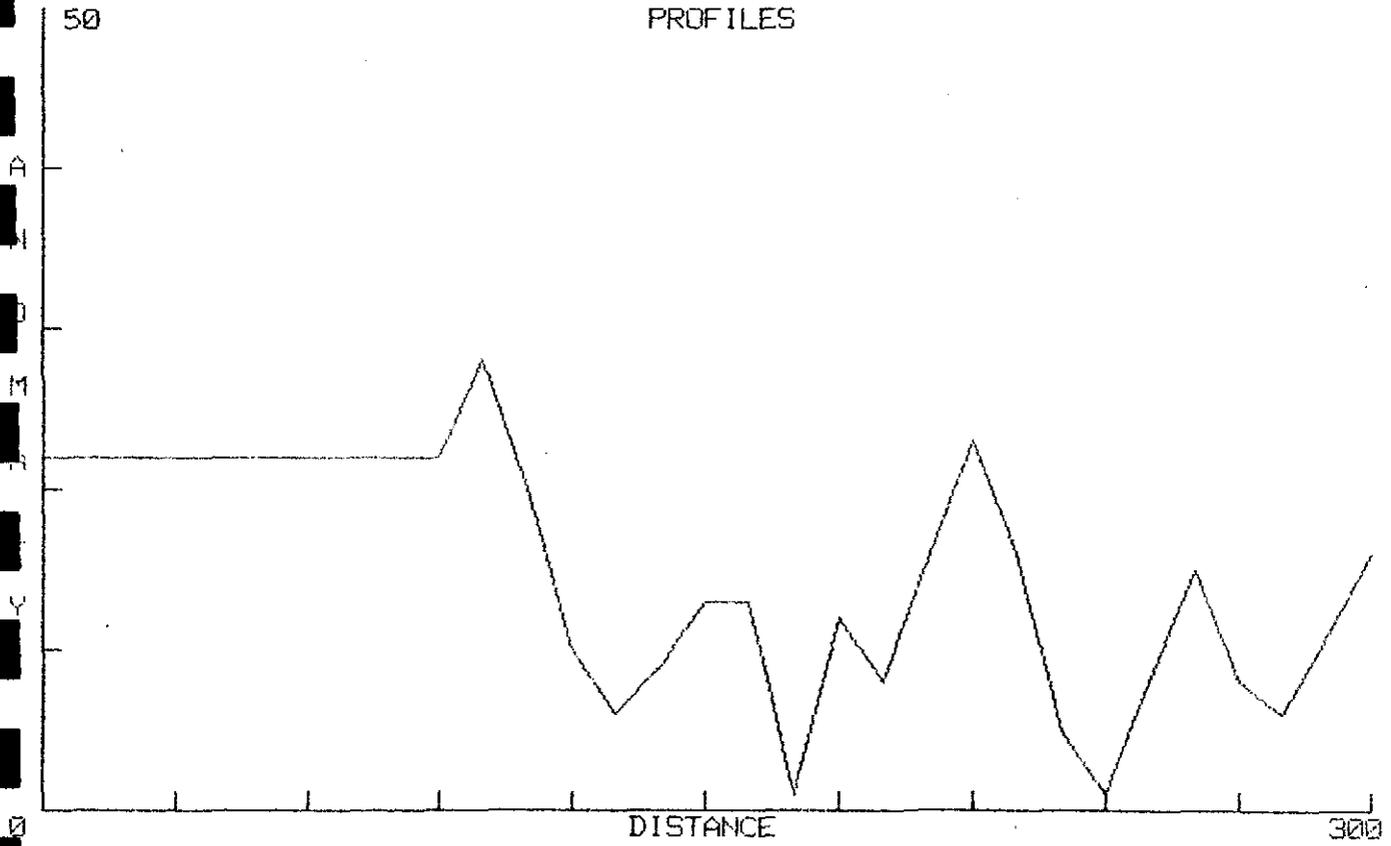
827095

B:PLSP400H PORTLAND MINE SP LINE 400N

ZERO SHIFT : 21

PROFILES

• 1



100M

0E

100E

FIGURE : 20

PORTLAND MINE TEST SURVEY  
SELF POTENTIAL PROFILE 400N

B:PLSP150N	PORTLAND MINE SP LINE 150N
B:PLSP200N	PORTLAND MINE SP LINE 200N
B:PLSP250N	PORTLAND MINE SP LINE 250N
B:PLSP300N	PORTLAND MINE SP LINE 300N
B:PLSP350N	PORTLAND MINE SP LINE 350N
B:PLSP400N	PORTLAND MINE SP LINE 400N

ERO SHIFT : 25

PROFILES

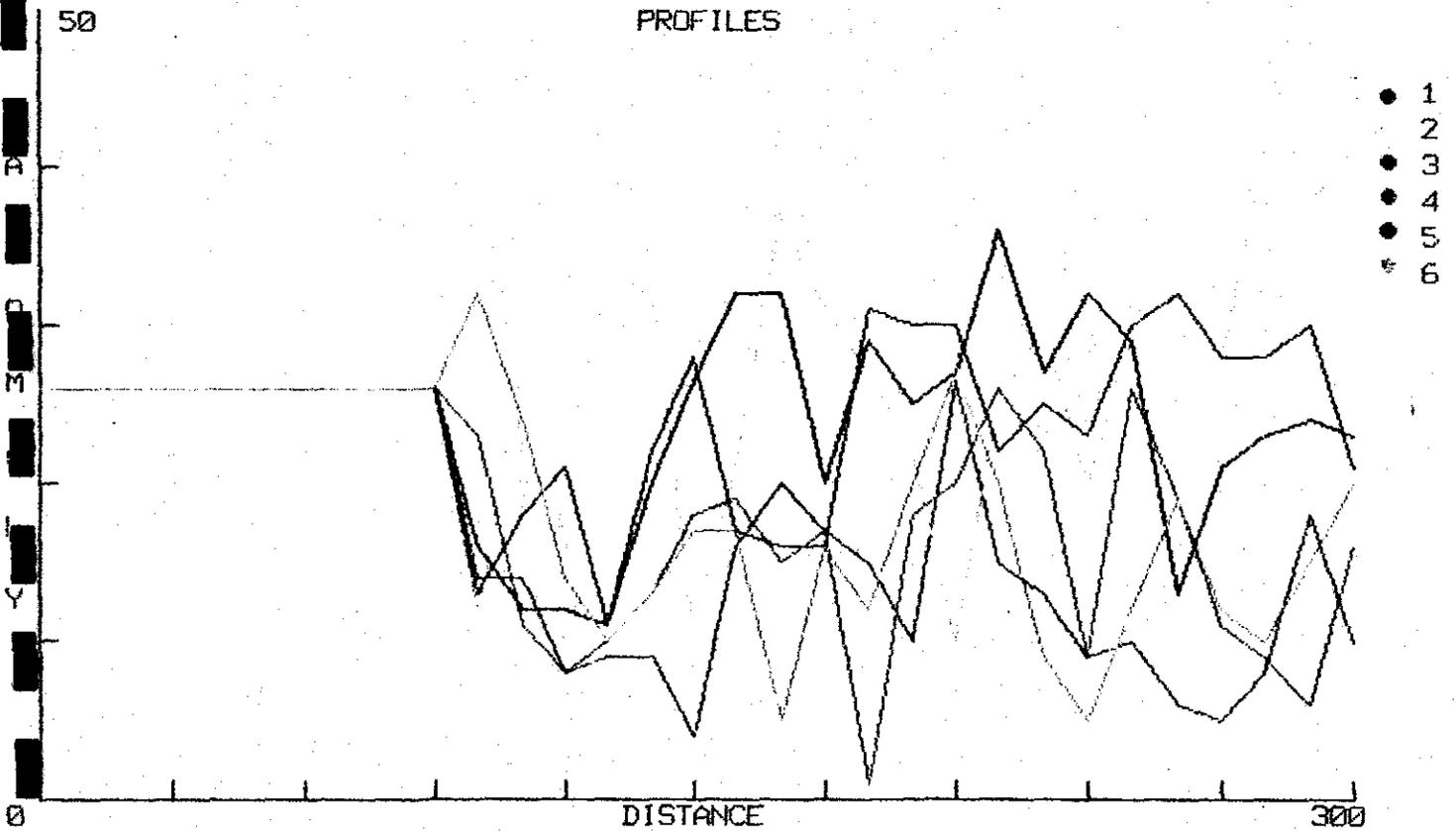


FIGURE : 21

PORTLAND MINE TEST SURVEY  
SURFACE POTENTIAL PROFILES SUMMARY

1	B:PLMG150N	PORTLAND MINE MAGNETICS 150N
2	B:PLMG200N	PORTLAND MINE MAGNETICS 200N
3	B:PLMG250N	PORTLAND MINE MAGNETICS 250N
4	B:PLMG275N	PORTLAND MINE MAGNETICS LINE 275N
5	B:PLMG300N	PORTLAND MINE MAGNETICS LINE 300N
6	B:PLMG350N	

ZERO SHIFT : 0

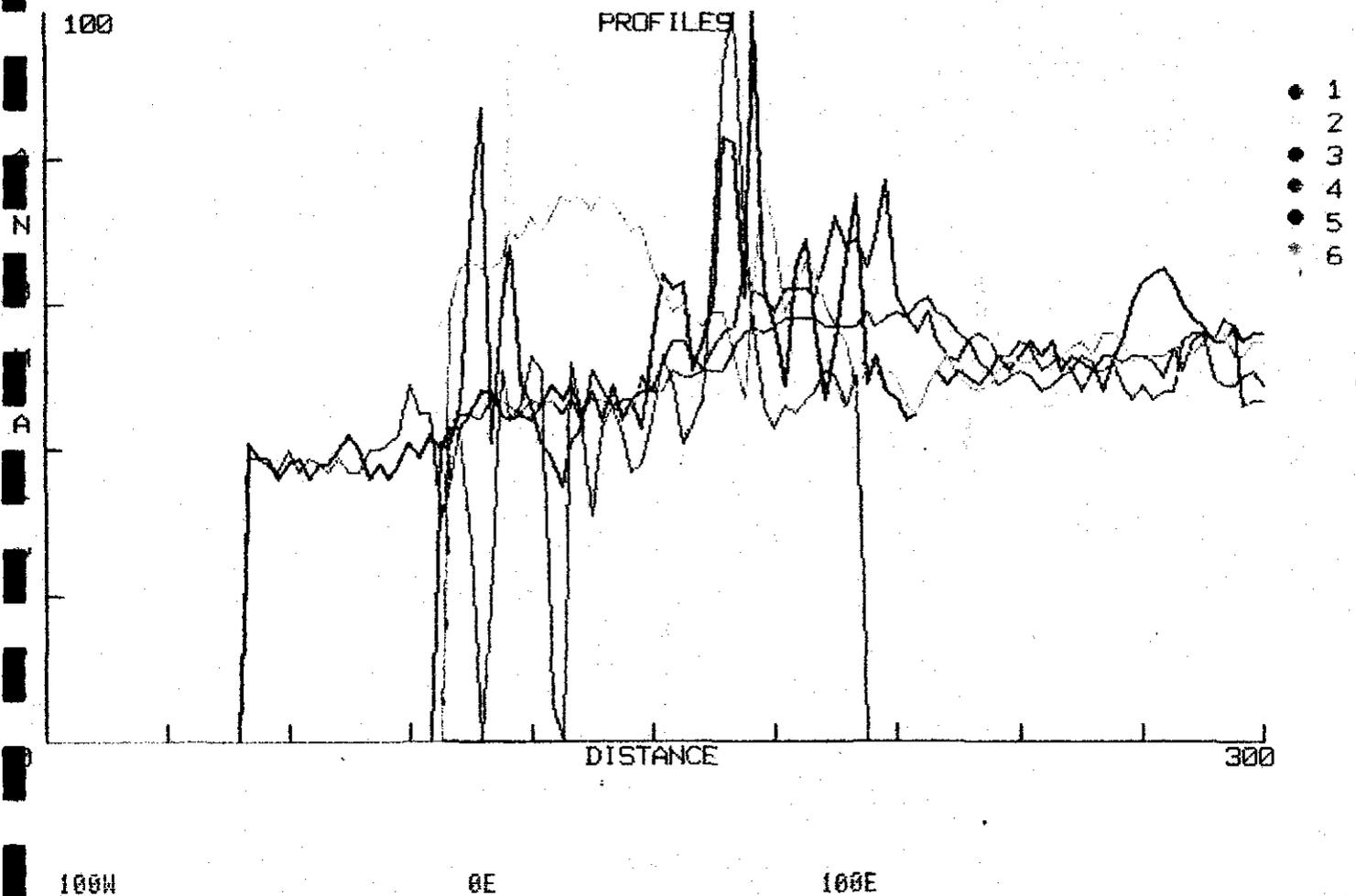


FIGURE : 22

- 1 B:PLRE175N PORTLAND MINE RESISTIVITY 175N
- 2 B:PLRE200N PORTLAND MINE RESISTIVITY 200N
- 3 B:PLRE225N PORTLAND MINE RESISTIVITY 225N
- 4 B:PLRE275N PORTLAND MINE RESISTIVITY 275N

ZERO SHIFT : 0

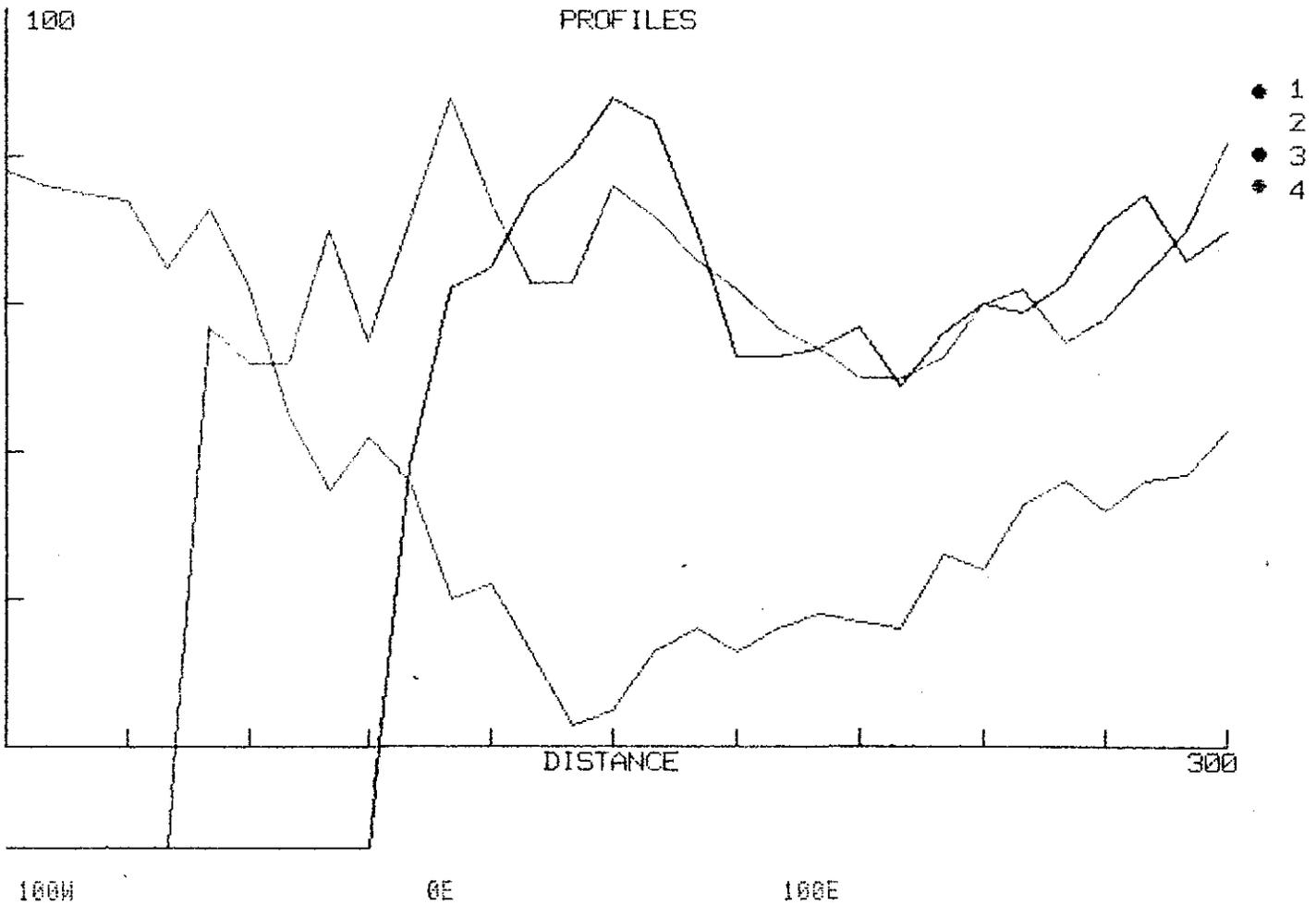


FIGURE : 23

PORTLAND MINE TEST SURVEY  
RESISTIVITY PROFILES SUMMARY

093

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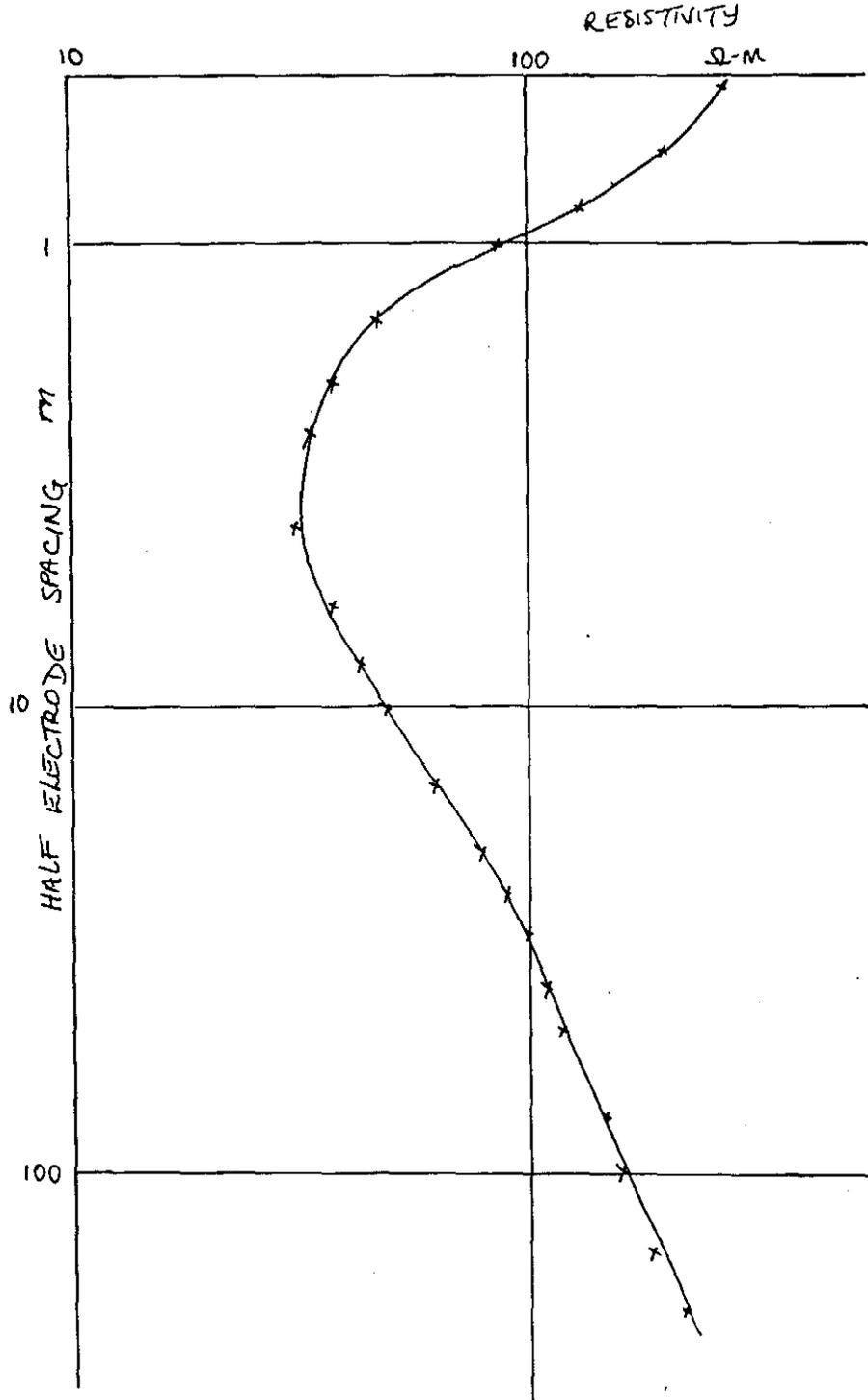


FIGURE 24

SCHLUMBERGER RESISTIVITY SOUNDING

BASELINE

CENTRE AT 200N



095

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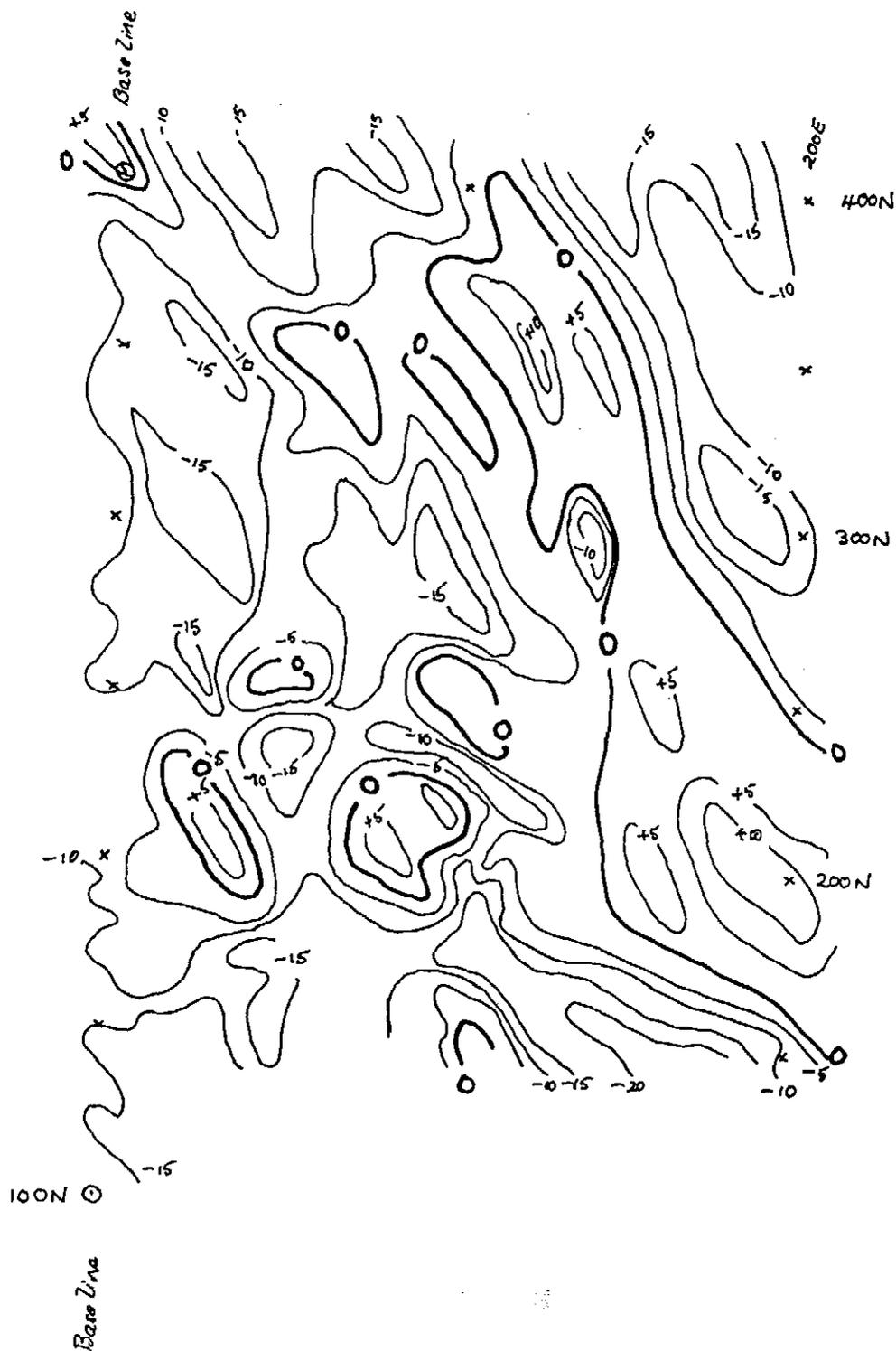


FIGURE 26

CONTOURS OF SELF POTENTIAL VOLTAGES  
Interval 5 mV.

1 B: PLM300NE PORTLAND MINE MAGNETICS LINE 300N  
 2 B: PLUC300C CONTINUATION 20N PORTLAND 300N  
 3 B: PLUC300D CONTINUATION 60N PORTLAND 300N  
 4 B: PLUC300E CONTINUATION 5M PORTLAND 300N

ZERO SHIFT :-3.483481

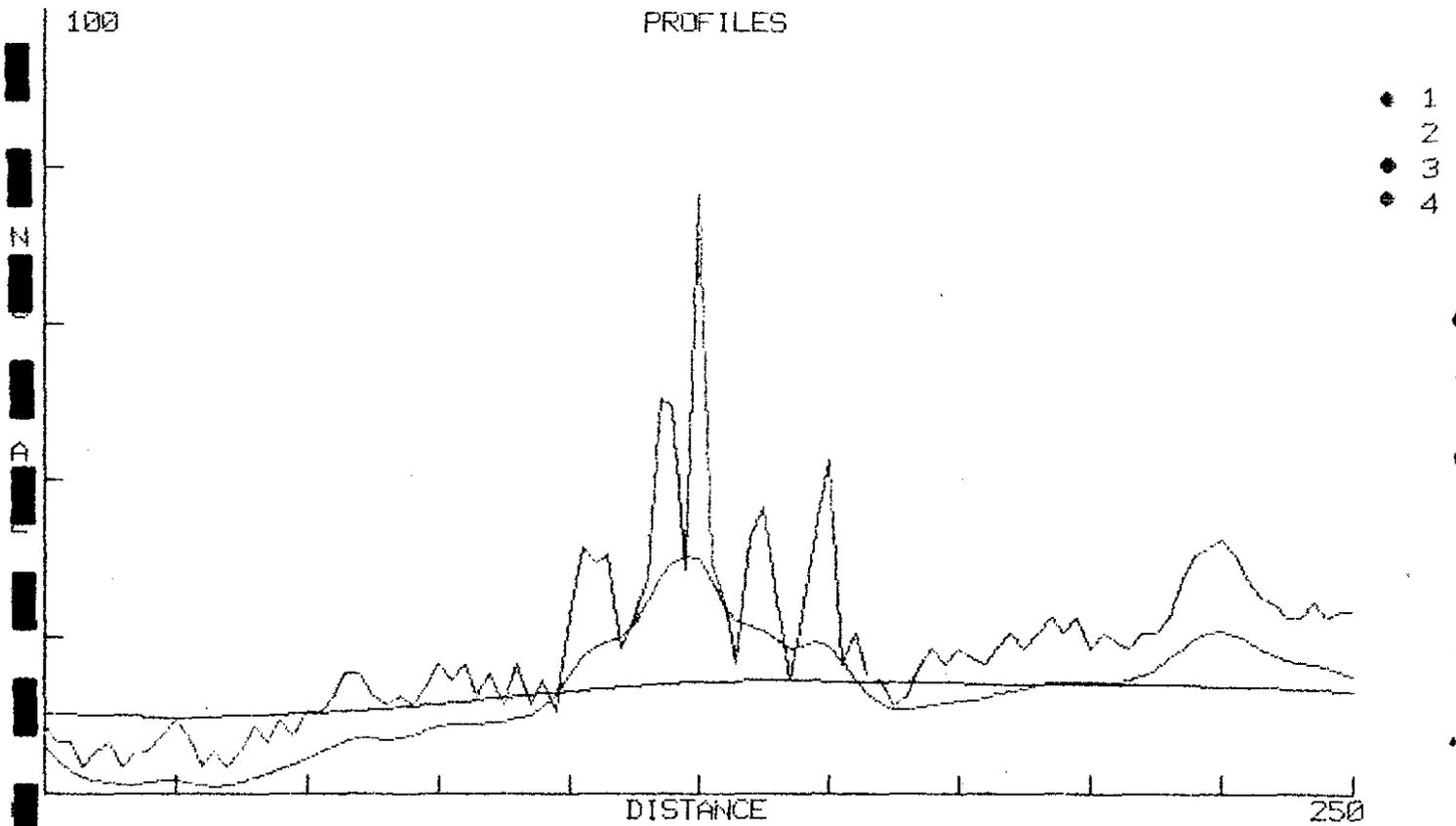
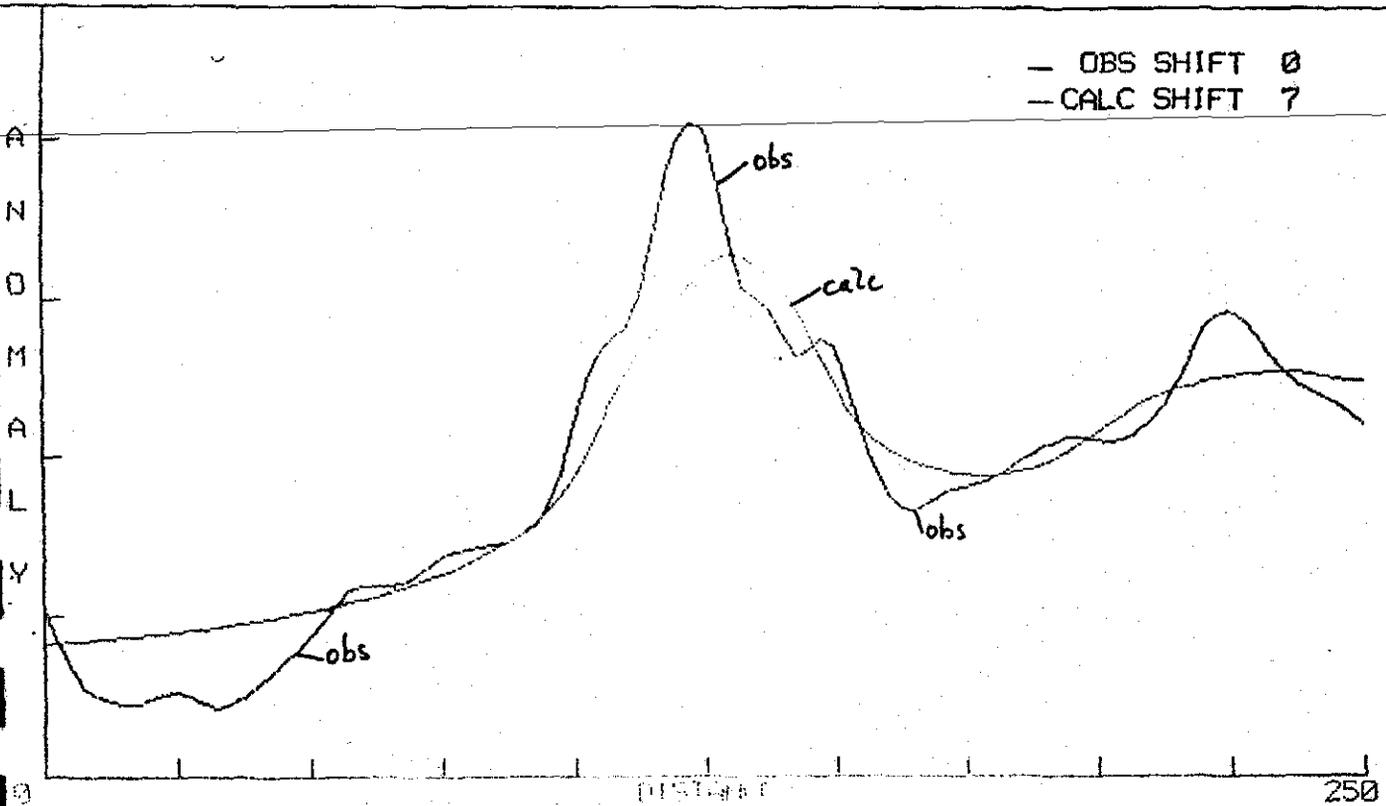


FIGURE : 27

PORTLAND MINE TEST SURVEY  
 MAGNETICS PROFILE 300N TEST OF SOURCE DEPTH EFFECTS



PORTLAND MINE TEST SURVEY 300N  
K7=00005

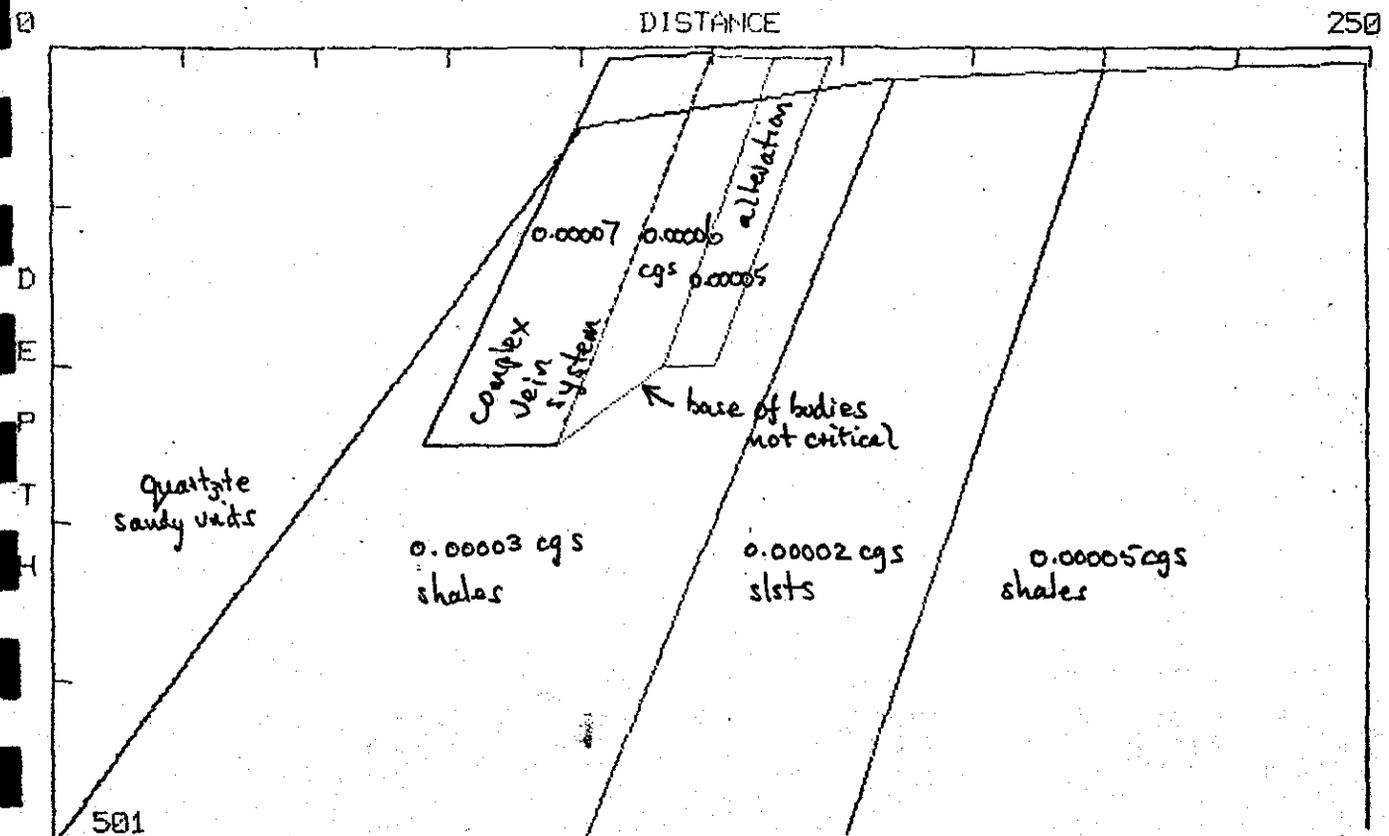


FIGURE 28

PROVISIONAL TRIAL SOLUTION OF MAGNETIC DATA ON LINE 300N  
Observed profile is continuation of observed data at 5m  
Implied dips offer best solution

098

827104

Report submitted on behalf of  
Leaman Geophysics  
by

*D. Leaman*

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*Aug 12, 1987*

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TABLE 1  
MAGNETIC DATA

B>B:PLMG00E  
PORTLAND MINE MAGNETICS BASE LINE  
2.5

161						
600.0	598.0	598.0	598.0	600.0	599.0	599.0
599.0	600.0	600.0	599.0	600.0	597.0	597.0
598.0	598.0	599.0	596.0	596.0	595.0	596.0
596.0	593.0	596.0	596.0	596.0	597.0	596.0
591.0	591.0	590.0	590.0	590.0	589.0	588.0
589.0	588.0	584.0	586.0	583.0	581.0	583.0
584.0	585.0	580.0	580.0	590.0	585.0	581.0
579.0	580.0	579.0	580.0	581.0	583.0	585.0
588.0	583.0	579.0	579.0	582.0	580.0	579.0
583.0	579.0	578.0	580.0	584.0	584.0	580.0
581.0	594.0	578.0	577.0	577.0	581.0	587.0
579.0	576.0	576.0	577.0	578.0	577.0	577.0
579.0	582.0	578.0	579.0	578.0	576.0	578.0
576.0	577.0	577.0	577.0	578.0	576.0	578.0
579.0	579.0	591.0	580.0	580.0	581.0	580.0
578.0	580.0	579.0	577.0	578.0	579.0	578.0
577.0	579.0	578.0	576.0	578.0	576.0	578.0
581.0	578.0	578.0	582.0	582.0	582.0	583.0
580.0	581.0	582.0	579.0	581.0	580.0	580.0
581.0	580.0	577.0	577.0	580.0	579.0	577.0
575.0	572.0	580.0	583.0	583.0	579.0	582.0
584.0	582.0	583.0	581.0	582.0	582.0	584.0
582.0	583.0	582.0	580.0	582.0	580.0	583.0
582.0						

B:PLMG200N  
PORTLAND MINE MAGNETICS 200N  
2.5

121						
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
578.0	579.0	576.0	578.0	578.576.0	577.0	580.0
578.0	577.0	577.0	579.0	577.0	578.0	578.0
581.0	581.0	580.0	586.0	587.0	535.0	570.0
574.0	583.0	581.0	582.0	584.0	584.0	583.0
581.0	584.0	581.0	585.0	584.0	587.0	588.0
588.0	584.0	580.0	588.0	586.0	585.0	587.0
589.0	588.0	588.0	584.0	584.0	585.0	580.0
574.0	601.0	590.0	591.0	586.0	584.0	583.0
581.0	581.0	584.0	582.0	584.0	585.0	584.0
585.0	587.0	584.0	586.0	583.0	585.0	586.0
584.0	585.0	586.0	585.0	586.0	584.0	586.0
584.0	587.0					

B:PLMG250N

PORTLAND MINE MAGNETICS 250N

2.5	121						
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	576.0	575.0	581.0
605.0	622.0	576.0	595.0	603.0	584.0	584.0	581.0
576.0	574.0	570.0	576.0	578.0	586.0	586.0	583.0
581.0	582.0	582.0	583.0	583.0	587.0	587.0	590.0
590.0	588.0	586.0	589.0	591.0	592.0	592.0	600.0
597.0	596.0	594.0	597.0	597.0	597.0	597.0	596.0
601.0	607.0	603.0	604.0	600.0	604.0	604.0	612.0
596.0	593.0	591.0	594.0	590.0	588.0	588.0	587.0
590.0	587.0	586.0	584.0	585.0	586.0	586.0	585.0
583.0	584.0	585.0	586.0	588.0	587.0	587.0	583.0
588.0	587.0	588.0	588.0	587.0	585.0	585.0	589.0
586.0	590.0	591.0	585.0	584.0	584.0	584.0	585.0
586.0	584.0						

B:PLMG150N

PORTLAND MINE MAGNETICS 150N

2.5	121						
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	576.0	580.0
580.0	579.0	582.0	582.0	581.0	580.0	580.0	582.0
581.0	582.0	580.0	582.0	579.0	582.0	582.0	582.0
581.0	580.0	580.0	585.0	583.0	583.0	583.0	586.0
585.0	585.0	586.0	586.0	586.0	586.0	589.0	591.0
592.0	591.0	592.0	593.0	593.0	593.0	593.0	593.0
592.0	592.0	592.0	592.0	594.0	592.0	592.0	593.0
594.0	593.0	595.0	596.0	594.0	593.0	593.0	591.0
590.0	591.0	590.0	588.0	588.0	590.0	590.0	589.0
586.0	587.0	588.0	586.0	583.0	586.0	586.0	586.0
587.0	584.0	582.0	584.0	582.0	583.0	583.0	583.0
590.0	591.0	591.0	590.0	593.0	592.0	592.0	581.0
582.0	582.0						

B:PLMG300N

PORTLAND MINE MAGNETICS LINE 300N

2.5	121						
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0	576.0
574.0	574.0	571.0	573.0	574.0	571.0	571.0	573.0
573.0	575.0	577.0	575.0	571.0	573.0	573.0	571.0
573.0	576.0	574.0	577.0	575.0	578.0	578.0	578.0
580.0	583.0	583.0	580.0	579.0	580.0	580.0	579.0
581.0	584.0	582.0	584.0	580.0	583.0	583.0	579.0
584.0	579.0	582.0	578.0	590.0	599.0	599.0	597.0
598.0	586.0	590.0	595.0	618.0	617.0	617.0	596.0
644.0	597.0	592.0	584.0	600.0	604.0	604.0	592.0
582.0	590.0	601.0	610.0	584.0	588.0	588.0	583.0
582.0	579.0	580.0	584.0	586.0	584.0	584.0	586.0
585.0	584.0	586.0	588.0	586.0	588.0	588.0	590.0
588.0	590.0	586.0	588.0	587.0	586.0	586.0	588.0
588.0	590.0	595.0	598.0	599.0	600.0	600.0	598.0
595.0	593.0	592.0	590.0	590.0	592.0	592.0	590.0
591.0	591.0						

B:PLMG225N  
PORTLAND MINE MAGNETICS LINE 225N  
2.5 121

535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	575.0	576.0
574.0	586.0	595.0	584.0	582.0	587.0	594.0
584.0	591.0	575.0	544.0	537.0	566.0	585.0
596.0	600.0	641.0	623.0	617.0	613.0	680.0
638.0	620.0	628.0	622.0	651.0	601.0	576.0
580.0	586.0	585.0	586.0	588.0	592.0	591.0
588.0	587.0	589.0	585.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0

B:PLMG275N  
PORTLAND MINE MAGNETICS LINE 275N  
2.5 121

535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	574.0
574.0	573.0	572.0	575.0	572.0	574.0	573.0
572.0	574.0	572.0	572.0	575.0	575.0	576.0
577.0	584.0	580.0	580.0	566.0	570.0	578.0
562.0	535.0	559.0	586.0	579.0	581.0	588.0
586.0	540.0	535.0	587.0	580.0	566.0	578.0
581.0	577.0	572.0	573.0	579.0	588.0	584.0
576.0	578.0	582.0	602.0	628.0	635.0	605.0
592.0	581.0	578.0	581.0	580.0	582.0	583.0
586.0	585.0	581.0	585.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0

B:PLMG350N  
PORTLAND MINE MAGNETICS LINE 350N  
2.5 121

535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
535.0	535.0	535.0	535.0	535.0	535.0	535.0
601.0	600.0	600.0	601.0	605.0	604.0	607.0
605.0	607.0	610.0	609.0	610.0	608.0	610.0
609.0	607.0	605.0	606.0	600.0	597.0	594.0
595.0	593.0	592.0	594.0	594.0	588.0	582.0
597.0	612.0	605.0	594.0	597.0	601.0	600.0
595.0	592.0	590.0	583.0	586.0	585.0	586.0
585.0	581.0	580.0	584.0	586.0	588.0	585.0
584.0	583.0	584.0	586.0	587.0	587.0	587.0
589.0	588.0	588.0	589.0	590.0	588.0	591.0
591.0	590.0	587.0	588.0	588.0	588.0	589.0
589.0	588.0	590.0	589.0	591.0	588.0	588.0
590.0	590.0					

TABLE 2  
SELF POTENTIAL DATA

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## B:PLSP150N

PORTLAND MINE SP LINE 150N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-12.0	-12.0	-18.0	-17.0
-17.0	-22.0	-10.0	-6.0	-9.0	-11.0	-16.0	-16.0
0.5	-11.0	-13.0	-17.0	-16.0	-20.0	-21.0	-21.0
-18.0	-8.0	-16.0					

## B:PLSP200N

PORTLAND MINE SP LINE 200N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-14.0	-1.0	-5.0	7.0
6.0	-15.0	-5.0	11.0	5.0	1.0	-4.0	-4.0
-16.0	-1.0	4.0	-6.0	3.0	6.0	2.0	2.0
15.0	12.0	15.0					

## B:PLSP250N

PORTLAND MINE SP LINE 250N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-13.0	-8.0	-5.0	-15.0
-4.0	2.0	-9.0	-10.0	-10.0	5.0	4.0	4.0
4.0	-4.0	-1.0	-3.0	4.0	6.0	2.0	2.0
2.0	4.0	-5.0					

## B:PLSP300N

PORTLAND MINE SP LINE 300N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-3.0	-15.0	-18.0	-16.0
-13.0	-8.0	-7.0	-11.0	-9.0	-25.0	-8.0	-8.0
-6.0	0.0	-4.0	-17.0	0.0	-7.0	-15.0	-15.0
-17.0	-20.0	-10.0					

## B:PLSP350N

PORTLAND MINE SP LINE 350N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-10.0	-14.0	-14.0	-15.0
-6.0	0.5	6.0	6.0	-6.0	3.0	-1.0	-1.0
1.0	10.0	1.0	6.0	3.0	-13.0	-5.0	-5.0
-3.0	-2.0	-3.0					

## B:PLSP400N

PORTLAND MINE SP LINE 400N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	6.0	-2.0	-12.0	-16.0
-13.0	-9.0	-9.0	-21.0	-10.0	-14.0	-6.0	-6.0
1.0	-6.0	-17.0	-21.0	-14.0	-7.0	-14.0	-14.0
-16.0	-11.0	-6.0					

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B:PLSP00E

PORTLAND MINE SP BASELINE 100-400N

10	31						
0.0	-15.0	-16.0	-13.0	-16.0	-12.0	-19.0	
-4.0	-19.0	-9.0	-14.0	-8.0	-7.0	-7.0	
-9.0	-13.0	-9.0	-8.0	-11.0	-8.0	-3.0	
-4.0	-7.0	-14.0	-14.0	-10.0	-6.0	2.0	
-12.0	-6.0	6.0					

B:PLSP50E

PORTLAND MINE SP 50E 100-400N

10	31						
0.0	0.0	0.0	0.0	0.0	-22.0	-16.0	
-13.0	-22.0	-19.0	-15.0	-16.0	-12.0	-22.0	
-20.0	2.0	-9.0	-8.0	-8.0	-3.0	-8.0	
-2.0	-4.0	-9.0	-2.0	0.5	-4.0	-15.0	
-10.0	-13.0	-9.0					

B:PLSP100E

PORTLAND MINE SP 100E 100-400N

10	31						
0.0	0.0	0.0	0.0	0.0	-16.0	-4.0	
-21.0	-24.0	-21.0	-6.0	2.0	6.0	-20.0	
-7.0	4.0	-10.0	-18.0	-13.0	-14.0	-8.0	
-9.0	-4.0	0.0	-4.0	0.5	9.0	5.0	
13.0	-3.0	-6.0					

TABLE 3  
RESISTIVITY DATA

B: PLRE175N

PORTLAND MINE RESISTIVITY 175N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	167.0	162.0
162.0	180.0	165.0	181.0	198.0	184.0	173.0	173.0
173.0	186.0	182.0	176.0	172.0	167.0	164.0	164.0
160.0	160.0	163.0	170.0	172.0	165.0	168.0	168.0
174.0	180.0	192.0					

B: PLRE200N

PORTLAND MINE RESISTIVITY 200N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	166.0	171.0	163.0	217.0	217.0
192.0	197.0	190.0	190.0	177.0	177.0	177.0	177.0
173.0	170.0	165.0	174.0	184.0	177.0	180.0	180.0
179.0	189.0	202.0					

B: PLRE225N

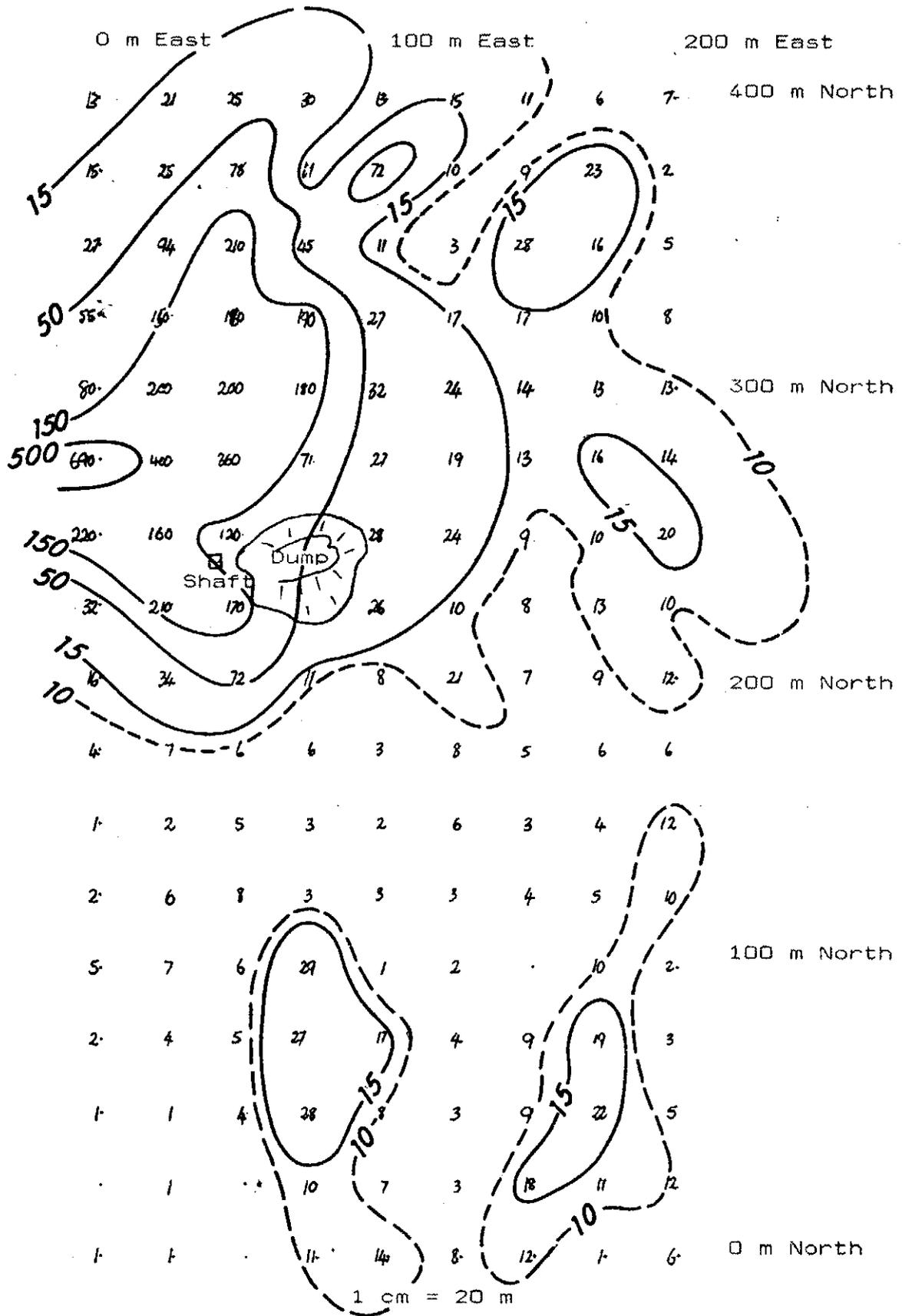
PORTLAND MINE RESISTIVITY 225N

10	31						
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	148.0	172.0	175.0	185.0	185.0
190.0	198.0	195.0	180.0	163.0	163.0	164.0	164.0
167.0	159.0	166.0	170.0	169.0	173.0	181.0	181.0
185.0	176.0	180.0					

B: PLRE275N

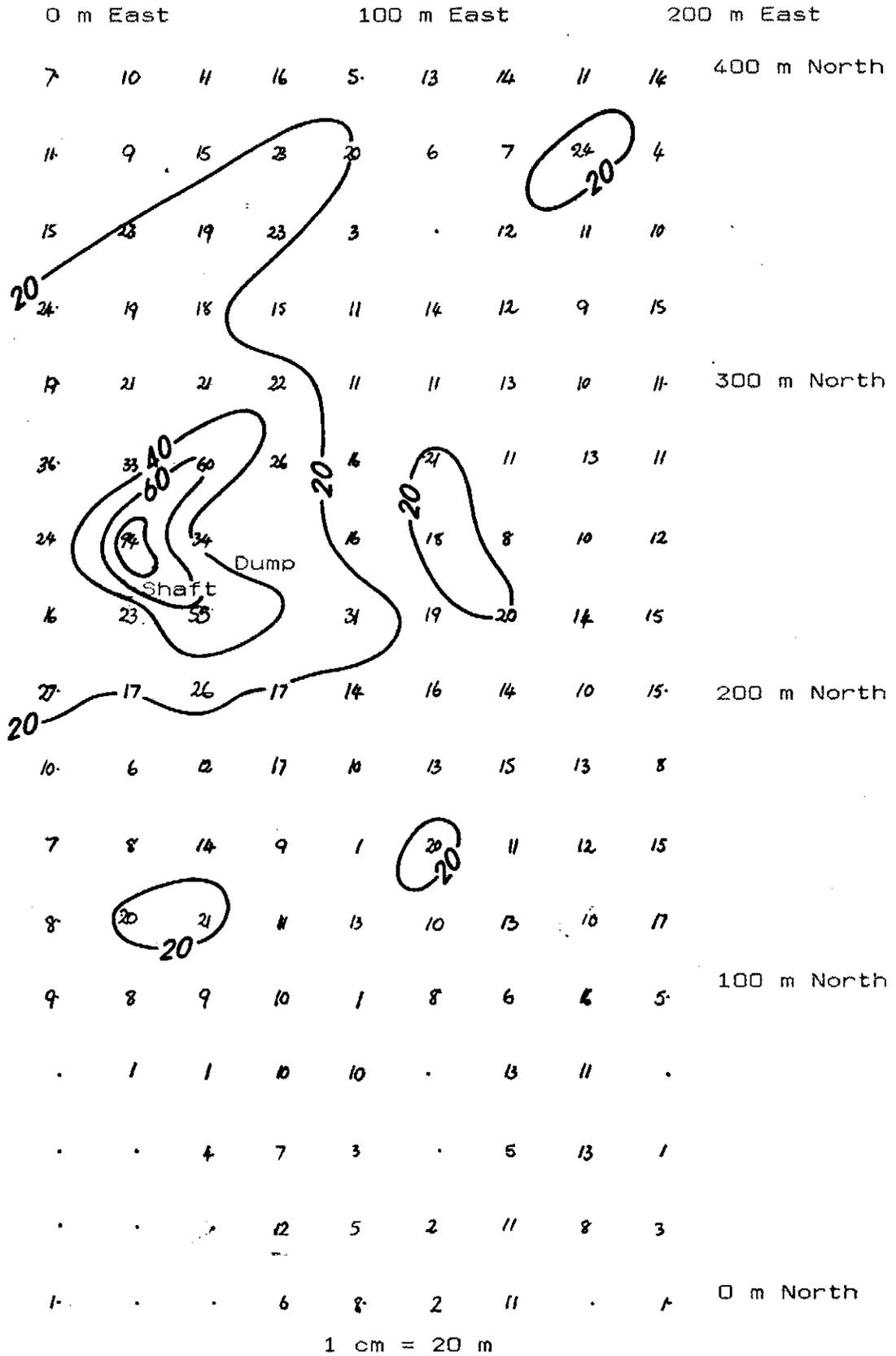
PORTLAND MINE RESISTIVITY 275N

10	31						
188.0	186.0	185.0	184.0	175.0	183.0	172.0	172.0
155.0	145.0	152.0	146.0	130.0	132.0	123.0	123.0
113.0	115.0	123.0	126.0	123.0	126.0	128.0	128.0
127.0	126.0	136.0	134.0	143.0	146.0	142.0	142.0
146.0	147.0	153.0					



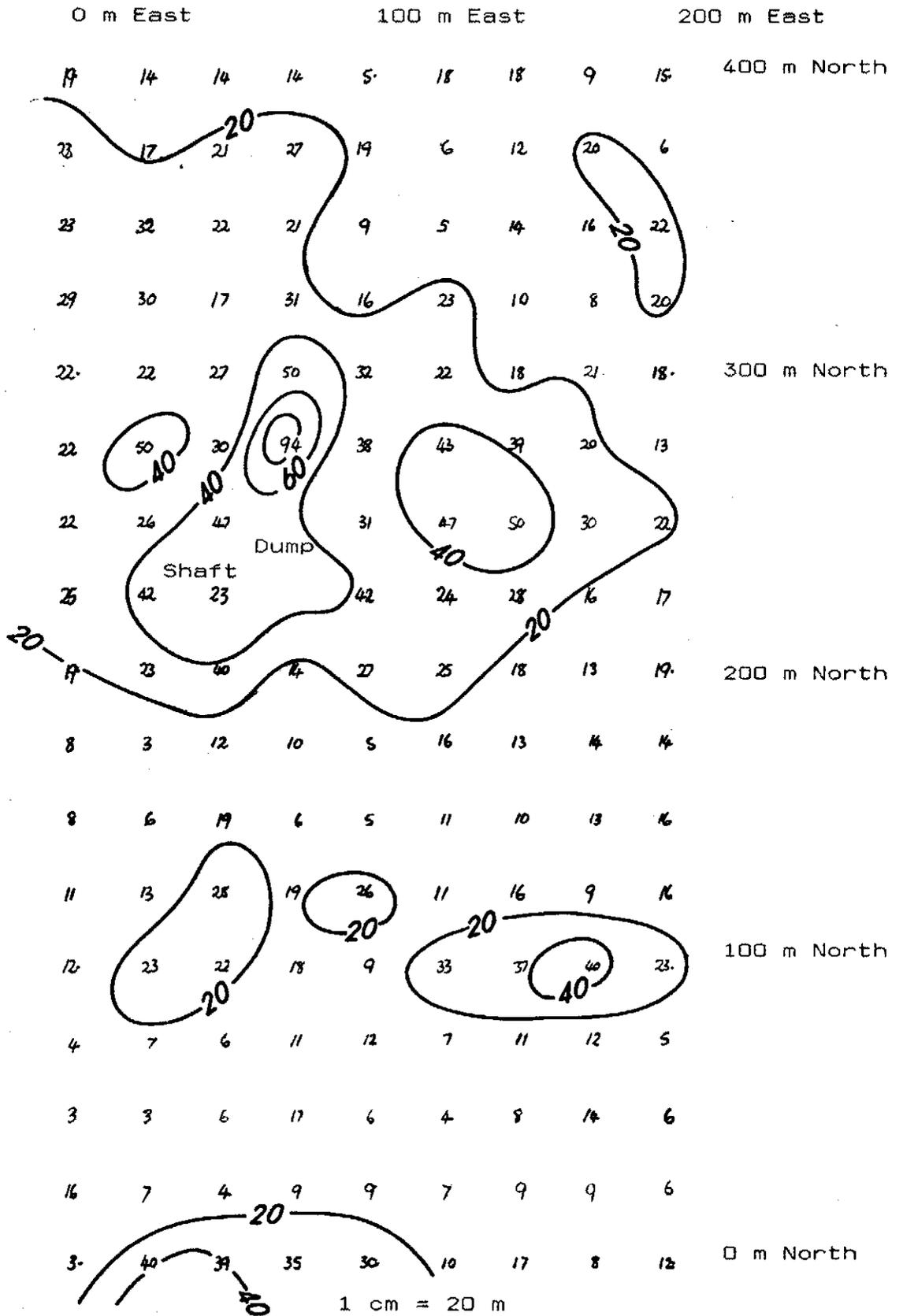
ARSENIC CONCENTRATION IN SOIL (ppm)  
 Portland Mine, EL 34/86 - Gladstone

Aug 1987



LEAD CONCENTRATION IN SOIL (ppm)  
 Portland Mine, EL 34/86 - Gladstone

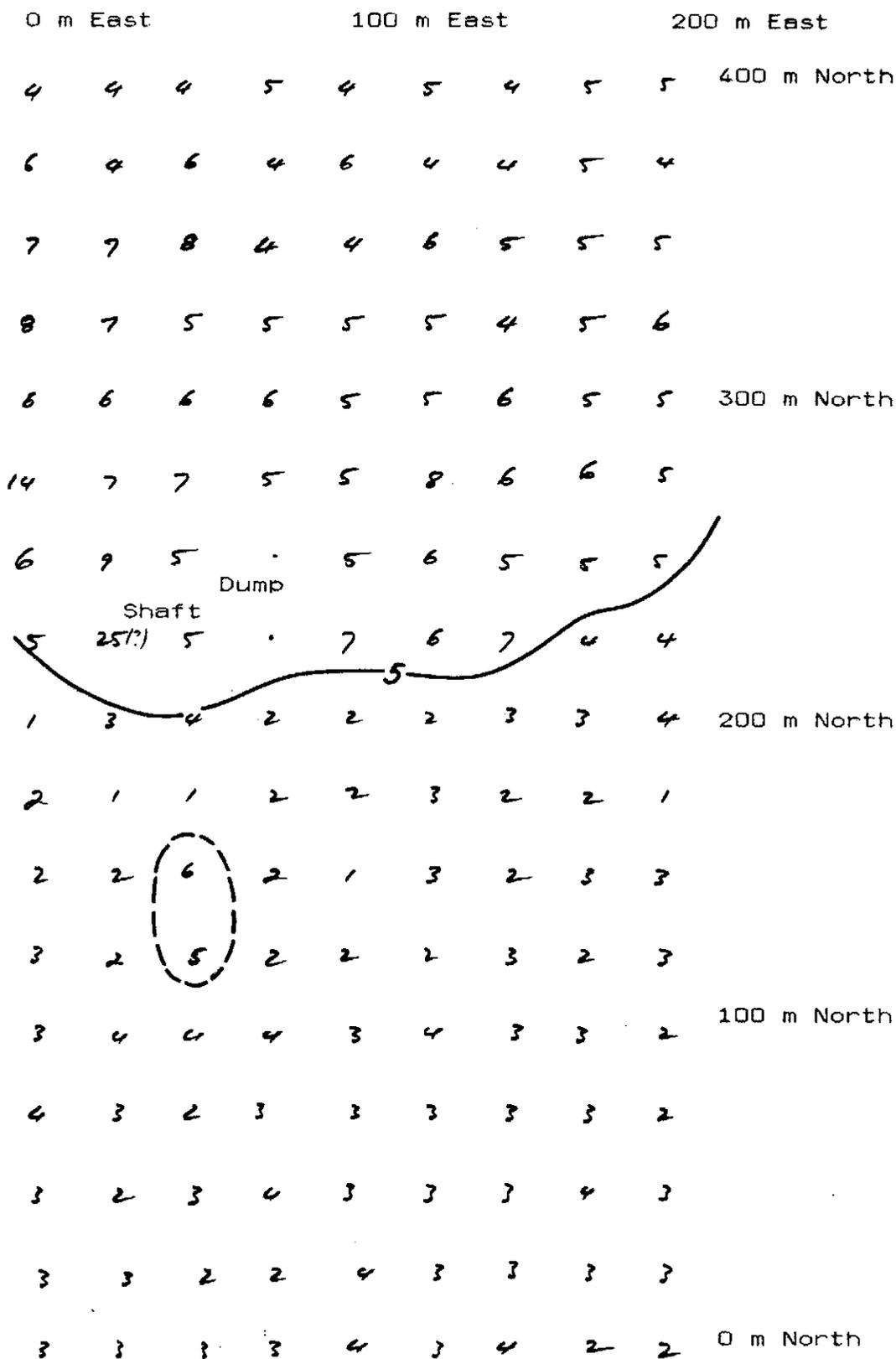
Aug 1987



ZINC CONCENTRATION IN SOIL (ppm)  
 Portland Mine, EL 34/86 - Gladstone

Aug 1987

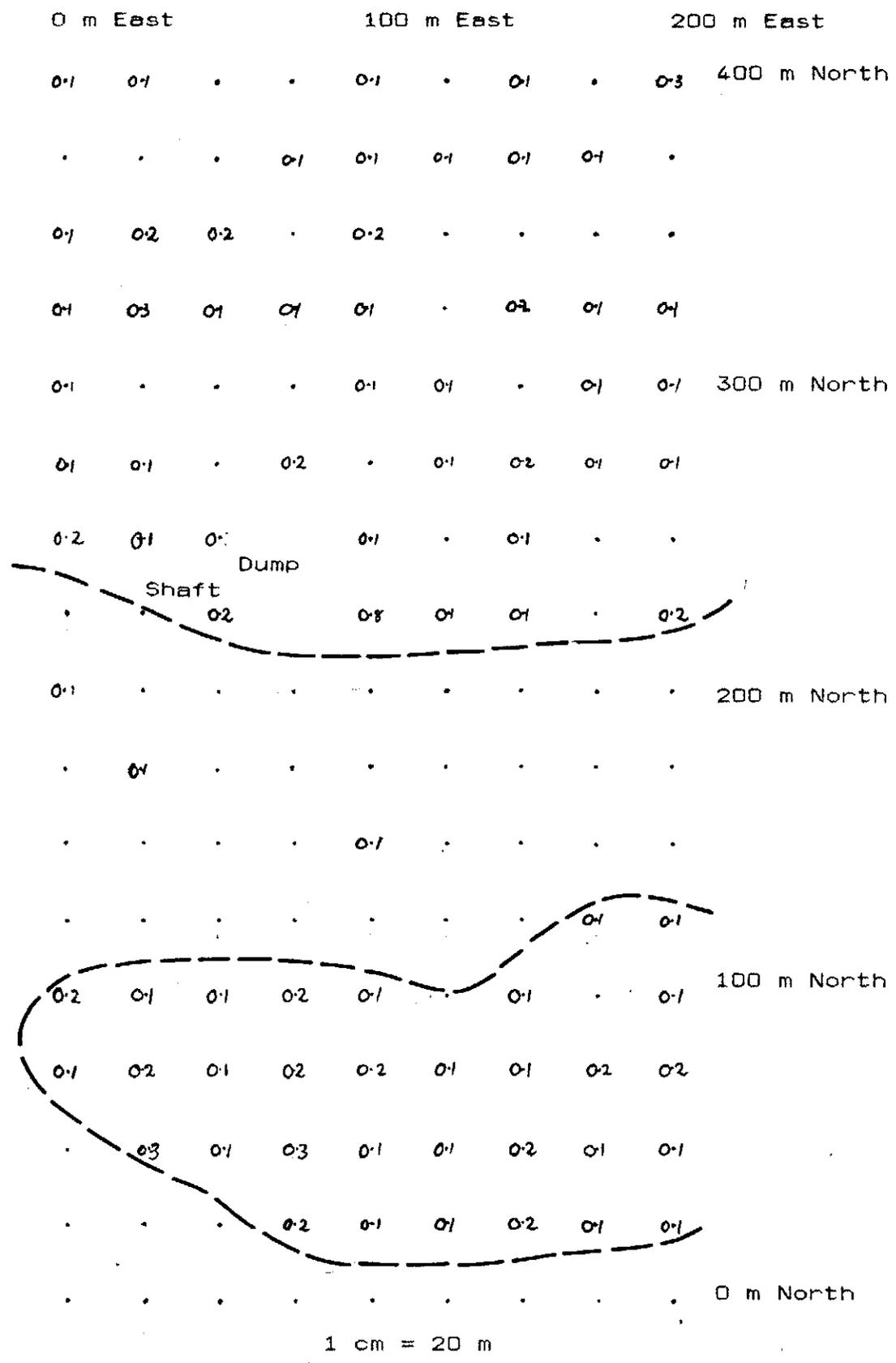




1 cm = 20 m

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827119



SILVER CONCENTRATION IN SOIL (ppm)  
 Portland Mine, EL 34/86 - Gladstone

Aug 1987

115

# ANALABS

827120

Phone (09) 458 7999

A division of MacDonell Hamilton & Co. Pty. Ltd.  
52 Murray Road, Welshpool, W.A. 6106  
(LX) AA 57224

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**ANALYTICAL REPORT No. 999.29.08.04674**

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

J.K. Davidson  
Placeco Australia Pty. Ltd.  
P.O. Box 42  
Bagdad  
Tasmania 7030

ORDER No.

PROJECT

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12/08/87

ASAP

No. OF PAGES OF RESULTS

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TOTAL No. OF SAMPLES

7

02/09/87

1

151

STATE OF SAMPLES	SAMPLE NUMBERS	PRE-TREATMENT							ANALYSIS			
		DRY	CRUSH	SPLIT	PULVERISE	SEIVE	OTHER (SEE REMARKS)	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD	
Various		SO	Prep: 005	013,016						Cu, Pb, Zn, Ag/102, As/114		
Various		SO	Prep: 005	013,016						Cu, Pb, Zn, Ag/102, As/114		
Various		SO	Prep: 005	013,016						Au, AuChk/329		
Various		SO	Prep: 005	013,016						Au, AuChk/329		
Various		SO	Prep: 005	013,016						Au/329		

RESULTS

TO

J.K. Davidson  
Placeco Australia Pty. Ltd.  
P.O. Box 42  
Bagdad  
Tasmania 7030

RESULTS

TO

REMARKS

STATE OF SAMPLES	ANALYSIS — PREPARATION	ANALYSIS — METHOD
whole core	WC perchloric acid A1 cold acid CA	atomic absorption AAS
pit core	SC hydrochloric acid A2 specific sulphide SS	x-ray fluorescence XRF
slag	CU nitric acid A3 other mixed acids MA	spectrophotometry SPEC
rock	RO aqua regia A4 alkaline attack AA	colorimetry COL
soil	SO nitric/perchloric A5 volatilization VO	chromatography CHR
slip	PU HF mixture A6 ignition IG	titration TIT
slur	WA HF under pressure A7 pressed powder (XRF) PP	other chemical means CHEM
slime	SI HF under pressure A8 glass fusion (XRF) GF	miscellaneous MSC
slime sediment		fluorescence FLUOR
heavy mineral		inductively coupled plasma ICP

AUTHORISED OFFICER



241 LL 24/60  
Cushman

1176

# ANALABS

A Division of International Harvester & Co. Inc. Ltd.

827121

## ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

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CLIENT ORDER No

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TUBE No	SAMPLE PREFIX	Cu	Pb	Zn	Ag	Au	Bu		
1	00N E000	3	1	3	<0.1	1	-	-	
2	00N E025	3	<1	40	<0.1	1	-	-	
3	00N E050	3	<1	39	<0.1	<1	-	-	
4	00N E075	3	6	35	<0.1	11	-	-	
5	00N E100	4	8	30	<0.1	14	-	-	
6	00N E125	3	2	10	<0.1	8	-	-	
7	00N E150	4	11	17	<0.1	12	-	-	
8	00N E175	2	<1	8	<0.1	1	-	-	
9	00N E200	2	1	12	<0.1	6	-	-	
10	25N E000	3	<1	16	<0.1	<1	-	-	
11	25N E025	3	<1	7	<0.1	1	-	-	
12	25N E050	2	<1	4	<0.1	<1	-	-	
13	25N E075	2	12	9	0.2	10	-	-	
14	25N E100	4	5	9	0.1	7	-	-	
15	25N E125	3	2	7	0.1	3	-	-	
16	25N E150	3	11	9	0.2	18	-	-	
17	25N E175	3	8	9	0.1	11	-	-	
18	25N E200	3	3	6	0.1	12	-	-	
19	50N E000	3	<1	3	<0.1	1	-	-	
20	50N E025	2	<1	3	0.3	1	-	-	
21	50N E050	3	4	6	0.1	4	-	-	
22	50N E075	4	7	17	0.3	28	-	0.01	
23	50N E100	3	3	6	0.1	8	-	-	
24	50N E125	3	<1	4	0.1	3	-	-	
25	50N E150	3	5	8	0.2	9	-	-	

Handwritten signature or initials

11415

# ANALABS

A Division of Macmillan, Inc. & Co., Inc.

827122

## ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

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TUBE No.	SAMPLE No.	Co	Pb	Zn	Ag	As	Hg	Cd	Cu
1	50N E175	4	13	14	0.1	22	-	0.04	
2	50N E200	3	1	6	0.1	5	-	-	
3	75N E000	4	<1	4	0.1	2	-	-	
4	75N E025	3	1	7	0.2	4	-	-	
5	75N E050	2	1	6	0.1	5	-	-	
6	75N E075	3	10	11	0.2	27	-	0.01	
7	75N E100	3	10	12	0.2	17	-	0.01	
8	75N E125	3	<1	7	0.1	4	-	-	
9	75N E150	3	13	11	0.1	9	-	-	
10	75N E175	3	11	12	0.2	19	-	<0.01	
11	75N E200	2	<1	5	0.2	3	-	-	
12	100N E000	3	9	12	0.2	5	-	-	
13	100N E025	4	8	23	0.1	7	-	-	
14	100N E050	4	9	22	0.1	6	-	-	
15	100N E075	4	10	18	0.2	29	-	<0.01	
16	100N E100	3	1	9	0.1	1	-	-	
17	100N E125	4	8	33	<0.1	2	-	-	
18	100N E150	3	6	37	0.1	<1	-	-	
19	100N E175	3	16	40	<0.1	10	-	-	
20	100N E200	2	5	23	0.1	2	-	-	
21	125N E000	3	8	11	<0.1	2	-	-	
22	125N E025	2	20	13	<0.1	6	-	-	
23	125N E050	5	21	28	<0.1	8	-	-	
24	125N E075	2	11	19	<0.1	3	-	-	
25	125N E100	2	13	26	<0.1	3	-	-	

ANALYST OFFICE

*[Signature]*

# ANALABS

A Division of Macdonald Hamilton & Co. Pty Ltd.

827123

## ANALYTICAL DATA

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Au	Hg		
1	25N E125	2	10	11	<0.1	3	-	-		
2	25N E150	3	13	16	<0.1	4	-	-		
3	25N E175	2	10	9	0.1	5	-	-		
4	25N E200	3	17	16	0.1	10	-	-		
5	50N E000	2	7	8	<0.1	1	-	-		
6	50N E025	2	8	6	<0.1	2	-	-		
7	50N E050	6	14	19	<0.1	5	-	-		
8	50N E075	2	9	6	<0.1	3	-	-		
9	50N E100	1	1	5	0.1	2	-	-		
10	50N E125	3	20	11	<0.1	6	-	-		
11	50N E150	2	11	10	<0.1	3	-	-		
12	50N E175	3	12	13	<0.1	4	-	-		
13	50N E200	3	15	16	<0.1	12	-	-		
14	75N E000	2	10	8	<0.1	4	-	-		
15	75N E025	1	6	3	0.1	7	-	-		
16	75N E050	1	12	12	<0.1	6	-	-		
17	75N E075	2	17	10	<0.1	6	-	-		
18	75N E100	2	10	5	<0.1	3	-	-		
19	75N E125	3	13	16	<0.1	8	-	-		
20	75N E150	2	15	13	<0.1	5	-	-		
21	75N E175	2	13	14	<0.1	6	-	-		
22	75N E200	1	8	14	<0.1	6	-	-		
23	200N E000	1	27	19	0.1	16	-	-		
24	200N E025	3	17	23	<0.1	34	-	0.01		
25	200N E050	4	26	40	<0.1	72	-	<0.01		

Results are given in micrograms per gram unless otherwise stated.  
 All analyses are done on a dry weight basis.  
 X-ray fluorescence spectrometry is used for the determination of lead, zinc, copper, silver, gold and mercury.  
 All samples are analysed as received.

AUTHORIZED OFFICER *[Signature]*

# ANALABS

A Division of Macmillan, Inc. NY, NY

827124

## ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

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LINE NO.	SAMPLE NO.	Cu	Pb	Zn	Ag	As	Au	Al		
1	200N E075	2	17	14	<0.1	11	-	<0.01		
2	200N E100	2	14	27	<0.1	8	-	0.01		
3	200N E125	2	16	25	<0.1	21	-	<0.01		
4	200N E150	3	14	18	<0.1	7	-	-		
5	200N E175	3	10	13	<0.1	9	-	-		
6	200N E200	4	15	19	<0.1	12	-	-		
7	225N E000	5	16	25	<0.1	32	-	-		
8	225N E025	25	23	42	0.2	210	-	0.01		
9	225N E050	5	55	23	0.8	170	-	0.04		
10	225N E100	7	31	42	0.1	26	-	<0.01		
11	225N E125	6	19	24	0.1	10	-	<0.01		
12	225N E150	7	20	28	<0.1	8	-	-		
13	225N E175	4	14	16	0.2	13	-	-		
14	225N E200	4	15	17	0.2	10	-	-		
15	250N E000	6	24	22	0.1	220	-	0.01		
16	250N E025	9	94	26	0.2	160	-	0.12		
17	250N E050	5	34	47	0.4	120	-	0.54		
18	250N E100	5	16	31	0.1	28	-	0.01		
19	250N E125	6	18	47	<0.1	24	-	<0.01		
20	250N E150	5	8	50	0.1	9	-	-		
21	250N E175	5	10	30	<0.1	10	-	-		
22	250N E200	5	12	22	<0.1	20	-	<0.01		
23	275N E000	14	36	22	0.1	690	0.110	0.08		
24	275N E025	7	33	50	0.1	400	0.060	0.22		
25	275N E050	7	60	30	<0.1	360	0.110	0.12		

*[Handwritten Signature]*

# ANALABS

A Division of Hamilton & Co., Inc.

827125

## ANALYTICAL DATA

SAMPLE NO.

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1	275N E075	5	26	94	0.2	71	0.040	0.05		
2	275N E100	5	16	38	<0.1	27	<0.008	0.01		
3	275N E125	8	21	43	0.1	19	<0.008	0.07		
4	275N E150	6	11	39	0.2	13	-	0.01		
5	275N E175	6	13	20	0.1	16	-	<0.01		
6	275N E200	5	11	13	0.1	14	-	<0.01		
7	300N E000	6	19	22	0.1	80	-	0.03		
8	300N E025	6	21	22	<0.1	200	-	0.04		
9	300N E050	6	21	27	<0.1	200	-	0.02		
10	300N E075	6	22	50	<0.1	180	-	0.02		
11	300N E100	5	11	32	0.1	32	-	0.04		
12	300N E125	5	11	22	0.1	24	-	0.01		
13	300N E150	6	13	18	<0.1	14	-	-		
14	300N E175	5	10	21	0.1	13	-	-		
15	300N E200	5	11	18	0.1	13	-	-		
16	325N E000	8	24	29	0.1	55	-	0.04		
17	325N E025	7	19	30	0.3	150	-	0.03		
18	325N E050	5	18	17	0.1	160	-	0.02		
19	325N E075	5	15	31	0.1	190	-	0.02		
20	325N E100	5	11	16	0.1	27	-	0.02		
21	325N E125	5	14	23	<0.1	17	-	<0.01		
22	325N E150	4	12	10	0.2	17	-	-		
23	325N E175	5	9	8	0.1	10	-	-		
24	325N E200	6	15	20	0.1	8	-	-		
25	350N E000	7	15	23	0.1	27	-	0.01		

# ANALABS

A Division of Reedfield Hamilton & Co. Pty Ltd

827126

## ANALYTICAL DATA

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					Ag	As	Cd	Cu		
1	350N E025	7	23	32	0.2	94	-	0.02		
2	350N E050	8	19	22	0.2	210	-	0.02		
3	350N E075	4	23	21	<0.1	45	-	0.03		
4	350N E100	4	3	9	0.2	11	-	0.01		
5	350N E125	6	<1	5	<0.1	3	-	<0.01		
6	350N E150	5	12	14	<0.1	28	-	0.02		
7	350N E175	5	11	16	<0.1	16	-	<0.01		
8	350N E200	5	10	22	<0.1	5	-	-		
9	375N E000	6	11	23	<0.1	15	-	-		
10	375N E025	4	9	17	<0.1	25	-	0.01		
11	375N E050	6	15	21	<0.1	78	-	0.03		
12	375N E075	4	23	27	0.1	11	-	0.03		
13	375N E100	6	20	19	0.1	72	-	<0.01		
14	375N E125	4	6	6	0.1	10	-	0.01		
15	375N E150	4	7	12	0.1	9	-	0.03		
16	375N E175	5	24	20	0.1	23	-	0.03		
17	375N E200	4	4	6	<0.1	2	-	-		
18	400N E000	4	7	19	0.1	13	-	-		
19	400N E025	4	10	14	0.1	21	-	-		
20	400N E050	4	11	14	<0.1	25	-	0.02		
21	400N E075	5	16	14	<0.1	30	-	0.01		
22	400N E100	4	5	5	0.1	13	-	<0.01		
23	400N E125	5	13	18	<0.1	15	-	0.06		
24	400N E150	4	14	18	0.1	11	-	0.02		
25	400N E175	5	11	9	<0.1	6	-	-		

Report for information only  
 T. Sample taken from the surface of the soil  
 X. Sample taken from the surface of the soil  
 L. Sample taken from the surface of the soil

AUTHORISED  
 OFFICER  


# ANALABS

A Division of Macdonald Hamilton & Co. Pty. Ltd.

827127

## ANALYTICAL DATA

SAMPLE PREFIX

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Line No	SAMPLE	PH	Zn	Pb	DE	AU	AU		
1	400N E200	5	14	15	0.3	7	-	0.03	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23	DETECTION	1	1	1	0.1	1	0.008	0.01	
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM	PPM	
25	METHOD	102	102	102	102	114	309	329	

Results in ppm unless otherwise specified  
 \* - element present but not determined  
 - - element concentration below detection limit  
 - - element not determined

AUTHORIZED OFFICE



Description of two samples of quartz - arsenopyrite ore from the Bluebell mine.

The samples were sawn into slabs about 12 mm thick and blocks of 15 sq. cm. (sample A) and 22 sq. cm. (sample B) were selected as areas showing a cross section of the mineralogy present. The blocks were treated by soaking in Araldite D because they were severely weathered and porous and they would not have been possible to polish otherwise. The presence of so much Araldite in the polished surface gives a false impression of the amount and nature of gangue minerals.

Because of the patchy nature of the sulphide mineralization it is not possible to give percentages of the minerals but to comment mainly on relative abundances and forms of the minerals present.

#### Sample A

This consists of euhedral crystals of arsenopyrite up to 1 cm. across in a solid mass of white quartz. The arsenopyrite crystals vary from being pristine to being weathered to a skeletal mass of more than 50% void or transparent gangue, which is the only material included in them.

Under high power (x 50 obj.) there are a few small ( $< 0.01$  mm) grains of a grey mineral, possibly sphalerite, though it is difficult to distinguish them being so close to the limit of optical resolution.

#### Sample B

This contains some large ( $> 1$  cm) subhedral aggregates of deeply corroded and skeletal arsenopyrite. These are notable for the extent and variety of corrosion textures.

Associated with the arsenopyrite aggregates there are several other sulphides. These would be less than 10% of the area of the arsenopyrite.

Covellite is widely scattered as small crystals ( $\sim 0.05$  mm) and aggregates filling or partially filling voids in the arsenopyrite. Acicular crystals of covellite surround and project into small irregular chalcopyrite masses.

A light brown soft mineral occurs occasionally as small exsolution grains in the arsenopyrite and as tiny ovoid blebs within quartz grains. This is probably bornite. One such ovoid body is filled 2/3 bornite? and 1/3 pale gold. Determination is difficult because the body is only 0.05 mm long.

There are a few other widely scattered very small grains resembling gold in the sample.

Pyrite is present as a few irregular grains (about 0.5 mm) in the arsenopyrite.

There appears to be two cycles of sulphide mineralization. The first seems to be emplacement of arsenopyrite, pyrite and minor gold and bornite. Secondly, covellite and chalcopyrite were emplaced in the corroded arsenopyrite, possibly where there was higher concentration of bornite.



Simon Stephens

This sample contained a very small amount of sulphide minerals in a mostly quartz gangue. Several slices had to be cut and polished until ore was found with enough sulphide minerals to give some idea of their interrelationship.

In order of abundance the minerals are:-

#### Quartz

Arsenopyrite Clearly the most abundant sulphide with grains ranging from 0 - 15 mm. The larger grains occupied mostly euhedral holes in the quartz but were usually embayed or skeletal in structure with many unfilled fissures. The medium to small grains (0 - 2 mm.) were mostly solid and euhedral. Some have what appear to be small exsolutions of galena within them.

Galena This is associated with the arsenopyrite but is about  $\frac{1}{2}$  the abundance. It occurs mostly as ragged irregular patches but one patch appears to be the skeletal remains of a euhedral crystal about 2.0 mm. across. The arsenopyrite is mostly euhedral against the galena but some irregular boundaries exist, especially the exsolutions mentioned earlier.

Sphalerite This occurs as very irregular stringy patches up to 2 mm. long. It is very weathered and pitted and is mostly isolated from the other sulphides so it is difficult to tell its relationship with them. One fairly unweathered grain contains a few very small rounded blobs of galena and chalcopyrite.

Pyrite A few 0.2 mm. euhedral grains can be found close to some of the arsenopyrite.

Gold This occurs as pale rounded blobs about 0.1 mm. across and slightly irregular in shape. It is mostly associated with the galena close to euhedral boundaries with arsenopyrite. One or two grains are associated with goethite in the weathered spaces of the large arsenopyrite grains.

#### Discussion

There appears to be at least two events of mineral deposition. Firstly there was emplacement of arsenopyrite and possibly galena. Secondly the galena and gold were introduced possibly with remobilized or new arsenopyrite. There may be separate events for the sphalerite and pyrite but it is not clear where they fit in if in fact they are separate from the second stage of mineralization. Finally some gold and iron oxides were deposited during weathering.

S.S. Geph