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PASMINCO EXPLORATION

EL 37/89 BULGOBAC HILL

Partial

RELINQUISHMENT REPORT

Vol 1/

**TRANSPARENCIES
HELD**

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AUTHOR: JG Purvis

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BURNIE
August
1995

95-3762

PASMINCO EXPLORATION EL 37/89
BULGOBAC HILL PARTIAL RELINQUISHMENT
REPORT 1995 PURVIS J G

CONTENTS

	Page
SUMMARY	
1 INTRODUCTION	1
2 TENURE	2
3 GEOLOGY	3
4 EXPLORATION PHILOSOPHY	5
5 EXPLORATION COMPLETED 1990-95	6
5.1 Introduction	6
5.2 Photogrammetry	6
5.3 Aeromagnetic Survey	7
5.4 SG and Magnetic Susceptibility Measurements	8
5.5 Geological Traverses (1991 & 1992)	8
5.6 Gravity Surveys (1991 & 1993)	10
5.7 Environmental Disturbance and Rehabilitation	11
6 CONCLUSIONS	12
7 BIBLIOGRAPHY	13
8 KEYWORDS & LOCALITY	14

LIST OF FIGURES

In text:

1	Location Map	1: 500 000
2	Land Tenure	1: 50 000
3	Regional Geology	1: 140 000
4	Bulgobac Hill – Simplified Geology	1: 50 000
5	Work Completed 1990–95	1: 50 000
6	Bulgobac Hill – Rock Sampling	1: 25 000
7	Tullabardine Gorge – Gravity Data & Structural Elements	1: 25 000
8	1993 In-Fill Gravity Survey, Sock Creek Area	1: 20 000

In Pockets:

9	Residual Magnetic Contours – North Sheet	1: 10 000
10	Residual Magnetic Contours – South Sheet	1: 10 000
11	Residual Magnetic Profiles – North Sheet	1: 10 000
12	Residual Magnetic Profiles – South Sheet	1: 10 000
13	Magnetic Flight Path Plan – North Sheet	1: 10 000
14	Magnetic Flight Path Plan – South Sheet	1: 10 000
15	Northern Leases, Interpreted Geology 1991–92	1: 25 000

LIST OF APPENDICES

1. Aeromagnetic Survey Acquisition Report and Preliminary Interpretation, by Dr D. Leaman, August 1990.
2. Specific Gravity & Magnetic Susceptibility Readings.
3. Petrological Reports, Bulgobac Hill & Tullabardine Gorge.
4. Rock Sample Geochemical Results, Bulgobac Hill & Tullabardine Gorge.
5. Gravity Coverage, Tullabardine Gorge Area, by Dr D. LEAMAN, January 1992.

SUMMARY

The Bulgobac Hill EL 37/89 was granted to Pasminco in March 1990. As per statutory requirements, the EL is to be reduced by 21sq km on 2nd September 1995.

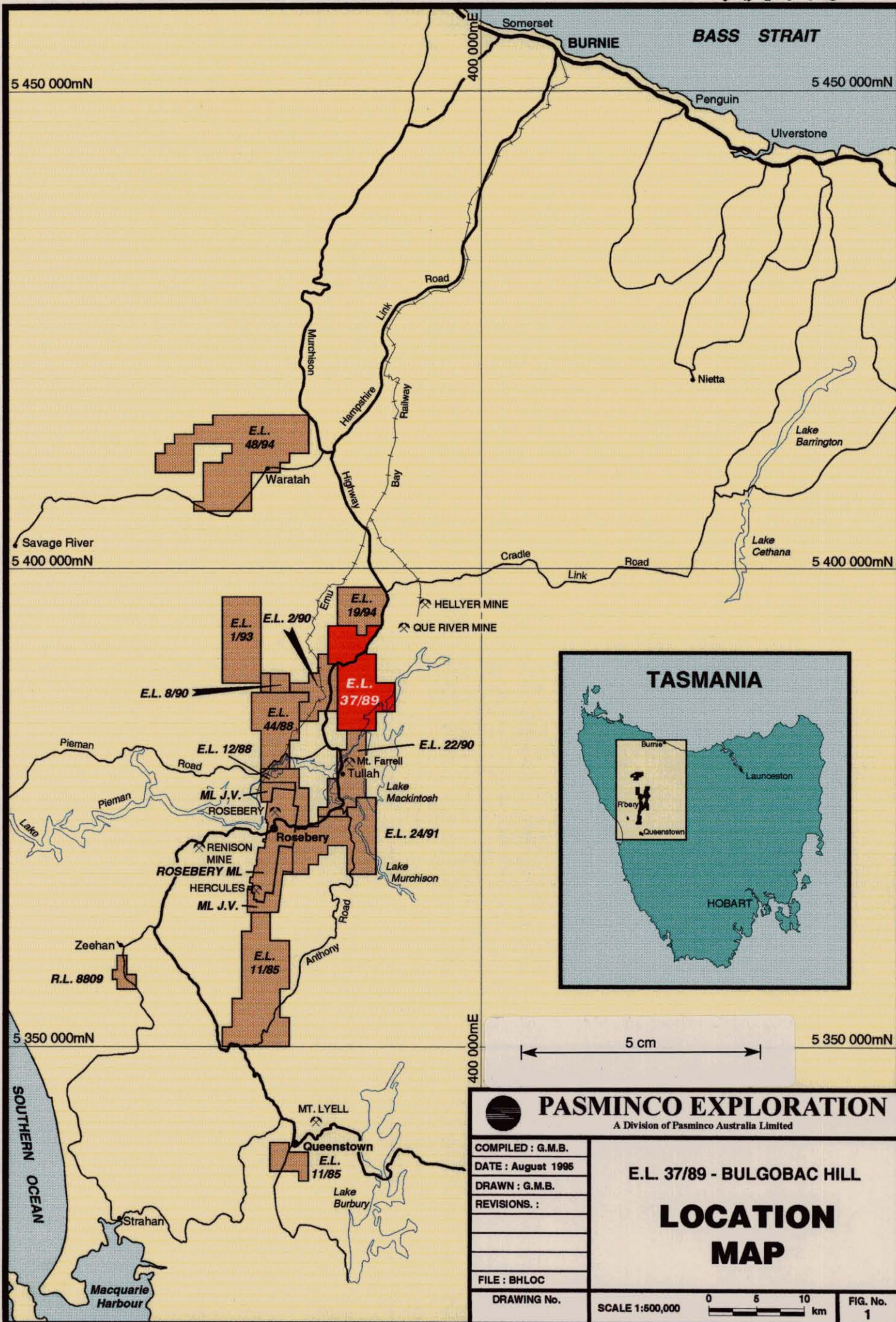
The relinquished areas comprise 20sq km covering mainly rhyodacitic CVC volcanics centred on Mt Block, and 1sq km covering Dundas Group quartz-feldspar porphyry and sediments to the NW of Sock Creek.

This report details all exploration carried out by Pasminco on the relinquished ground between 1990 and 1995. The vast majority of exploration on EL 37/89 in that period has been in areas that are to be retained.

Work on the relinquished areas has included geological and gravity traverses, mapping, rock sampling, a detailed aeromagnetic survey, aerial photography and photogrammetry.

Results of this work have not been encouraging. The Mt Block Volcanics, the vast bulk of the relinquished ground, are considered to have low potential for base and precious metal ore deposits.

The only known mineralization in these rocks, in fact the only known mineralization anywhere on the relinquished ground, is weak and insignificant barite-sphalerite-arsenopyrite veining in felsic lava at the Boundary Prospect (drilled by Aberfoyle in 1988).



PASMINCO EXPLORATION

A Division of Pasma Australia Limited

COMPILED : G.M.B.

DATE : August 1996

DRAWN : G.M.B.

REVISIONS :

FILE : BHLOC

DRAWING No.

E.L. 37/89 - BULGOBAC HILL

LOCATION MAP

SCALE 1:500,000

0 5 10 km

FIG. No.

1

1 INTRODUCTION

This report catalogues results of exploration carried out in the period March 1990 to August 1995 on the 21sq km relinquished from Bulgobac Hill EL 37/89.

The EL covers Cambrian Mt Read Volcanics SW of Hellyer Mine in Western Tasmania. See Figures 3 & 4. A Hellyer-type volcanogenic Pb-Zn-Ag-Au massive sulphide deposit has been the main target of Pasminco's exploration programme.

The terrain is very rugged and heavily vegetated. Vehicular access is limited to the sealed Murchison Highway and a few 4WD tracks branching from it. Much of the relinquished ground is transected by 100m or 200m spaced gridlines and walking tracks cut by BHP in the period 1985 to 1987.

The old prospectors found no mineralized showings anywhere on the relinquished ground. In 1988 Aberfoyle drilled a 367.4m hole (MAC16) into weak barite-sphalerite-arsenopyrite veining exposed by HEC powerline construction north of Mt Block (their Boundary Prospect). The hole did not encounter significant mineralization, neither did 9 shallow diamond drill holes (each less than 50m) put down by BHP in 1988 at Tullabardine Gorge. BHP and Aberfoyle covered most of the area with UTEM.

Pasminco's involvement commenced in 1990. Field work in the relinquished areas has largely been limited to mapping, rock sampling and gravity traverses. They have also been covered by detailed aeromagnetics and aerial photography.

2 TENURE

The Bulgobac Hill Exploration Licence 37/89, covering 32sq km, was granted to Pasminco Mining Rosebery on 3rd March 1990.

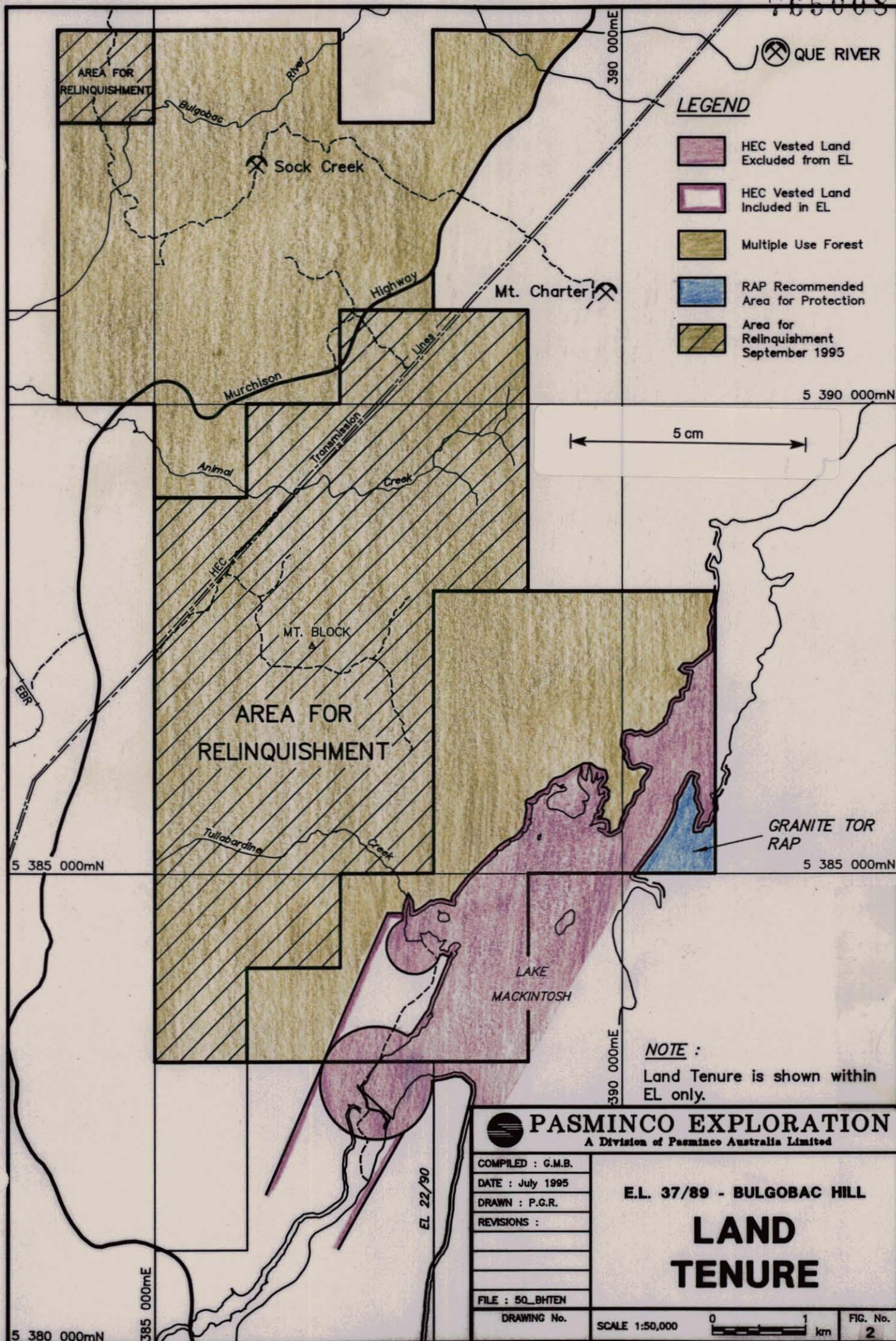
On 19th August 1990 the licence was transferred to Pasminco Exploration, who have been sole operators and managers of the tenement.

In March 1992 the Division of Mines allowed EL 37/89 to be renewed for 18 months (rather than the normal 12 months), so that the annual reporting period would fall in September when field work was at a lower level.

In May 1992 and October 1993, EL 37/89 was increased to 49sq km by the addition of 7sq km in the Lake Mackintosh area (EL 17/92) and 10sq km in the South Mt Charter area (EL 7/93).

On 2nd September 1995, 21sq km of EL 37/89 will be relinquished and the EL reduced to 28sq km.

The EL and relinquished areas are almost entirely Unallocated Crown Land. See Figure 2.



3 GEOLOGY

The geology of EL 37/89 is shown in Figure 4.

The tenement covers two main groups of the Cambrian Mt Read Volcanics – the Central Volcanic Complex (CVC), and correlates of the Dundas Group.

The relinquished ground largely comprises rocks of the Central Volcanic Complex: a gently-dipping pile of rhyodacitic lavas and sub-volcanic intrusives, porphyries, volcanoclastics and tuffaceous sediments. These rocks are known as the Mt Block Volcanics.

The CVC is overlain by Dundas Group sediments and volcanics. Work by Pasminco and others has shown that the contact between the two rock groups is conformable and gradational. Sections of the contact occur within the relinquished area around Mt Block.

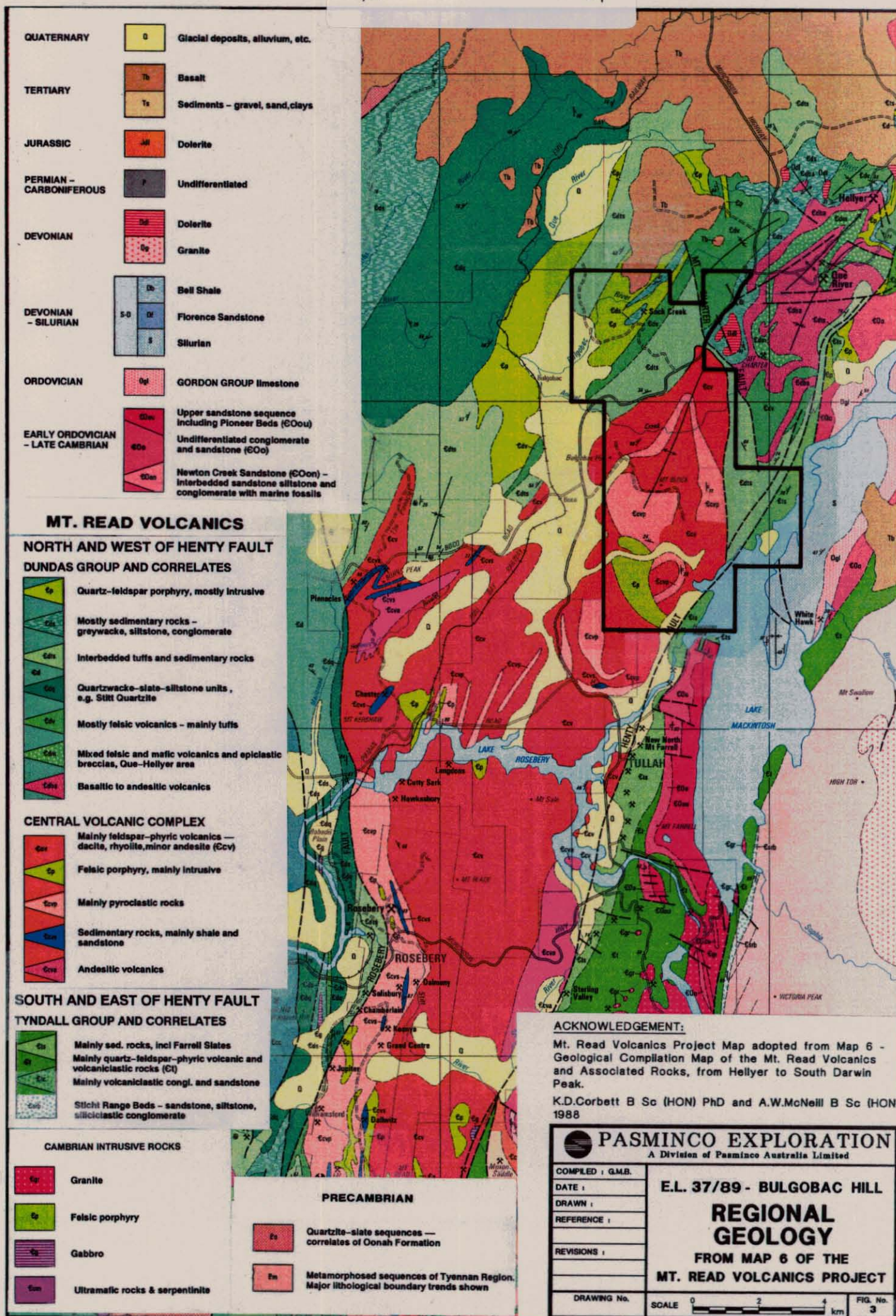
The 1sq km relinquished from the NW corner of EL 37/89 comprises quartz-feldspar porphyry and sediments of the Dundas Group.

The magnetics and gravity highlight the presence of several major, apparently deep-seated, unmapped or poorly-mapped structures trending broadly E-W. Two of these, the Boco Corridor and the Tullabardine Gorge Transform, occur on relinquished ground and are shown on Figure 7.

The only known mineralization within the areas relinquished is at the Boundary Prospect on the HEC transmission line track 3km north of Mt Block. This is a localized zone of quartz-sphalerite and pyrite-arsenopyrite-barite veining within sheared and strongly altered (silica-sericite-K feldspar-manganese) felsic lava. See Figure 4. Drilling showed the mineralization is shallow and very weak.

No other sulphide occurrences of note are known anywhere on the relinquished areas, although minor pyrite and pyrrhotite occurs in fine tuffaceous sediments within the CVC.

[Note: the 9 shallow BHP holes at Tullabardine Gorge in 1988 were put down as a result of anomalous basemetal values in soil, which were eventually traced to contamination of the samples in the laboratory. The drilling and follow-up rock sampling detected minor pyrite and pyrrhotite, but no basemetal or precious metal mineralization].



ACKNOWLEDGEMENT:

Mt. Read Volcanics Project Map adopted from Map 6 - Geological Compilation Map of the Mt. Read Volcanics and Associated Rocks, from Hellyer to South Darwin Peak.

K.D. Corbett B Sc (HON) PhD and A.W. McNeill B Sc (HON) 1988



PASMINCO EXPLORATION
A Division of Pasma Australia Limited

COMPILED: G.M.B.

DATE:

DRAWN:

REFERENCE:

REVISIONS:

DRAWING No.

E.L. 37/89 - BULGOBAC HILL

REGIONAL GEOLOGY

FROM MAP 6 OF THE
MT. READ VOLCANICS PROJECT

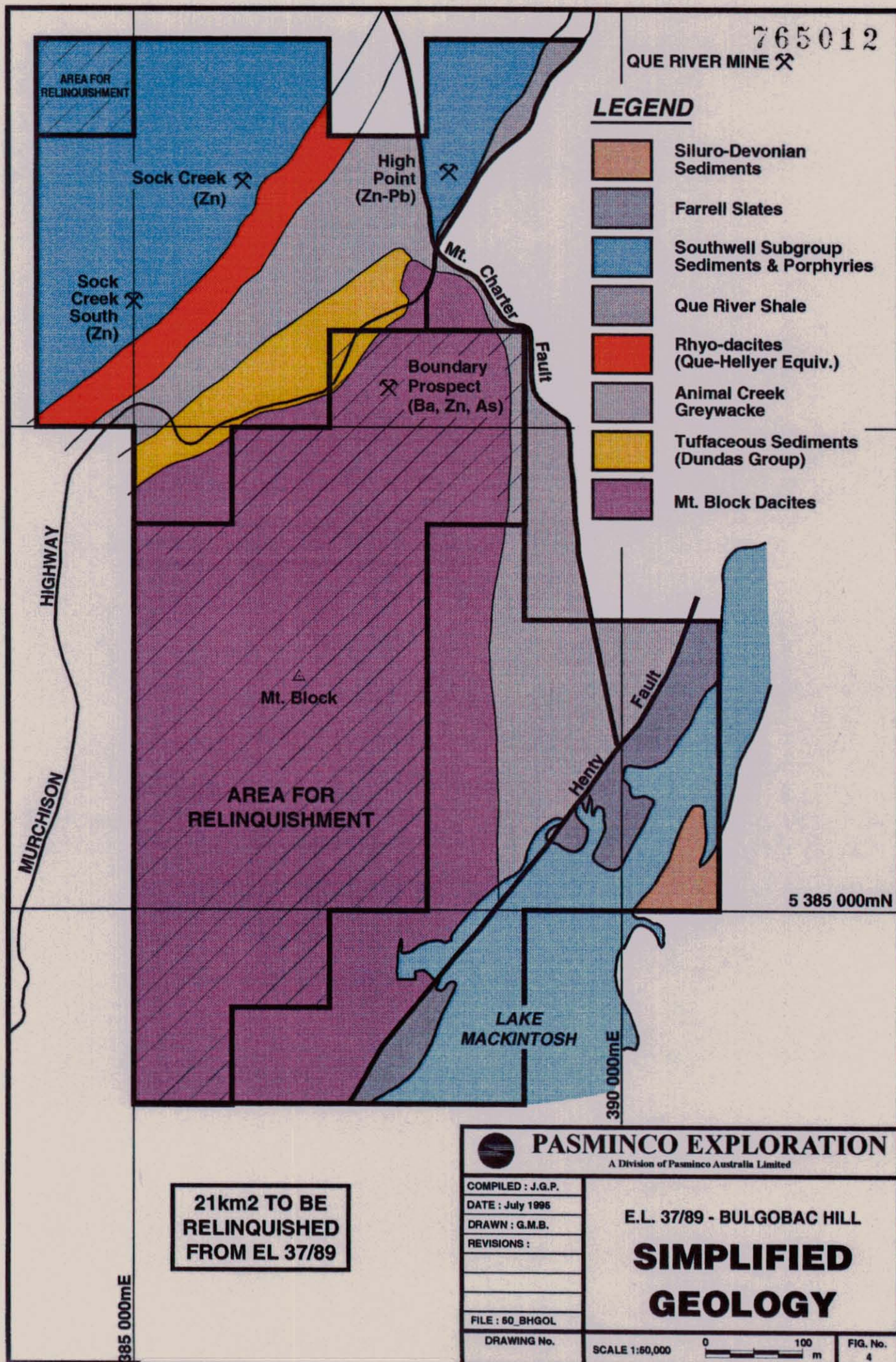
SCALE 0 2 4 km FIG. No. 3

765012

QUE RIVER MINE ⚡

LEGEND

-  Siluro-Devonian Sediments
-  Farrell Slates
-  Southwell Subgroup Sediments & Porphyries
-  Que River Shale
-  Rhyo-dacites (Que-Hellyer Equiv.)
-  Animal Creek Greywacke
-  Tuffaceous Sediments (Dundas Group)
-  Mt. Block Dacites



**21km² TO BE
RELINQUISHED
FROM EL 37/89**

**PASMINCO EXPLORATION**

A Division of Pasma Australia Limited

COMPILED : J.G.P.

DATE : July 1995

DRAWN : G.M.B.

REVISIONS :

FILE : 60_BHGOL

DRAWING No.

E.L. 37/89 - BULGOBAC HILL

SIMPLIFIED GEOLOGY

SCALE 1:50,000

FIG. No.
4

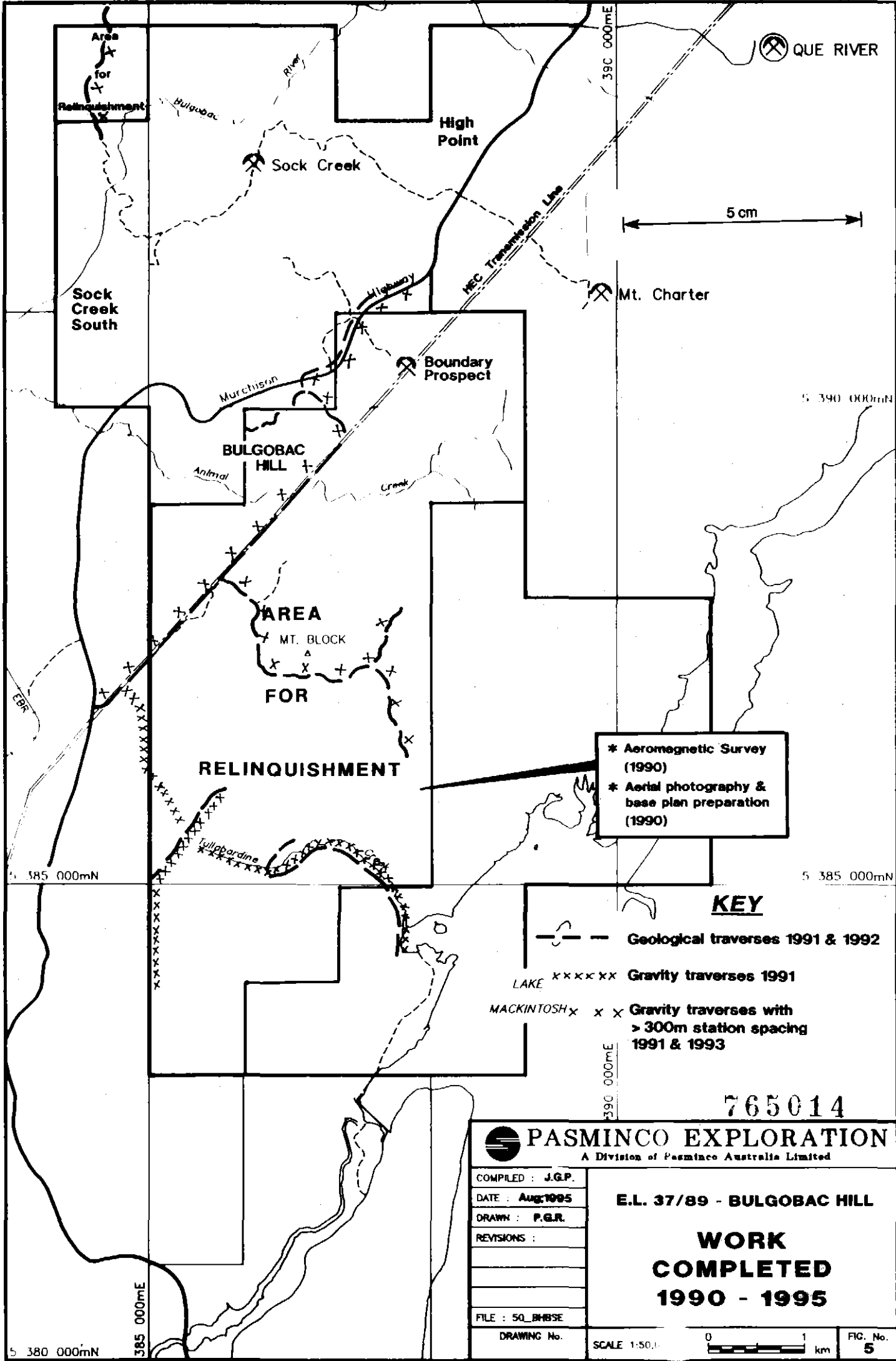
4 EXPLORATION PHILOSOPHY

Pasminco's exploration programme on EL 37/89 has been directed at locating auriferous basemetal massive sulphide bodies within the Mt Read Volcanics.

The type of deposits sought are expected to have characteristics similar to either the Hellyer and Que River orebodies in the Que-Hellyer Mafic Volcanics, or to the Company's felsic volcanic-hosted Rosebery deposit.

To this end, most effort has been directed at the Que-Hellyer Volcanics at the High Point Prospect in the NE corner of the EL. Initial exploration in the rhyodacitic Mt Block Volcanics of the CVC yielded disappointing results, and it is considered these rocks have low potential for Rosebery-type massive sulphides.

Secondary targets have included dispersed (vein-style or disseminated) basemetal and/or precious metal accumulations in favourable lithological or structural sites. The most prospective sites for these deposit types are considered to be associated with the Henty Fault in the SW part of the EL. From the results of work undertaken, the Mt Block Volcanics have given no encouragement for these styles of mineralization.



- * Aeromagnetic Survey (1990)
- * Aerial photography & base plan preparation (1990)

KEY

- Geological traverses 1991 & 1992
- xxxxxx Gravity traverses 1991
- x x x Gravity traverses with > 300m station spacing 1991 & 1993

765014

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.
DATE : Aug 1995
DRAWN : P.G.R.
REVISIONS :
FILE : 50_BH15E

E.L. 37/89 - BULGOZAC HILL

**WORK
COMPLETED
1990 - 1995**

DRAWING No. SCALE 1:50,000 0 1 km FIG. No. 5

5.1 Introduction

The vast majority of Pasminco's exploration effort over the past five years has been directed at the retained area of EL 37/89. On the relinquished areas the following work has been done (in approximate chronological order):

- 1 Aerial photography, photogrammetry and base plan preparation (1990).
- 2 High resolution aeromagnetic survey and preliminary interpretation (1990).
- 3 Magnetic susceptibility and SG measurements on BHP Tullabardine Gorge drill core (1990).
- 4 Geological traverses at Bulgobac Hill, Mt Block, Tullabardine Gorge and NW of Sock Creek (1991).
- 5 Gravity traverses at Tullabardine Gorge, Mt Block – Bulgobac Hill, and NW of Sock Creek (1991).
- 6 Geological traverse and structural analysis at Tullabardine Gorge (1992).
- 7 In-fill gravity traverse NW of Sock Creek (1993).

5.2 Photogrammetry

In 1990, air photography in colour and black & white at 1: 10,000 and 1: 22,000 scales respectively, was flown over EL 37/89 by HEC Enterprises under a contract with Pasminco Mining. The HEC then produced a series of computer-generated topographic base maps at 1: 5,000 scale.

The photogrammetric data is stored on tape in digital form, enabling plans to be produced at any scale.

5.3 Aeromagnetic Survey

In February – March 1990, 700 line km of helicopter-borne high-resolution aeromagnetics and radiometrics was flown over the entire Bulgobac Hill EL by Geo Instruments.

Nominal line spacing was 100m and nominal terrain clearance 80m.

Full details and results of the survey appear in Appendix 1 – the acquisition and preliminary interpretation report by Dr D. LEAMAN (1990). Flight path plans, magnetic contours and profiles, appear in Figures 9–14.

The radiometrics have not been corrected or compiled.

On the relinquished ground the following observations by Leaman are relevant:

- 1 The Mt Block area comprises a contorted and thrust sliced volcanic pile, which is largely unaltered. Unrelated rocks lie beneath it.
- 2 The exception is an inferred slice of altered volcanics associated with an east–west structural "corridor" in the Tullabardine Gorge, south of Mt Block.

For further details see Appendix 1.

5.4 SG and Magnetic Susceptibility Measurements

To assist in the interpretation of the aeromagnetic and gravity survey data, density and magnetic susceptibility measurements were taken from existing drill core on EL 37/89.

Within the areas to be relinquished, measurements were made on core from BHP Tullabardine Gorge holes TG7 (33.6m, located at 5384800mN / 385315mE) and TG9 (35.0m, located at 5385000mN / 385250mE).

Results are listed in Appendix 2.

5.5 Geological Traverses (1991 & 1992)

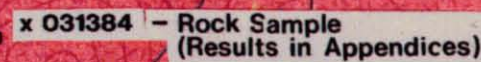
During 1991–92, geological traverses were carried out at Bulgobac Hill, Mt Block, Tullabardine Gorge and NW of Sock Creek. See Figure 5. Results of petrological and lithogeochemical samples taken during these traverses appear in Appendices 3 & 4.

Bulgobac Hill

On the Bulgobac Hill a traverse was made in the vicinity of the CVC / Dundas Group contact just south of the Murchison Highway (see Figure 6). The local geology is dominated by siliceous and vitric tuffaceous sediments, with lesser feldspar–crystal volcanoclastic sandstones and dacitic volcanics. The rocks are unaltered to weakly altered.

Petrological results show the sediments are derived from silicic volcanics, with some displaying a mixed silicic and mafic provenance. Although the siltstones locally contain up to 3–5% very fine pyrrhotite/pyrite and rare traces of sphalerite, the basemetal and precious metal values are insignificant.

765018

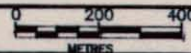


PASMINCO EXPLORATION

DRAWING No.

ROCK SAMPLING

SCALE

FIG. No.
6

Tullabardine Gorge

Tullabardine Gorge is a spectacular glacial valley 2km south of Mt Block. In 1991 and 1992 traverses were made to examine the geology across the Tullabardine Gorge Transform Structure, an east-west aeromagnetic feature that broadly coincides and parallels the valley (Leaman, 1990).

Outcropping primary volcanic units in the Tullabardine area are overwhelmingly rhyodacitic or dacitic, although some minor intercalated mafic units were mapped by Corbett and McNeill (1986). Tuffaceous sediment horizons show the volcanic pile has generally gentle to moderate dips, and is flat-lying in places.

The traverse along the floor and lower slopes of the gorge found exposure to be extremely poor, limited to widely scattered outcrops of primary dacitic and rhyodacitic volcanics.

A second traverse was made along a gridline cut for a gravity survey in the headwaters of Farm Creek (see Figure 7). This line was designed to cross the Transform Structure.

However, on the traverse line exposure was not good despite the steep terrain, with fairly extensive areas of no outcrop or float. The exposed local geology is dominated by unaltered to weakly altered tuffaceous and volcanoclastic sediments, with lesser rhyodacitic volcanics and quartz-feldspar porphyry.

The sediments, comprising mainly siliceous tuffaceous siltstones and pumiceous crystal-lithic volcanoclastic sandstones, are very similar to those on the Bulgobac Hill – a fact borne out by the petrological results. These again show that although the volcanic provenance of the epiclastics is largely silicic (rhyodacitic), there is a small but persistent mafic volcanic component in the detritus. Some of this mafic material is derived from pre-existing mafic volcanoclastics.

Only traces of pyrite were noted during the traverse and the rock sample assay results are all low. No features that might occur along a major structure (eg: fracturing, veining, strong cleavage or localized alteration), were seen.

In fact, it is a characteristic of most of the rocks at Tullabardine Gorge and in the Mt Block massif generally, particularly the siliceous tuffaceous siltstones, that they are essentially uncleaved and unveined – a most unusual feature for the Mt Read Volcanics.

This is at odds with Leaman's description of the Mt Block Volcanics as "contorted" (see Section 5.3. above).

Mt Block–Bulgobac Hill, NW Sock Creek

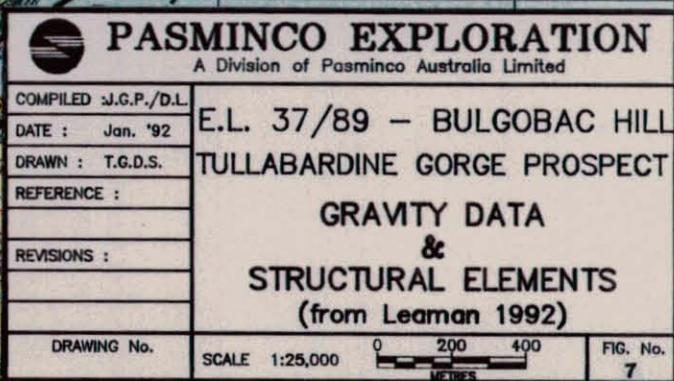
As part of a regional investigation of Pasminco's northern licences, detailed geological traverses were made during 1991 in several places on the relinquished areas.

The principal traverses were within the CVC volcanics around Mt Block, between Mt Block and the Bulgobac Hill, and within the Dundas Group along an old 4WD track NW of Sock Creek (see Figure 5). Mapping from these traverses is shown in Figure 15.

5.6. Gravity Surveys (1991 & 1993)

Late in 1991 several detailed gravity traverses were made in and around the Tullabardine Gorge in order to examine the large east–west Transform Structure interpreted by Leaman (1990). Surveyed gravity station spacing along the cut traverse lines was nominally 200m.

In addition, upgrading of the overall gravity coverage of the EL continued. Within the relinquished areas this saw stations measured at +300m spacings in



the vicinity of Mt Block and Bulgobac Hill. In February 1993, four further gravity stations were surveyed NW of Sock Creek.

Gravity survey coverage is shown in Figure 5 and results in Appendix 5. Some interpreted features of the results are shown in Figure 7. The NW Sock Creek results are shown in Figure 8.

The gravity data is discussed in greater detail in Leaman (1992) – see Appendix

5. The most significant elements of Leaman's interpretation are:

- 1 Delineation of a major lineament 1–2km west and sub-parallel to the Henty Fault, SE of Mt Block.
- 2 Apparent alteration or acid intrusive rocks associated with the above linear (as inferred from unusual deep bouguer lows aligned along it).
- 3 Intersection of this linear with at least two major E–W structures – the Tullabardine Gorge Transform and the Boco Corridor.

5.7 Environmental Disturbance and Rehabilitation

On the relinquished areas during their five year tenure, the only Pasminco activities with any environmental impact have been the very limited cutting of survey lines for gravity and geological traverses. In fact, over 50% of the traverses shown in Figure 5 were on old 4WD tracks or pre-existing cut survey lines.

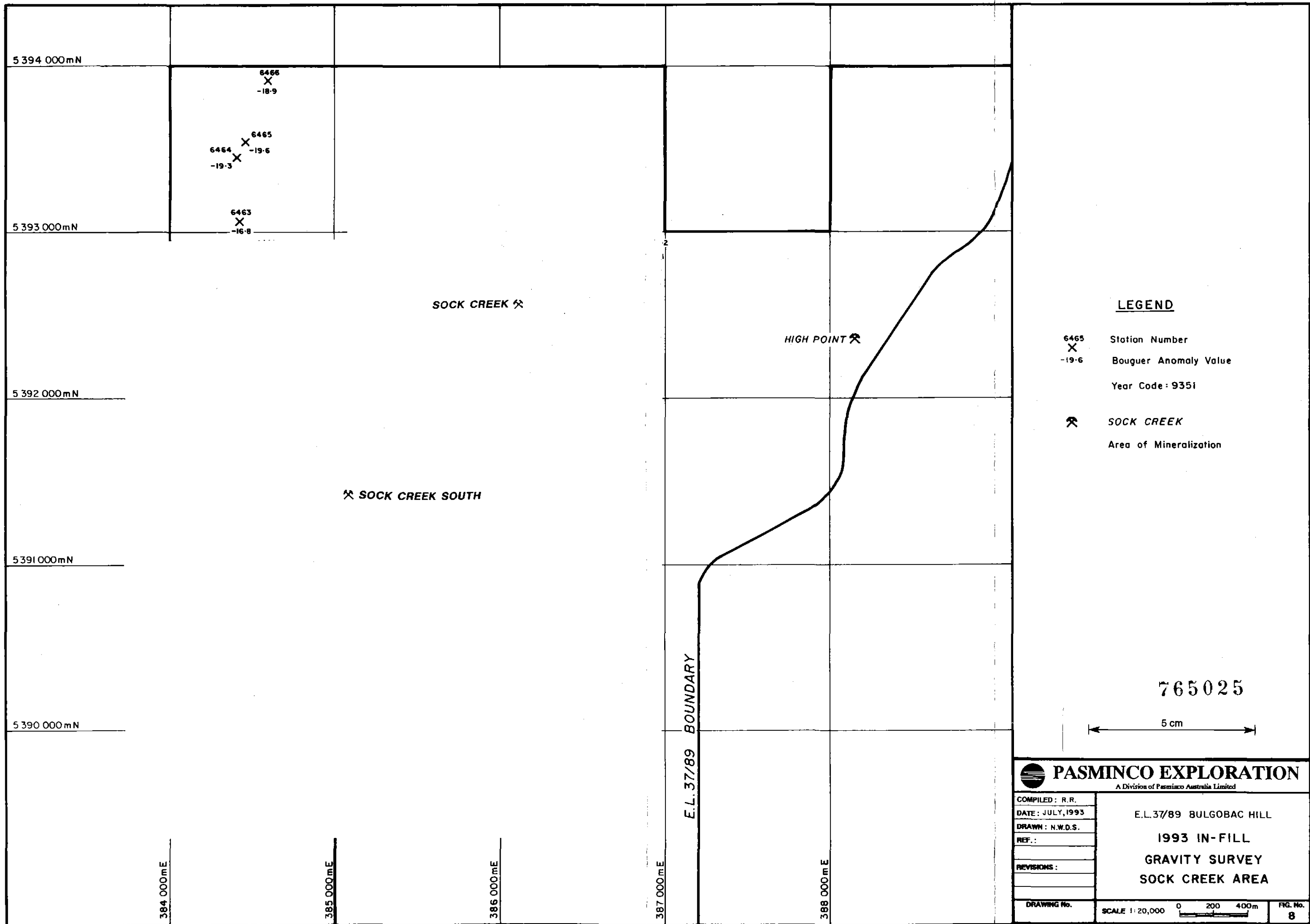
Pasminco has not used any form of earthmoving machinery on the relinquished areas.

6 CONCLUSIONS

- 1 The only known mineralization on the relinquished areas, the ak barite–sphalerite–arsenopyrite veining in CVC volcanics at Boundary Prospect, is insignificant.
- 2 The CVC volcanics, which comprise the vast bulk of the relinquished areas, are considered to have low potential for massive sulphide and vein–style basemetal / precious metal ore deposits.

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11 KEYWORDS & LOCALITY**Keywords**

MASSIVE SULPHIDE, VOLCANOGENIC, MT READ VOLCANICS, FELSIC VOLCANICS, GEOLOGY, STRUCTURE, LITHOGEOCHEMISTRY, PETROLOGY, MAGNETICS, GRAVITY

Locality

BURNIE SK55-3: BULGOBAC HILL, MT BLOCK

APPENDICES

APPENDIX 1

**Aeromagnetic Survey Acquisition Report and Preliminary
Interpretation, by Dr D. Leaman, August 1990.**

LEAMAN GEOPHYSICS

Survey Review, Specification, Reduction, Interpretation
Gravity, Magnetic and Seismic Methods
Structure and Prospect Evaluation

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765029

AEROMAGNETIC SURVEY
EL 37/89 BULGOBAC HILL

ACQUISITION REPORT
(INCLUDING PRELIMINARY INTERPRETATION)
for
PASMINCO MINING

by
Dr. D.E. Leaman

August 1990

BULGOMAG

CONTENTS

SUMMARY

A new high resolution helicopter aeromagnetic survey of the Bulgobac Hill - Mt Block region between Tullah and Que River in western Tasmania has revealed dissimilar terranes and explained many aspects of the structure.

This report describes specification and acquisition of the survey. It also includes a discussion of possible implications but further interpretation requires some re-examination of specific features observed at, or near, known mineralised sites such as Sock Creek or which affect significant volumes of the Mt Read Volcanics such as south of Mt Block. Any further examination must use observed rather than processed contour data and fully compensate for terrain effects due to the subtlety of many responses.

The most obvious features of the magnetic field trend NE-SW. These clearly reflect compositional variations within the volcanic piles. Other trends and lineaments can be recognised. These display NW-SE and sub E-W orientations approximately. It is not possible to define the relative significance of these features due to their variable presentation in different image or contour displays. Such features probably represent transverse or conjugate fracture sets and some clearly truncate shallow source texture. The large E-W effects have been noted regionally and associated with mineralisation. Features associated with the Mt Read Volcanics can not be traced into Dundas Group rocks.

The largest anomaly observed in the survey area can be associated with mafic members of the Cambrian sequence, either ultramafic rocks, gabbros or a thick basaltic sequence. Depending upon the source chosen various structural and depth options can be inferred. The anomaly balance shows that the basaltic sequence exposed near Que River and Hellyer extends toward this EL in a thickened form but is then faulted out near the Mt Charter Fault. The sequence, or effect is restored further west. Much more work is necessary to resolve the nature and implications of variations in this sequence which lies at depths in excess of 1 km.

The Dundas Group rocks, including the mafic sources at depth, are structurally overlain by slices of the Mt Read Volcanics and the whole folded. These slices dip east at about 40 degrees and several may be inferred. The fold system plunges northward. Structural patterns or lineaments within this complex overlay contrast with those inferred within the Dundas Group below.

These observations raise the important issue of which features are related to mineralisation and whether they correctly point to mineralised sites today. A block of volcanics may have been altered during deposition and mineralisation but then moved in bulk at a later time. Or, alteration zones may reflect the position of crustal controls which will remain active at all times, in which case an alteration may reflect that later time and not the mineralising event or position.

The volcanics section of the licence area has been reviewed with these issues in mind. Many elements are either unaltered or too thin to carry significant remnants of alteration systems and are therefore not of interest to large scale base metal exploration within them. Targets may lie beneath these slices. One such target block has been identified, although it may also be allochthonous, simply because it has sufficient volume and preservation of a large alteration system. The indicator presence of various igneous lithologies along the alteration corridor provides the evidence that this zone was active during creation of the volcanic pile and not merely a younger superimposed alteration.

The western end of this same corridor is terminated a little south of the southernmost exposures of the Boco alteration and mineralisation.

The potential of the northern part of the area is less clouded or difficult since the survey has clearly revealed a structural grain which was previously unsuspected and which can explain Sock Creek. Several of the structures identified are associated with localised anomalies, one half of which may suggest alteration phenomena. Ground, rock property, chemical and detailed magnetic analysis of raw data is advised in all cases.

INTRODUCTION

EL 37/89, Bulgobac Hill, is located south and west of Mt Charter and the Que River mineralisation in western Tasmania (Figure 1). It includes the northern exposures of the Central Volcanic Sequence of the Mt Read Volcanics and includes mineralisation in the adjacent Dundas Group at Sock Creek.

Gravity and magnetic data in the area have only been reviewed in regional terms previously (Leaman, 1986a, b; 1988). Results indicated that these data sets could reveal much information about structural setting and control within the area and further analysis was recommended. The regional data available were shown, however, to lack resolution due to line spacing or terrain clearance excesses.

This report describes a detailed aeromagnetic survey undertaken to upgrade the regional data base. The principal aims of this survey were to

- a) define alteration within the volcanics,
 - b) assess structural controls,
 - c) aid mapping and subdivision of the volcanics and
 - d) identify any mineralisation signatures present.
- A detailed, high resolution survey was specified.

This report outlines survey specification, presents the results of survey and provides a preliminary outline of implications and interpretation.

The report forms a basis for idea generation and testing with suggestions for further analysis.

MAGNETIC SURVEY

SPECIFICATION

Specifications for the survey were determined by the previous experience provided by the Mines Department survey (Leaman, 1986a) and the need to resolve possible alteration features, subtle trends, and the contribution due to various parts of the Cambrian volcanic pile. Leaman (1986) has established the general viability of magnetic methods for assessment of alteration and mineralised sites in areas free of strong interference effects such as introduced by Tertiary basalt or Cambrian ultramafics.

Many of the features sought are known to be subtle and all previous data has lacked the necessary data resolution - in terms of low clearance, close sampling and line density. Detail, once lost due to variable or excessive clearances, is not recoverable.

Since the reliability of the regional data set was not known, and there is little information available on the variability of contrasts within the volcanics it was important to ensure that a fair and substantial trial of the application was permitted. The best practicable specification was defined.

Line spacing: 200 metres E-W
Tie line spacing: 1000 metres N-S
Nominal terrain clearance: 80m.
Sample interval: < 10 m.
Magnetometer sensitivity: < 0.1 nT.

The line balance and orientation reflects a general compromise in order to obtain cost effective coverage, the general form of the terrain and the need to define sub E-W or NW-SE and SW-NE trends as suggested by regional analysis of the Mines Department survey. Rigorous draping necessitated use of a helicopter. Use of fixed wing aircraft, a higher nominal clearance and general wide variation in that clearance effectively destroyed the resolving power of the Mines Department survey across the important, relatively low relief magnetic field environment associated with Cambrian volcanics and adjacent Dundas Group. Only high relief features were defined by that survey in this area.

Multichannel radiometric data were also specified but no commitment was made toward processing of that data pending inspection of the raw data.

(This data has not yet been fully processed and it is possible that no further analysis will be undertaken).

SURVEY

The survey was flown between February 22 and March 17, 1990 by Geo Instruments Pty Ltd under the supervision of Zoltan Beldi using a G-813 proton precession magnetometer in a towed bird and a GR 3001 spectrometer with 16.8 l capacity.

An equivalent magnetometer was used as base station and the survey was completed over several days.

Survey tracking was visual supported by colour video using topographic basemaps and aerial photographs with a recovery scale of 1: 10000.

Total line coverage was about 700 km. Line recovery and line location details are presented in Map 1 (folder).

PROCESSING

Flight path digitising, processing, gridding and mapping were performed by Pitt Research Pty Ltd of Adelaide (previously based in Sydney).

IGRF 1985 was removed from the data and a scalar of 4850 nT added to residual data.

The stability of gridding and acquisition was tested by preparation of pixel image maps which expose line misties. The many cross ties generated by this survey were adjusted by spline interpolations in both directions.

Processing statistics are summarised in Appendix 1.

A contour interval of 2 nT was selected for the primary presentation (Map 3 - folder). Stacked profiles are presented in Map 2.

Radiometric data have not been corrected, levelled or compiled.

DATA PRESENTATION

Maps 1, 2 and 3 (folders) provide detailed presentation of the survey coverage, observed profiles and contours of the magnetic field at 1: 10000 scale.

Figure 5B provides a colour pixel image version of the magnetic data and other image presentations are included in Figures 5 and 6.

All images were prepared by Pitt Research Pty Ltd.

Maps used as bases have been derived from Corbett & McNeill (1986) and Komyshan (1986) - see Figures 4A, 4B.

The specifications were closely approximated for this survey. The effective terrain clearance was 100 m for the entire area and the line coverage, including tie line intersections, was satisfactory. The sample spacing condition was not met; this averages 12 to 15 m in practice. This variation has not created any problems in terms of survey use in view of the slightly higher terrain clearance and is about one third that of previous regional surveys. However, the fact was not known until the data tape and flight path map was supplied by the contractor - after approval of contour plans and all other materials. Others are warned that specifications and payment schedules should require proof of specification prior to acceptance of any data (preliminary or final).

COMPARISON WITH PREVIOUS DATA

The previous regional survey described by Corbett et al (1982) and Leaman (1986a) has been reproduced as Figure 2 and may be compared with the new survey (Figure 3). Contour intervals are 2 nT for the new survey and 5 or 10 for the old.

The regional survey can be seen to provide a reasonably reliable view of the magnetic field in terms of the location and identification of all significant responses but there was clearly considerable loss of resolution and definition in many areas. Specific examples relate to the western exposures of the volcanics, the shoulder and compound detail on large anomalies and the differentiation of responses in the Sock Creek and Mt Block areas.

The lower clearance, higher resolution and better constrained flight path with closer line spacings has considerably improved feature recognition and location. The significance of some of this detail is discussed below.

Character correlation of the older data was used to suggest possible sub E-W alteration corridors (approx 5386 000 and 5394 000 mN) and many NE-SW and NW-SE fractures generally (see Leaman, 1987). The validity of many of these was unknown. Alteration responses have not been recognised previously.

The large sub-circular anomaly west of Sock Creek was described by Leaman (1986a) and associated with a slice of ultramafics trapped in fault surfaces which may dip east at some depth. Regional magnetic modelling of this region suggested conflicting dip arrangements for possible sources and no conclusions about the source was offered. Other features have not been examined in detail previously.

INTERPRETIVE COMMENTS

The following comments outline possible correlations and implications within, and of, the data set with respect to exposed geology and mineralised sites.

The principal object of this discussion has been to assess observed features and possible identification of patterns and relationships which may lead to explanation of known sites and prediction of possible targets for follow-up study.

All styles of presentation have been reviewed.

FEATURES OF THE MAGNETIC FIELD

The features and elements of the magnetic field are best displayed in Figure 5C.

Three principal characteristics are evident.

A very large anomaly centred just west of the surveyed area dominates the magnetic field. The pervasive influence of the source extends across a radius of at least 6 km and normal gradients are evident to north and east. Some truncation is evident along its SE aspect, however. The scale of the effect and the magnitude and consistency of the observed gradients imply that the source is deep and of high contrast. (As shown below, this is not necessarily the case).

Relatively shallow-sourced effects are clearly superimposed - but only in the southern part of the area. Such sources are aligned NE-SW across the central part of the surveyed region near Mt Block and Bulgobac Hill, N-S east of Mt Block and NW-SE in the SW portion of the licence area.

Subtler features are present in each magnetic terrane - the stable, essentially single source north and the more disturbed southern area. These trends are best seen in gradient form in the northern segment (Figure 6A) but are apparent in any form in the southern area (e.g., Figures 5C, 6B). The contrast between orientation patterns in each part of the area is clearly displayed in Figure 6B. These patterns and relationships suggest distinct geological regimes, or terranes and a primary structural or stratigraphic displacement. The key contact can be correlated with the NW face of the Mt Read Volcanics (refer Figures 4A, 4B).

The lack of structural continuity, as illustrated by character north of this contact, between regions (non-volcanic, volcanic) suggests that the fracture(?) systems mapped north of the Mt Read Volcanics are either older than, or buried beneath, structurally emplaced volcanic masses. Komyshan (1986) and

Corbett and McNeill (1986) each indicate faulted margins for these volcanic blocks north of Bulgobac Hill.

Although the coverage of the present survey is not definitive it appears that similar relationships may exist across the faulted boundary of the volcanics south of Mt Charter toward the Henty Fault Zone.

Trends evident in the region NE of Mt Block and Bulgobac Hill, as displayed by high frequency volcanic sources at surface, appear to fan or cross over within the area SW of Boco Siding. Regional data, although of lower resolution (Figure 2) indicate a continuity of these trends SW toward Chester from this focus.

The "V" notch between the radiating arms of the fan and the N-S closures (see Figure 5B; approx. 387 000 mE, 5387 000 mN) also appears to repeat and the orientation is not unlike the fold closure patterns observed near Que River and Hellyer. A similar anomaly pattern may also be present north of Lake Rosebery. All features lie on an axis oriented NE-SW. More detailed data inspection is required to test or confirm these inferences.

The magnetic features of the NORTHERN part of the area are distinctive and generally subtle and steplike. Most present the character of fractures or faults.

Comparison with the mapping of Komyshan (1986) shows negligible correlation. Either this mapping is incorrect, all units are comparable in properties, or the features reflected are concealed.

Consider the Mt Charter Fault.

This has been mapped as a twin structure S and W of Mt Charter. The northern fault is indicated to trend N-S south of 5390 000 mN, NW-SE to the Murchison Highway (388 000, 5392 000) and then N-S toward Que Road. The southern fault is mapped as the irregular margin of the Mt Read Volcanics (N-S on the eastern side and NE-SW to the west) (See Figures 4A, B).

The faults diverge near 388 000, 5392 000.

The N-S arm of the Mt Charter Fault, as mapped, north of the highway is suggested but not unambiguously defined magnetically. Much of the apparent definition is related to an isolated but elongated source adjacent to it. The NW-SE trend projection, however, extends for at least 2 km toward Sock Creek. This is not mapped but it is clearly defined by the gradients (Figure 6B). It is likely that this structure arcs westward toward 383 000, 5392 700 but is apparently less significant (magnetically) than several N-S features.

The principal N-S structure, at about 345 degrees true, is not even hinted geologically by present mapping.

The Dundas Group variations mapped, and porphyries, do not obviously disturb the magnetic field. This indicates a uniform magnetisation (possibly zero). The lithic wackes further east are also little different.

These properties and correlations demonstrate two things; the large anomaly is not related to any exposed materials and there is a physical uniformity within these materials.

Some isolated responses are, however, present.

Anomalies at 385 700, 5394 000 and 385 800, 5393 300 are spiky and probably related to Tertiary basalt. Some other features in this area may also be associated with basalt remnants (e.g., 387 300, 5393 500; 387 900, 5393 000; 383 900, 5392 200) and localised features must be ground checked. These features may, alternatively, be associated with patchy variants within the Dundas Group sequence. Since most of these can be linked to faults (known) or trends (inferred, Figure 6B), some oxidation or alteration is implied. Gradients observed near each local deviation do indicate a moderate depth range for the source effect and show that it is not simply concentrated at or near the surface. The absence of strong couplet anomalies, such as generated by the Tertiary basalt outliers, supports such an inference.

Many of these effects are best displayed by Figure 6A. This figure also shows that two sub E-W features are present north of 5393 000 mN. These correlate with known structures at Que River (5393 400 mN).

Figure 6A also draws attention to several "knot point" anomalies where trends or structures intersect or to terminations of such structures. Examples include the intersection knob at 385 300, 5391 800 and the termination at 385 900, 5392 700 - near Sock Creek. The latter termination occurs on the probable extension of the Mt Charter Fault, rather than the fault labelled in extant mapping.

Most of the orientations identified in the northern area cannot be recognised within the disturbed responses related to the Mt Read Volcanics which cover the entire SOUTHERN portion of the survey area.

Close examination of the anomaly patterns within the volcanics reveals a number of inconsistencies with available mapping. Since most sources within the volcanics are clearly exposed or at very shallow depths these differences indicate that many revisions of the geological mapping are possible using the magnetic data and are required for complete appraisal of the area. The anomalies mark lithological and compositional changes in most instances.

The clearest examples of the use of the magnetic data, as well as need for revision of mapping, are seen around Mt Block.

N-S texture mapped magnetically on the eastern side of the mountain is mirrored in mapping generally although there are several instances where component anomalies are acute to the mapped boundaries (e.g., 388 000, 5388 000) and suggest a crossed grain or offsets, in detail.

This approximate correlation is acceptable for regional mapping and the magnetic survey offers many opportunities for fine detailing. No such correlation can be observed on the western

face of the mountain however.

The contrast between mapping judgments or exposure indications and the magnetic field is abrupt. Units exposed high on Mt Block extend SW to the highway. This suggests that petrological differences which presumably form the basis of the geological mapping are physically irrelevant. Furthermore, they produce a misleading view of structure or stratigraphic continuity. Only a small part of this pattern has been mapped - or is mappable. These strong cross trends are apparent in Figures 5C and 6B and persist into the hills SE of Burns Peak (see regional data).

Some other internal variations may be observed within the volcanics.

The porphyry S of Mt Block, near 386 000, 5385 000, is much less magnetised than other volcanics nearby and there is good correlation between the mapping of Corbett and McNeill (1986) in respect of their contact position - especially the northern and western margins. The lack of magnetic responses along the eastern side of this body suggests geometric factors vary (dips for example).

While the magnetic response around a hill at 387 000, 5385 000 is consistent with mapping (and inferred volcanic changes) there is no correlation with andesites mapped near 385 000, 5383-4 000.

A major NE-SW trend SE of Mt Block is also recognisable in several presentation. This feature parallels the Henty Fault Zone.

All responses, whether due to porphyry, porphyry margins or other volcanics, are greatly diminished and may be fully muted at about 5385 500 mN. This zone is about 300 m wide. A string of E-W elongated anomalies picks out the northern side of this corridor. The projection of this zone passes south of the known mineralisation and alteration south of Boco Siding, but may be related - the critical area is covered by glacials, and extends to Leo's Find near Burns Peak.

The description of features and nominal relationships given above shows that the magnetic data can be used to upgrade mapping and unit definition in the area. Some features are obvious, others require some analysis in order to precisely define boundaries or offsets.

The boundary between the Mt Read Volcanics and the Dundas Group is evident but the continuity of underlying Dundas Group is implied by the large overprinted anomaly centred to the west of the surveyed area.

Repetition of lithologies within the volcanics, whether stratigraphic or structural, is apparent. The gross pattern implies folding. The high frequency character of many responses shows that the sources are shallow and of limited depth range as well.

Several of the elements of this qualitative interpretation have been reviewed quantitatively.

MODELLED SECTIONS

Five sections have been modelled in order to provide a preliminary assessment of the interaction of various elements of the magnetic field and the likely general solution for the observed patterns. The profiles examined sample all principal elements described above.

The modelling described is of simple assumption preliminary nature and designed only to provide some indication of source styles and relationships. Some elements would require extended three dimensional analysis supported by a rock property survey for full appraisal.

PROFILE 1: 5391 000 mN 383 - 389 000 mE (Figure 7)

This E-W profile provides an indication of the form of the large anomaly which dominates the northern part of the licence area.

The uniformity of the gradient is evident and a deep, high contrast source is implied. This has not been evaluated accurately due to its three dimensional nature but an equivalent source-response has been generated for each profile in order to satisfy the more regional elements of each section. A thin slice of high contrast material at depths of 4 to 6 km best satisfies this, and most other profiles. The slice of material, presumed to be ultramafic or magnetite rich may dip either west or east but the true dip could only be extracted from complete analysis of the entire anomaly and only part of it is included here.

Specification of a reasonable regional gradient does, however, expose the scale and nature of the local gradients - which are so obvious in Figure 6A. These are seen to be small step anomalies and do suggest significant fault or fracture systems given the lack of contrasts within the Dundas sequence.

The profiles samples the northern tip of the volcanic pile and its faulted boundaries. The isolated anomaly near 388 000 mE reflects this intersection.

Modelling has shown that this intersection involves very little volcanics but that the source rocks are exposed. The nominal dips shown in Figure 7 are essential to any fit. The fault zone, however, is compound and involves some alteration and contrast reversal. Figure 3A shows that the association of negative effect west of the volcanic front is general but its presence shows that a wedge of altered volcanics must be present. The change in profile form up to 300 m west of the main effect also suggests that the structure is not simple. The model suggests that the portion of the Mt Charter Fault sectioned by this profile is relatively low angle and a possible thrust.

PROFILE 2: 5386 400 mN 384 - 389 000 mE (Figure 8).

This section samples the volcanics on the southern face of Mt Block immediately north of the strong E-W demarcation. The section should sample any plunging antiform which has been suggested - both by discussion above and Corbett and McNeill.

The regional source is again evident and has been satisfied approximately. The western end of the section misses the magnetic anomalies which trend toward Boco and Burns Peak but the eastern end samples the eastern limb of the presumed fold. These anomalies trend approximately N-S (see Figure 5C).

Their source is compound and generally dips east. This is consistent with the fold concept but might also fit an overthrust pattern. Such patterns were implied by the suggestion that the Mt Charter Fault might be a folded thrust (above). This issue is further discussed under Profile 5.

The nature of the source contrasts required to fit this profile is consistent with the simpler case outlined in Profile 1.

PROFILE 3: 385 000 mE 5382 - 5393 000 mN (Figures 9, 10)

This section samples the western limbs of the presumed Mt Block fold system, the faulted boundary of the volcanics and the stable field of the northern zone.

Figure 9 provides an example of the regional characteristics of the field and an equivalent solution for it. This should not be accepted as geologically correct; it is a solution for the regional effect only.

Consideration of the volcanic sources which are superimposed on the gross response shows that all sources dip to the south. Any local variation occurs near their northern exposure limits. This suggests either the bounding structures are curled about the blocks of volcanics or that there is locally deep alteration about the block noses. Some locally deep glacials in these locations would support the presence of marginal alteration and engraving. The lower surface interpreted projects toward the mapped, or inferred mapped, position of the related boundaries. The suggestion of southerly dips for all blocks south of the faulted boundary of the volcanics west of Mt Charter is not consistent with any simple fold view of the lithological or magnetic patterns on Mt Block.

These blocks cannot dip north unless the magnetic properties of the volcanics are most unusual with dominant remanence. There is little evidence of this.

PROFILE 4 383 000, 5391 000 - 389 000, 5395 000 (Figures 11, 12 and 13)

This apparently uninteresting profile samples the stable northern area which is dominated by the effects of the large

source west of the licence area.

As in the case of previous profiles an equivalent solution was established in order to review the more detailed facets. These are of very low amplitude and stress the subtleties revealed in Figure 6A. The profile also demonstrates the lack of magnetic contrast within the Dundas Group rocks and intruded porphyries.

The relatively smooth regional profile does not possess a simple solution, however. It cannot be explained by a single deep source of the type incorporated in previous models. This profile extends NE toward Que River and partially samples other effects - including those of the basaltic sequences near Que River and Hellyer. Unless such effects are included no solution can be found for profiles north of east within this zone.

Furthermore, it can be shown that the basaltic sequence must thicken and then disappear somewhere between Que River and its exposure along the Murchison Highway (Komyshan, 1986) and the Mt Charter Fault - as mapped by Komyshan. Such volcanics do not persist SW of the mapped Mt Charter Fault at any moderate depth (1-3 km) - if at all. A large N-S structure is implied near 389 000 mE.

Figures 11 to 13 present three solutions for the regional field. Figure 11 provides the normal form of solution generated for other models and is based on a deep very high contrast source. Such sources easily fit the amplitude and gradient parameters of the anomaly although no perfect fit is shown in this example.

Figure 12, however, presents a solution based on a moderately mafic source pile at depth within the Dundas Group section. This type of body may also satisfy the profile. Note that it must have relief and variations in thickness and cannot uniformly extend NE toward Que River where such sources become an integral, but off diagram, part of the solution. Such sources must also be at considerable depth.

Figure 13 provides a limiting example of a mafic pile, or massive porphyries perhaps which can only fit the profile with difficulty. This is not a viable solution overall since it cannot be made to satisfy all orientations of sections.

Modelling of this profile thus demonstrates that the major northern anomaly is associated with slices of ultramafics or irregular faulted piles of mafic volcanics deep within the Dundas Group section.

This enables the northern section of the licence area to be placed in regional perspective (note Figure 5C). The primary change in field character occurs beneath the southernmost belt of volcanics, shown in Figure 10 to dip south at a moderate angle. If the anomaly is generated by mafic rocks, and these are an essential component at the NE end of this profile then the boundary of the section containing such rocks is deeply buried and nearly 3 km south of the faulted boundary of the exposed volcanics. This is an important location regionally since it can be aligned with structures extending through Chester, the nick point on the Rosebery Fault at Lake Rosebery, the pinch point of the Huskisson Syncline and the gross fault pattern at, and west

of, Renison.

PROFILE 5: 383 000, 5391 000 - 389 000, 5385 000 (Figure 14)

This profile passes SE across Mt Block and samples the repeated volcanic pattern anomalies and any presumed fold structure.

Most blocks must dip east or south. Only in the central region can any north dipping blocks be inferred. The effect must be localised but can be used to support the concept of a plunging antiform on the northern side of Mt Block.

These comments can be made irrespective of any gross assumptions about the profile. The regional, deep high contrast source option has been used to provide the long wavelength component of the anomalies recorded. Whatever source type is used to satisfy this condition its upper surface must lie deeper than any extent of the volcanic pile.

The depth extent presumed or calculated for the volcanic blocks depends on contrast assumptions which should be confirmed. Anomaly character does restrict the options feasible and the base of the volcanics certainly lies at depths no deeper than about 2 or 2.5 km anywhere.

The regional profile could be drawn through different parts of this profile; it could account for the minima, or the nominal mean as in Figure 14. If the first option is presumed then once can argue a bulk contrast for all rocks but this would require that the Dundas Group and Mt Read Volcanics possessed similar properties. This is not true. This means that the relatively negative zone which extends SW from Mt Block involves either reversely magnetised volcanics, overturned volcanics or some geometric effect since the option to argue that this block is of locally lesser contrast than volcanic background cannot be sustained on present information or analysis.

Checking of these options shows that the natural solution for the anomaly depression at 6000 m is due to geometric factors and is the requirement which shows the existence of antiformal dips. There is no need for reversals of any kind, whether magnetic or structural.

The model analysis, though merely a sampler of key elements of the magnetic field, shows that mafic volcanics are locally present and may exceed 600 m in thickness. It also shows that the Mt Read Volcanic "pile" of the Mt Block region is made up of slices which dip south or east and that any anticlinal folding is disguised by recumbent folds (possibly). The Mt Charter Fault is probably a folded thrust which dips beneath the volcanics and depth limits them.

The magnetic field pattern on Mt Block is consistent with two generations of east or SE dipping thrusts.

Alteration can be inferred on some profiles where it is associated with major fault surfaces.

MINERALISATION

No major mineralised sites have yet been in the area covered by this licence but mineralisation is known to exist. The principal example is at Sock Creek and the Boco alteration is just outside the study area.

Sites such as these represent the very different magnetic terranes described above.

Sock Creek can be explained in terms of the findings of this survey; it lies near a major fracture intersection including one arm, previously unknown, of the Mt Charter Fault system. The fault element recognised is regionally significant. It is interesting to note that the known mineralisation is offset several hundred meters from the primary magnetic confluence and it is clear that this site must be inspected in detail since the known site may only be a flag to demonstrate the presence of mineralisation in the area.

The magnetic uniformity within the northern, Dundas Group, zone is not especially encouraging for base metals unless the alternate concept of massive mafic sequences can be established at shallow depths. Alteration character is not readily detected when most units are similar in character - although this has not been attempted here. This review has been based on contour and raw profile data and the actual data would need to be examined to assess such subtle character. It is clear that significant structures are present, and that mafics are present at moderate depth, since small step anomalies are evident. Changed magnetic character can be associated with these and some of it may represent alteration. This judgment must await some rock property studies and detailed evaluation. These structures must be ground traced and checked geochemically. The possible concealment of a Hellyer type sequence is sufficient reason to fully detail these features.

The potential of the volcanics within the southern part of the EL is not immediately apparent. No substantial mineralised sites are known and the reason for this is now evident. The volcanic pile is contorted and sliced. Most large alteration and mineral systems will have been multiply displaced.

In addition, significant portions of the pile, or slices of the pile are not altered. Sustained bulk contrasts demonstrate this for large volumes. The south face of Mt Block may be exceptional in this respect and should be assessed. It is possible that the low contrast embayment recorded merely reflects porphyry exposed or shallowly buried.

These comments notwithstanding, there is no doubt that the largest single element of the pile contains a large alteration zone, or fragment of one. It is also allochthonous since inspection of regional magnetic data suggests that it does not persist with the same, or any, intensity to the east of the Henty Fault Zone or to the west of 384 000 mE. This alteration

corridor lies at a northing of about 5385 400 - 800 mN. Many notable and anomalous features delimit it, especially along its northern limit. There are also some major intersections, including the structure which parallels the Henty Fault. It is possible that this structure carries late movement, but it may also be a rejuvenation of earlier movements. The structure was mapped by Corbett & McNeill (1986) outside the volcanics but not carried by them into the pile - where it clearly continues. The form of porphyries and patches of andesite associated with this structure suggests its structural activity in the long term and it must be assessed.

Several issues have been raised by the properties of the magnetic field and the structure of the volcanic pile which have wider ramifications. These are discussed below.

TREND IMPLICATIONS

Several trend or lineament systems have been identified in this small survey area. There is clear evidence of lack of continuity and conflicting trends in different parts of the area. While part of these differences can be assigned to structural overlays there are some wider issues relevant to the tracing of mineralised sites - assuming these have any association with major crustal structures and their high level incarnations.

The structures noted within the northern area with its exposure of Dundas Group rocks are clearly old and presumably predate any overthrusting of the volcanic pile. The relative subtlety of these trends prevents any clear transmission of their pattern through the noise of overlying volcanics.

Similarly, any trends or alteration systems imposed on the volcanic blocks during their formation may also be preserved, but highly disrupted due to the structural shattering of the pile or volcanic arc. The displacement of these blocks thus produces the trend and structural conflict across the various arms of the fault system which bounds the pile.

This history does not affect search and exploration use of the trend patterns within the area beyond the volcanic pile as seen today. Thus the association and comments with respect to Sock Creek and neighbouring areas may be maintained. Similarly the trends identified can be carried essentially to Que River and the fault-fracture patterns there.

But this is not the case within the pile and I do not believe this has been recognised previously.

What do the persistent structures within the volcanics actually tell us? Consider the primary corridor at about 5385 500 mN. Such features indicate the primary grain of the deep basement or crust but they do not tell us when the observed alteration was imposed.

For example. The alteration recorded could have been imposed in situ as the formation was deposited, or at any time thereafter while it remained in place above the crustal suture. Clearly if the formation has not been displaced, and the structure has a long history, it is likely that such alteration will draw attention to some attractive sites. These will arise from both syngenetic or subsequent epigenetic processes and both certainly affect mineralisation within the western Tasmania province. Thus we can have both in place volcanogenic deposits and, perhaps granite-related, remobilised deposits derived from such pre-existing concentrations. Fluid circulation using major sutures will be an important element in all such cases.

But, equally, if a portion of a formation, or volcanic pile, is translated from an original position unaffected by a crustal suture into a position which is, it will today show some degree of band alteration due to the rejuvenation of motions and fluid processes at that position. But it cannot contain or be associated with syngenetic deposits, and unless there has been some other mineralisation introduced by some other process in its history nor will that formation ever carry mineralisation. But it will be altered and will display lineament alteration character due to normal water and other circulation from depth.

Consider the position in the Mt Block region. A large alteration corridor - or fragment of one - has been observed. It even has an intersection with another major structure. It has curious terminations involving andesites and porphyries. But is it in situ? More important if so, does it represent enough of a primary system to be able to still conceal mineralisation?

The in-situ question is critical. If the zone is not in place above a crustal suture we need to establish if it ever was - at the time that counted. The present work, though admittedly preliminary, shows that ALL the surrounding volcanic blocks are not in place. They are pieces of a folded thrust stack which seems to have been produced by two waves of compression, one directed to the NW and a more recent set from the east. It may be possible to fold and arrange these as one set but the crossed magnetic grain within this and adjacent areas suggests the more complex arrangement.

Thus if any block is in place, it is the one carrying the corridor. None of the others carry the corridor or any part of a similar corridor. I downrate them for base metals accordingly. Any target is beneath them.

In this respect the lower southern slopes gain exploration interest. The complex presence of other intrusives then takes on new significance.

The question still remains, is this lower block in place? The primary intrusive patterns suggest that it was once, or still is, over a crustal suture. These suggest therefore that it does not now matter if it is no longer in place; it was when it mattered. It may be noted that the lack of clear continuity of this corridor fragment to east or west suggests that this block has also been displaced since subsequent and lesser alteration should be evident beyond it.

Thus the second question becomes important. How much of the pile is present in this location? If it is a thin skin remnant, or another thrust slice - which just happened to preserve a piece of the primary alteration and be exposed today - then it may be of little economic interest. But if there remains a reasonable volume of altered volcanics then it becomes an important target zone.

Much thus depends on the interpretation of the models shown in Figures 8 and 14 and the precise identification of the location of the thrust surfaces. Figure 14 could be interpreted to imply that the entire folded and thrust volcanic pile is simply folded and that only about 700 m of porphyry-intruded pile is present in the critical zone. Or both could be interpreted to imply that slices extend over the critical zone and that no depth information on the zone has been gleaned. It might then exceed more than 2 km. In either case there is considerable exploration potential, but there is clearly more in the second case.

This study has identified the issues and the preliminary work is sufficient to show that magnetic methods can be used to unravel the issues once further ground and property control is available.

Gravity data can be used to resolve some of these issues. Regional gravity data in the region of the corridor fragment discussed here have been inspected. Although station coverage is coarse (1 km spacing) the zone from 385 to 387 000 mE at about 5386 000 mN is anomalous in regional context. Its positive sign is unexpected if the pile is thin locally. The Mt Block zone to the north carries anomalies up to 4 mGal less which are quite consistent with lesser amounts of volcanics.

Conclusions drawn from the above discussion and its modelling basis have been summarised in Figure 15. Although areas of specific interest have been suggested it should be noted that further work using the actual observations, fully corrected for all influences, is advised.

CONCLUSIONS AND RECOMMENDATIONS

The new high resolution survey of the Bulgobac Hill area will be able to resolve many geological issues. Although the present work has been restricted and preliminary in terms of data use it has been possible to consider many issues relevant to subsequent analysis.

The volcanics of the area are structured and particular units can be recognised and traced. All yield systematic dip patterns but are depth limited, indicating the presence of detachments. There are three and perhaps four distinct blocks of material. Only one appears to be a carrier for a primary alteration zone - on the southern face of Mt Block.

The Mt Charter Fault may be misnamed since the magnetic survey can be used to show that the structure so named is the least significant of the several faults which fan from the Mt Charter zone. One extends past the Sock Creek mineralisation and another wraps about the volcanic pile as a folded thrust. The named Mt Charter Fault may, however, displace the basaltic Hellyer sequence.

The survey has revealed a structural texture within the northern part of the area which was quite unexpected and contrasts with exposed or mapped geology. There is considerable potential for exploration in this zone even though the magnetic contrasts are clearly subtle. The clear association of the known trace mineralisation with such trend systems suggests that all such features be assessed. All can be located within perhaps 100 m and several display on trend or parallel alteration couplets.

Geochemical review of the northern zone is recommended. This should be coupled with magnetic property studies and detailed positioning of the gradient changes. The area about Sock Creek should be examined in detail. It should be noted that the principal anomaly and trend intersection is slightly offset from the known mineralisation and coverage should not be restricted to the narrow confines of the established site. Detailed review of the magnetic profiles, corrected for terrain issues, is recommended in this zone.

Similar appraisals are suggested south of Mt Block. Terrain correction is very important near the inferred corridor at 5385 500 mN.

The magnetic data should be used to check indications of concentrated alteration and to further support mapping and structural appraisal. More sophisticated modelling will be required. The feasibility of both applications has already been demonstrated.

Magnetic analysis might be productively supported by gravity survey of the critical structural zones, especially around northern targets and the Mt Block corridor. General infill of the regional data base is suggested.

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- Corbett, K.D. & McNeill, A.W., 1986. Geology of the Rosebery Mt Block area. Map 2 Mt Read Project Map, Mines Dept. Tasm.
- Komyshan, P., 1986. Geology of the Mt Charter-Hellyer area. Map 1 Mt Read Project Map, Mines Dept. Tasm.
- Leaman, D.E., 1986a. Interpretation and evaluation report on the 1981 West Tasmania Aeromagnetic Survey. Mt Read Volcanics Project Report Mines Dept. Tasm.
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765051

Report submitted on behalf of
Leaman Geophysics
by

D. Leaman

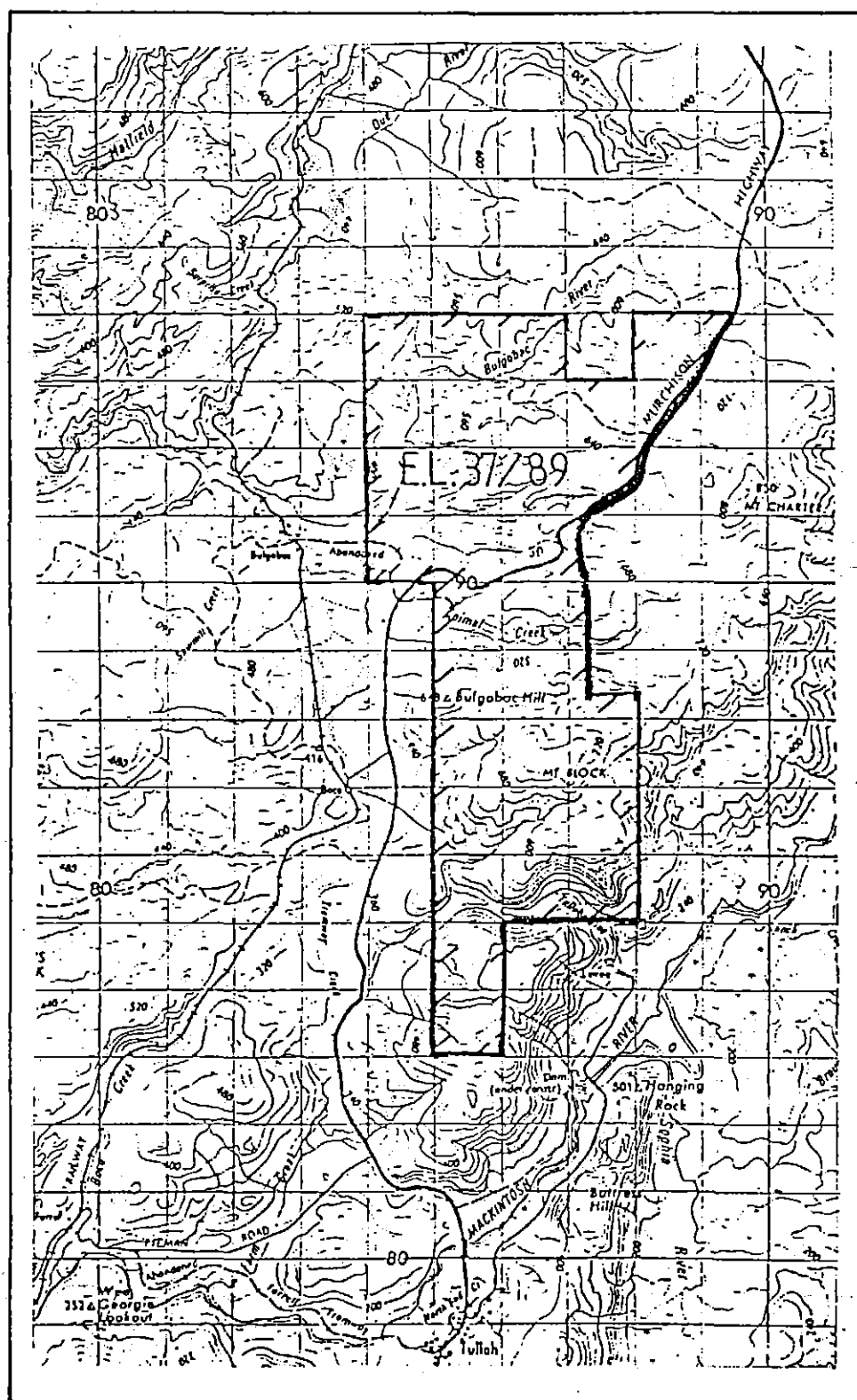
Dr. D.E. Leaman, B.Sc., Ph.D
M.Aus.I.M.M., M.M.I.C.A

11-8-90

380

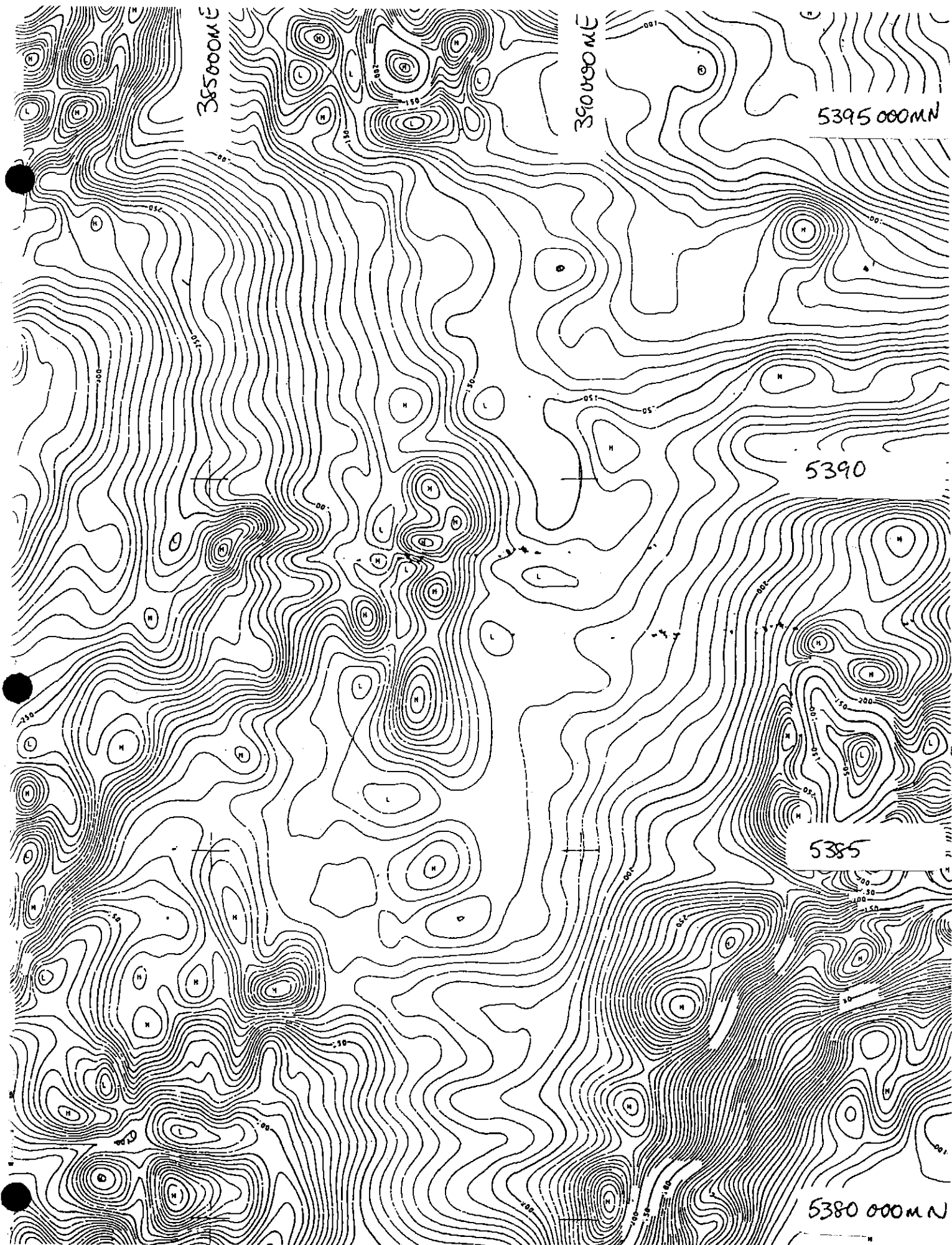
385

390 000 ME



LOCATION OF EL 37/89 BULGOBAC HILL

FIGURE 1



EXTRACT OF 1981 MINES DEPARTMENT REGIONAL SURVEY IN BULGOBAC
HILL AREA

FIGURE 2

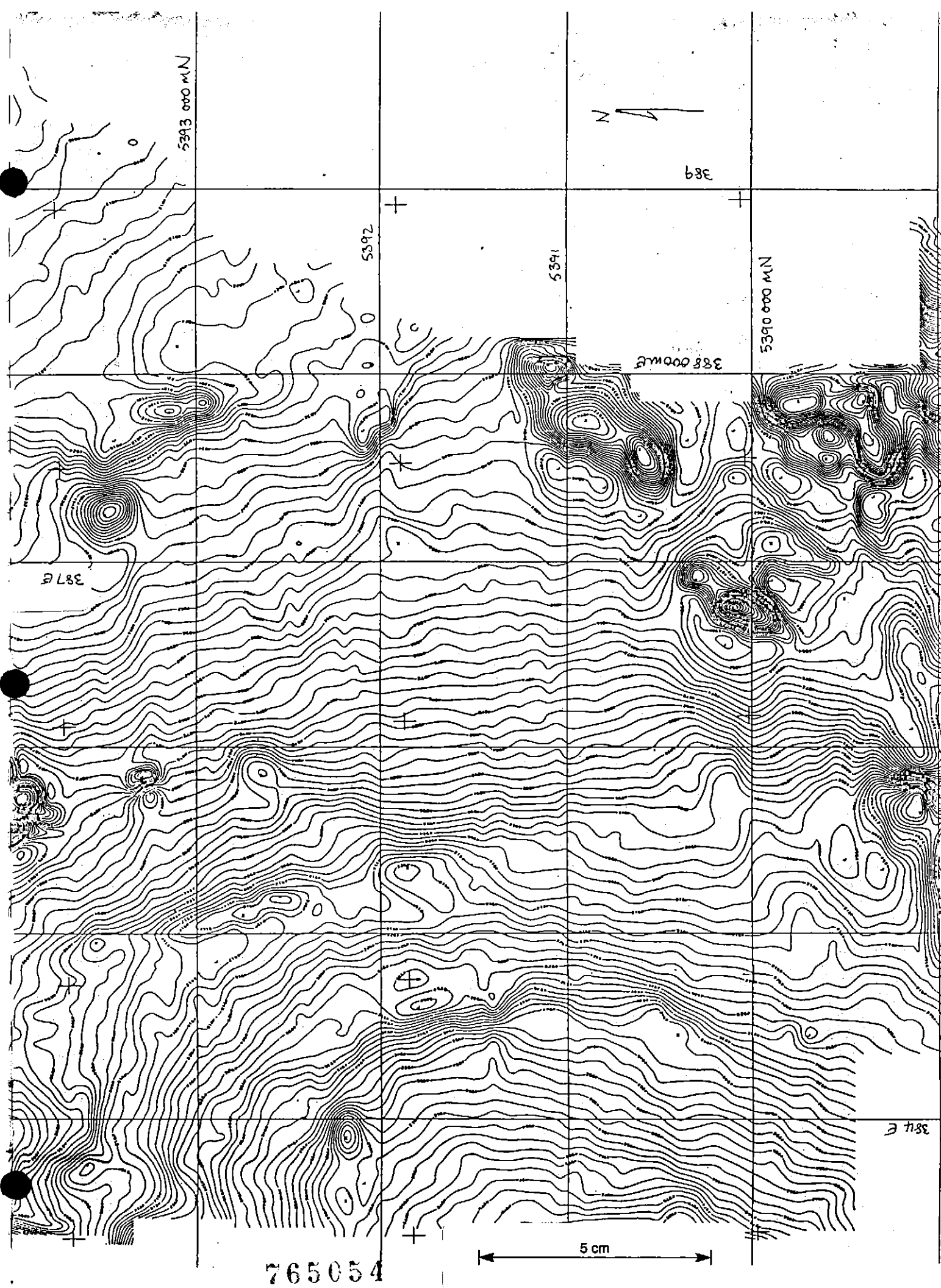
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765053

385000

390000

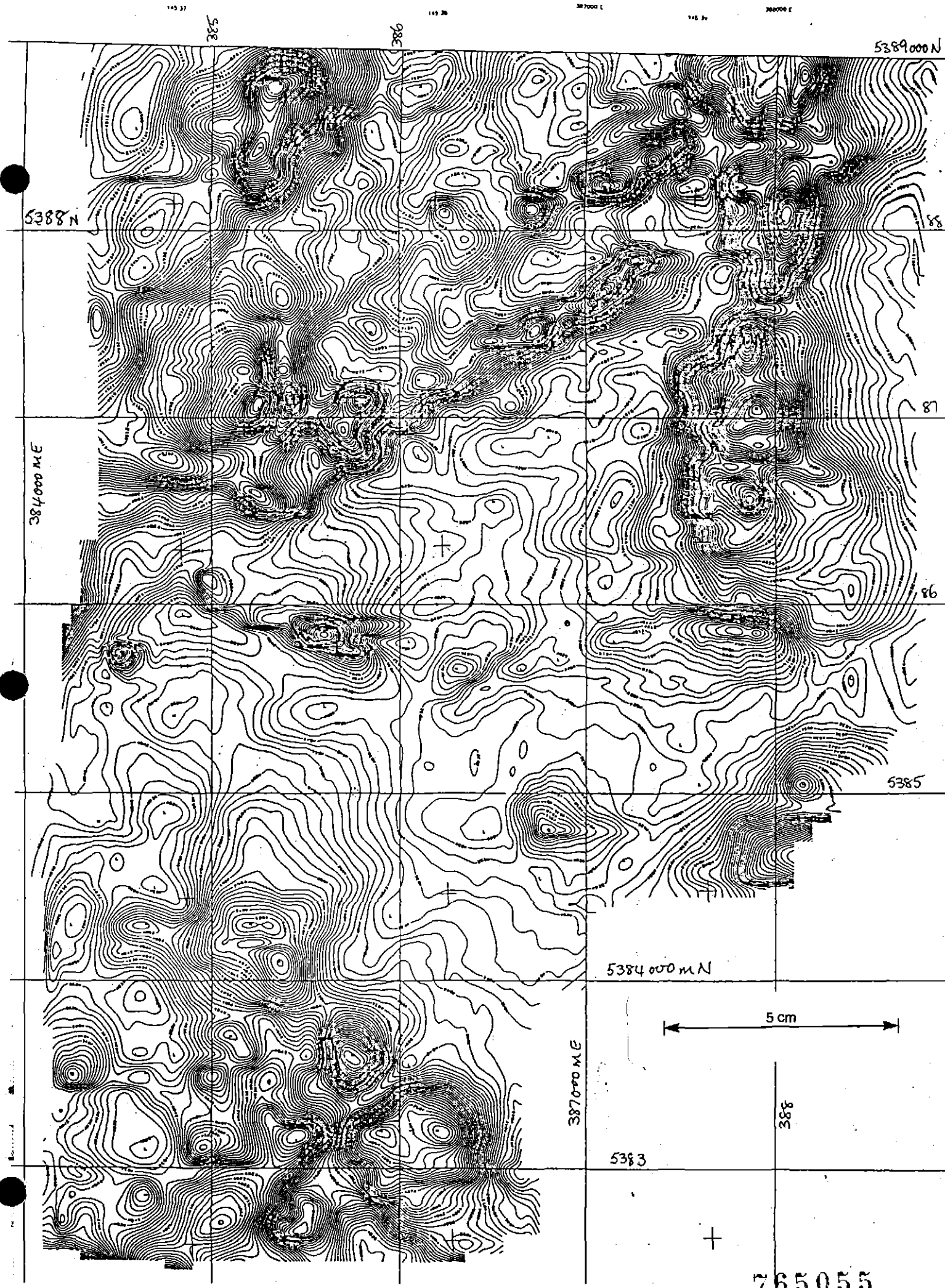
395



CONTOURS OF RESIDUAL MAGNETIC FIELD
(contour interval 2 nT) See also map 3

EL 37/89 NORTH

FIGURE 3A

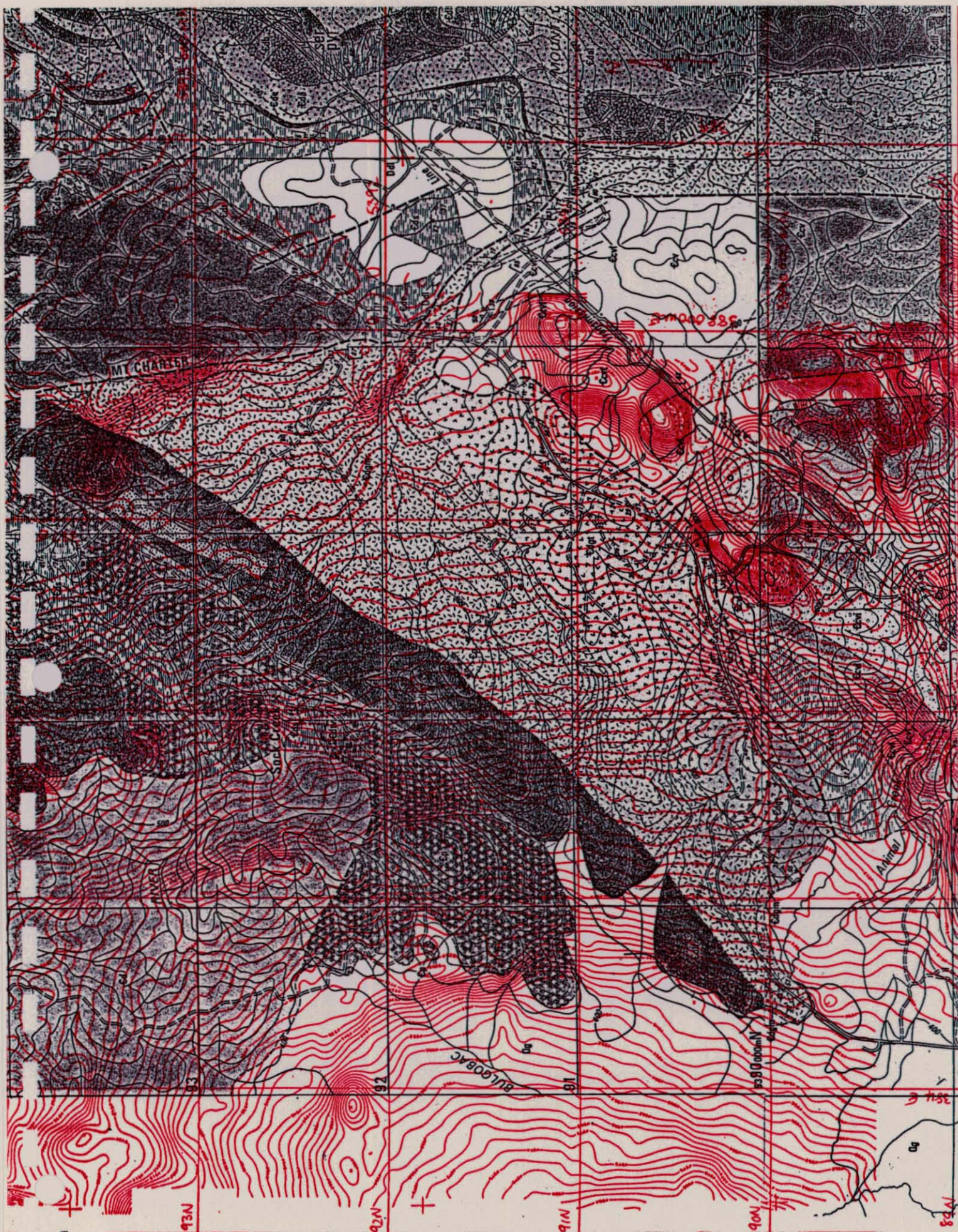


CONTOURS OF RESIDUAL MAGNETIC FIELD
(Contour interval 2nT) See also Map 3

EL 37/89 SOUTH

FIGURE 3B

765055

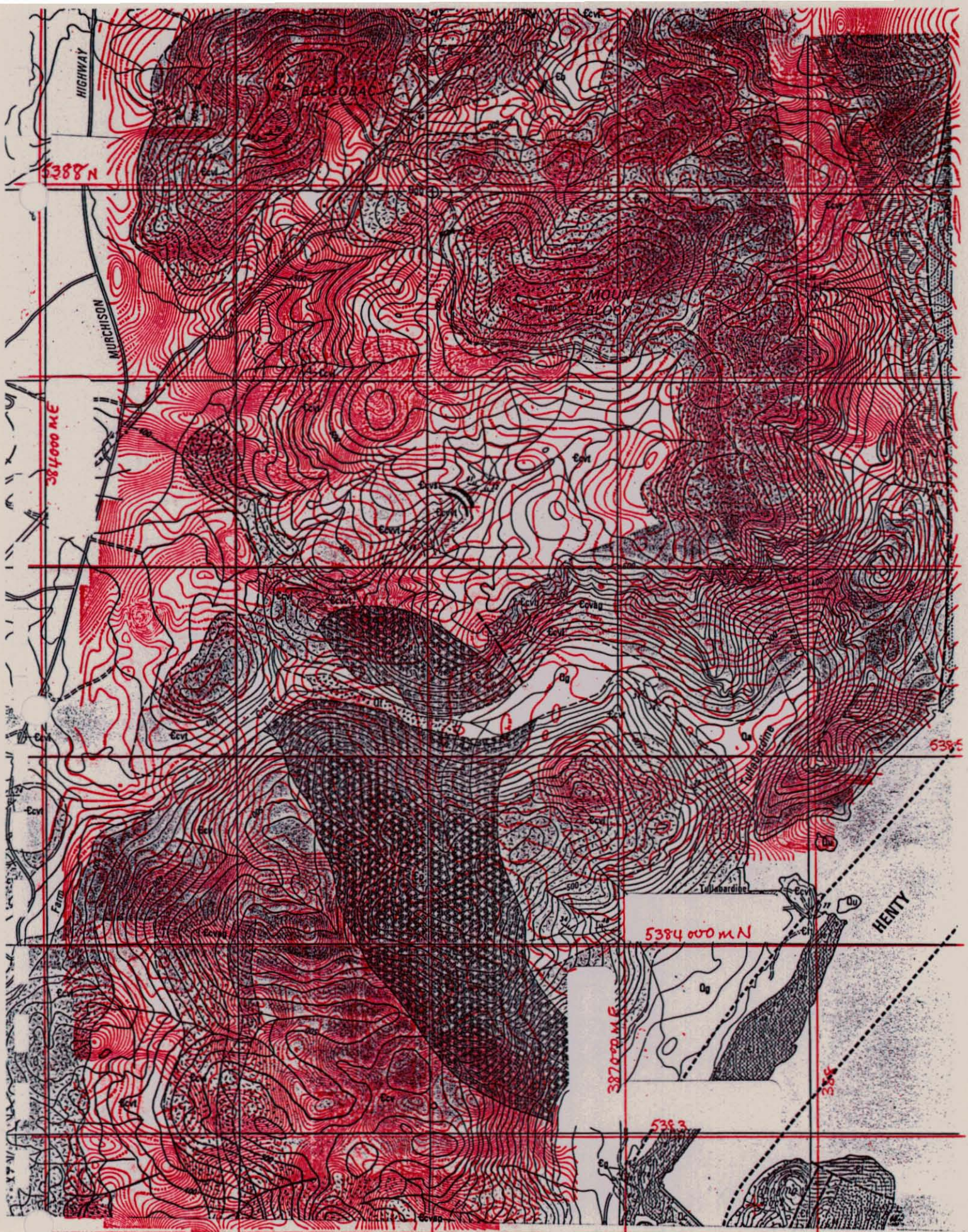


CONTOURS OF MAGNETIC FIELD EL 37/89 NORTH
 Basemap after Komyshan (1986) and Corbett & McNeill (1986)

FIGURE 4A

765056

5 cm



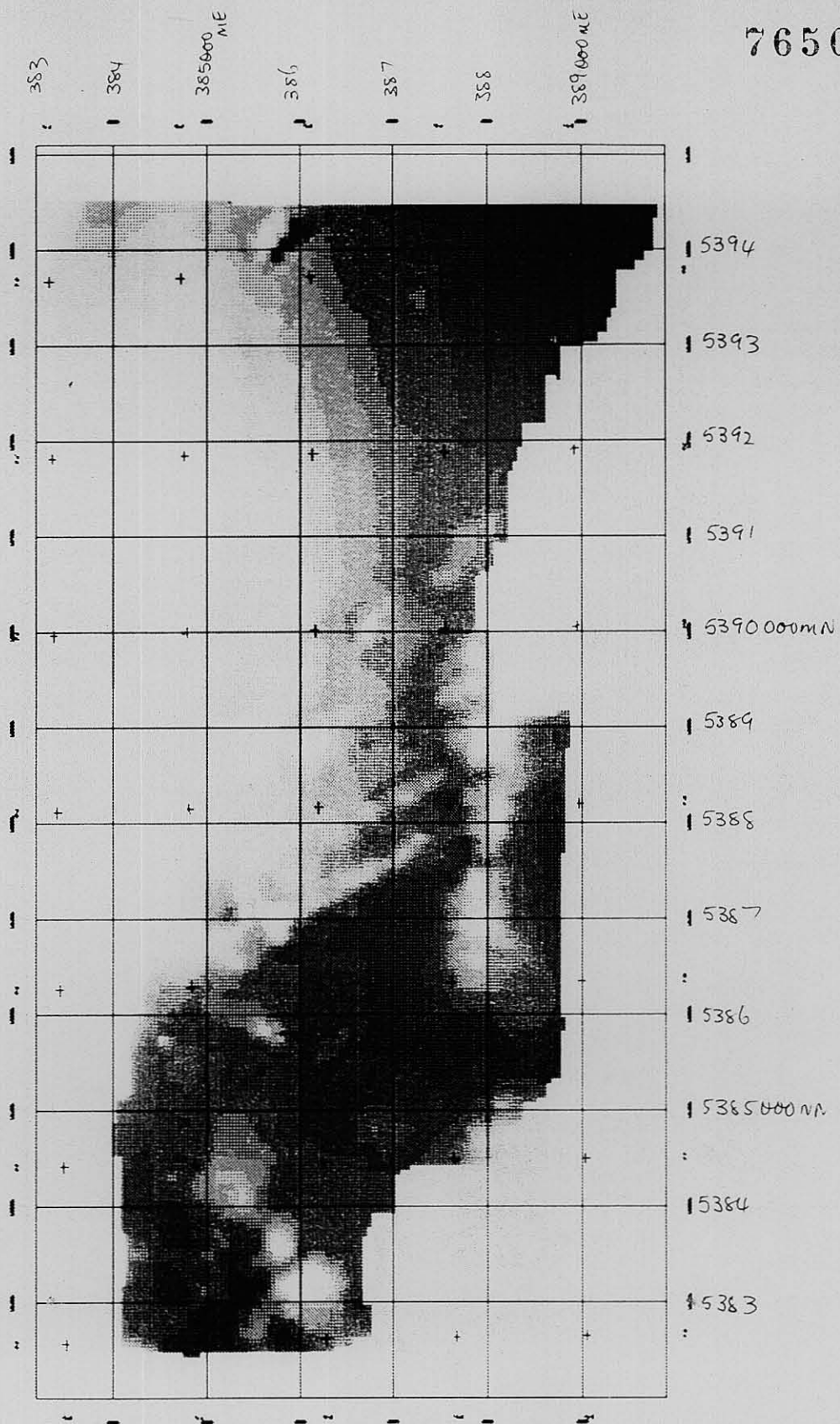
CONTOURS OF MAGNETIC FIELD EL 37/89 SOUTH
(Basemap after Corbett & McNeill, 1986)

FIGURE 4B

765057

5 cm

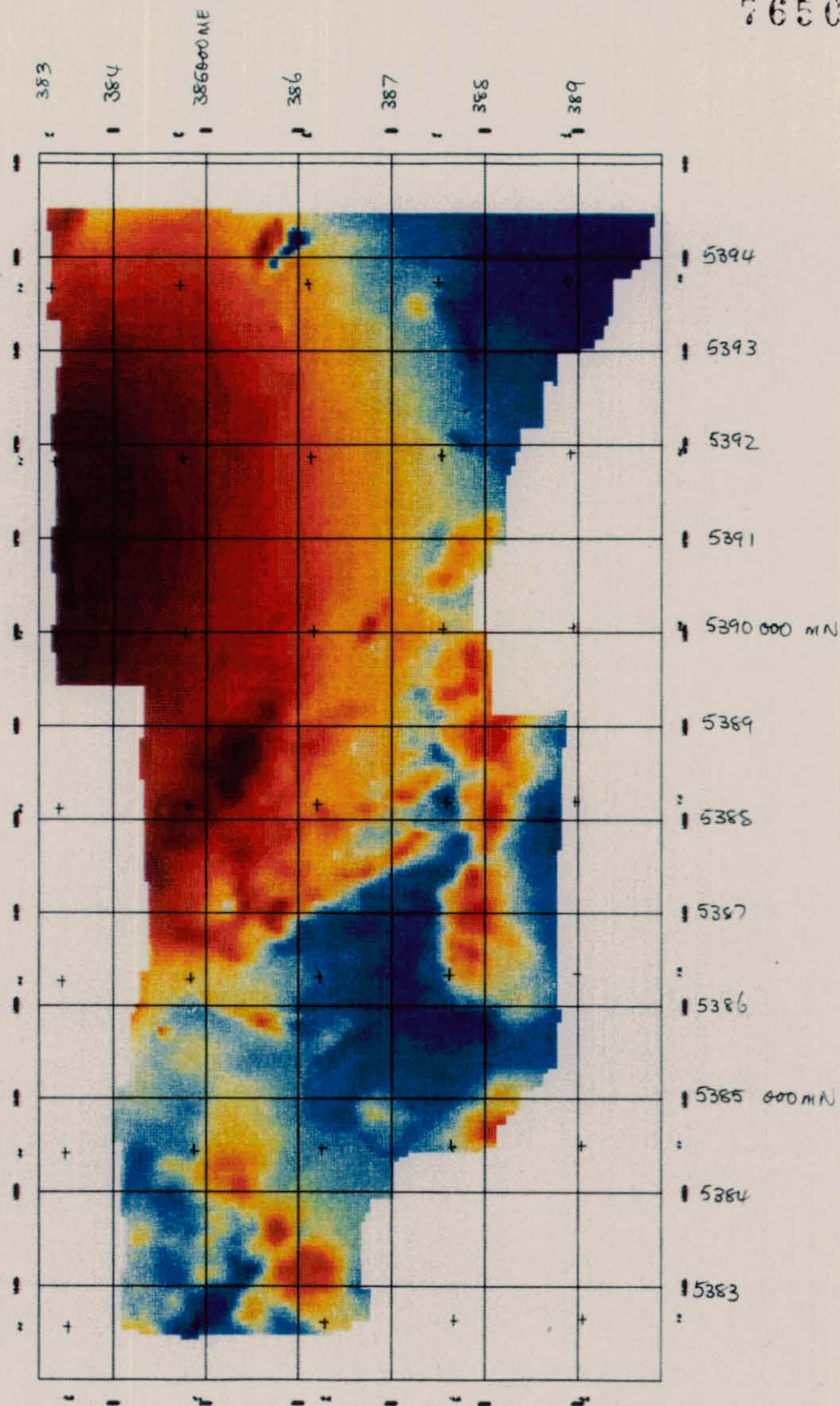
765058



5 cm

Processed with Research

FIGURE 5A



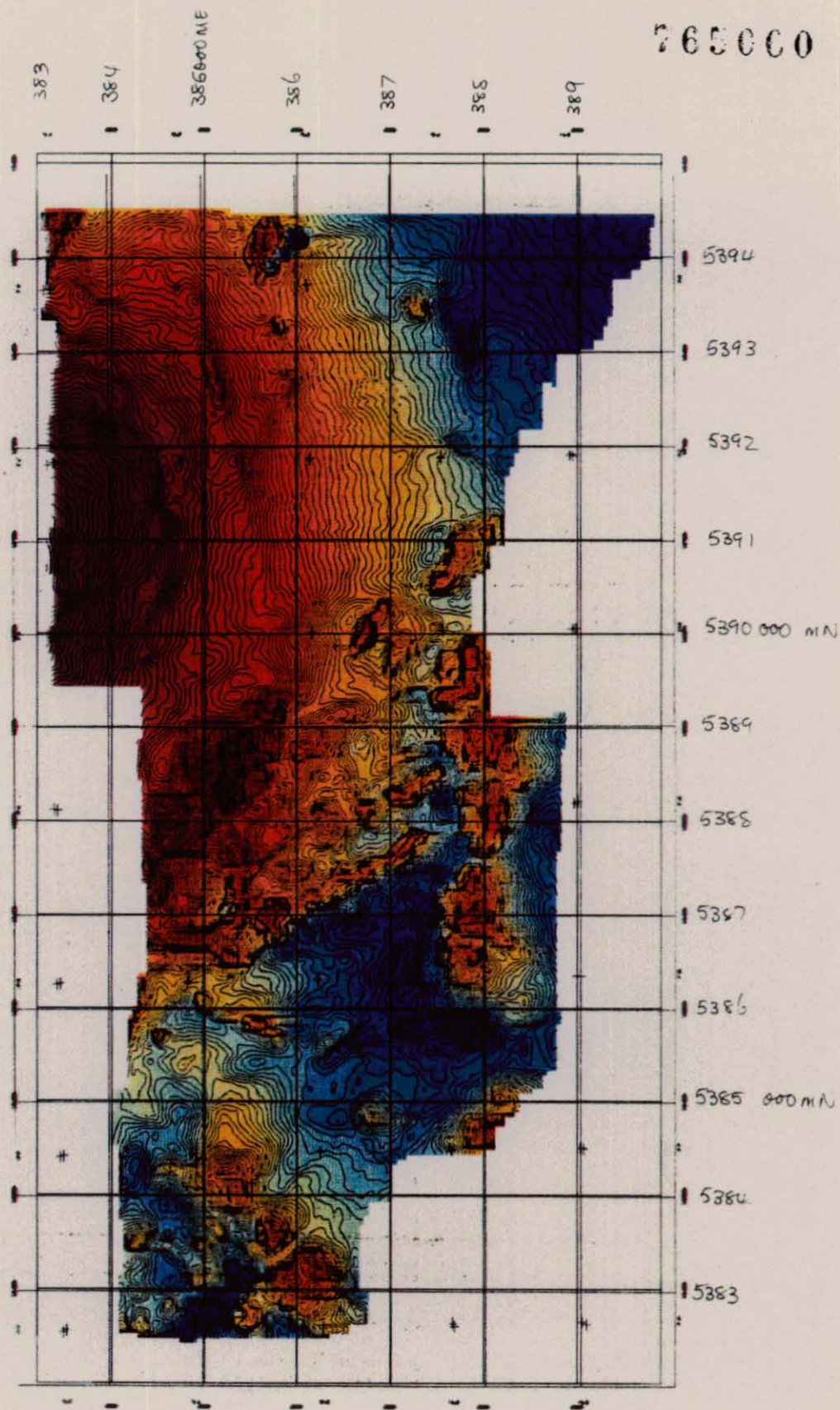
TMI - BULGOBAC

Processed: PiH Research

5 cm

FIGURE 5B

265000



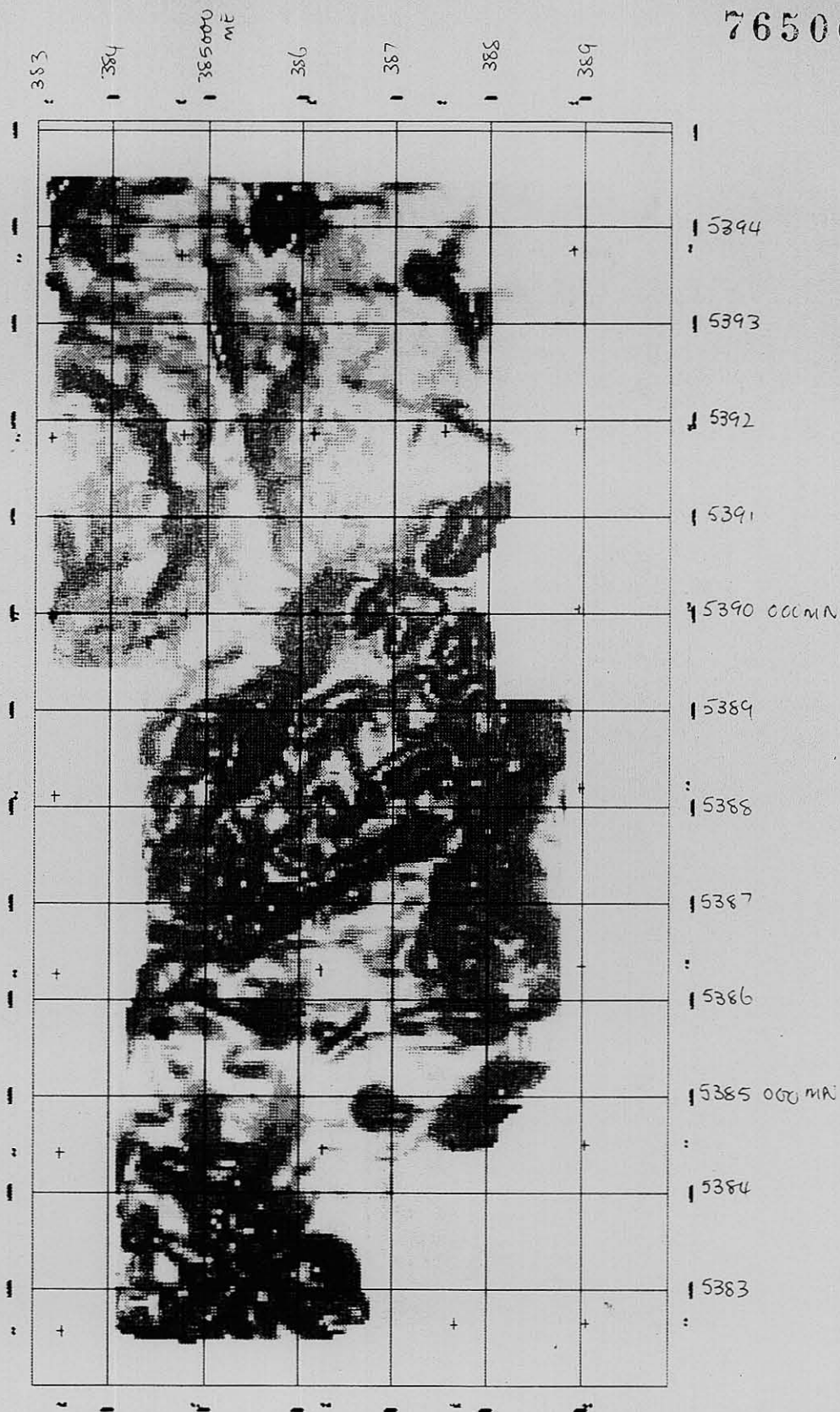
TMI - BULGOBAC

Processed: P.H. Research

5 cm

FIGURE 5C

765061

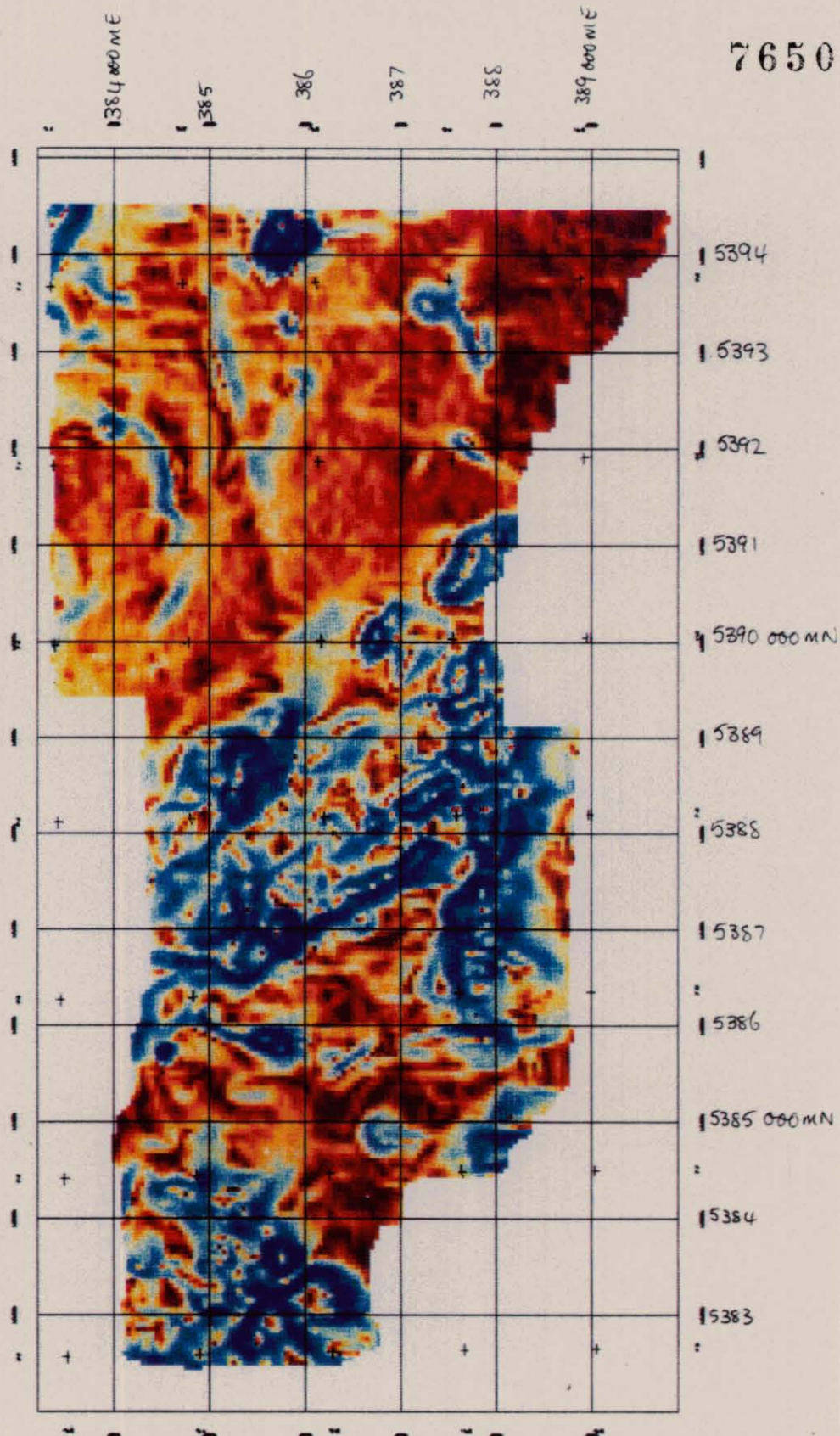


TMI GRADIENT - BULGOBAC

Processed: Pitt Research

FIGURE 6A

765062

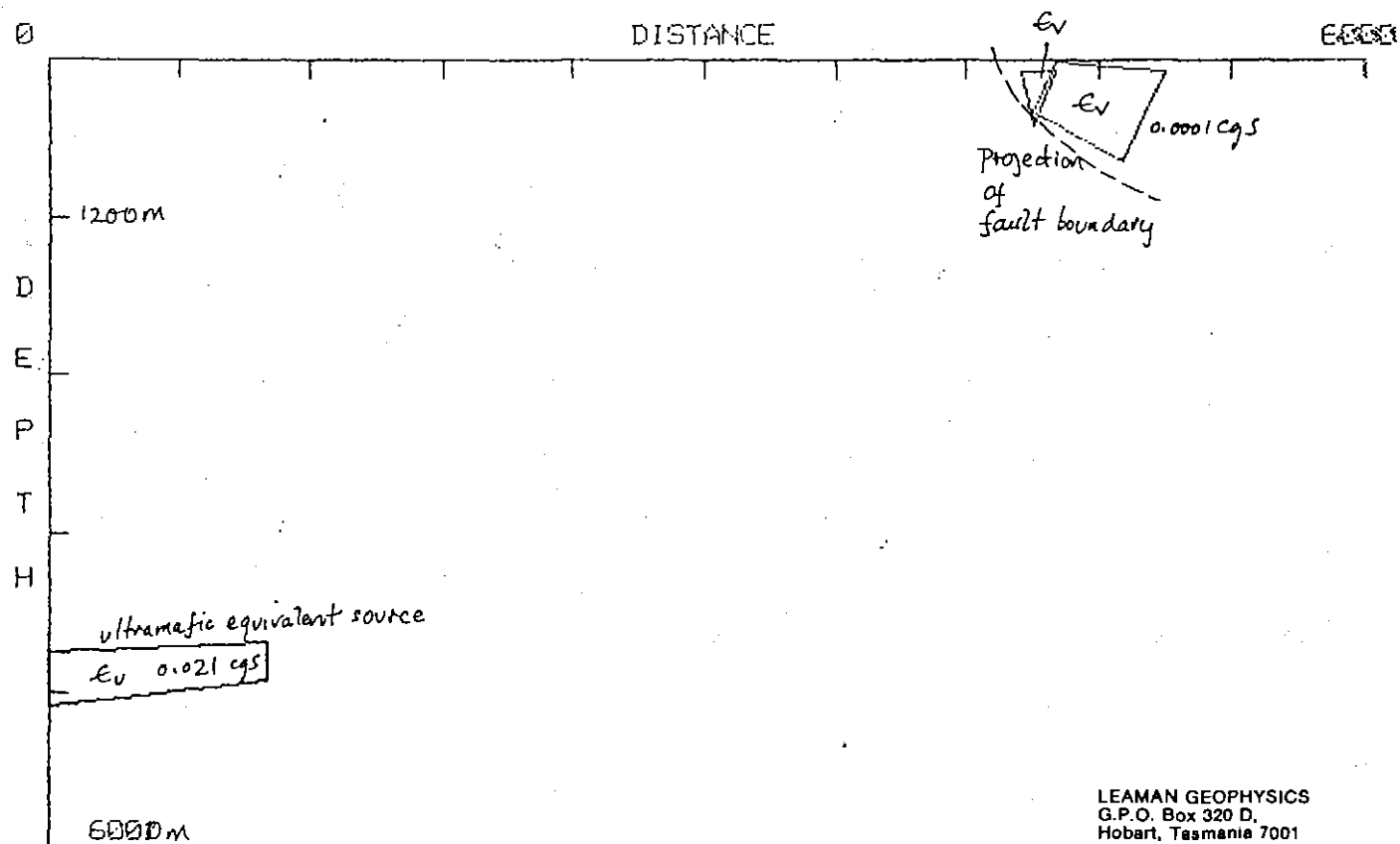
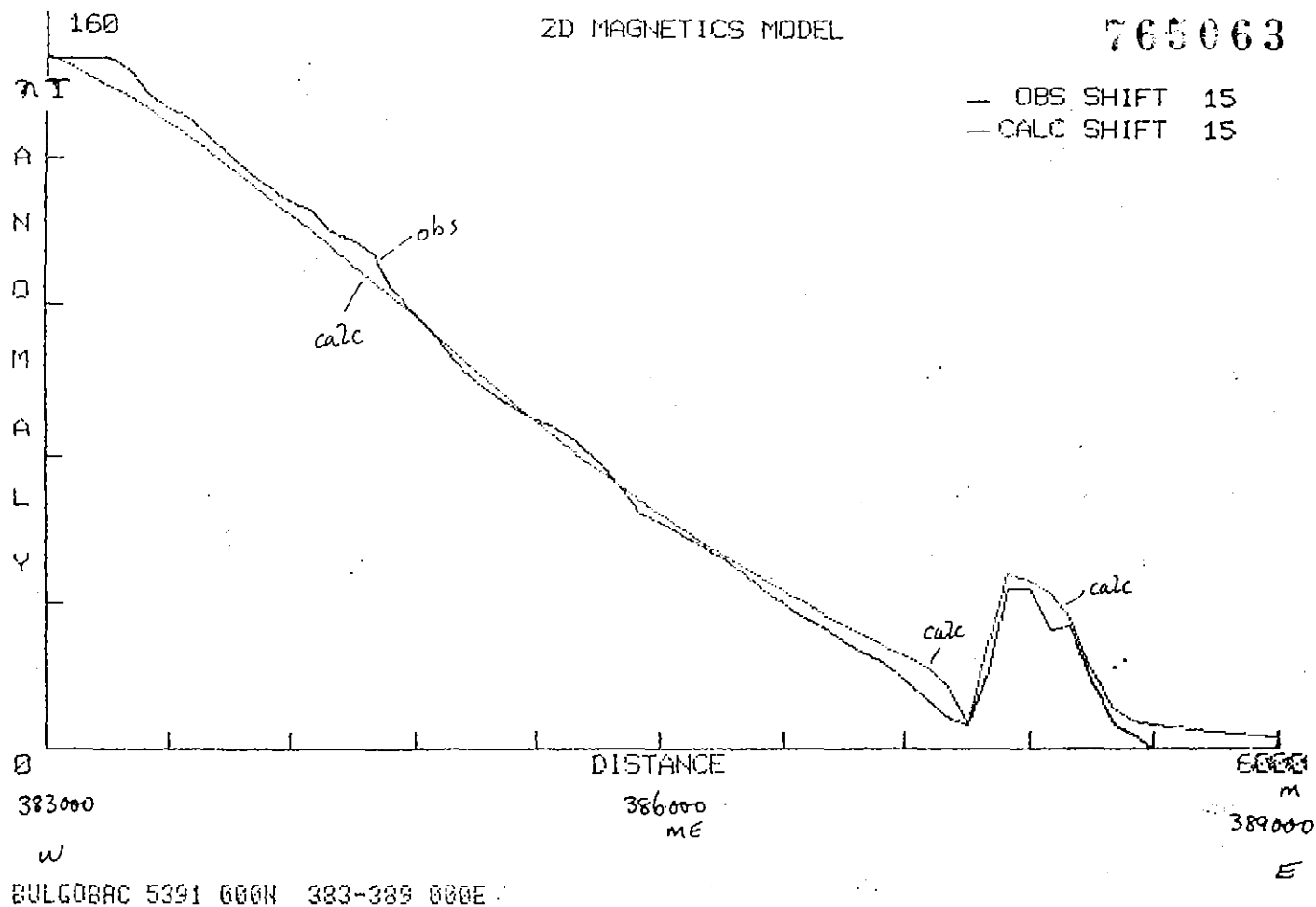


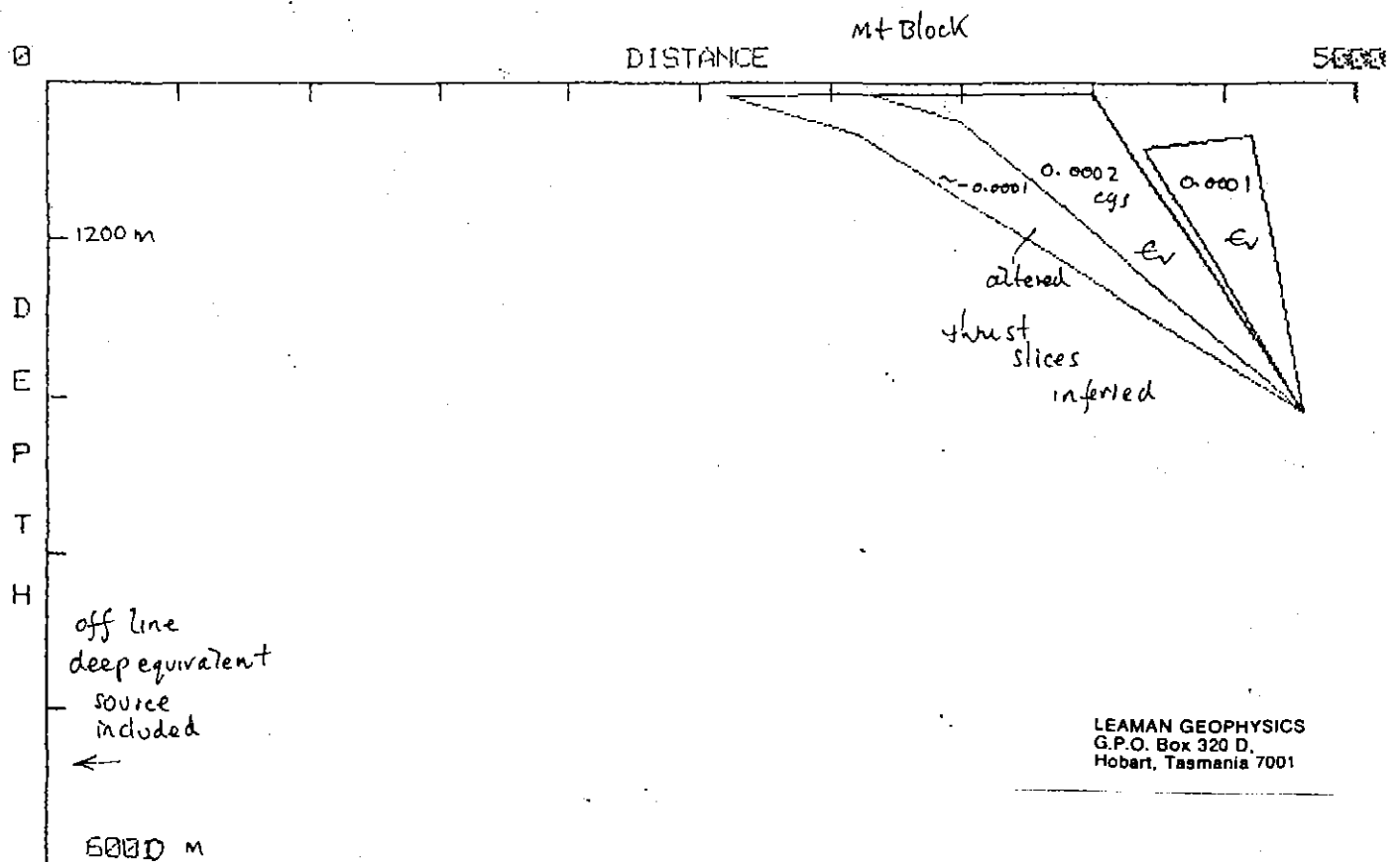
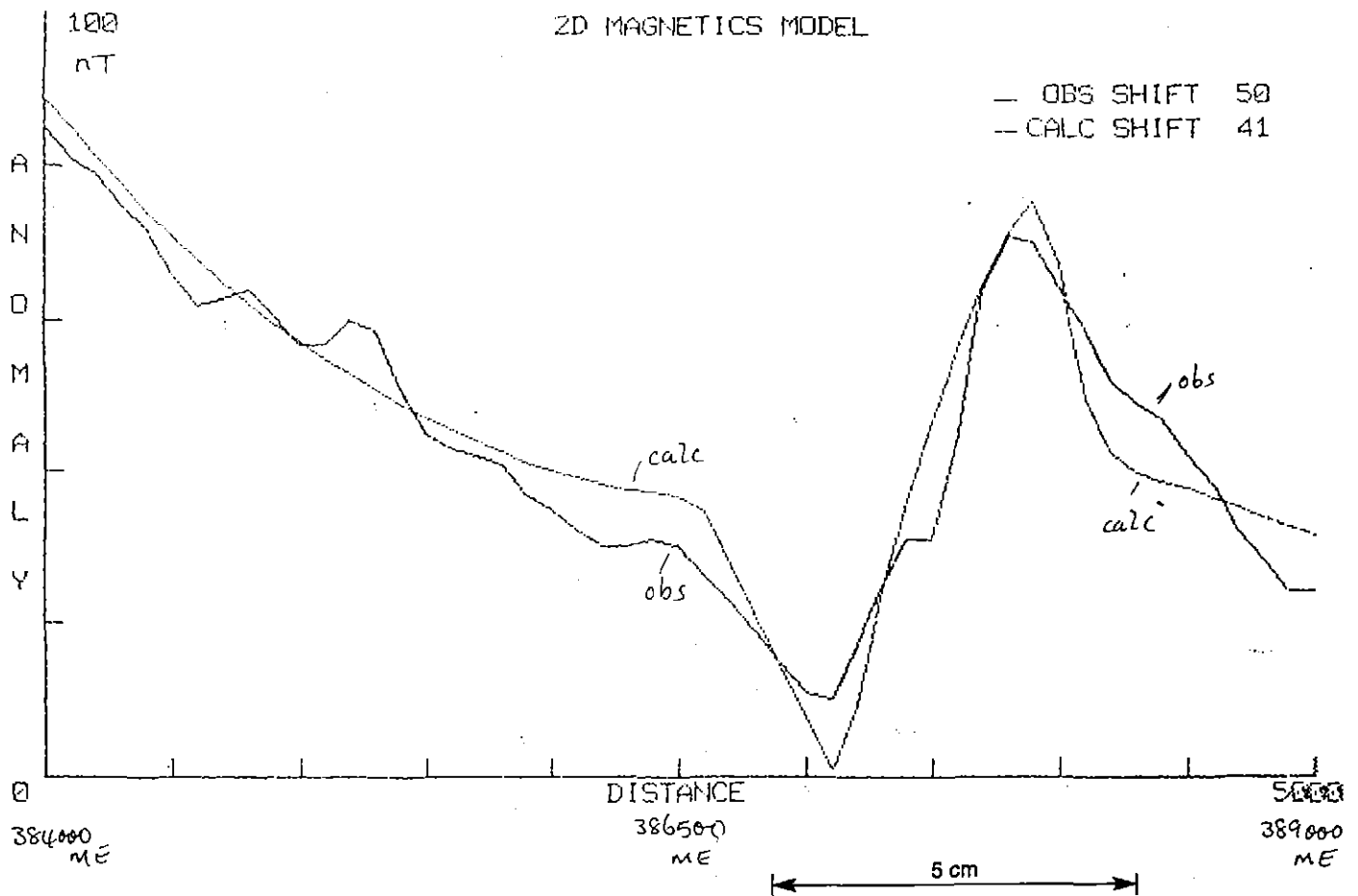
TMI GRADIENT - BULGOBAC

Processed: Piff Research

5 cm

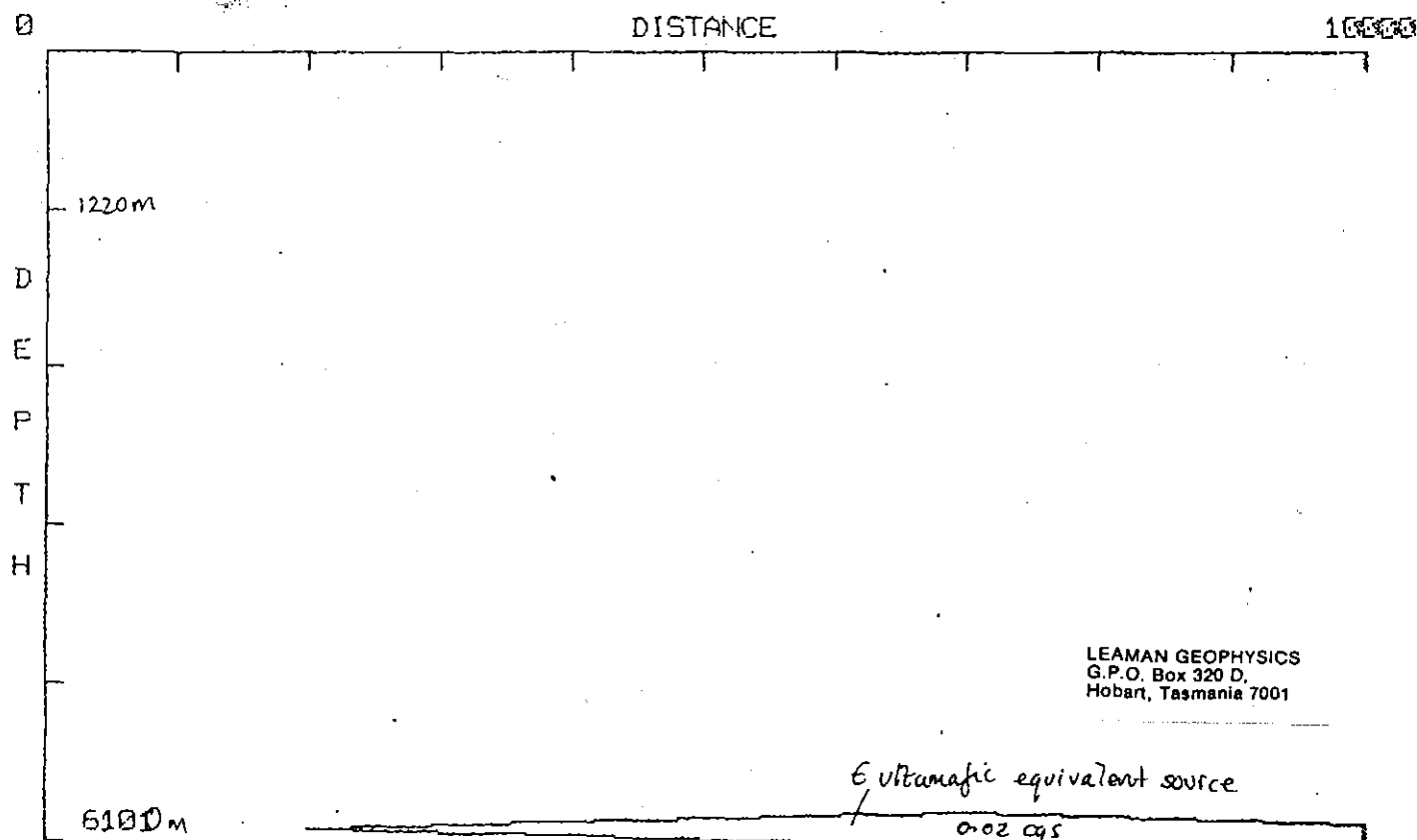
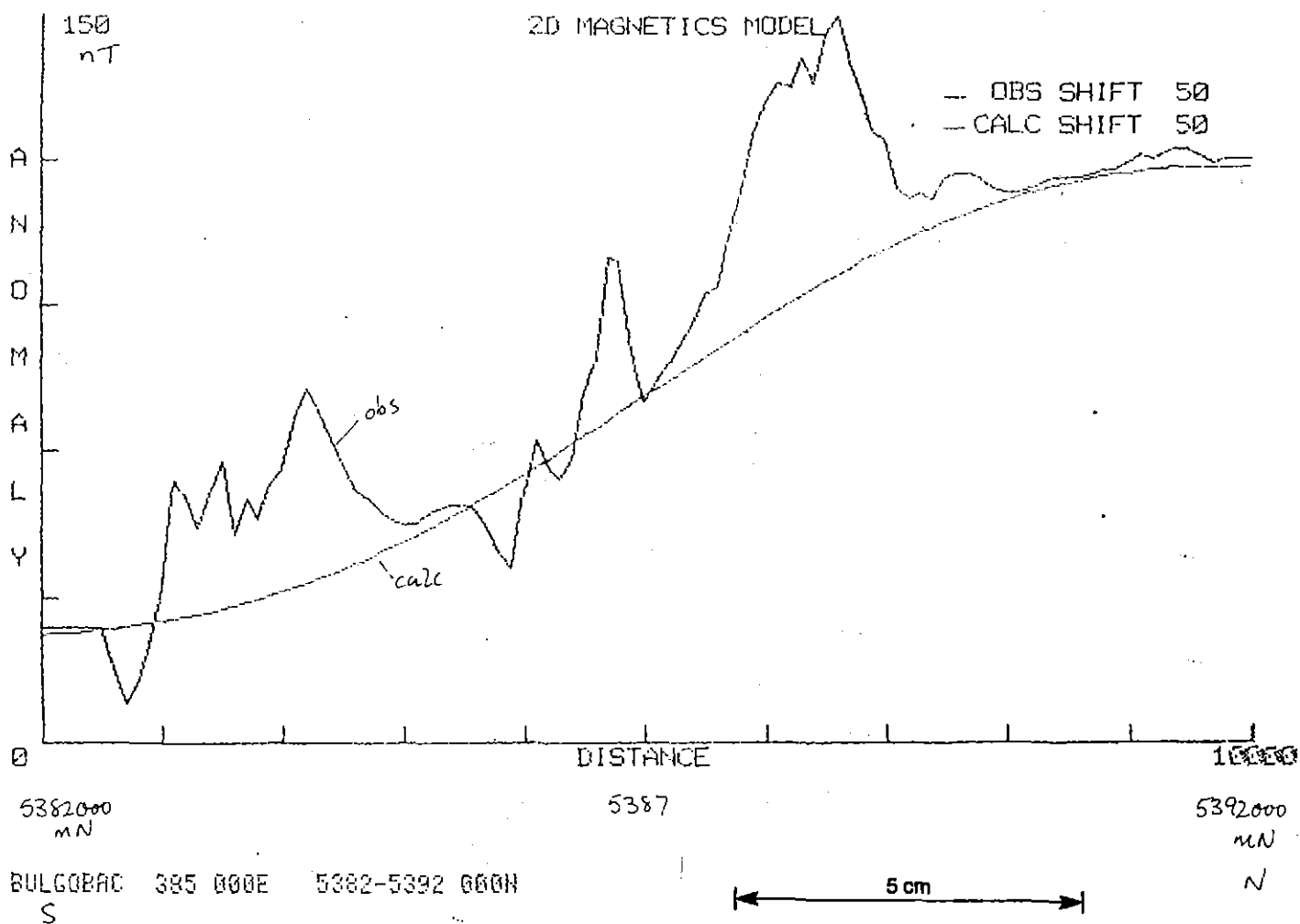
FIGURE 6B





LEAMAN GEOPHYSICS
G.P.O. Box 320 D,
Hobart, Tasmania 7001

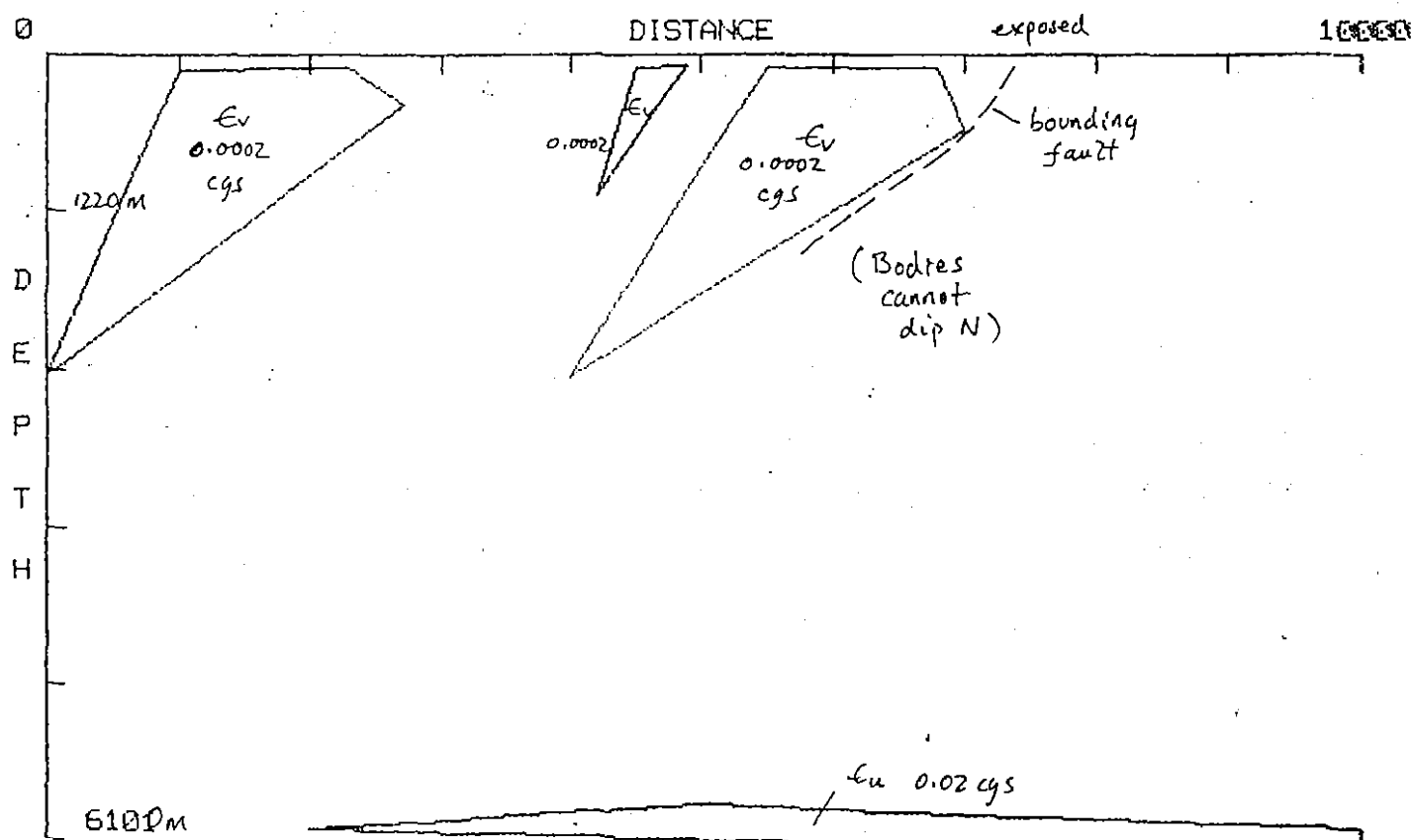
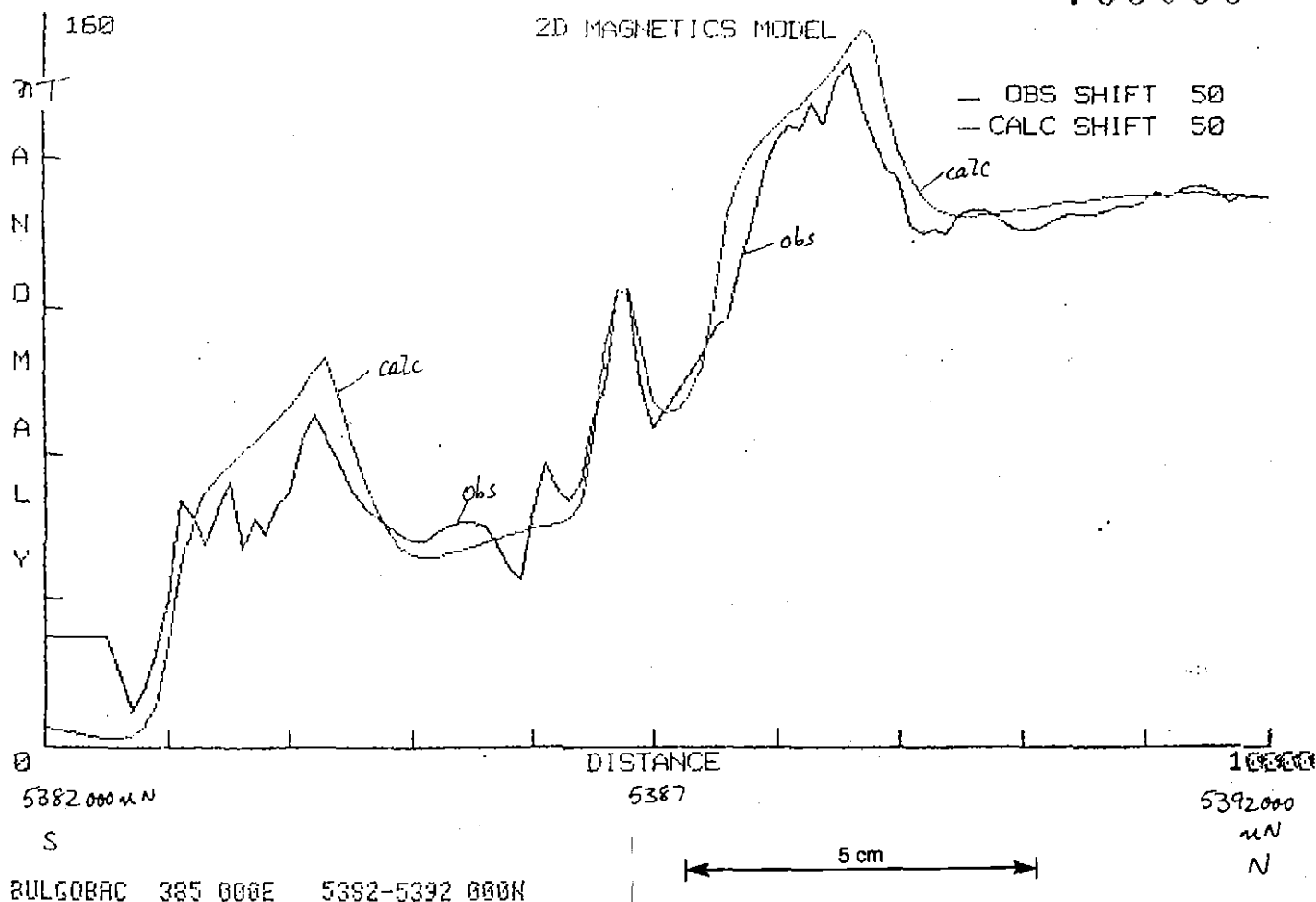
765065



PROFILE 3. 385 000 ME 5382-5392 000 MN REGIONAL EFFECT

FIGURE 9

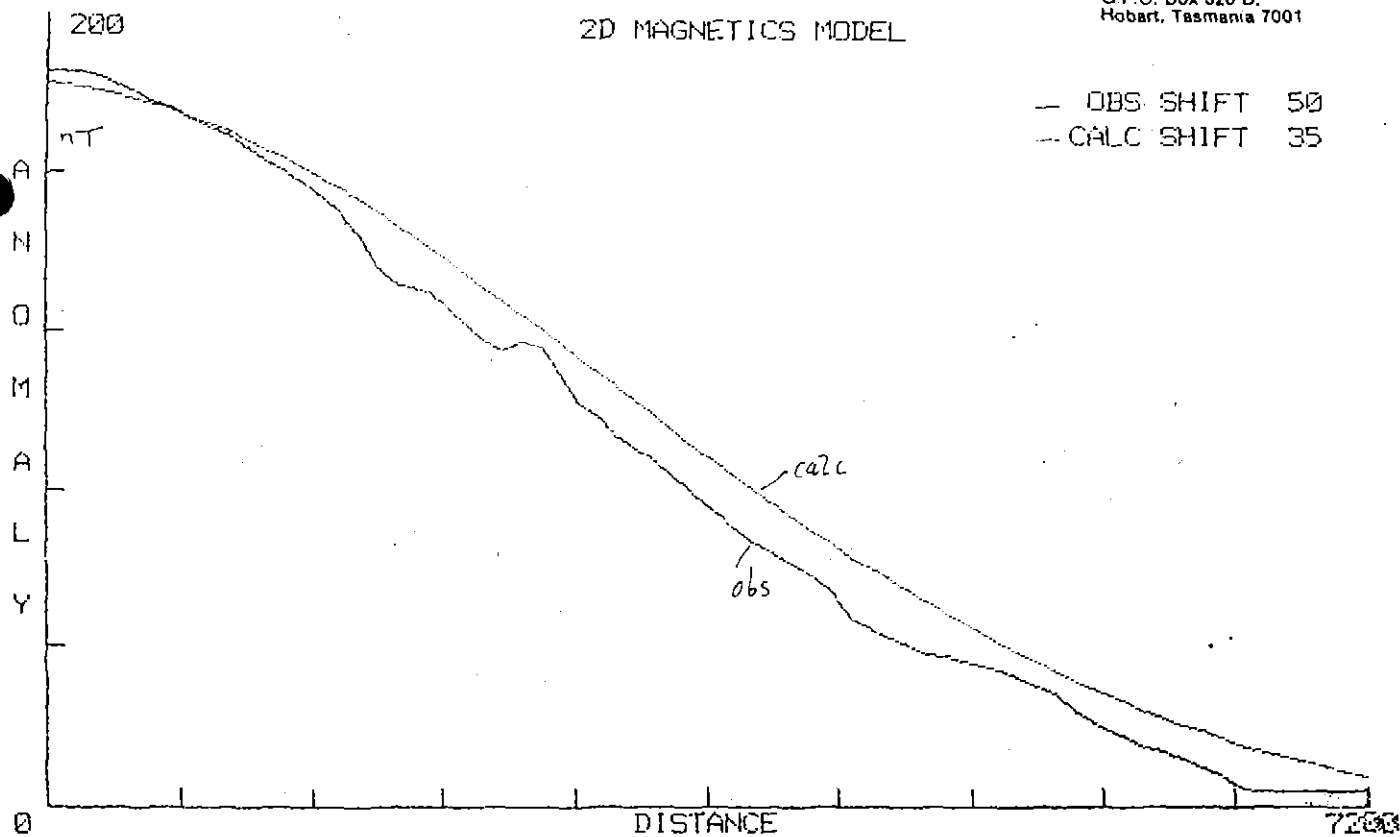
765066



PROFILE 3. 385 000 ME 5382-5392 000 MN MODEL

FIGURE 10

2D MAGNETICS MODEL

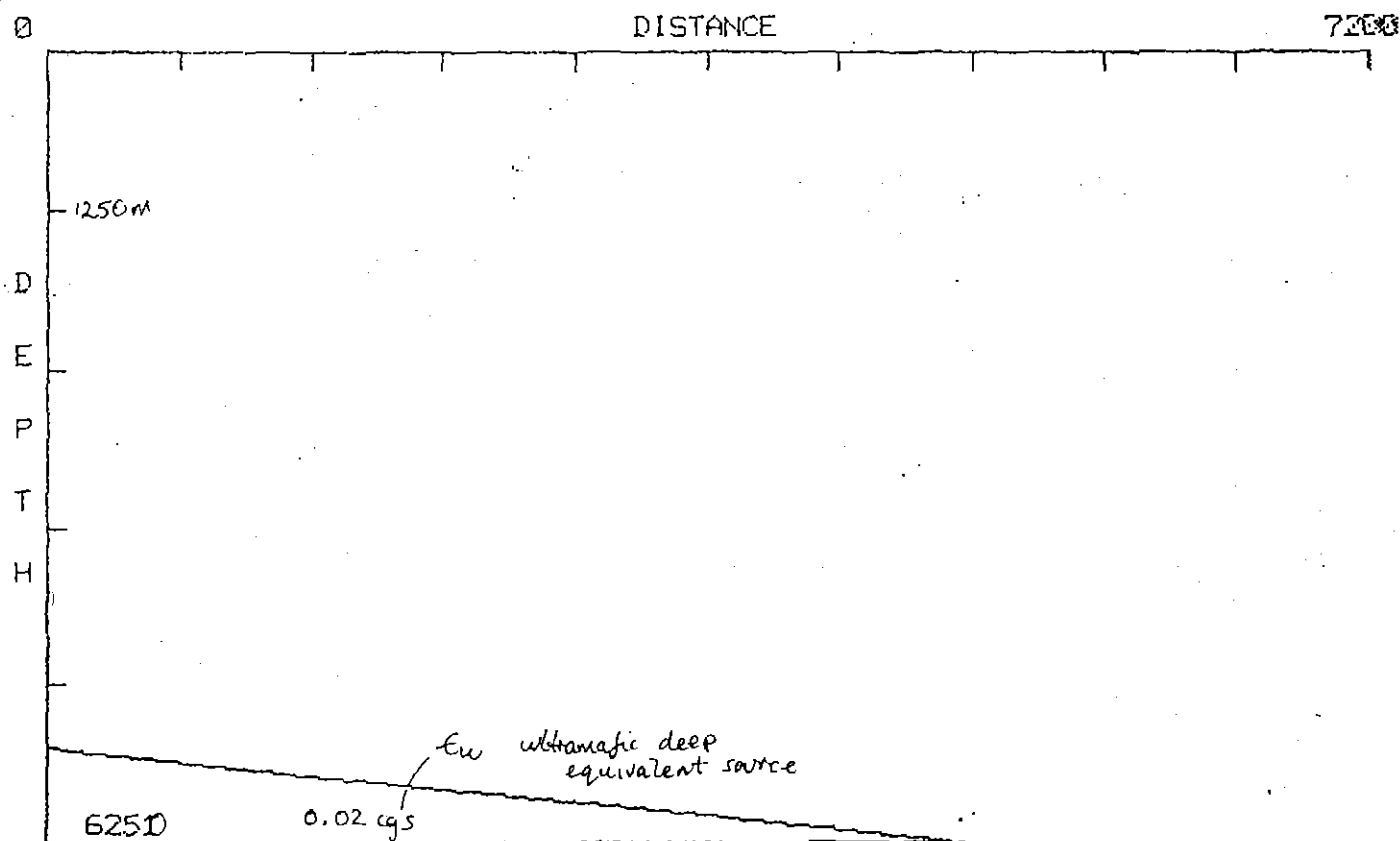


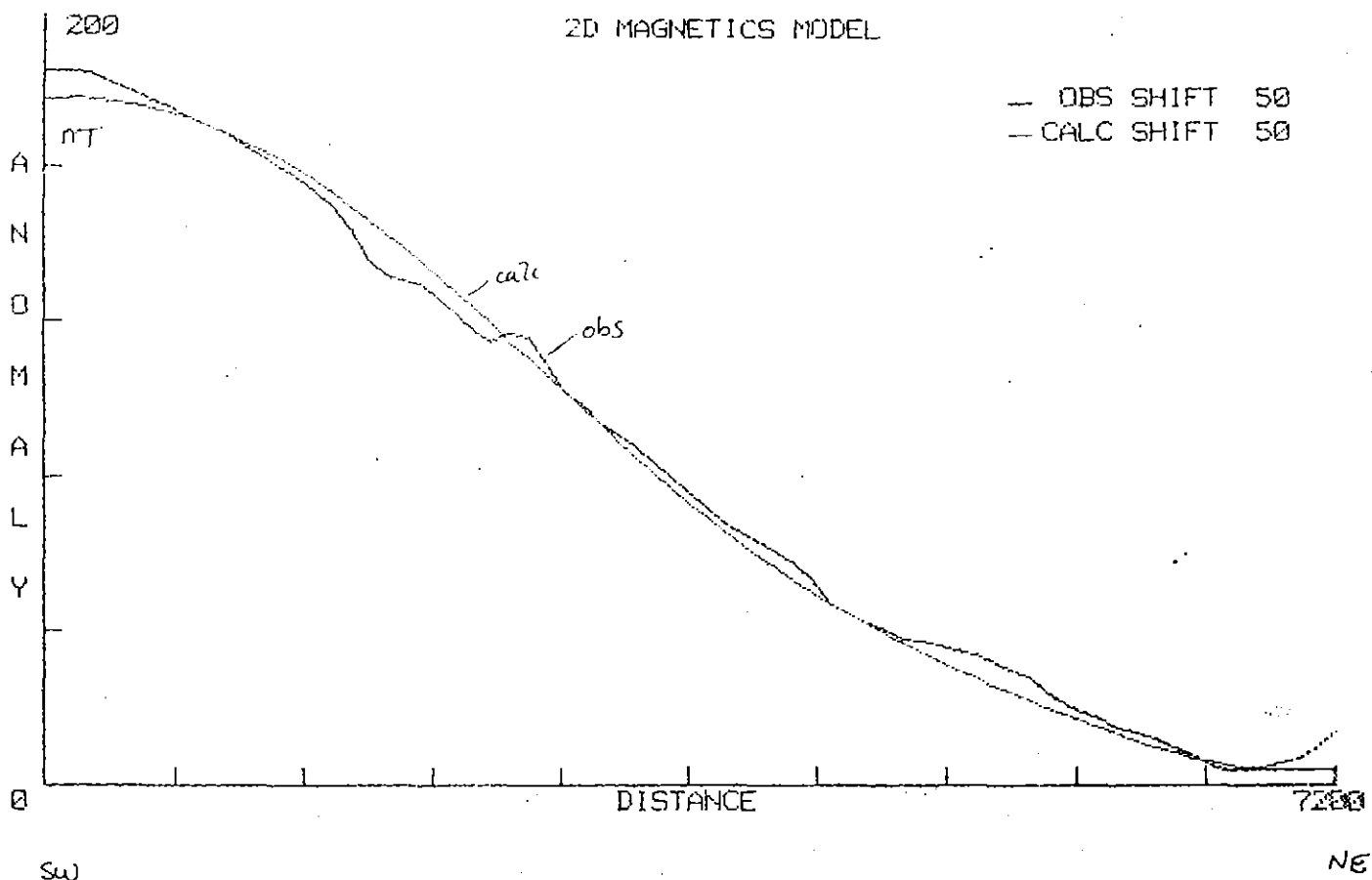
SW

5 cm

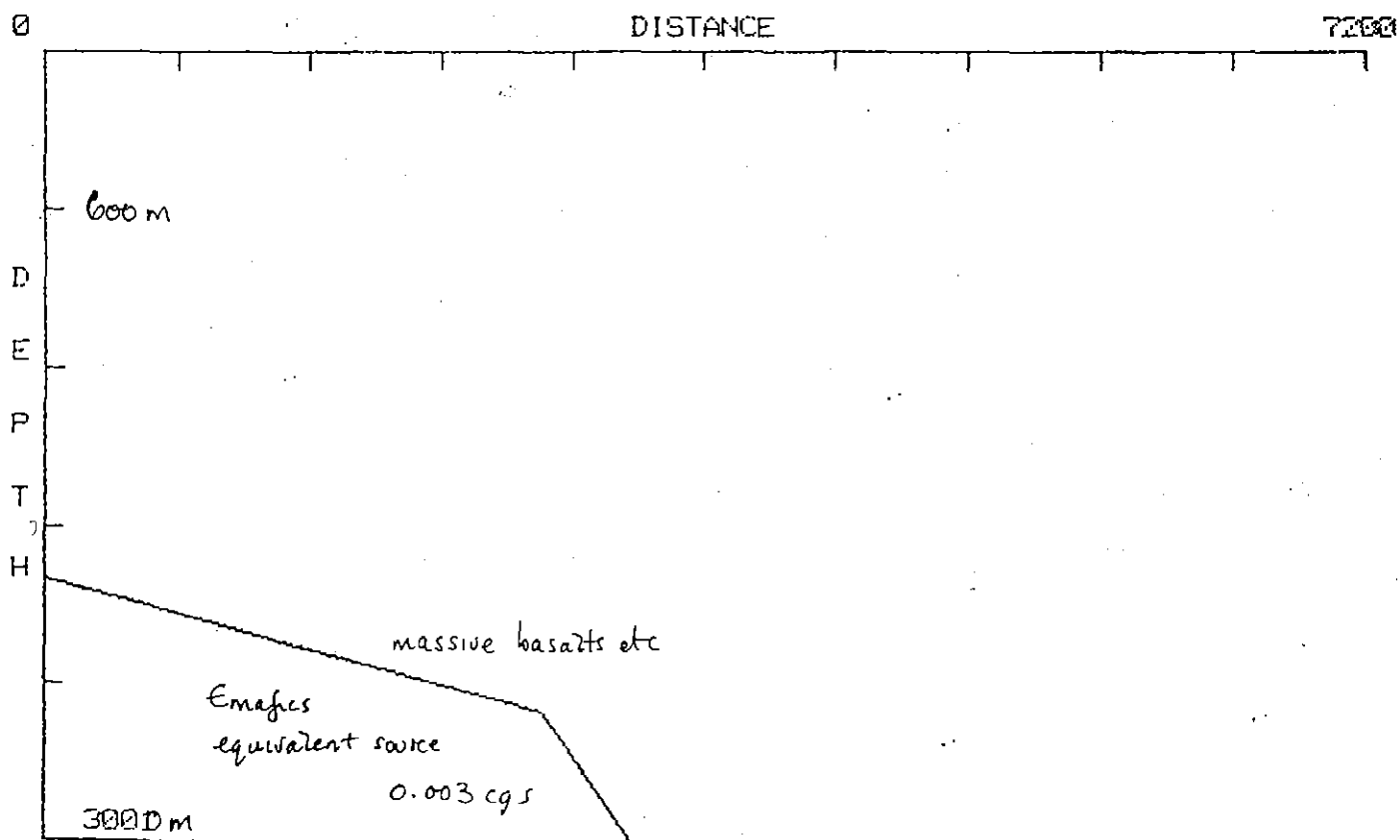
NE

BULGOBAC 4 383/5391-389/5395
1/2=5/6.2



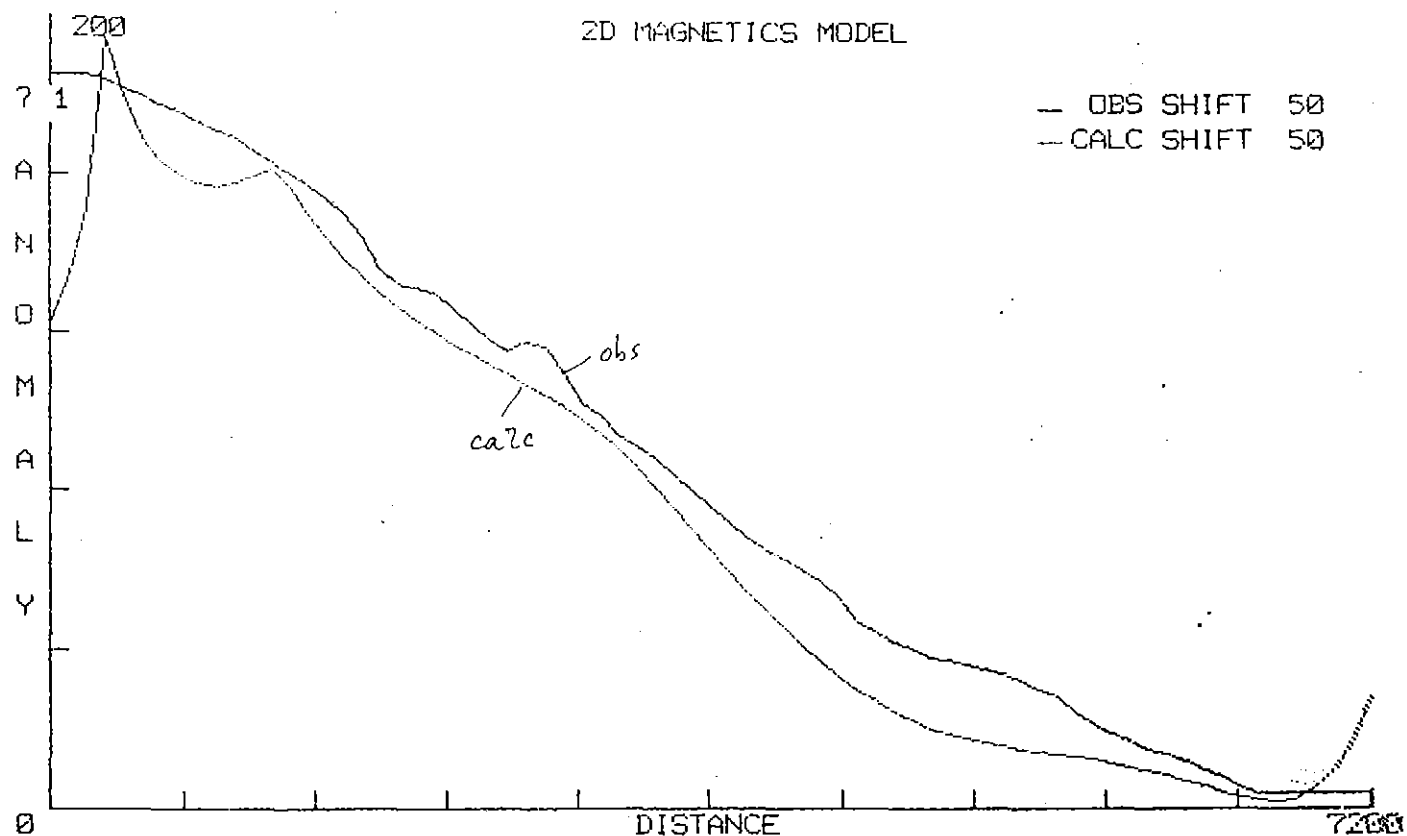


BULGOBAC 4 383/5391-389/5395



PROFILE 4. 383/5391 000 - 389/5395 000 SHALLOW MAFIC SOURCE
FIGURE 12

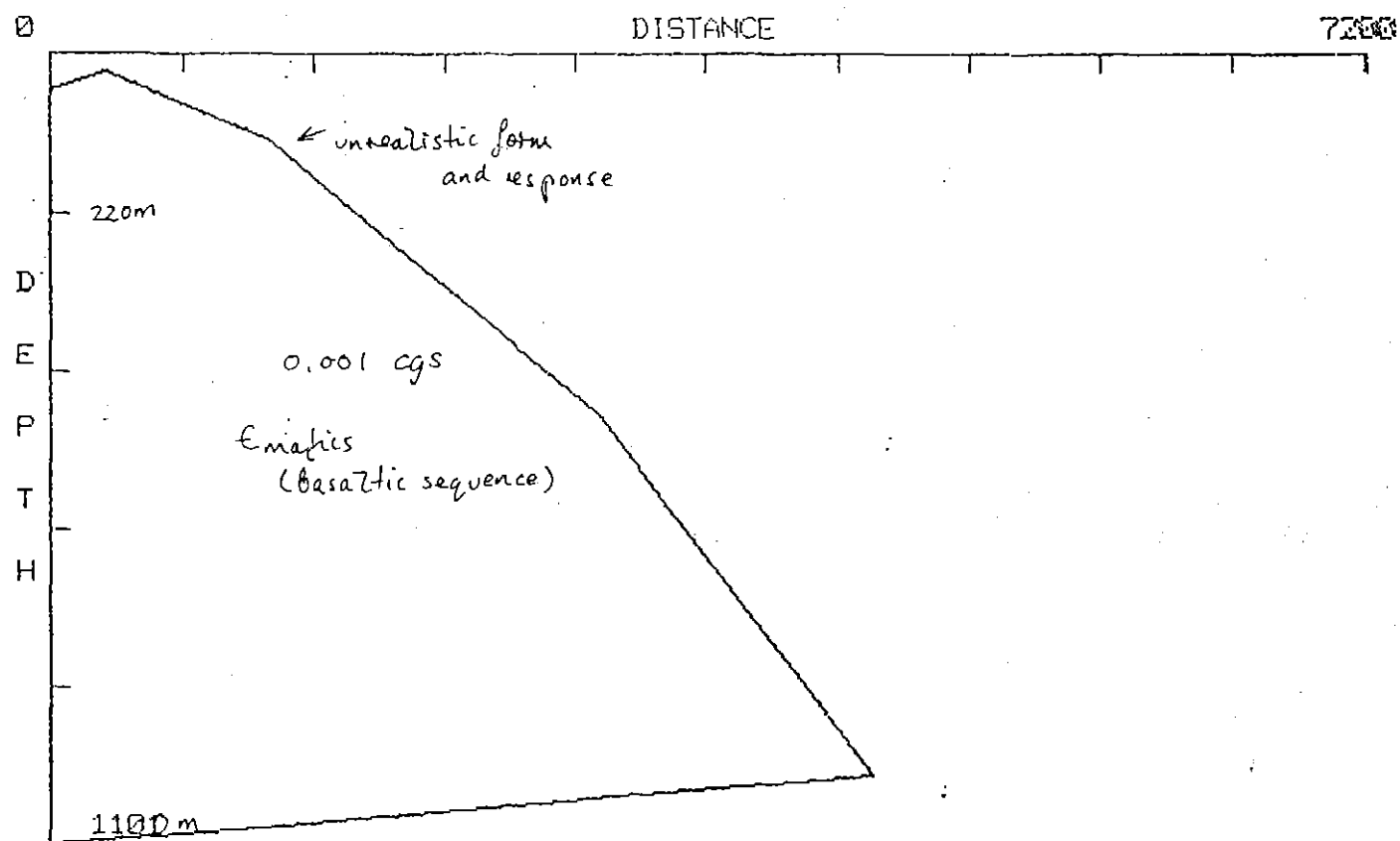
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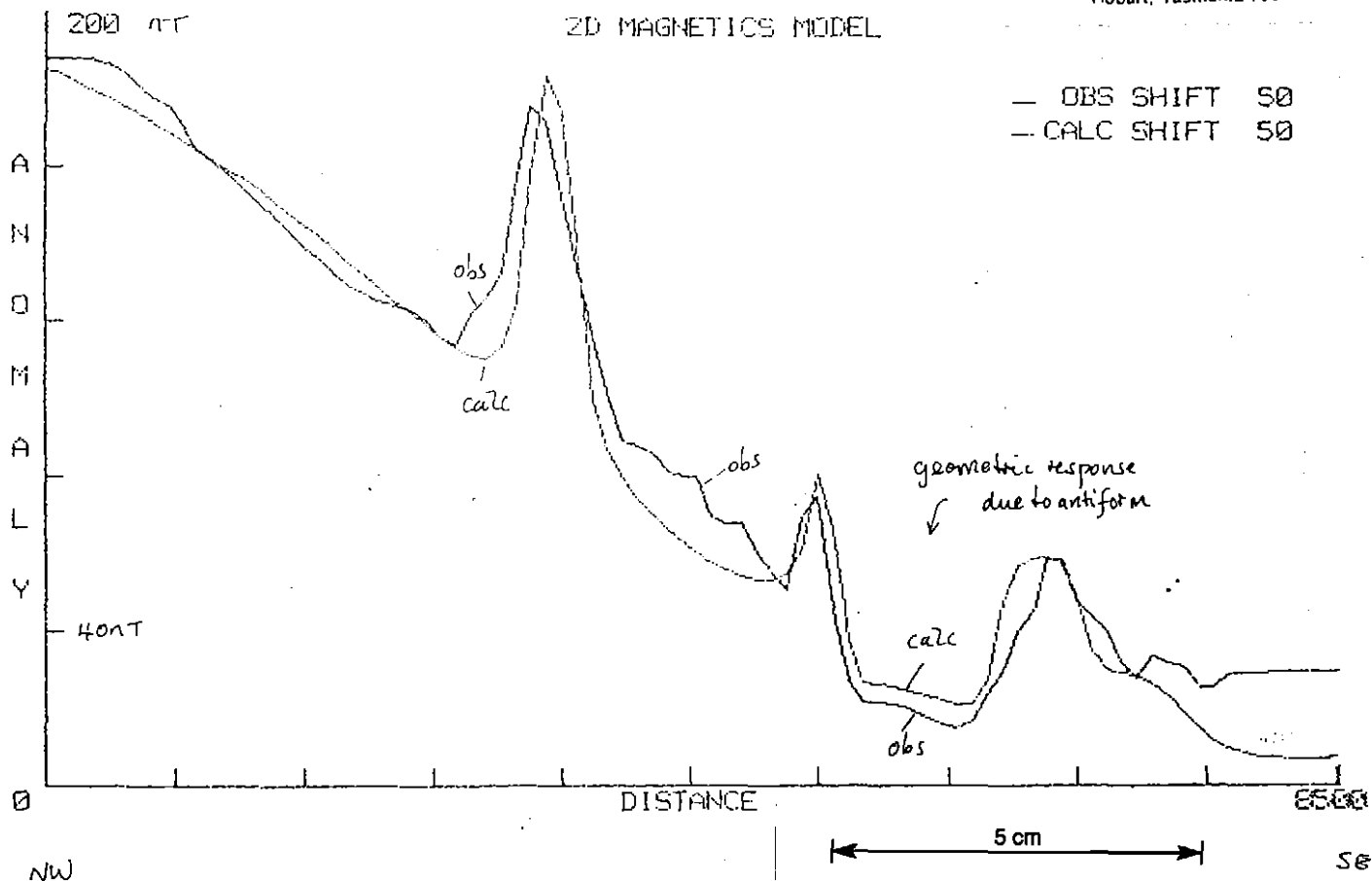
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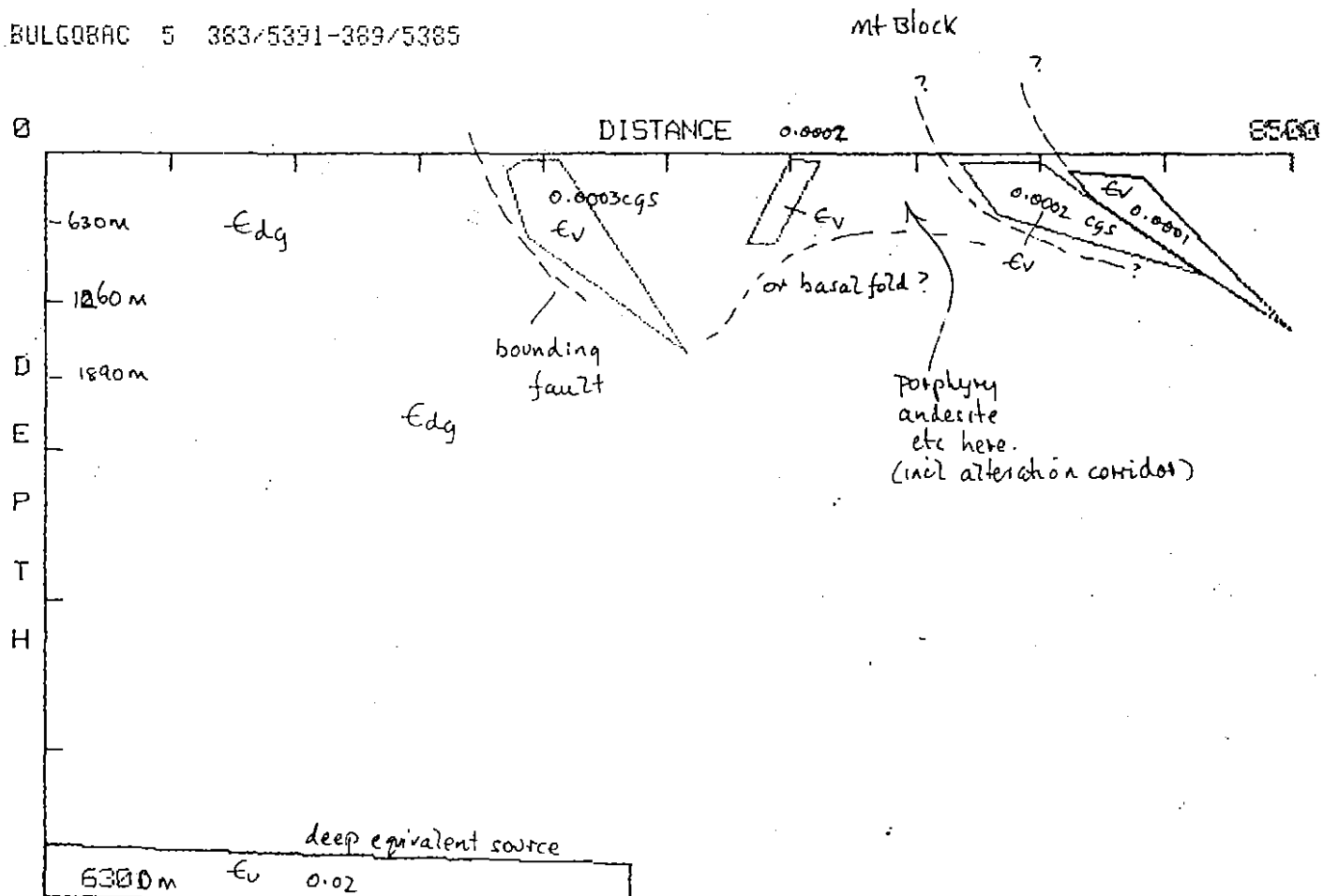
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PROFILE 4. 383/5391 000 - 389/5395 000 VERY SHALLOW MAFICS
FIGURE 13

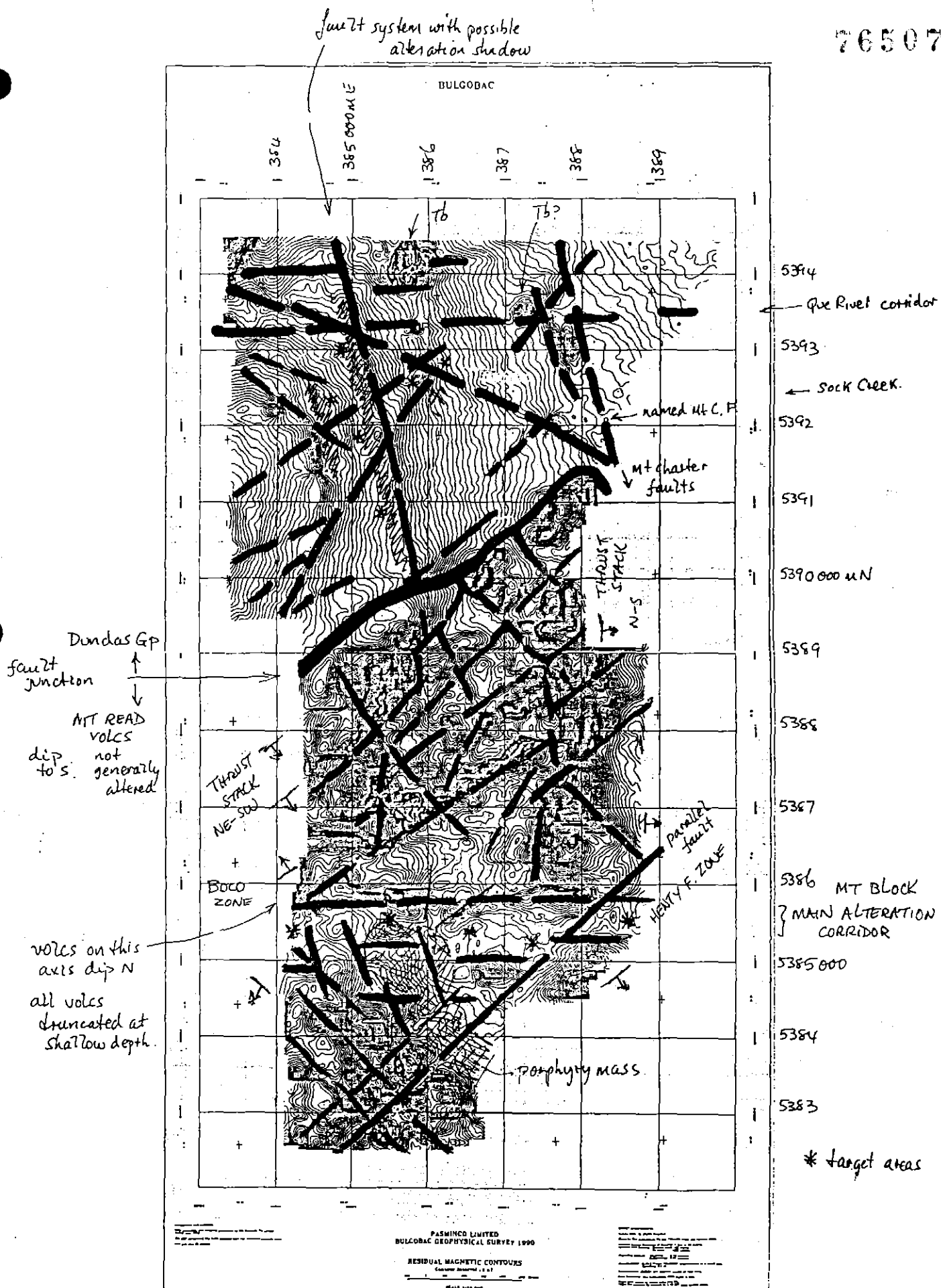


BULGOBAC 5 383/5391-389/5385



5 cm

765071



INTERPRETATION AND TREND SUMMARY OF PRELIMINARY INTERPRETATION
FIGURE 15

Pitt Research Pty Ltd : 19th June 1990 : Job 74IE

This tape comprises 4 data files as follows:

- File 1 : Data description (this file).
- File 2 : Yolande located data
- File 3 : Rosebery Mine Leases located data
- File 4 : Bulgobac located data

These airborne surveys were performed by GeoInstruments Pty Ltd for Pasminco Limited in February 1990.
Data processing and mapping was performed by Pitt Research Pty Limited in May/June 1990.

Data is recorded on this file in 132 byte ASCII records with bytes/record block.
and on located data files in 85 byte ASCII records with 6+800 bytes/record block.

CONSTRUCTION OF LOCATED DATA RECORDS:

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*   Number of variable in source file
*   --- Format of variable
*   |   +--- Start character in format string
*   |   |   +--- Start character in output buffer
*   |   |   |   +--- Number of characters in output field
*   |   |   |   |   +--- Variable name
*   |   |   |   |   |
1 "(F7.0)" 1 1 6 * Line
2 "(F3.0)" 1 7 2 * Flight
3 "(F7.0)" 1 9 6 * YYDDD
4 "(F8.0)" 1 15 7 * Fiducial
10 "(F7.0)" 1 22 6 * Time (samn)
10 "(F3.0)" 1 28 2 * Recovery pt flag
19 "(F8.0)" 1 30 7 * AMG Easting (m)
20 "(F9.0)" 1 37 8 * AMG Northing (m)
14 "(F8.0)" 1 45 4 * Radar altimeter
17 "(F4.0)" 1 49 5 * Barometric altimeter
11 "(F9.2)" 1 54 9 * Total Mag Field (raw)
12 "(F4.0)" 1 63 5 * Total count (raw)
13 "(F8.0)" 1 68 4 * Potassium count (raw)
14 "(F4.0)" 1 72 3 * Uranium count (raw)
15 "(F4.0)" 1 75 3 * Thorium count (raw)
22 "(F8.2)" 1 78 8 * IGRF Corr lev mag (nT)
85 char/record
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Notes: Irrelevant data field is filled with spaces where an observation is undefined.

STARTING INCLUDING VARIABLES OF FILE 2 :

765072

STATISTICS INCLUDING VARIABLES OF FILE 4 :

File Title : GEONSTRUMENTS - PASMINCO - BULGABAC (TAS)

GLOBAL STATISTICS

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51	P	5	8	N4	Bearing from north (deg)	49661	90	90	90	
61	P	6	10	N4	Fiducial increment	49661	1	1	1	
71	P	7	12	N4	Fid no. of first obs	49661	1	32290.511	75571	243
81	P	8	14	N4	Fid no. of last obs	49661	130	32645.589	75850	243
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101	S	2	3	N4	Time (samn)	49602	35950	48720.06	60437	715
111	S	3	5	N4	Total Mag Field (raw)	49602	59483.402	62067.307	62190.359	44.
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131	S	5	8	N2	Potassium count (raw)	49602	2	28.866961	105	9.8
141	S	6	9	N2	Uranium count (raw)	49602	2	21.680376	77	7.3
151	S	7	10	N2	Thorium count (raw)	49600	1	15.25629	56	5.9
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201	S	12	20	N8	AMG Northing (m)	42229	5382056	5389070	5395051	340
211	S	13	24	N4	IGRF Corr mag (m)	42175	4745.4653	4868.4492	4992.6992	42.
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END OF HEADER FILE DATA

765073

APPENDIX 2

Specific Gravity & Magnetic Susceptibility Readings.

S G READINGS

7 6 5 0 7 5

[illegible]

7 6 5 0 7 6

MAGNETIC SUSCEPTIBILITY READINGS

[illegible]

MAGNETIC SUSCEPTIBILITY READINGS

[illegible]

APPENDIX 3

Petrological Reports, Bulgobac Hill & Tullabardine Gorge.

TULLABARDINE GORGE

032724

Volcaniclastic Sandstone

765079

Mineralogy	%
quartz	1
plagioclase	5
pumice fragments	20
lithic fragments	20
silicic matrix	45
sericite	2
chlorite	2

This is an epiclastic rock composed of a variety of pumiceous and siliceous to intermediate volcanic lithic fragments together with some detrital quartz and plagioclase in a very fine grained recrystallised siliceous matrix.

Angular quartz grains and subidiomorphic plagioclase crystals (0.5 - 2 mm) occur as discrete detrital grains within the matrix. These phases also occur as phenocrysts within the lithic fragments. Partially resorbed, subidiomorphic quartz phenocrysts and euhedral plagioclase phenocrysts occur together set in the very fine grained quartz-feldspar-rich groundmass of some silicic (rhyodacitic) lava fragments. The plagioclase crystals throughout the rock are extensively altered to sericite. Plagioclase also occurs as a phenocryst phase and as laths in chlorite-rich clasts which represent originally more mafic lava fragments.

Another common clast type is composed of alternating fine bands of chlorite and plagioclase plus quartz which have the appearance of pumiceous flow-banded material. Other chlorite-rich clasts have a vesicular character.

The matrix is composed of extremely fine grained quartz and feldspar, with chlorite and some secondary Fe oxides. Vitriclastic textures are frequently apparent within the matrix indicating the volcaniclastic (tuffaceous) nature of this component.

This sample has been derived by reworking of a variety of source materials including rhyolitic lavas and andesitic to basaltic volcanoclastic material. The variety of lithic fragments and the unwelded variable orientation of the pumice fragments precludes an origin as an ignimbrite.

TULLABARDINE GORGE AREA

032725A

Tuffaceous Siltstone

Mineralogy	%
quartz	2
plagioclase	3
silicic matrix	89
pumice fragments	5
chlorite	<1
sericite	<1
rutile	trace
carbonate	1
zircon	trace
opaques (pyrite)	<1

This is a very fine grained silicic sedimentary rock. It is composed of angular quartz and plagioclase grains (0.02-0.1mm), and angular, recrystallised silicic pumice fragments in an extremely fine grained matrix of quartz, chlorite and feldspar with minor carbonate, sericite, pyrite and zircon.

The angular plagioclase grains are essentially unaltered, and the quartz grains are unstrained. The recrystallised pumice fragments (up to 0.3mm long) are composed of very fine grained quartz and chlorite in alternating bands which typify tubular pumice in these rocks.

The bulk of the matrix is probably recrystallised finer grained silicic ash dominated by fine quartz, feldspar and chlorite. There are small grains of carbonate, isolated crystals of sericite, large anhedral pyrite, and minor zircon and rutile disseminated through the matrix.

This sample is very similar to 032715A, except that the latter sample contains slightly more sericite, and the tubular pumice fragments are more obvious in 032725A. Despite the slight differences, these rocks have essentially identical mineralogy and textures, and would have been derived from a very similar source.

032726A

Pumiceous feldspathic sandstone

Mineralogy	%
quartz	<1
plagioclase	10
silicic matrix	60
pumice fragments	15
lithic fragments	7
chlorite	3
sericite	2
carbonate	3
zircon	trace

This is an epiclastic rock composed of a variety of silicic lithic fragments (including tubular pumice), together with detrital quartz and plagioclase in an extremely fine grained silicic matrix.

The quartz grains (0.2-0.5mm) are unstrained and some retain evidence of partial magmatic resorption. Plagioclase occurs as relatively large (0.3-3mm) subidiomorphic grains which are variably altered to sericite and carbonate.

There are two principal types of lithic fragments. The first are angular, randomly oriented, banded pumice fragments (0.3-3mm long). These are composed of alternating fine bands of chlorite, and fine recrystallised quartz and feldspar, with minor sericite, granular sphene and epidote.

The other lithic fragments generally occur as rounded to subangular clasts (0.3-2mm) composed of very fine grained recrystallised quartz and feldspar, slightly coarser grained (0.1mm) feldspar-rich aggregates with subordinate chlorite and carbonate, or chlorite-carbonate-rich aggregates which may have a more mafic volcanic parentage. A number of the silicic lithic fragments have either partially resorbed quartz, or plagioclase phenocrysts within them, and they may represent devitrified glassy lava fragments. There are also occasional angular lithic fragments of tuffaceous siltstone

composed of fine angular quartz grains in a chlorite-quartz-rich matrix.

The matrix is composed of extremely fine grained quartz and feldspar with minor chlorite , and disseminated fine aggregates of epidote, carbonate and sphene.

The variety of lithic fragments and crystal detritus suggests a mixed source for this rock. The predominant source materials are dacitic to rhyolitic volcanics and volcaniclastics, with a minor more mafic component. The mixture of fine matrix, lithic fragments and crystal detritus suggests this is some sort of poorly sorted mass-flow deposit.

032727A

Dacitic lava

Mineralogy	%
plagioclase	8
silicic groundmass	88
chlorite	1
sericite	1
secondary Fe oxides	2

Subhedral plagioclase phenocrysts (0.5-2mm) and smaller plagioclase laths (0.02-0.2mm) are fairly evenly distributed throughout a variably recrystallised silicic groundmass.

The plagioclase phenocrysts display generally minor alteration to sericite, chlorite and clay minerals. The groundmass features randomly oriented subhedral plagioclase laths and xenoblastic quartz and feldspar aggregates (typically 0.05-0.1mm) in a very fine grained Fe-stained groundmass consisting of very fine plagioclase laths, chlorite and quartz.

The relatively coarse xenoblastic quartz-plagioclase aggregates may be the result of patchy subsolidus recrystallisation, or recrystallised spherulites. Fine veinlets of sericite traverse the rock together with narrow (0.1mm wide) quartz-chlorite, and chlorite-sericite-rich veins.

The bulk of the textural evidence favours the interpretation of this sample as a lava. The dominance of plagioclase as a phenocryst phase, and a predominantly silicic groundmass suggests a dacitic composition. As such, this sample is not directly comparable with 032713A, 032714A or 032715A.

032728A

Volcanic breccia

Mineralogy	%
lithic clasts	63
plagioclase	1
quartz	<1
silicic matrix	35
secondary Fe oxides	1

This is a coarse volcanic breccia composed of a variety of silicic and chloritised volcanic fragments (up to several cm diameter), with minor detrital plagioclase and quartz in a very fine grained silicic matrix.

The detrital quartz and plagioclase occur as small (0.1-0.3mm) angular to subidiomorphic grains, the plagioclase showing some clay alteration.

There is a considerable variety of lithic fragments. However, the dominant type appears to be devitrified glassy volcanic fragments. Some consist of relatively large (0.5-2mm) subhedral plagioclase phenocrysts in an extremely fine grained, devitrified quartz-feldspar-rich groundmass. Many of the clasts have well developed perlitic fractures and/or spherulites reflecting their original glassy nature.

Some other clasts are composed of plagioclase phenocrysts (0.5-1mm) and smaller plagioclase laths in a chlorite-rich groundmass which also features some aggregates of recrystallised albite. These are likely to be fragments of more mafic (andesitic-basaltic) volcanics.

In addition, there are fragments with the textural and mineralogical features of the tubular pumice fragments which have been described from a number of other samples in this suite.

The matrix is dominated by very fine grained quartz and feldspar, with minor sericite and chlorite, after original silicic volcanic ash. Much of the matrix displays relict vitriclastic textures.

Most of the clasts in this rock have analogues from the other clastic samples, particularly 032726A. The siliceous pumice from this sample is perhaps the most widely represented lithic type, being particularly well developed in 032717A and 032719A.

This rock does not display evidence of significant hydrothermal alteration in the form of sericite, chlorite or pyrite. However, there are secondary Fe oxides disseminated through the matrix and within many of the clasts which may be partly after original pyrite.

The matrix of this sample is very similar to 032715A, but contains more secondary Fe oxides and less sericite.

**Report To Pasminco Exploration :
Samples From Bulgobac Hill Area**

for Gerald Purvis

by Joe Stolz
20 Bath St.,
Battery Point,
Tas. 7004.

7th November 1991

031384A

Mineralogy

quartz
plagioclase
carbonate
sericite
chlorite
kaolinite ?

This sample is a very fine grained, silicic, low-grade metasediment. It consists of tiny angular grains of quartz, cryptocrystalline fragments of volcanic ash, rare plagioclase (0.01 - 0.1 mm), fine carbonate, sericite, chlorite and possible clay minerals. Many of the fine quartz grains and devitrified ash fragments have shard-like forms reflecting an explosive volcanic origin. Carbonate occurs as very fine grains disseminated throughout the matrix and also in larger (up to 0.3 mm) more widely disseminated aggregates occasionally with subordinate quartz or chlorite.

Fine grains of sericite are weakly aligned in two principal orientations, at roughly right angles to each other. The finest components of the matrix include tiny grains of quartz, pale green chlorite and a higher relief, low birefringence phase which may be kaolinite. The fine angular shards of silicic volcanic ash have devitrified to low relief cryptocrystalline aggregates which are probably very fine grained quartz and feldspar.

This sample is a well sorted volcanoclastic which possibly represents the fines component of hyaloclastite material from a subvolcanic eruption of silicic magma. Alternatively it was erupted subaerially and deposited under relatively deep calm water conditions.

031386A

Mineralogy

quartz
plagioclase
sericite
chlorite
carbonate
graphite?

This sample is mineralogically identical to 031384A except that it exhibits good laminar bedding which is defined by concentrations of fine opaques (possibly graphite) with fine chlorite and sericite. These layers alternate with paler coloured layers which are relatively enriched in fine quartz and devitrified ash. This rock also contains some larger (0.2 - 0.3 mm) sparsely disseminated aggregates of ?graphite.

Apart from the well defined bedding this sample is identical to 031384A and would have originated in a similar manner.

031387A

Mineralogy

quartz
plagioclase
sericite
chlorite
carbonate
?illite

This sample is also very similar mineralogically and texturally to 031384A. Its major difference is the presence of a slightly higher proportion of phyllosilicate material. It contains a similar amount of sericite and chlorite as 031384A, but also contains a significant amount of a pale-brown, high-birefringence sheet silicate - probably illite. These platy crystals are typically bent but broadly aligned with the sericite.

These three samples (031384A, 031386A and 031387A) would appear to have been deposited in a similar manner and may well be part of the same unit.

031385A

Mineralogy

plagioclase
quartz
lithic fragments
chlorite
carbonate
matrix
zircon

This sample is composed of angular grains of plagioclase (0.05 - 0.4 mm) and fine-grained, feldspar-rich lithic fragments in a very fine grained matrix dominated by recrystallised quartz and feldspar. The larger plagioclase grains exhibit albite twinning and only minor sericite and clay alteration.

There are some very fine grained lithic fragments composed of feldspar and chlorite, and variants rich in very fine chlorite or feldspar with minor chlorite. Some chlorite-rich examples also contain subordinate sericite.

The matrix is dominated by variably recrystallised xenoblastic feldspar and subordinate quartz. Much of the matrix is extremely fine grained xenoblastic aggregates (<0.02 mm), but there are numerous coarser grained patches of recrystallised xenoblastic feldspar (typically 0.05 mm) which grade into finer grained material. The coarser grained patches also occasionally have associated relatively coarse grained chlorite aggregates. The rock contains minor disseminated carbonate, a few rounded grains of zircon, minor sericite and graphite.

The dominance of feldspar in this sample indicates a different source to 031384A, 031386A and 031387A. The abundance of detrital plagioclase together with feldspar- and chlorite-rich lithics (probably after volcanic glass) implies an andesitic source. The relatively fine, sandy material was probably derived from an explosive submarine eruption and sorting of hyaloclastic material.

APPENDIX 4

**Rock Sample Geochemical Results,
Bulgobac Hill & Tullabardine Gorge.**



PASMINCO EXPLORATION GEOCHEMICAL ANALYSES RECORD

Sample Type ROCK CHIPS

PROSPECT BULGOBAC HILL
PROJECT BULGOBAC HILL EL 37/89

Sample No.	Sample Type	Location (AMG)	METAL CONTENT (ppm unless specified)																		→ %										COMMENTS
			Cu	Pb	Zn	Ag	Au	As	Ba	Bi	Cr	Rb	Sr	V	Nb	Y	Zr	Al ₂ O ₃	SiO ₂	TiO ₂	Fe ₂ O ₃	MnO	Na ₂ O	CaO	K ₂ O	MgO	P ₂ O ₅				
0313848	Sub ofc	5389940mN / 386500mE	30	43	304	<0.5	<0.008	9	1130			135	359	25	3	76	224	11.22	75.2	0.36	3.73	0.11	2.23	0.40	3.49	0.84	0.051	Vitric + siliceous tuffaceous sediment. Minor.			
0313858	"	5389900mN / 386380mE	40	34	147	<0.5	<0.008	9	287			27	416	15	9	34	199	11.86	78.3	0.27	1.65	0.02	5.57	0.41	0.95	0.25	0.036	Siliceous volcanoclastic sst. 2-3% py.			
0343868	"	5389820mN / 386330mE	41	50	113	<0.5	<0.008	9	1398			213	344	54	9	39	275	13.29	70.1	0.56	4.31	0.11	2.24	0.86	4.60	1.16	0.076	Silic + vitric bedded tuffaceous sediment. 1-2% py.			
0313878	"	5390190mN / 386240mE	51	17	464	<0.5	<0.008	7	1070			161	139	29	14	37	139	11.89	75.6	0.30	2.58	0.06	2.80	0.20	3.57	1.04	0.028	Silic + vitric tuffaceous sst. Trace sp-gr on fact.			

LABORATORY: ANALABS																
ANALYTICAL METHODS:		AAS	AAS	AAS	AAS	F/A	XRF XRF	AAS AAS	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
PASMINCO EXPLORATION ORDER N°s:		0165 + 0173														
ANALABS JOB N°s:		111310.60.08344 + 111310.60.08459														



PASMINCO EXPLORATION GEOCHEMICAL ANALYSES RECORD

PROSPECT TOLLABARDINE GORGE

PROJECT BULGOBAC HILL EL 37/89

Sample Type ROCK CHIPS

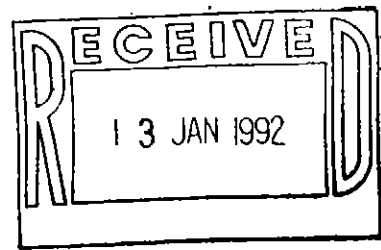
Sample No	Sample Type	Location (AMG)	METAL CONTENT (ppm unless specified) %																							COMMENTS		
			Cu	Pb	Zn	Ag	As	Ba	Bi	Cr	Rb	Sr	V	Nb	Y	Zr	Al ₂ O ₃	SiO ₂	TiO ₂	Fe ₂ O ₃	MnO	Na ₂ O	CaO	K ₂ O	MgO		P ₂ O ₅	LOI
032724B	Sub s/c	S 385620N / 385440E	9	10	49	<0.5	14	1100	19	120	260	45	12	25	250	15.70	66.8	0.67	4.91	0.10	3.40	0.31	3.35	1.70	0.143	2.89	0.04	Volcaniclastic sandstone. Unaltered.
032725B	Float	S 385775N / 385530E	9	<5	19	<0.5	10	930	6	200	180	25	17	50	160	12.80	74.6	0.32	2.49	0.04	2.35	0.55	4.42	0.65	0.028	1.28	0.16	Vitric + siliceous tuffaceous siltstone
032726B	Float	S 385800N / 385570E	8	26	64	<0.5	7	1150	8	220	380	20	8	35	250	15.20	67.2	0.69	4.36	0.07	2.10	2.74	4.09	1.10	0.126	2.45	0.14	Pumiceous feldspathic sst. Weakly altered.
032727B	o/c	S 385880N / 385620E	7	<5	44	<0.5	9	1000	11	130	100	9	9	25	190	13.30	73.6	0.27	3.17	0.04	2.55	0.10	4.96	0.35	0.038	1.47	0.03	Dacitic lava. Fine sericite veinlets.
032728B	Float	S 386030N / 385730E	7	<5	70	<0.5	12	560	9	95	210	30	13	25	210	13.40	71.5	0.42	5.03	0.14	2.95	0.42	2.75	0.85	0.046	2.37	0.03	Volcanic breccia. Some clasts altered.
032729B	Float	S 386030N / 385730E	7	5	51	<0.5	9	900	8	180	150	9	14	25	170	10.60	78.6	0.25	2.02	0.03	1.80	0.23	4.17	0.25	0.05	1.57	0.07	Vitric + siliceous tuffaceous siltstone. Minor py.
032730B	o/c	S 385000N / 384780E	15	6	72	<0.5	10	840	15	170	380	55	11	30	230	15.40	63.8	0.67	5.12	0.12	2.45	4.07	3.11	1.80	0.143	2.87	0.28	Feldspar-phryic pbb ignimbrite. Trace py.
LABORATORY: ANALABS																												
ANALYTICAL METHODS			AAS	AAS	AAS	AAS	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
PASMINCO EXPLORATION ORDER N°			0173																									
ANALABS JOB N°			1113.10.60.08459																									

765094

APPENDIX 5

**Gravity Coverage, Tullabardine Gorge Area,
by Dr D. LEAMAN, January 1992.**

765096



MEMORANDUM:

FROM: D.E. LEAMAN, LEAMAN GEOPHYSICS

TO: PASMINCO EXPLORATION. Attention: F. Fitzgerald
G. PurvisRE: CURRENT STATUS
GRAVITY COVERAGE TULLABARDINE GORGE AREA

Until recently the only gravity stations in the area between Mt Block and Tullah were those acquired by the Department of Mines and Mineral Resources as part of its regional Mt Read Volcanics Project survey. These stations have a nominal station spacing of 1 km. and were observed to regional specifications. They may be identified in Figure 1 as those stations with a diagonal cross. Compilations based on them appeared anomalous and inconsistent in the Mt Block area but no evaluation was possible until some infill had been completed.

Recent work on behalf of Pasminco Exploration has improved the coverage in the region although still very patchy and generally inadequate. The current coverage is shown in Figure 1. Some old stations (3 or 4 sites) thought to be suspect are now definitely considered suspect and are marked with (?). These were ignored to produce the contoured version shown in Figure 2. The nature of the problem is unknown but barometric elevations may be implicated pending checking of control points. All suspect values are too positive which is not consistent with insufficient terrain correction or gravity links.

The values plotted in Figures 1 and 2 are residual Bouguer anomalies derived from the raw Bouguer anomalies using the crustal separation process known as MANTLE91. This has been done to improve ease of direct geological correlation and ease evaluation or recognition of suspect stations. All stations have been fully linked to state datum, terrain corrected to a radius of 22 km and reduced with a Bouguer density of 2.67 gm/cc. The contour presentation should be regarded only as indicative of the gravity field with the present coverage.

The compilation of residual anomalies has been overlain on a geological base map in Figure 3.

The higher negative values in the south of the area, near Tullah, are related to shallowing of the Pine Hill - Granite Tor Granite and there may be some relationship between the location of the Henty Fault Zone and the change in roof depth. Most other features are very poorly defined with present coverage but the significant negative values east of Mt Block are based on a number of stations.

The general negative values across the entire region in which Cambrian rocks of various types are exposed is odd.

All the Cambrian rocks have bulk densities in excess of the Bouguer assumption and the average elevation of the terrain is about 400 to 500 m. This means that residual values should be positive. Part of the negative effect can be assigned to diffusion of the effect of the batholith to the south and south west of the area but this cannot explain the deeper low values.

Several previous analyses undertaken for Pasminco Exploration have implied siliceous basement at shallow to moderate depth in order to balance the denser Cambrian suites. The new work would certainly indicate that this relationship persists at least as far west as Boco. Local, more negative effects, may be associated with siliceous lavas or intrusives, perhaps quartz porphyry masses. Any relationship between lithology and anomaly must await a more even coverage and better definition of the gravity field.

If this data set is considered as an inset within a more regional distribution then a number of trends, consistent with it, can be recognised. They are not well defined in the Mt Block area with present coverage but they are approximately located. These are shown in Figure 4.

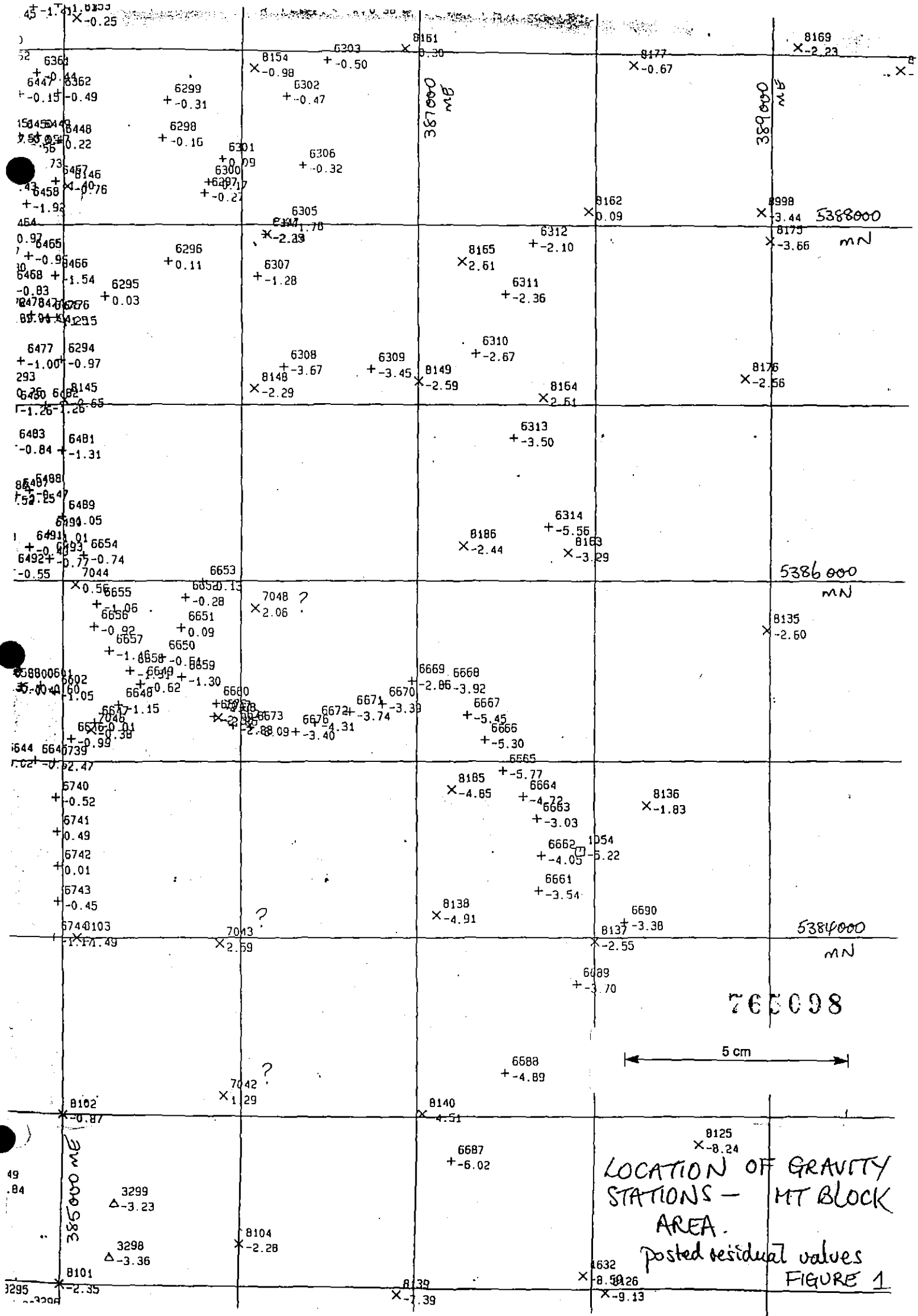
Three ENE trends can be continued into and across the area. One of these is defined by an undoubted step in the field near 5387 000 mN and this has been called the "Boco corridor".

Another significant feature, which is associated with the deep internal lows, trends NNE. This seems an unusual trend in an anomalous location until the geological map is placed in regional context. This is the trend of, and extension of, the eastern side of the Henty Fault Zone south of Tullah. The origin of lows along such a feature are not easily explained unless there is extensive alteration or acidic intrusion. Some inspection is warranted.

The extant data do not justify more detailed review, or modelling, for specific targetting at this stage but are certainly suggestive in regional terms. Proper definition of the field, and any gross structural trends, in this area requires a general coverage in which four or five stations have been observed in each grid square. It will be noted that some kilometre squares contain no stations as at January 1992.



D.E. Leaman
Jan 10, 1992



LOCATION OF GRAVITY STATIONS - MT BLOCK AREA.
posted residual values
FIGURE 1

Compilation: Leaman Geophysics
Jan 92

Bouguer density: 2.67 gm/cc
Separation: Mantle 91.

765099

538800
MN

538600
MN

538400
MN

5 cm

385000 ME

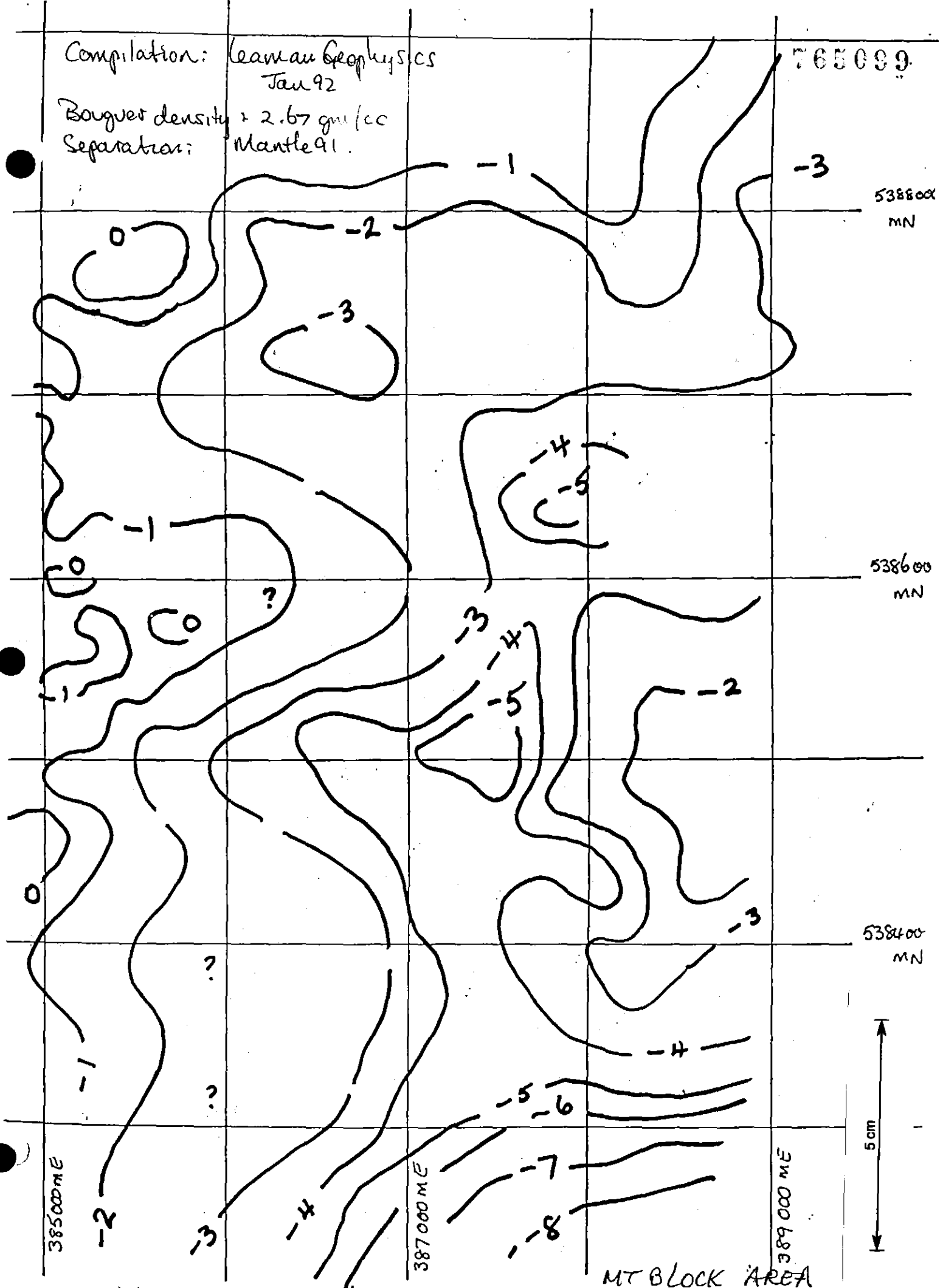
387000 ME

389000 ME

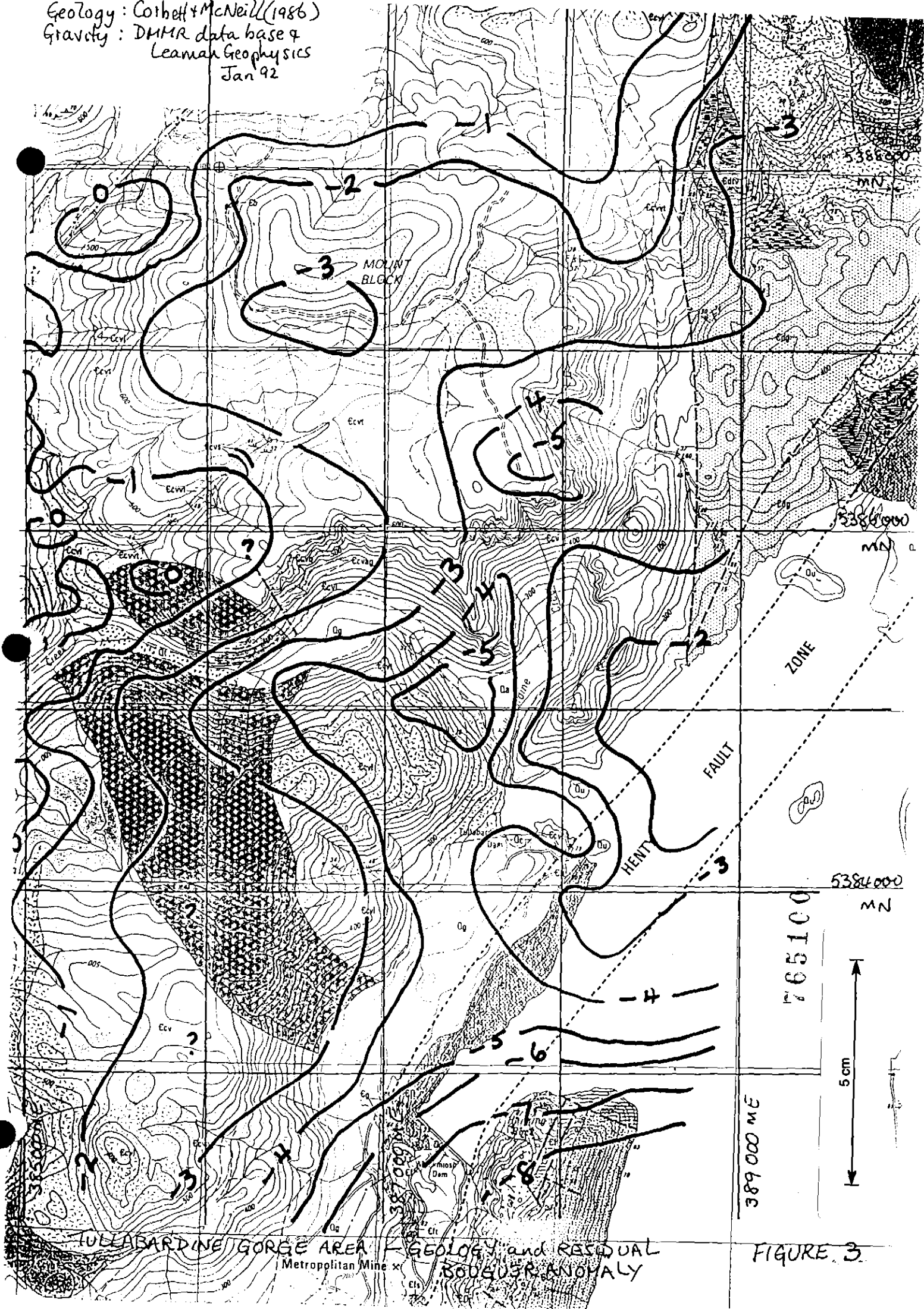
MT BLOCK AREA

CONTOURS - RESIDUAL BOUGUER ANOMALY

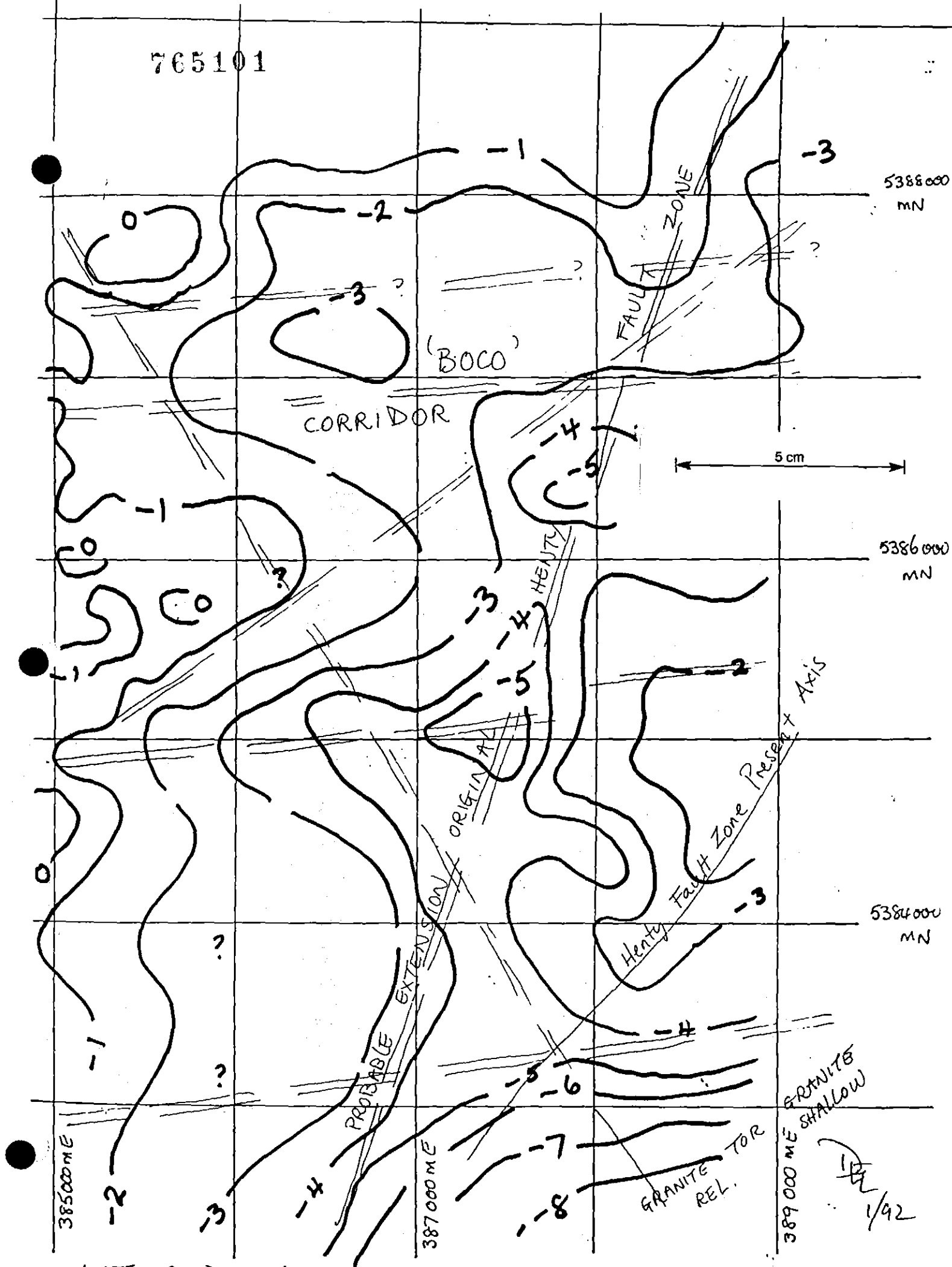
FIGURE 2



Geology: Corbett & McNeill (1986)
Gravity: DMMR data base &
Leaman Geophysics
Jan 92



765101



INFERRED TRENDS - MT BLOCK AREA

FIGURE 4

1/92

FIGURES

This is a detailed topographic map of a coastal region. The map features a grid with Easting coordinates (383000 E to 389000 E) and Northing coordinates (5390000 N to 5395000 N). Contour lines represent elevation, with labels such as 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6500, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7500, 7600, 7700, 7800, 7900, 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000. The map shows a complex terrain with numerous peaks and valleys. A prominent peak is located in the upper right quadrant, reaching an elevation of over 5000 feet. The coastline is visible on the right side of the map, with several small islands and peninsulas. The map is oriented with North at the top.

95-3762
PASMINCO EXPLORATION ET 37/89
BULGOBAC HILL, PARTIAL RELINQUISHMENT
REPORT 1986 PURVIS J G

Survey Area: EL 37/89 Bulgobac

Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9003

Nominal Terrain Clearance of Detector in Bird at 80 metres.

Nominal Line Spacing: Traverse Lines 100 metres
Tie Lines 1000 metres.

Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.96 seconds

Magnetometer: G-813 Proton Precession Magnetometer in a towed bird
Sensitivity 0.1 nT.

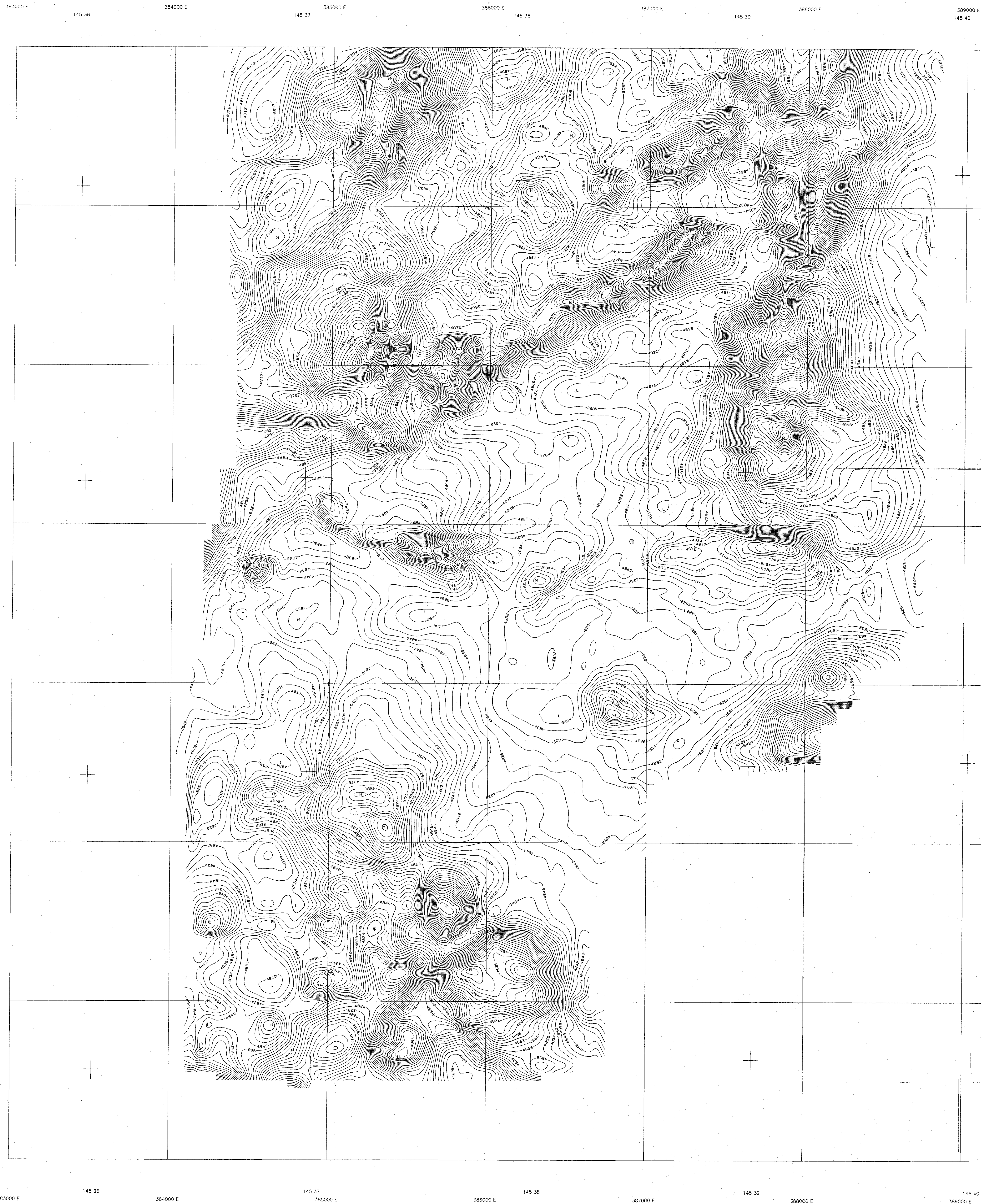
Spectrometer: GR3001 with detector volume of 16.8 litres.

Data Recording: Geo Instruments 2000 Digital to disk.

Flight path record by colour video VHS PAL

Flight line recovery by transfer to 1:10 000 scale control maps.

BULGOBAC



PROCESSING AND MAPPING:
Data processing and mapping performed by Pitt Research Pty Limited during June 1990.
The IGRF component has been removed from the measured magnetic data.
Map grid size: 50 metres

95-3762
PASMINCO EXPLORATION PTY LTD
BULGOBAC HILL PARTIAL REINFORCEMENT
REPORT 106 PURVIS J G

PASMINCO LIMITED
BULGOBAC GEOPHYSICAL SURVEY 1990

RESIDUAL MAGNETIC CONTOURS
Contour Interval : 2 nT

250 0 250 500 750 1000 1250 Metres

SCALE 1:10 000

765103

Figure 10

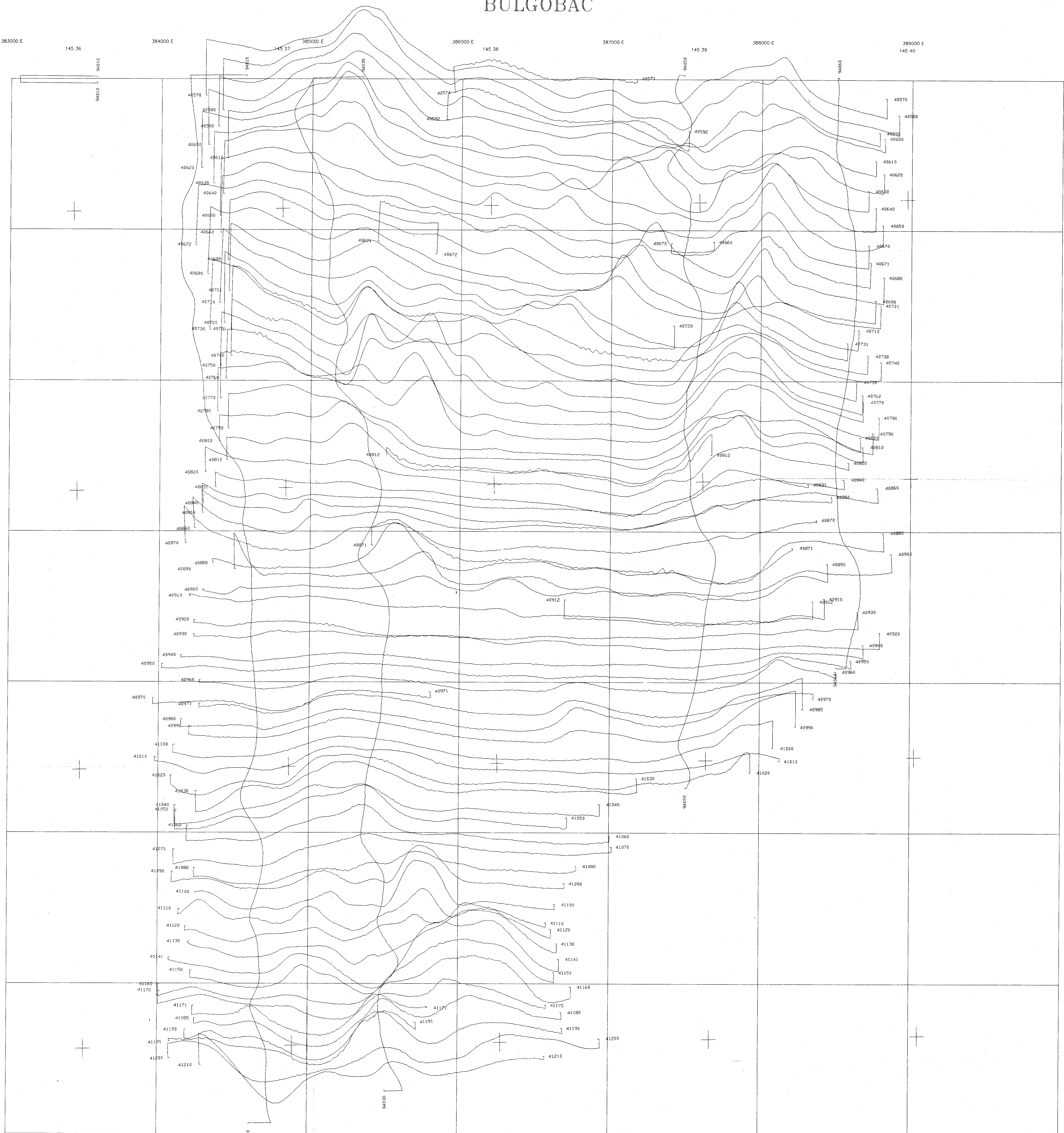
5cm

SURVEY SPECIFICATIONS:
Survey Area: EL 37/89 Bulgobac
Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9003.
Nominal Terrain Clearance of Detector in Bird at 80 metres.
Nominal Line Spacing: Traverse Lines 100 metres
Tie Lines 1000 metres.
Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.96 seconds
Magnetometer: G-813 Proton Precession Magnetometer in a towed bird.
Sensitivity 0.1 nT
Spectrometer: GR3001 with detector volume of 16.8 litres.
Data Recording: Geo Instruments 2000 Digital to Disk.
Flight path record by colour video VHS PAL.
Flight line recovery by transfer to 1:10 000 scale control maps.

BULGOBAC



BULGOBAC



PROCESSING AND MAPPING:
Data processing and mapping performed by Pitt Research Pty Limited during June 1990.
The IGRF component has been removed from the measured magnetic data.

95-3762
P. J. JONES
BULGOBAC HILL PARTIAL RELINQUISHMENT
REPORT 1989 SURVIS J G

PASMINCO LIMITED BULGOBAC GEOPHYSICAL SURVEY 1990

RESIDUAL MAGNETIC PROFILES

Base value 4,850 nT and Vertical Scale 20 nT/cm.

250 0 250 500 750 1000 1250 Metres

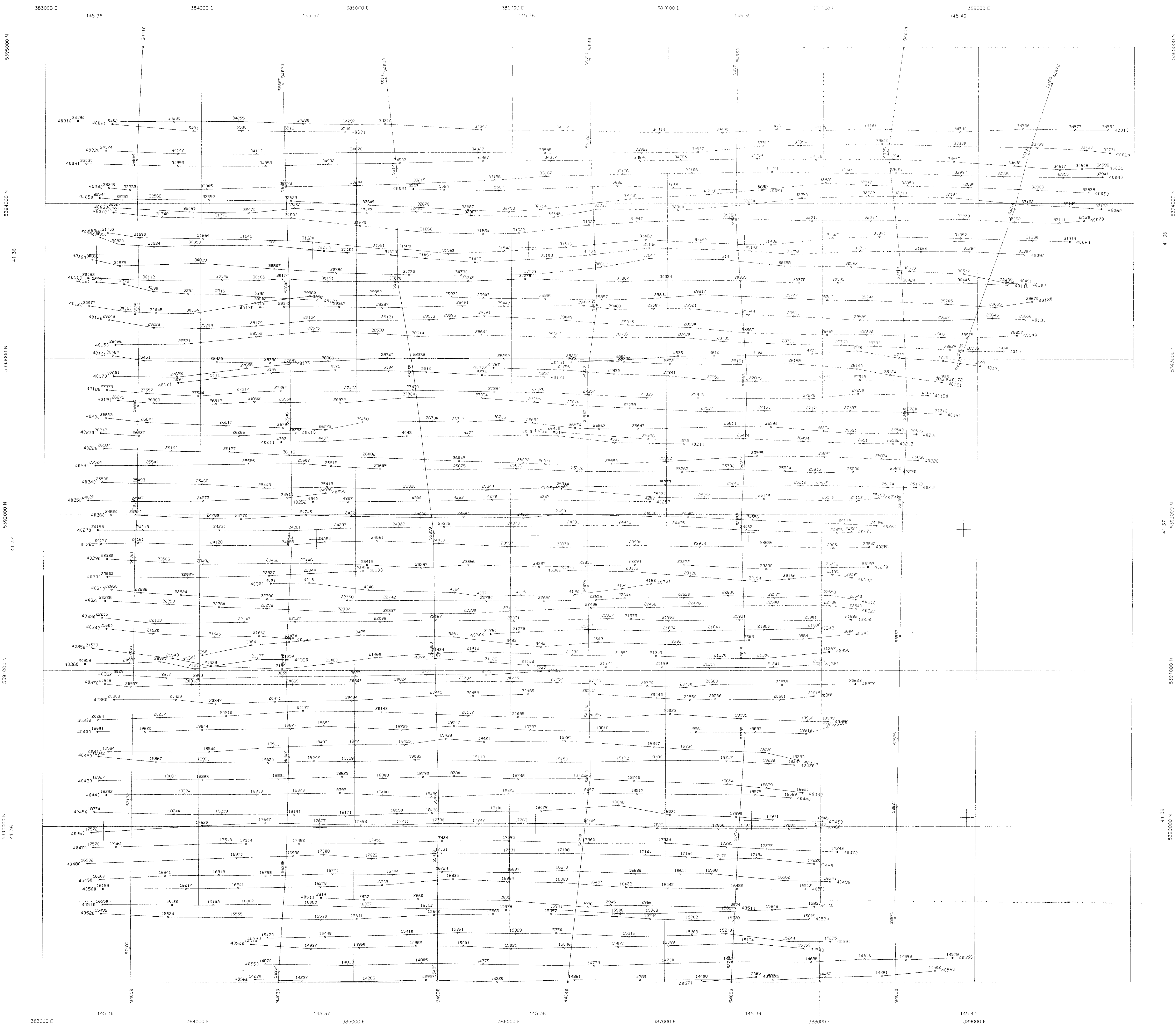
SCALE 1:10 000

Figure 12

765105

SURVEY SPECIFICATIONS:
Survey Area: EL 37/89 Bulgobac
Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9003.
Nominal Terrain Clearance of Detector in Bird at 80 metres.
Nominal Line Spacing: Traverse Lines 100 metres
Tie Lines 1000 metres.
Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.96 seconds
Magnetometer: G-813 Proton Precession Magnetometer in a towed bird.
Sensitivity 0.1 nT.
Spectrometer: GR3001 with detector volume of 16.8 litres.
Data Recording: Geo Instruments 2000 Digital to Disk.
Flight path record by colour video VHS PAL.
Flight line recovery by transfer to 1:10 000 scale control maps.

BULGOBAC



PROCESSING AND MAPPING
Data processing and mapping performed by Pitt Research Pty Limited during June 1990
The IGRF component has been removed from the measured magnetic data

PASMINGO LIMITED
BULGOBAC GEOPHYSICAL SURVEY 1990

FLIGHT PATH

765106

250 0 250 500 750 1000 1250 Metres

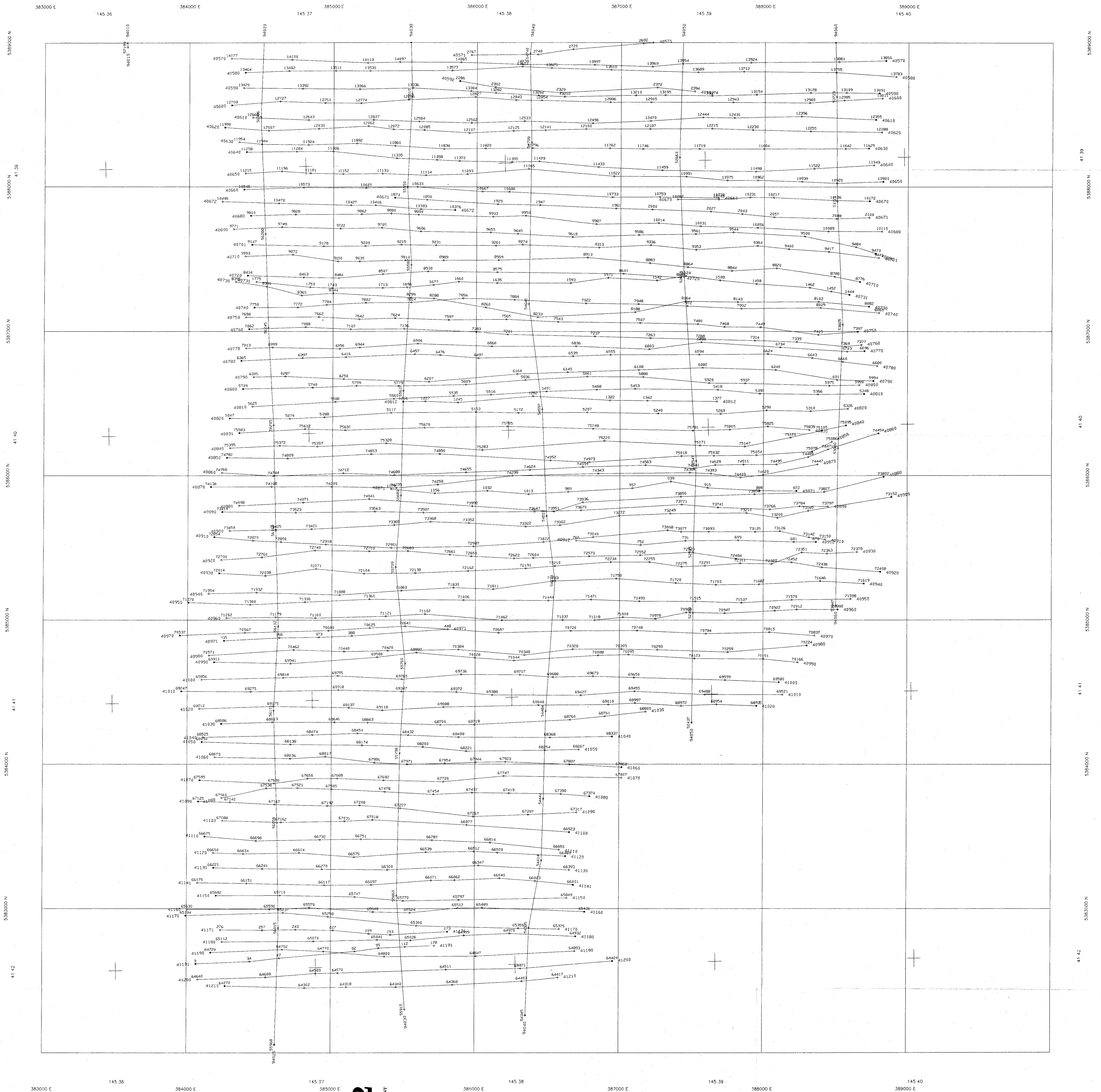
SCALE 1:10 000

figure 13

95-3762
PASMINGO LIMITED
BULGOBAC GEOPHYSICAL SURVEY 1990
REPORTING NUMBER 10

SURVEY SPECIFICATIONS
Survey Area EL 37/89 Bulgobac
Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9003
Nominal Terrain Clearance of Detector in Bird at 80 metres
Nominal Line Spacing Traverse Lines 100 metres
Tie Lines 1000 metres
Recording Interval Magnetics 0.45 seconds
Spectrometer 0.96 seconds
Magnetometer G-813 Proton Precession Magnetometer in a towed bird
Sensitivity 0.1 nT
Spectrometer GR3001 with detector volume of 16.8 litres
Data Recording Geo Instruments 2000 Digital to Disk
Flight path record by colour video VHS PAL
Flight line recovery by transfer to 1:10 000 scale control maps

BULGOBAC



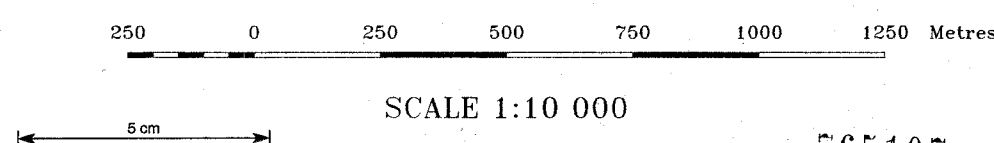
PROCESSING AND MAPPING:
Data processing and mapping performed by Pitt Research Pty Limited during June 1990.
The IGRF component has been removed from the measured magnetic data.

95-3762

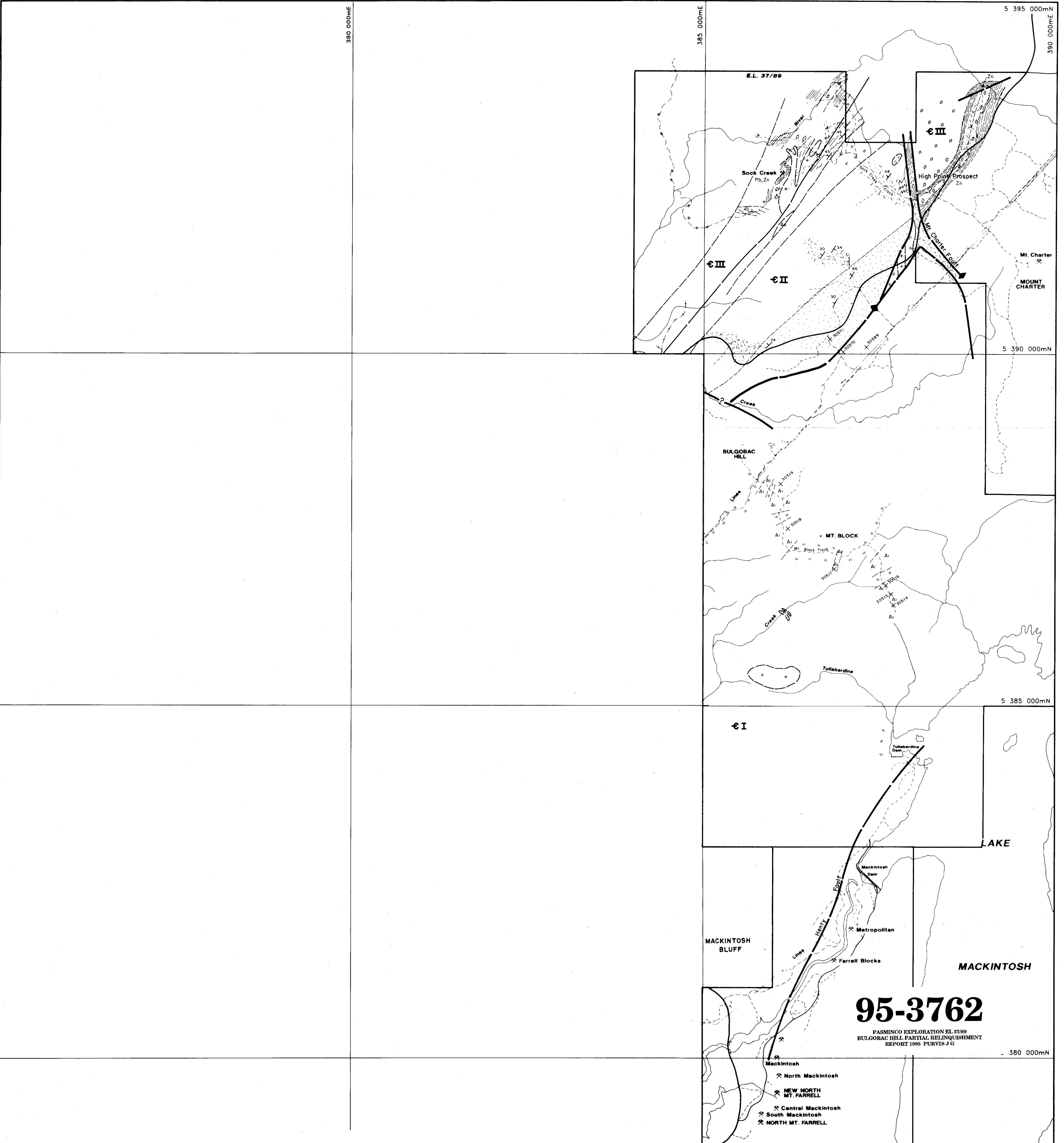
PASMINCO LIMITED
BULGOBAC GEOPHYSICAL SURVEY 1990
REPORT 95-3762

PASMINCO LIMITED BULGOBAC GEOPHYSICAL SURVEY 1990

FLIGHT PATH



SURVEY SPECIFICATIONS:
Survey Area: EL 37/89 Bulgobac
Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9003.
Nominal Terrain Clearance of Detector in Bird at 80 metres.
Nominal Line Spacing: Traverse Lines 100 metres.
Tie Lines 1000 metres.
Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.90 seconds
Magnetometer: G-813 Proton Precession Magnetometer in a towed bird.
Sensitivity 0.1 nT.
Spectrometer: GR3001 with detector volume of 16.8 litres.
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Flight path record by colour video VHS PAL.
Flight line recovery by transfer to 1:10 000 scale control maps.



ROCK TYPES	
	Mafic intrusion
	Dolomitic silt/sandstone
	Conglomerate, Quartz matrix silt. sed., quartz, ultra mafic & rare volcanic clasts
	Conglomerate, Volcanic quartz & mudstone matrix volcanic and rare sediment clasts
	Siltstone, grey mudstone
	Detrital quartz & feldspar sandstone
	Volcanic quartz sandstone. Often black mud matrix
	Black, highly graphitic mudstone
	Quartz-feldspar porphyry
	Quartz-feldspar rhyolite lava

	Feldspar dacite
	Dark grey, basalt-andesite. Feldspar, pyroxene
	Volcaniclastic sandstone, quartz bearing
	Coarse, volcaniclastic breccia, rhy-dacite comp.
	Siliceous mudstone & siltstone
	Micaceous sandstone
	Pumiceous volcaniclastic without quartz
	Green, feldspar andesite

ALTERATION/MINERALISATION	
sil	silicification
ser	intense sericite alteration
cb	carbonate
MnO	manganese oxide
py	pyrite
Pb	Lead
Zn	Zinc
Au	Gold

SYMBOLS	
	Fault - mapped or drilled with dip
	Fault - inferred with sense of mov't.
	Major rock group boundary
	Lithological boundary
	Conformable geological boundary
	Bedding
	Cleavage

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED: A.N.L.
DATE: 6-12-92
DRAWN BY: N.W.D.S.
REF.:
REVISIONS:
DRAWING No. 765108

NORTHERN LEASES
INTERPRETED GEOLOGY
1991-1992 MAPPING PROGRAMME

SCALE 1:25,000
METRES
FIG. No. 16