

000

OPEN FILE

400001

MISPLACED

**PASMINCO EXPLORATION
EL 37/89
BULGOBAC HILL
ANNUAL REPORT
MARCH 1990 - JANUARY 1991**

91-3225

MINES	
File Ref. E.L. 37/89	
- 5 FEB 1991	
Doc. Ref.	
Action Officer	Initials
REFER	TO
1.2.91	
Resubmit to	Date

Transparencies held
in vertiplan.

AUTHOR: A.N Lorrigan
 DATE: January 1991
 REPORT No: T91-2
 SUBMITTED TO: Regional Exploration Manager - Tasmania
 DISTRIBUTION: Mines Department - Hobart
 Pasminco Exploration - Burnie
 - Melbourne
 SUBMITTED BY: *A. Lorrigan*
 ACCEPTED BY: *[Signature]*
 Burnie
 January 1991

TABLE OF CONTENTS	PAGE No.
SUMMARY	1
1. INTRODUCTION	2
2. LOCATION & ACCESS	2
3. TENURE	2
4. REGIONAL GEOLOGY	2
5. PREVIOUS WORK	5
6. EXPLORATION PHILOSOPHY	8
7. WORK COMPLETED 1990-1991	8
7.1 Photogrammetry	8
7.2 Aeromagnetic Survey	9
7.3 Density & Magnetic Susceptibility Readings on BHP Core	9
7.4 Sock Creek South Study	9
7.5 High Point Mapping	10
8. CONCLUSIONS	14
9. RECOMMENDATIONS	14
REFERENCES	16

LIST OF FIGURES

1. Location Map
2. Land Tenure
3. Regional Geology
4. Summary of Previous Work by Comstaff & BHP (1963-1989)
5. Outcrop Geology - High Point
6. Interpreted Geology - High Point
7. High Point section through HP 1 & 4 (7800N)
8. Section Through HP 4 (3880E) Interpreted Geology

LIST OF APPENDICES

- I. Aeromagnetic Survey - EL 37/89 Bulgobac Hill Acquisition Report (including Preliminary Interpretation) for Pasminco Mining.
- D E Leaman, August 1990.
- II. Specific Gravity & Magnetic Susceptibility Readings.
- III. Sock Creek South. Study of Drill Core.
- S R Hunns, Pasminco Mining, November 1990.

SUMMARY

1

Exploration Licence 37/89 (Bulgobac Hill) was granted to Pasminco on 2 March 1990. During the first year of tenure Pasminco has completed the following exploration: an aeromagnetic survey and photogrammetry over the entire licence area; geological mapping at the High Point Prospect and a detailed study of the Sock Creek South area.

An initial assessment of the aeromagnetic survey has outlined two areas of probable prospectivity, in the Sock Creek area and on the southern slopes of Mt Block.

The study at Sock Creek South has identified some similarities between the sequence there and the Que-Hellyer sequence.

Geological interpretation of the High Point Prospect indicates that highly altered and weakly mineralised mafic-intermediate lavas increases in width close to the Mt Charter Fault. Work is continuing to determine the style of alteration so that drilling can be targeted to follow up the known mineralisation.

Other work planned for the EL during the forthcoming year includes: a regional gravity survey; comprehensive lithogeochemical sampling; further interpretation of the aeromagnetic data; detailed mapping of prospective areas and diamond drilling of targets identified by the above investigations.

1. INTRODUCTION

This report describes all work undertaken on EL 37/89 (Bulgobac Hill) from February 1990 to March 1991.

2. LOCATION & ACCESS

The Exploration Licence 37/89 is located 5km south-west of the Hellyer volcanogenic massive sulphide deposit in Western Tasmania (see Fig 1). The Murchison Highway, a sealed road linking Tasmanias' West Coast settlements with Burnie on the North Coast, bisects the EL from North East to South West. Access within the EL is along 4WD tracks off the Murchison Highway. These tracks are shown on Lands Department, 1:25 000 topographic maps.

A set of 200m spaced NW-SE orientated grid lines transect the licence area. These cut lines allow access on foot to other parts of the tenement.

3. TENURE

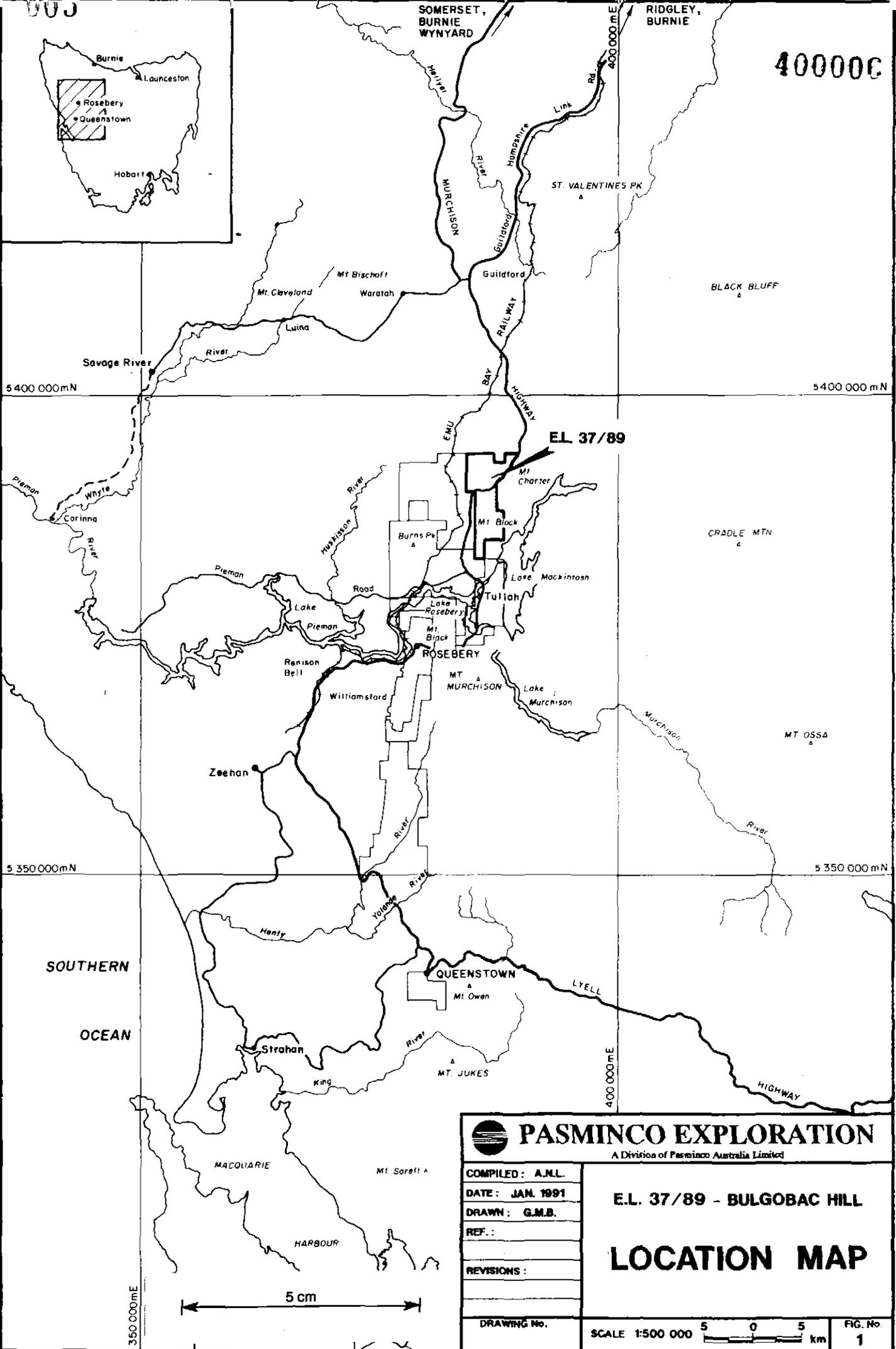
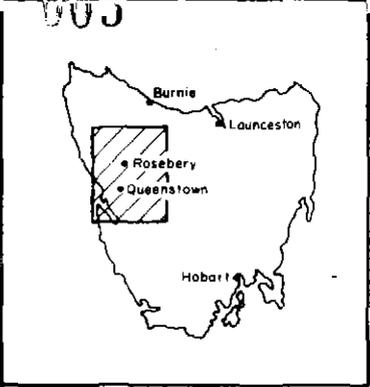
Exploration Licence 37/89, covering 32km², was granted to Pasminco Mining, Rosebery on 3 March 1990 following the successful tender application, ETA 118, lodged in August 1989. Title to the tenement was transferred to Pasminco Australia Limited on 19 August 1990. Pasminco Exploration, a division of Pasminco Australia Limited, are operators and managers of EL 37/89.

The licence area lies almost entirely within Unallocated Crown Land apart from a Highway Reserve which extends 100m either side of the Murchison Highway in the far north eastern part of the EL (see Figure 2).

4. REGIONAL GEOLOGY

The EL lies entirely within the highly prospective, Cambrian Mt Read Volcanics of Western Tasmania. These rocks host the Mt Lyell, Hercules, Rosebery, Que River and Hellyer ore bodies. They extend in a N-S trending arc, approx 10-20 km wide, from Elliot Bay in the South, to the Sheffield area in the North. They consist of numerous volcanic and sedimentary units, for which complex stratigraphic relationships have been established. (Brown, AV et al 1986)

400000E



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED: A.M.L.
DATE: JAN. 1991
DRAWN: G.M.B.
REF.:
REVISIONS:
DRAWING No.

E.L. 37/89 - BULGOBAC HILL
LOCATION MAP

SCALE 1:500 000 FIG. No. 1

006

400007

385 000 mE

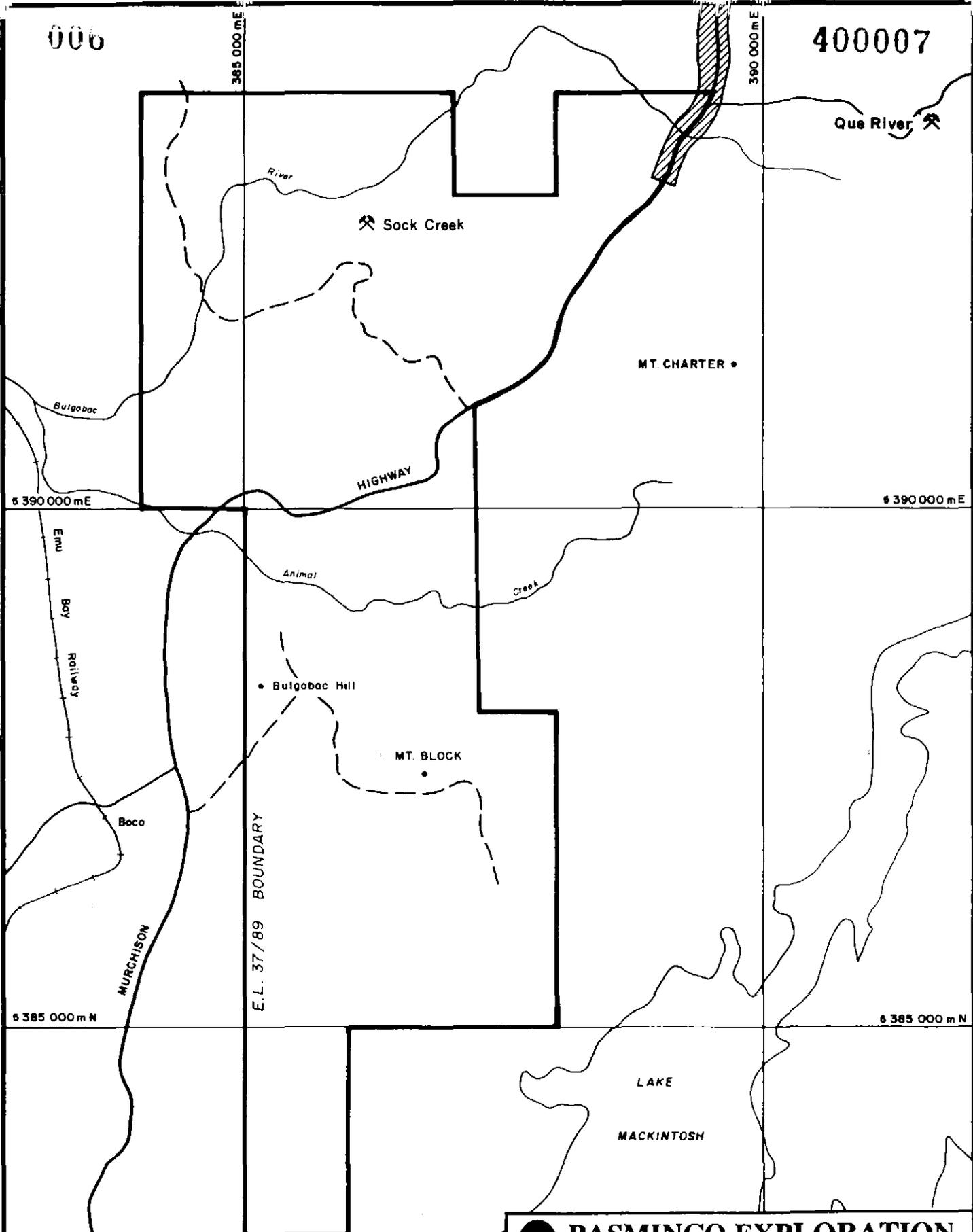
390 000 mE

390 000 mE

390 000 mE

385 000 m N

385 000 m N



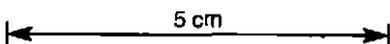
KEY



Murchison Highway State Reserve (100m on either side of road)



Leased on uncommitted Crown Land



PASMINCO EXPLORATION

A Division of Pasma Australia Limited

COMPILED: A.N.L.

DATE: JAN. 1991

DRAWN: G.M.B.

REF.:

REVISIONS:

DRAWING No.

SCALE 1:50,000

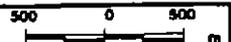


FIG. No.

2

E.L. 37/89 - BULGOBAC HILL

LAND TENURE

Three main sequences have been identified within EL 37/89 by the Mines Department Mt Read Volcanics Project team. The stratigraphic relationship between these sequences is illustrated in Figure 3. The distribution of these principal rock groups are as follows:

1. Central Sequence

These rocks outcrop in the southern part of the EL and are composed mainly of their northern boundary is thought to be faulted (Corbett & Komysam, 1989). Regional mapping has indicated that they correlate with rocks overlying the Rosebery ore body 20km to the south. (Corbett & McNeill 1986)

2. Dundas group Correlates – SW of Mt Charter Fault

These occur over the NW section of the EL. They consist predominantly of sediments, with an interval of felsic volcanics and minor basic-intermediate volcanics which are thought to correlate with the Que-Hellyer Sequence, which hosts the ore bodies after which it is named. (Corbett & Komysam 1989)

3. Dundas Group Correlates – NE of Mt Charter Fault

These cover the extreme NE of the EL. They consist of a thick sequence of shallow – dipping sediments and volcanics. In many respects they are similar to the rocks SW of the Mt Charter Fault, however there is a far greater thickness of Que-Hellyer Sequence correlates. These are composed of a pile of submarine mafic-intermediate volcanics.

5. PREVIOUS WORK

The area covered by EL 37/89 was previously held as part of the much larger EL 5/63 which was granted to Mt Costigan Mines Limited in early 1963. The licence was transferred to Comstaff Pty Limited in 1964. Then in 1977 Comstaff formed a Joint Venture with Pruessag Australia Pty Limited. A further Joint Venture was formed with BHP Minerals Limited in 1985. BHP were managers of the exploration program up until June 1989 when the licence was surrendered.

During the life of EL 5/63, this initially large tenement was progressively reduced in area and from 1985 existed in six separate blocks. The current area of EL 37/89 was designated part 3 of EL 5/63.

- QUATERNARY**
- Q Glacial deposits, alluvium, etc.
- TERTIARY**
- Tb Basalt
- DEVONIAN**
- Dol Dolerite
 - Dg Granite
- ORDOVICIAN**
- Ogl GORDON GROUP limestone
- EARLY ORDOVICIAN - LATE CAMBRIAN**
- COu Upper sandstone sequence including Pioneer Beds (COu)
 - CO Undifferentiated conglomerate and sandstone (CO)
 - COm Newton Creek Sandstone (COm) - interbedded sandstone siltstone and conglomerate with marine fossils

MT. READ VOLCANICS

**NORTH AND WEST OF HENTY FAULT
DUNDAS GROUP AND CORRELATES**

- Ca Quartz-feldspar porphyry, mostly intrusive
- Cd Mostly sedimentary rocks - greywacke, siltstone, conglomerate
- Cd Interbedded tuffs and sedimentary rocks
- Cd Quartzwacke-slate-siltstone units, e.g. Silt Quartzite
- Cd Mostly felsic volcanics - mainly tuffs
- Cd Mixed felsic and mafic volcanics and epiclastic breccias, Que-Hellyer area
- Cd Basaltic to andesitic volcanics

CENTRAL VOLCANIC COMPLEX

- Ccv Mainly feldspar-phyric volcanics - dacite, rhyolite, minor andesite (Ccv)
- Cp Felsic porphyry, mainly intrusive
- Ccp Mainly pyroclastic rocks
- Ccs Sedimentary rocks, mainly shale and sandstone
- Cca Andesitic volcanics

**SOUTH AND EAST OF HENTY FAULT
TYNDALL GROUP AND CORRELATES**

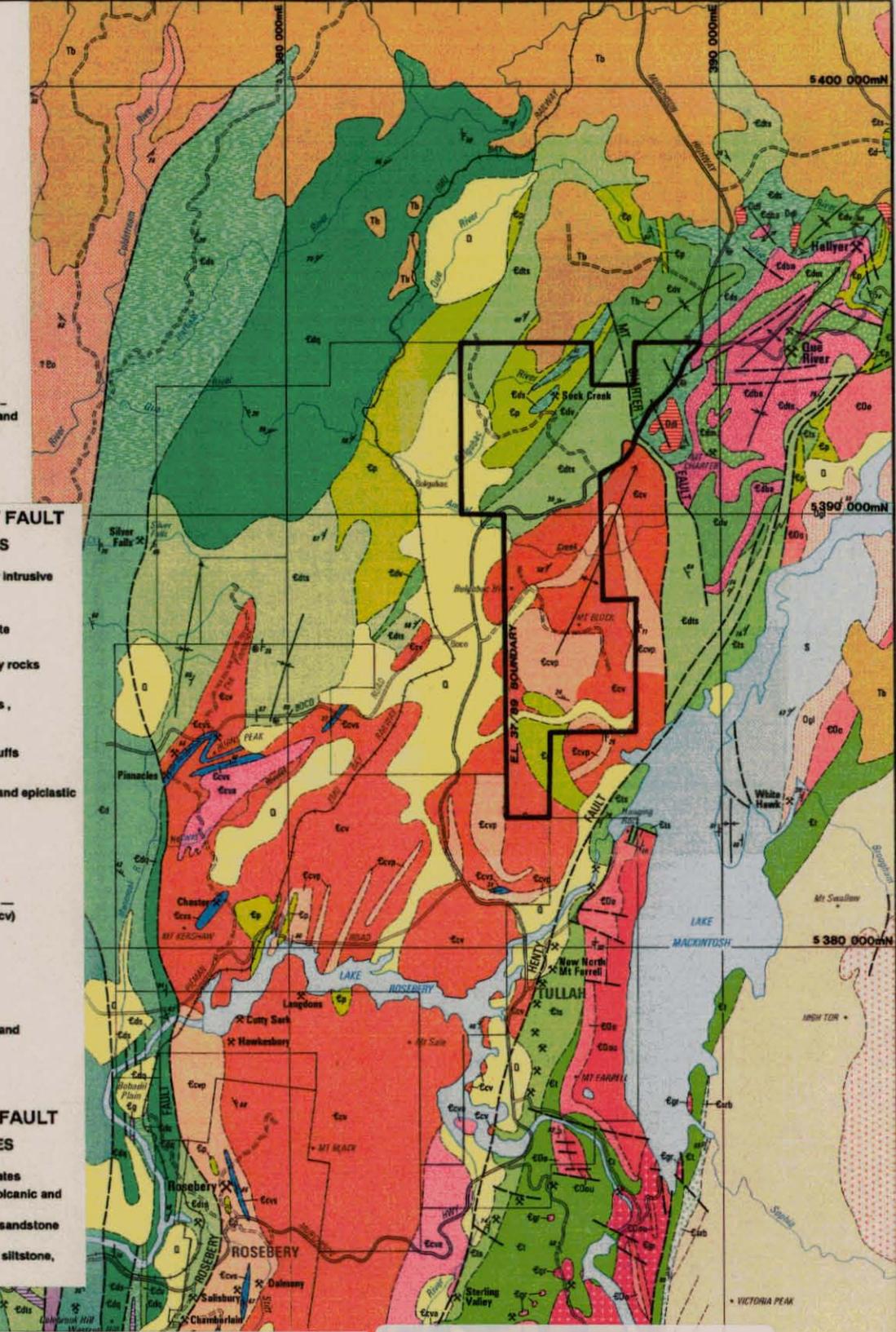
- Cts Mainly sed. rocks, incl Farrell Slates
- Ct Mainly quartz-feldspar-phyric volcanic and volcanoclastic rocks (Ct)
- Ct Mainly volcanoclastic cong. and sandstone
- Cab Sticht Range Beds - sandstone, siltstone, siliciclastic conglomerate

UNASSIGNED CAMBRIAN UNITS

- Cv Volcano-sedimentary sequence
- Cs Sedimentary sequence
- Cba Basaltic-andesitic volcanics

CAMBRIAN INTRUSIVE ROCKS

- Cgr Granite
- Cp Felsic porphyry
- Cg Gabbro
- Cum Ultramafic rocks & serpentinite



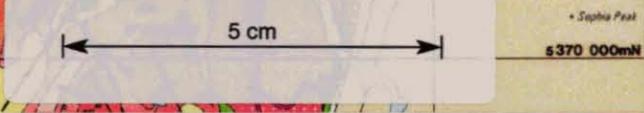
CRIMSON CREEK FORMATION

- Ccc Mafic greywacke, mudstone, tholeiitic basalt

SUCCESS CREEK GROUP

- Csc Quartz sandstone, mudstone, siltstone with minor conglomerate and carbonate
- Cs Quartzite-slate sequences - correlates of Oonah Formation
- Csm Metamorphosed sequences of Tyennan Region. Major lithological boundary trends shown

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 & A.W. McNeill B Sc (Hon), 1988.



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED :
DATE : JAN. 1990
DRAWN : G.M.B.
REF:
REVISIONS :
DRAWING No. SCALE 0 2 4 Kilometres FIG. No. 3

E.L. 37/89 - BULGOBAC HILL

REGIONAL GEOLOGY
(FROM MAP 6
MT. READ VOLCANICS PROJECT)

Stream sediment anomalies
B horizon soils. Cu, Pb, Zn.
anomalous zone trend
NNE. - SSW. - minor
sphalerite and galena in
slates in costeans
2nd. metric grid.
14 diamond drill holes.
Vein controlled discont.
mineralisation.
BHP re-logged core
verified Au assays.

Que River - Hellyer volcanics
at >600m. north of HP3.

DAA & SOCK CREEK
METRIC GRIDS

1975 COMSTAFF INPUT
ANOMALY

Soil sampling
Crone EM. ground
magnetics.
Costeans/rock
chip samples for
Cu, Pb, Zn.
Slates anomalous
in base metals.

UTEM anomaly.
Drilling HPI-4, HPI-
Que - Hellyer sequence
250m. at >0.2% Zn,
HP4-125m. Zn. EM.
sounding. All DHEM
anomalies attributed
to shale.

5 390 000 m.N.

UTEM anomaly.
Drilling SCS1-3
SCS4 - 72m. sp. vng.
UTEM thought to be
fault.

Due to fault &
lithology contact.

OTHUNDERBOX CREEK

Stream sediments
anomalies not
reproduced.

UTEM
ANOMALIES E & D

DAC GRID

Covered prospective
stratigraphy. A B C
horizon soil samples
- Cu, Pb, Zn, Ag, Mn,
Fe & Ba.
3 lines of ground
magnetics.

E.L. 5/63

TULLABARDINE GORGE

UTEM anomaly.
9 shallow holes (N. Pattock)
no mineralisation.
Follow up SIROTEM
indicated faults & contacts
were the cause.



5 cm

Regional Cyanide Au. drainage.
UTEM survey - Most of E.L.

----- Comstaff Grids
BHP 200m.
Mount Block Grid (1987)

0 1 2 3 4 km.
SCALE

<p>PASMINCO EXPLORATION A Division of Pasminco Australia Limited</p>	
<p>COMPILED: A.N.L. DATE: 24-1-'91 DRAWN: N.W.D.S. REF.: A4-2934</p>	<p>SUMMARY OF PREVIOUS WORK BY COMSTAFF and BHP. (1963 - 1989)</p>
<p>REVISIONS:</p>	
<p>DRAWING No.</p>	<p>SCALE N.T.S. </p>
	<p>FIG. No. 4</p>

Exploration undertaken by Comstaff and their various Joint Venture partners within the Bulgobac Hill licence area comprised the following activities:

Stream sediment sampling

Establishment of prospect areas, each covered by a separate grid;

Soil sampling, 1 P & EM surveys of some grid areas;

Diamond drilling at Sock Creek, following up soil & stream anomalies;

UTEM coverage of the entire EL;

Diamond drilling of UTEM anomalies at Sock Creek South, High Point and Tullabardine Gorge;

A detailed review of the previous exploration is given in Wilde and Kerr (1989).

6. EXPLORATION PHILOSOPHY

The principal target of the current Pasminco Exploration program is for polymetallic base metal massive sulphides such as the world class deposits that occur at Hellyer and Rosebery. Lithogeologies within the licence area appear to correlate with those found overlying both the Rosebery or Hellyer ore bodies. The generally shallow dip of the stratigraphy here suggests that either the Rosebery or Hellyer stratigraphy may be present at depth. Previous drilling within the current licence area has intersected areas of hydrothermal alteration and weak mineralisation (Wilde & Kerr, 1989). It is possible that this may be related to more significant mineralisation within the area.

7. WORK COMPLETED 1990-91

The following work programme has been completed by Pasminco during the period March 1990-January 1991.

- Photogrammetry to produce accurate base maps.
- A high resolution aeromagnetic survey and preliminary interpretation.
- Detailed logging and limited geochemical analysis of Sock Creek South drill core.
- Magnetic susceptibility and density readings on BHP drill core from the High Point, Sock Creek and Tullabardine Gorge Prospects.
- A detailed mapping programme and geological interpretation in the High Point area.

7.1 Photogrammetry

Air photography at 1:22 000 & 1:10 000 scale was collected over the entire licence area. Accurate base maps at 1:5 000 scale were then produced. The data is stored in digital form, on tape, to enable easy enlargement or reduction of scale to be produced. This work was

undertaken by the HEC Enterprise.

9

7.2 Aeromagnetic Survey

This high resolution survey covered the entire licence area at 100m line spacing. A report by Leaman Geophysics contains all the details of the survey including aims, specifications and preliminary interpretation. (see Appendix I).

The principal conclusions of Leaman's interpretation are as follows:

The Sock Creek mineralisation lies close to a major fracture intersection. A number of anomalies which may relate to alteration occur in the area. The main intersection is approximately 200m away from the vein-style mineralisation which was intersected in the Comstaff drill holes at Sock Creek.

The Central Sequence Volcanics, which occur in the southern part of the EL are probably stacked thrust slices overlying unrelated sequences. The volcanics appear to be weakly altered.

In contrast the volcanics forming the southern portion of Mt Black appear to be "in situ" and related to a corridor of alteration above a fundamental suture.

This interpretation is regarded as preliminary. A more detailed interpretation will follow when the results of magnetic susceptibility measurements and detailed geological mapping can be incorporated into the models.

7.3 Density & Magnetic Susceptibility Readings on BHP Core

Measurements of specific gravity and magnetic susceptibility were collected from drill core stored at the Department of Energy & Resources in Hobart. The results are in Appendix II.

This data will be used to help refine a more detailed magnetic interpretation and a regional gravity survey.

7.4 Sock Creek South Study

A detailed examination of the core from three holes drilled by BHP at Sock Creek South was undertaken. The location of this prospect is shown in Figure 4. A report by SR Hunns, a Pasminco Mining contract geologist, in submitted as Appendix III. This report incorporates the results of volcanics consultant R Allen, who also examined the prospect for BHP (Allen, 1989).

Detailed logging of the core has established a stratigraphic correlation between the three drill holes. The stratigraphy consists of dacite breccias and hyaloclastites overlain by bedded, black mudstone, volcanogenic siltstones and sandstones which in turn are overlain by submarine pillow basalts and hyaloclastites. Above this sequence graded massive units of quartz-feldspar crystal sandstones occur which have been intruded by sills of quartz-feldspar porphyry.

The sequence at Sock Creek South has been interpreted to result from dacite cryptodomes which intruded a sequence of wet, semi consolidated sediments. These were subsequently overlain by submarine basalts. Observed mineralisation appears to be primarily vein type and comprises mostly sphalerite and pyrite. It is not related to significant alteration, although Allen (1989) notes some similarity between these veins and those which are marginal to the Hercules ore body.

A Mines Department drill hole (MCH 1), which penetrated the Que-Hellyer Sequence was also logged as part of this study to enable a comparison of the Que-Hellyer rocks with those at Sock Creek South. Similarities between the two sequences were established. The most significant feature is the transition from pillow basalts to rhyolitic, quartz-feldspar sandstones (Allen 1989).

Limited whole rock geochemical analyses of the core were also undertaken to try and establish whether the volcanic units have any chemical similarities to the Que-Hellyer Sequence. In particular titanium:zirconium ratios and rare earth element concentrations were compared. The dacites from Sock Creek South appear to be chemically similar to those from the Que-Hellyer Sequence. The basalts however, are different even though the shape of rare earth element plots are similar. Hunns attributes this feature to a common genesis for the two basalt types.

7.5 High Point Mapping

A programme of geological mapping and drill core examination was undertaken in the High Point area (the prospect location is shown in Figure 4). This work was designed to follow up intersections of highly altered and weakly mineralised andesite and basalt, thought to be equivalents of the Que-Hellyer Sequence, in drill holes HP 1&4. These were part of a programme of four holes drilled by BHP in 1988 & 1989. They are reported in BHP (1988) and Wilde & Kerr (1989).

3700E.

FACING N.E.

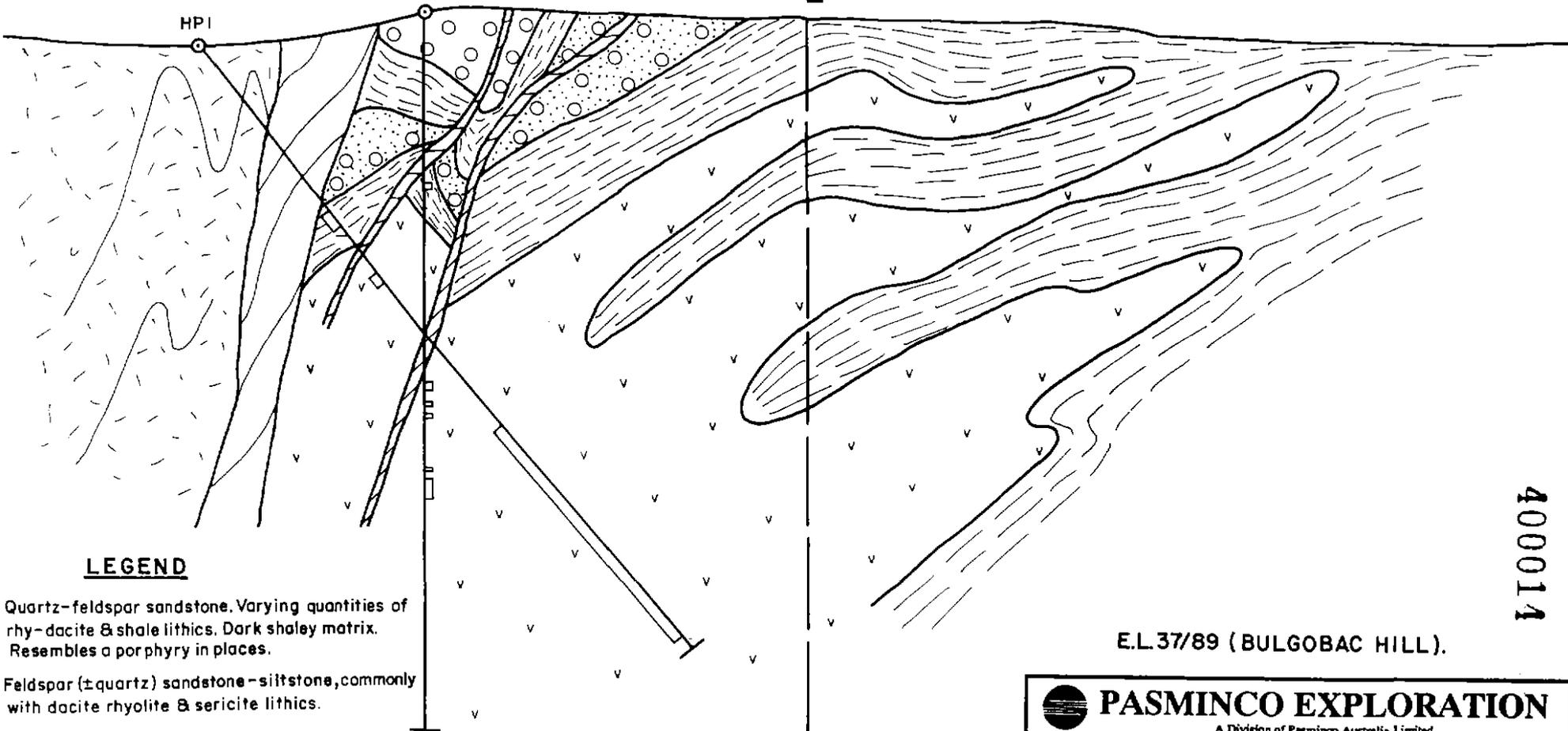
013

RL.675m.

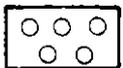
HP1

HP4

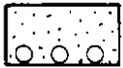
E.L.
BOUNDARY



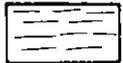
LEGEND



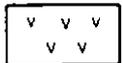
Quartz-feldspar sandstone. Varying quantities of rhy-dacite & shale lithics. Dark shaley matrix. Resembles a porphyry in places.



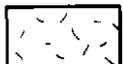
Feldspar (±quartz) sandstone-siltstone, commonly with dacite rhyolite & sericite lithics.



Black Shale.



Mafic-intermediate hyaloclastite lavas & intrusives with minor epiclastics.



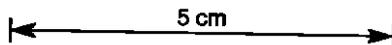
Quartz-mica sandstone, siltstone & minor shale.



Shear Zone.



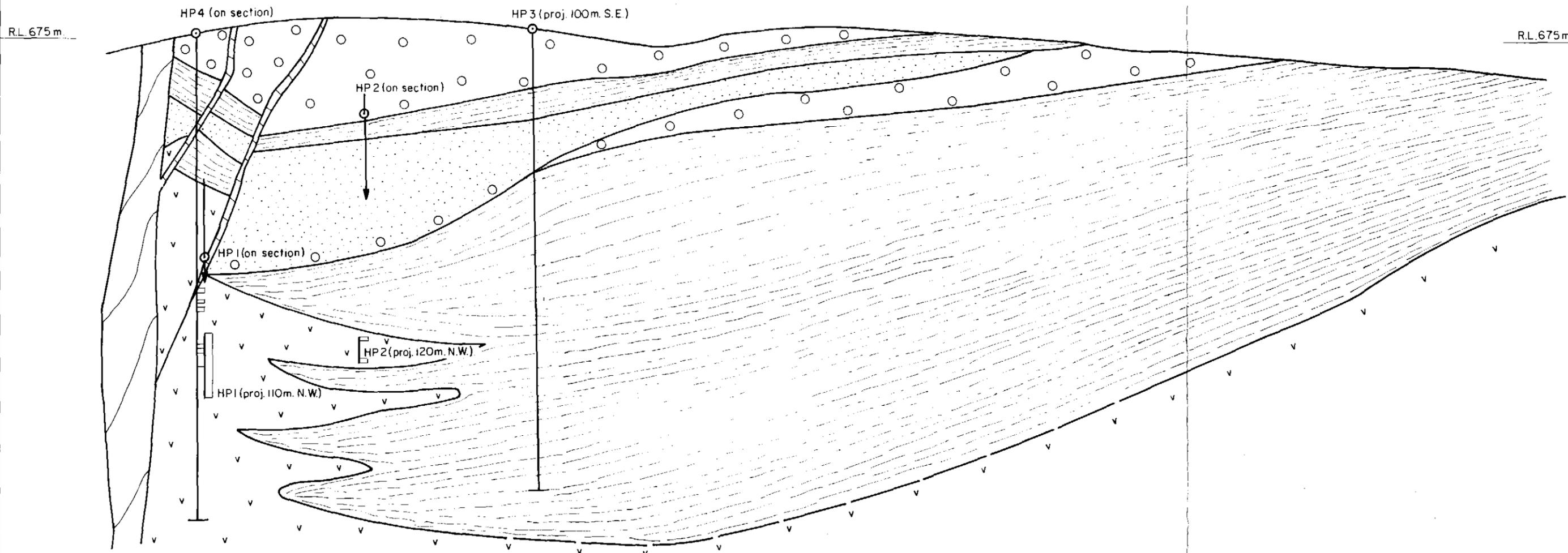
Drill hole intersection (> 0.2% Zn).



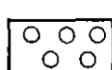
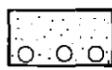
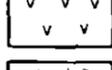
400014

E.L.37/89 (BULGOBAC HILL).

PASMINCO EXPLORATION <small>A Division of Pasminco Australia Limited</small>	
COMPILED: A.N.L.	HIGH POINT PROSPECT SECTION THROUGH HP1 & 4 (7800N) INTERPRETED GEOLOGY
DATE: 24-1-'91	
DRAWN: N.W.D.S.	
REF.:	
REVISIONS:	
DRAWING No.	SCALE 1: 5000
	0 50 100 m
	FIG. No. 7

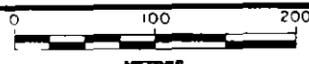


LEGEND

-  Quartz-feldspar sandstone. Varying quantities of rhy-dacite & shale lithics. Dark shaley matrix. Resembles a porphyry in places.
-  Feldspar (± quartz) sandstone-siltstone, commonly with dacite rhyolite & sericite lithics.
-  Black Shale.
-  Mafic-intermediate hyaloclastite lavas & intrusives with minor epiclastics.
-  Quartz-mica sandstone, siltstone & minor shale.
-  Shear Zone.
-  Drill hole intersection (>0.2% Zn).

5 cm

E.L. 37/89 (BULGOBAC HILL)

 PASMINCO EXPLORATION <small>A Division of Pasmenco Australia Limited</small>	
COMPILED: ANL. DATE: 25-1-91 DRAWN: N.W.D.S. REF: REVISIONS:	HIGH POINT PROSPECT SECTION THROUGH HP4 (3800E) INTERPRETED GEOLOGY
DRAWING No.	SCALE - 1 5000 
	FIG. No. 8

The prospective rocks lie at considerable depths (>300m) below the surface at High Point. Mapping was therefore aimed at identifying structures in the overlying sediments, which may penetrate the host rock basalts and andesites and either alter their distribution or act as conduits for mineralisation. The results of geological interpretation, arising from mapping and core examination are shown on two 1:5 000 scale maps (Figures 5 & 6) and the accompanying 1:5 000 scale sections (Figures 7 & 8).

A consistent stratigraphy within the sediments that overlie the basalts and andesites could be discerned in drill core. However, the stratigraphy beneath the Que River Shale, which is thought to be the lowest of the sedimentary units, is less clear. In holes HP 1 & 4 the thickness of andesites and basalts is greater than in holes HP 2 & 3 whereas the thickness of the Que River Shales is diminished. Faulting also appears to be common with much of the core sheared and broken. The two cross sections show the interpretation that these structures are parallel to the stratigraphy. A syncline is also present adjacent to the fault and at least in places, the axial plane appears to be sheared.

Although most of the evidence for faulting appears to come from late, probably Devonian movement in the Mt Charter Fault System there is some evidence that it was active during the Cambrian. Although some units can be correlated across the fault others, particularly the Que-Hellyer andesites and basalts are present in much smaller thicknesses or are absent altogether. This suggests that the fault may have formed a graben margin during deposition of these units.

The observed change in thickness of the andesite and basalts between holes HP 1 and 4 and HP 2 and 3 is probably the result of Cambrian tectonics rather than a simple Devonian offset. The primary evidence for this is that in the tops of HP 2, 3 and 4, the overlying sedimentary units correlate well and are not offset between holes. It is possible that Cambrian movement on structures close to the Mt Charter Fault controlled the location of the volcanics. It is also possible that they acted as a conduit for the volcanics to reach the basin floor and intrude into overlying wet sediments. The peperitic and intrusive contacts between the shale and volcanics in HP 2 and 4 favour the latter interpretation. Whatever the interpretation it appears from the evidence available, that the volcanic units which host the weak mineralisation at High Point are thickest adjacent to the Mt Charter Fault.

The intersections of alteration and weak mineralisation are illustrated on the sections (Figures 7 & 8). The mineralisation is predominantly vein-type sphalerite, although some is associated with pervasive silification. Most of the mineralisation is confined to the volcanic rocks, despite the deformed and sometimes veined, nature of the shales. The veins are typically quartz-carbonate and are often deformed. Other veins appear to be later and to cross-cut deformed veins and amygdaloids. Both sets of veins are mineralised. Alteration is closely associated with veining and gives the rock a characteristic khaki colour. Fuchsite, carbonate, chlorite and quartz are the main alteration minerals.

Lithogeochemical work is currently underway to try to establish whether the alteration is more likely to be above, alongside or below a massive sulphide deposit, or whether it is vein type only, related to the adjacent Mt Charter Fault. The latter case would seem to be unlikely as the alteration is essentially confined to the volcanic rocks. Also the zinc number calculations, reported by Hunns (Appendix III) are more akin to VMS style, Cambrian mineralisation.

8. CONCLUSION

The aeromagnetic survey has highlighted several areas of probable prospectivity within the licence area, in particular the Sock Creek area and the Southern Slopes of Mt Block.

In addition the High Point area is considered to be prospective because mineralised and altered Que-Hellyer volcanics have been intersected there. The style of mineralisation in this area is unclear at present.

A study in the Sock Creek South area has confirmed that mineralisation is confined to veins and not related to significant alteration. It has however, identified similarities between the stratigraphy and the Que-Hellyer Sequence.

9. RECOMMENDATIONS

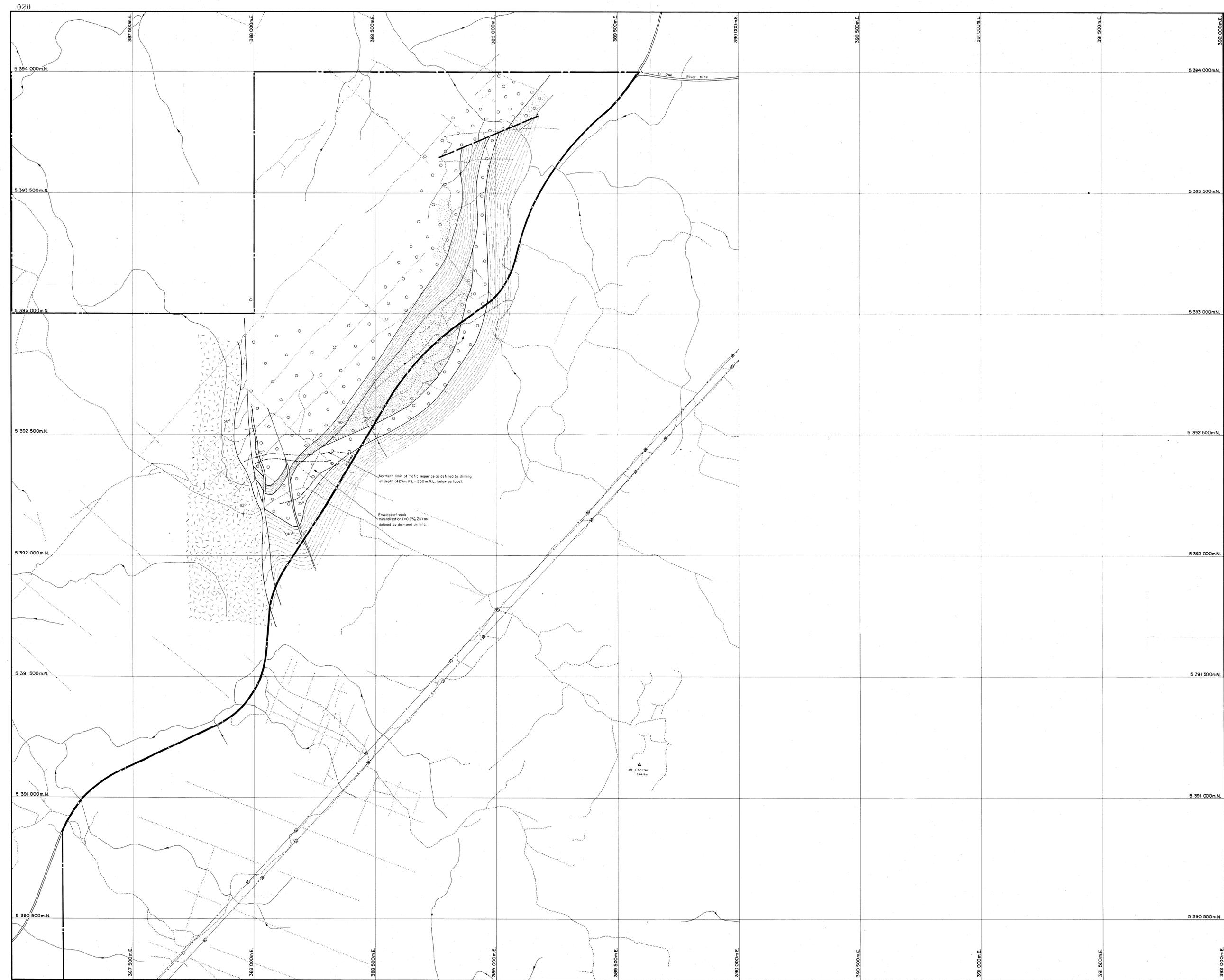
The following program is recommended for 1991-92 to further investigate those areas highlighted during the current work:

1. Identification of the mineralisation style at High Point, if possible, to enable a drill hole to be targeted there;

2. A regional gravity survey to be undertaken to enhance the aeromagnetic interpretation, especially in areas thought to be altered.
3. Refinement of the aeromagnetic interpretation using magnetic susceptibility data.
4. Detailed mapping and lithogeochemical surveys in the areas highlighted by the aeromagnetic survey ie. Sock Creek and Southern Mt Block. Some of this work is to be undertaken by an honours student from the University of Tasmania.
5. Diamond drilling of targets identified by the above programme.

REFERENCES

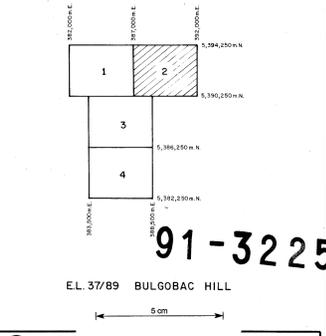
- ALLEN, R (1989)
BHP(1988) Sock Creek South Drill Core, a memo to BHP. Exploration Licence 5/63. Comstaff JV, NW Tasmania Report on Exploration in Area 3 for the year ended 30th June 1988.
- CORBETT, KD & KOMYSHAM, P (1989) Geology of the Hellyer - Mt Charter Area. Geology Report Mt Read Volcanics Project Tasmania.
- CORBETT, KD & McNEIL, A (1986) Map 2. Geology of Rosebery - Mt Block Area. Mt Read Volcanics Project, Tasmania.
- CORBETT, KD & McNEIL, A (1988) Map 6. Geological Compilation maps of the Read volcanics & associated rock, Hellyer to South Darwin Peak.
- HUNNS, SR (1989) Tender Document for ETA 118 Pasminco Mining - Rosebery August 1989.
- KOMYSHAM, P (1986) Map 1 geology of the Mt Charter - Hellyer Area. Mt Read Volcanics Project Tasmania.
- WILDE, AR & KERR, TL (1989) Exploration Licence 5/63 Comstaff JV, NW Tasmania Final Report, May 1989.



Northern limit of mafic sequence as defined by drilling of depth (425m. RL = 250m. RL. below surface).

Envelope of weak mineralization (Pb, Zn) as defined by diamond drilling.

- LEGEND**
- Quartz-feldspar sandstone. Varying quantities of rhy-dolite & shale lithics. Dark shaly matrix. Resembles a porphyry in places.
 - Feldspar (quartz) sandstone-siltstone, commonly with dolite rhyolite & vesicite lithics.
 - Black Shale.
 - Mafic-intermediate hydrothermal lavas & intrusives with minor epiclastics.
 - Quartz-mica sandstone, siltstone & minor shale.
 - Shear Zone.
 - H.E.C. Powerline.
 - Highways.
 - E.B.R. Railway.
 - Vehicle Tracks.
 - Foot Tracks.
 - Rivers/Creeks.
 - Swamps.
 - Lakes.
 - E.L. Boundary.



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED: A.N.L.
DATE: 25-11-91
DRAWN: N.W.D.S.
REF:
REVISIONS:

HIGH POINT PROSPECT
INTERPRETED GEOLOGY
400021

DRAWING No. SCALE: 1:5000 METRES FIG. No. 6

APPENDIX I
AEROMAGNETIC SURVEY
EL 37/89 BULGOBAC HILL
ACQUISITION REPORT
(INCLUDING PRELIMINARY INTERPRETATION)
FOR
PASMINCO MINING
BY
DR D E LEAMAN
AUGUST 1990

022

LEAMAN GEOPHYSICS

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

Registered Office:
21 ZOMAY, AVENUE, DYNMYRNE, TAS. 7005
All Correspondence to:
G.P.O. BOX 320 D, HOBART, TAS. 7001.
TELEPHONE: (002) 24 0319
FACSIMILE: (002) 23 3194

400023

AEROMAGNETIC SURVEY
EL 37/89 BULGOBAC HILL

ACQUISITION REPORT
(INCLUDING PRELIMINARY INTERPRETATION)
for
PASMINCO MINING

by
Dr. D.E. Leaman

August 1990

BULGOMAG

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 Komysan (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 one 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 allocthonous 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.

REFERENCES

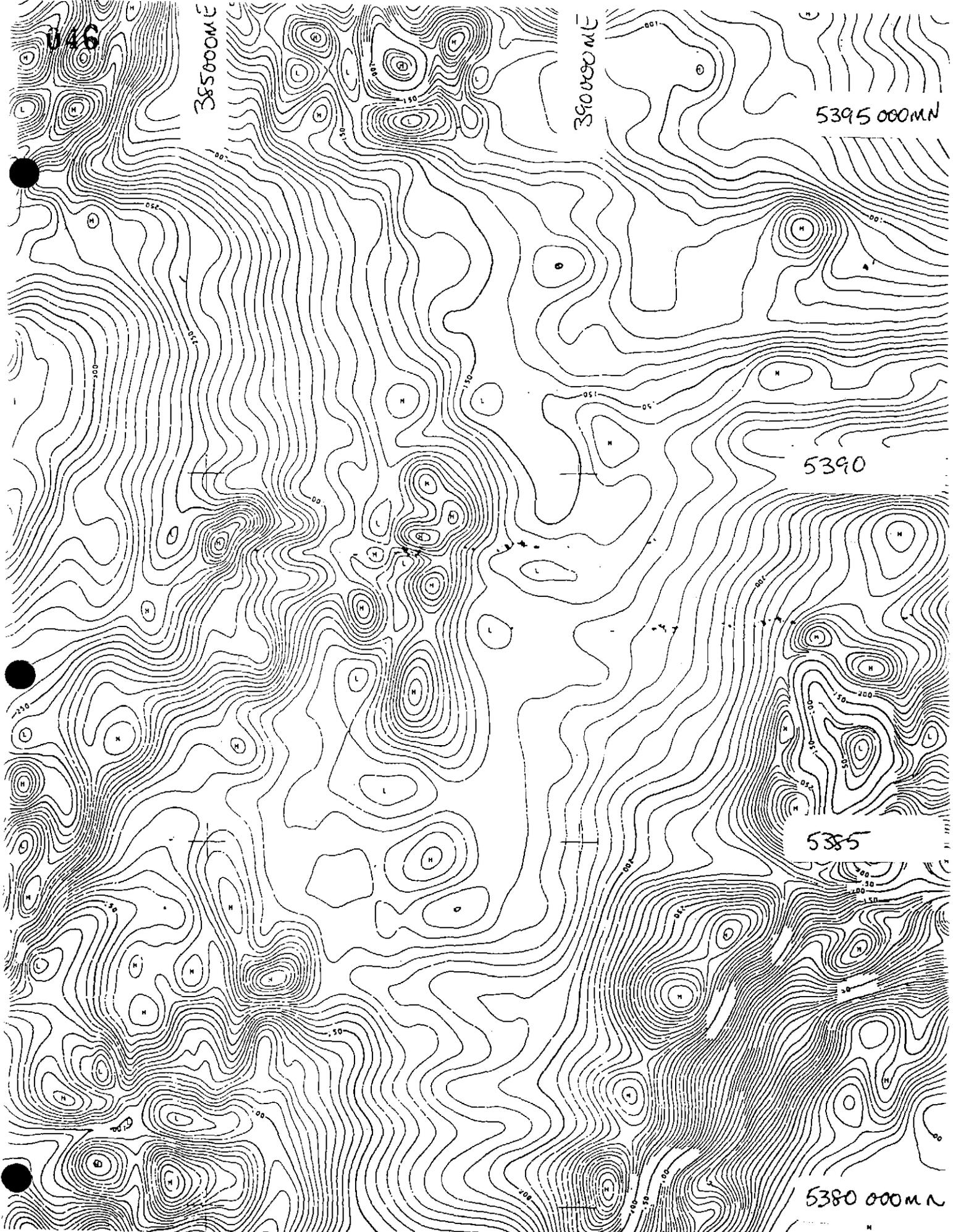
- Corbett, K.D., Richardson, R.G., Collins, P.L.F., Green, G.R., and Brown, A.V., 1982. The 1981 West Coast aeromagnetic survey: summary of information and results. Unpub. Rep. Dep. Mines Tasm. 1982/39.
- Corbett, K.D. & McNeill, A.W., 1986. Geology of the Rosebery Mt Block area. Map 2 Mt Read Project 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.
- Leaman, D.E., 1986b. Gravity interpretation west and north west Tasmania. Mt Read Volcanics Project Rep. Dep. Mines Tasm.
- Leaman, D.E., 1987. Mineralisation signature study: geophysics. Gravity and magnetics. Mt Read Volcanics Project Rep. Dep. Mines Tasm.
- Leaman, D.E., 1988. Regional evaluation, west and north west Tasmania. Precambrian and lower Palaeozoic structural relationships. Mt Read Volcanics Project Rep. Dep. Mines Tasm.

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



EXTRACT OF 1981 MINES DEPARTMENT REGIONAL SURVEY IN BULGOBAC HILL AREA

FIGURE 2

400047

047

5393 000 MN

400048



68E

5392

5391

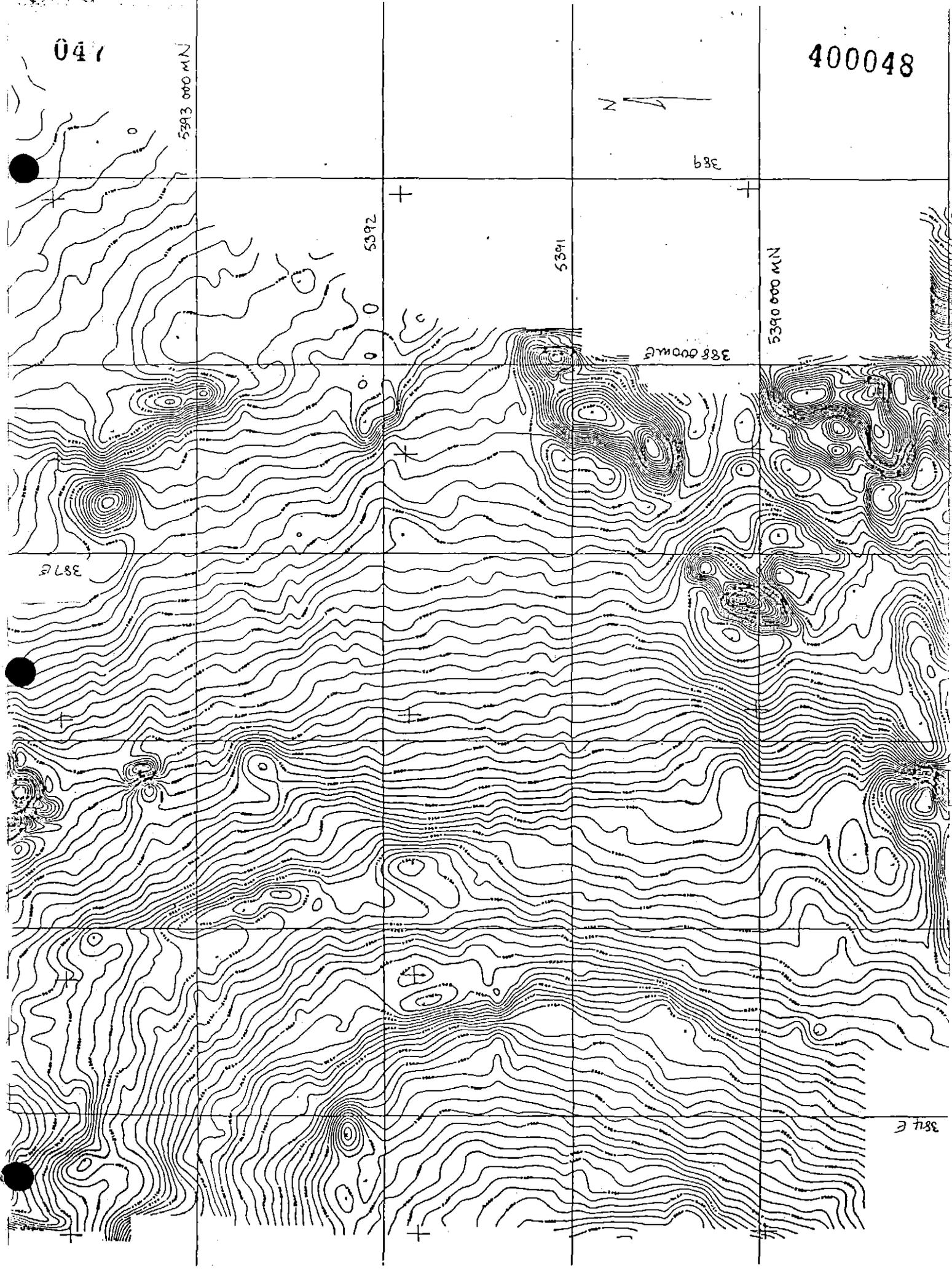
NW 000 0555

388 000 WE

387E

387E

CONTOURS OF RESIDUAL MAGNETIC FIELD EL 37/89 NORTH (contour interval 2 nT) See also map 3 FIGURE 3A



538

536

5389000 N

5388 N

384000 ME

85

8

86

5385

5384000 MN

387000 ME

388

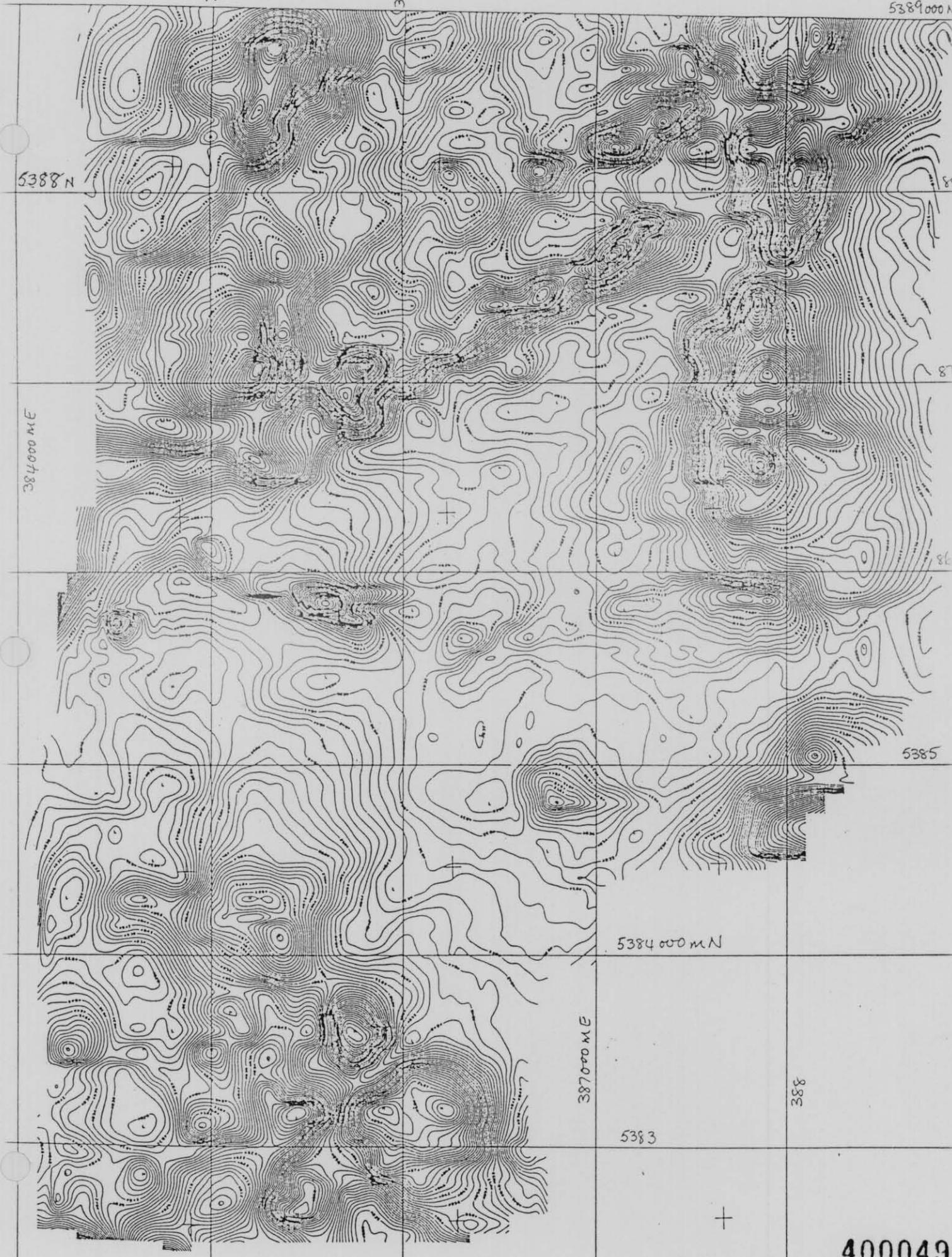
5383

400049

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

EL 37/89 SOUTH

FIGURE 3B





CONTOURS OF MAGNETIC FIELD: EL 37/54 NORTH
 Basemap after Komysan (1963) and Carbutt & McNeill

400050

050

HIGHWAY

358 N

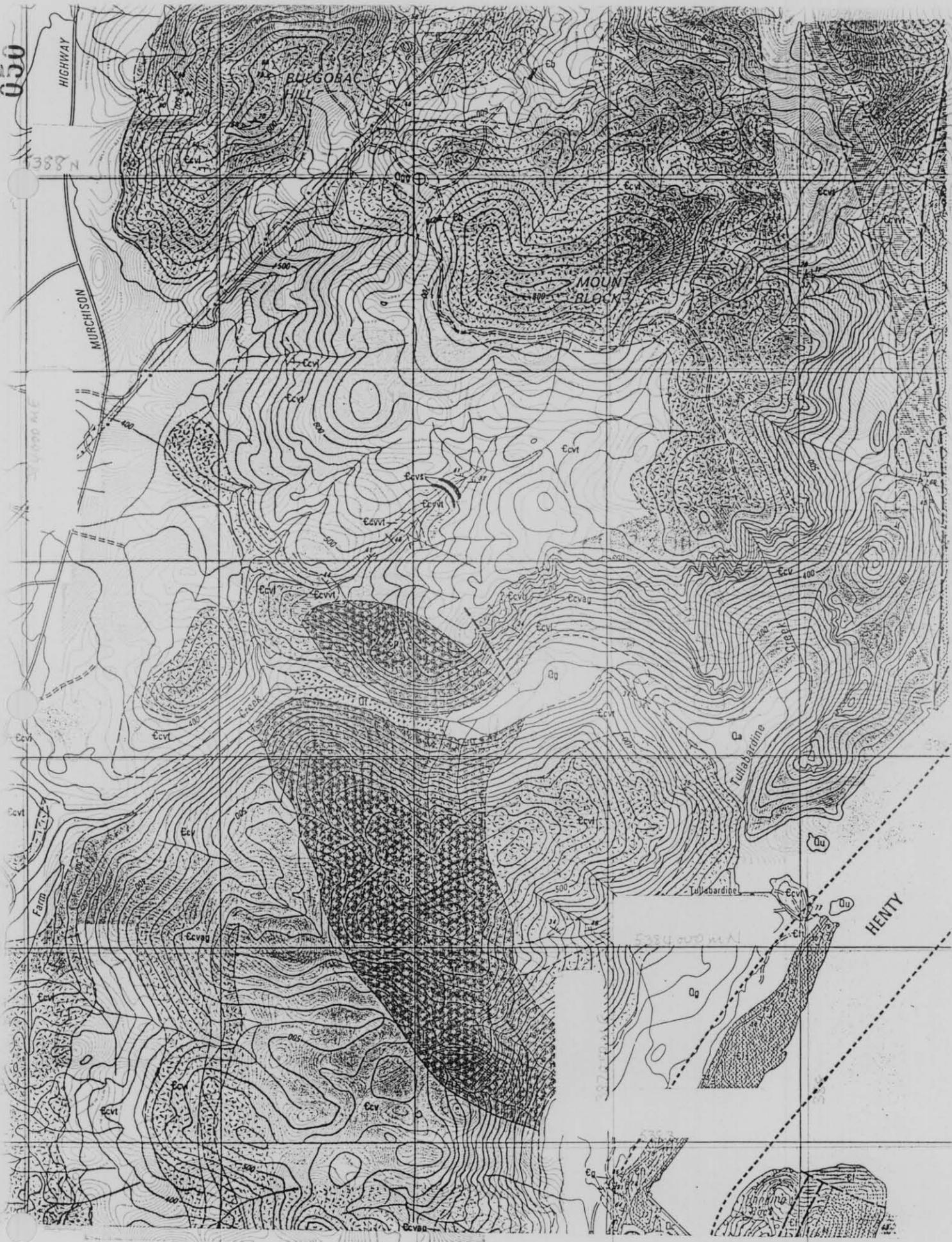
MURCHISON

BUGOBAC

MOUNT
BLOCK

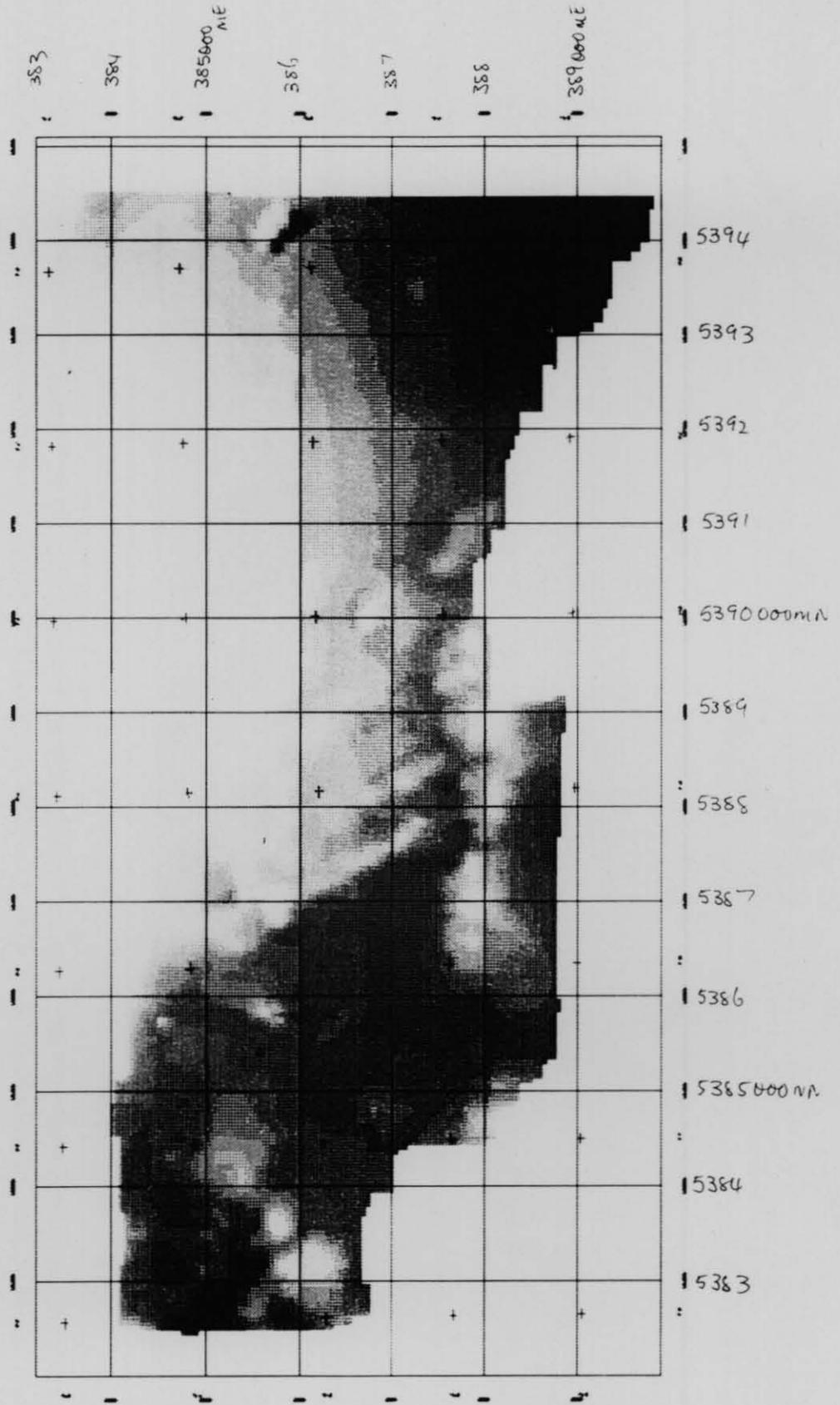
Farm

HENTY



CONTOURS OF MAGNETIC FIELD EL 37789 SOUTH
 (Basemap after Corbett & McNeill, 1985)

400051
 FIGURE 1B

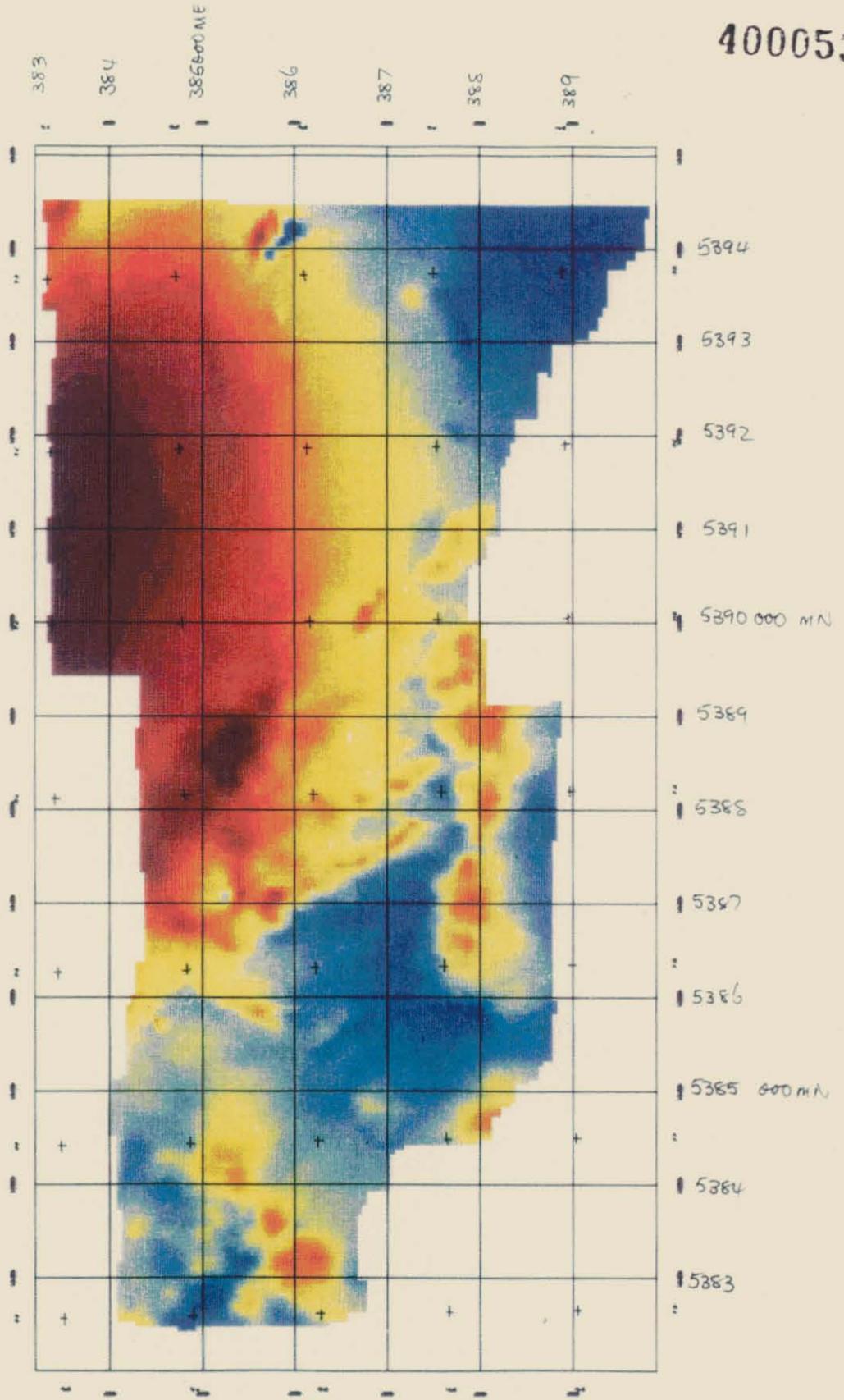


TMI - BUT GOBAC

400052

Processed with Research

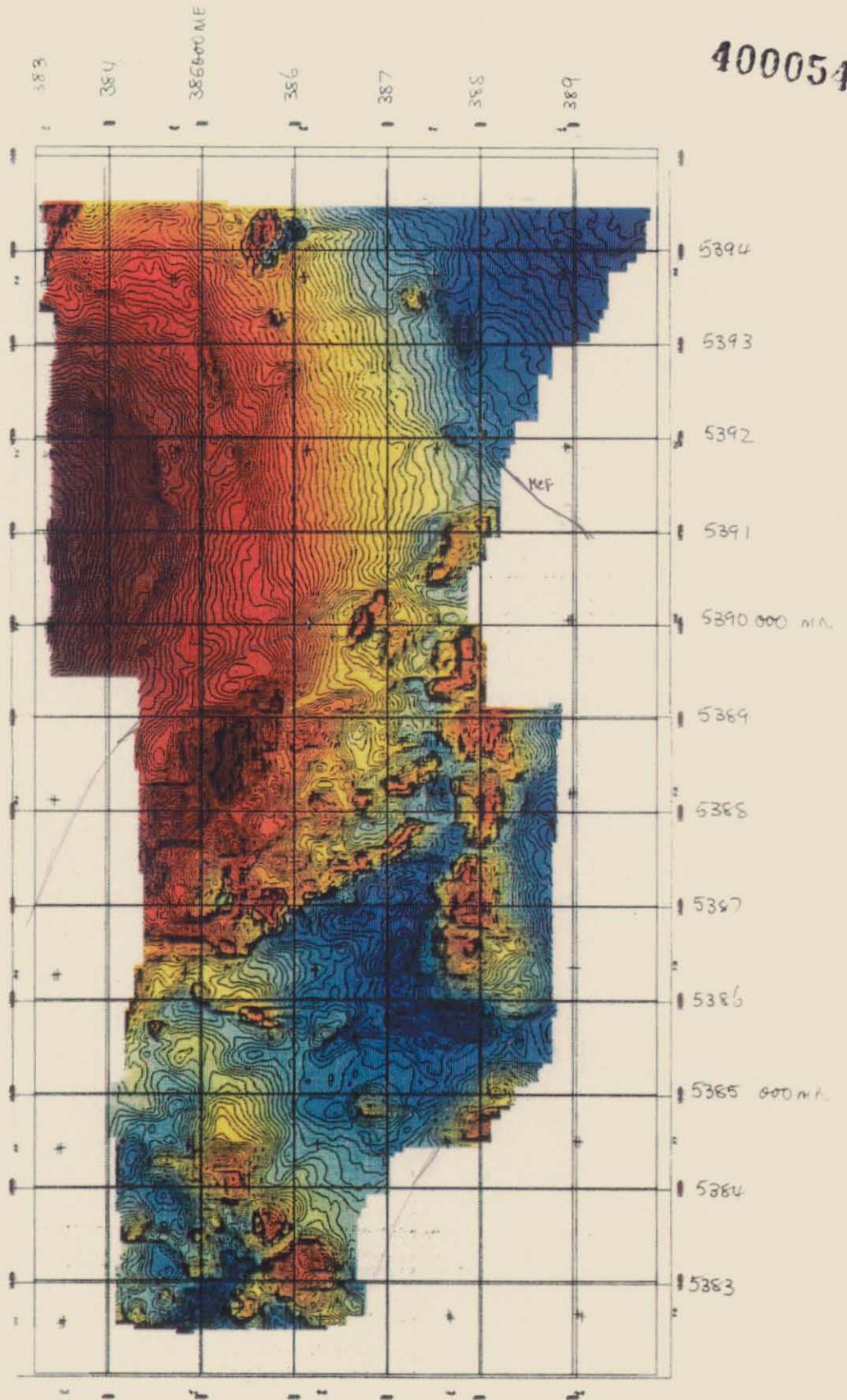
FIGURE 5A



TMI - BULGOBAC

Processed: PIH Research

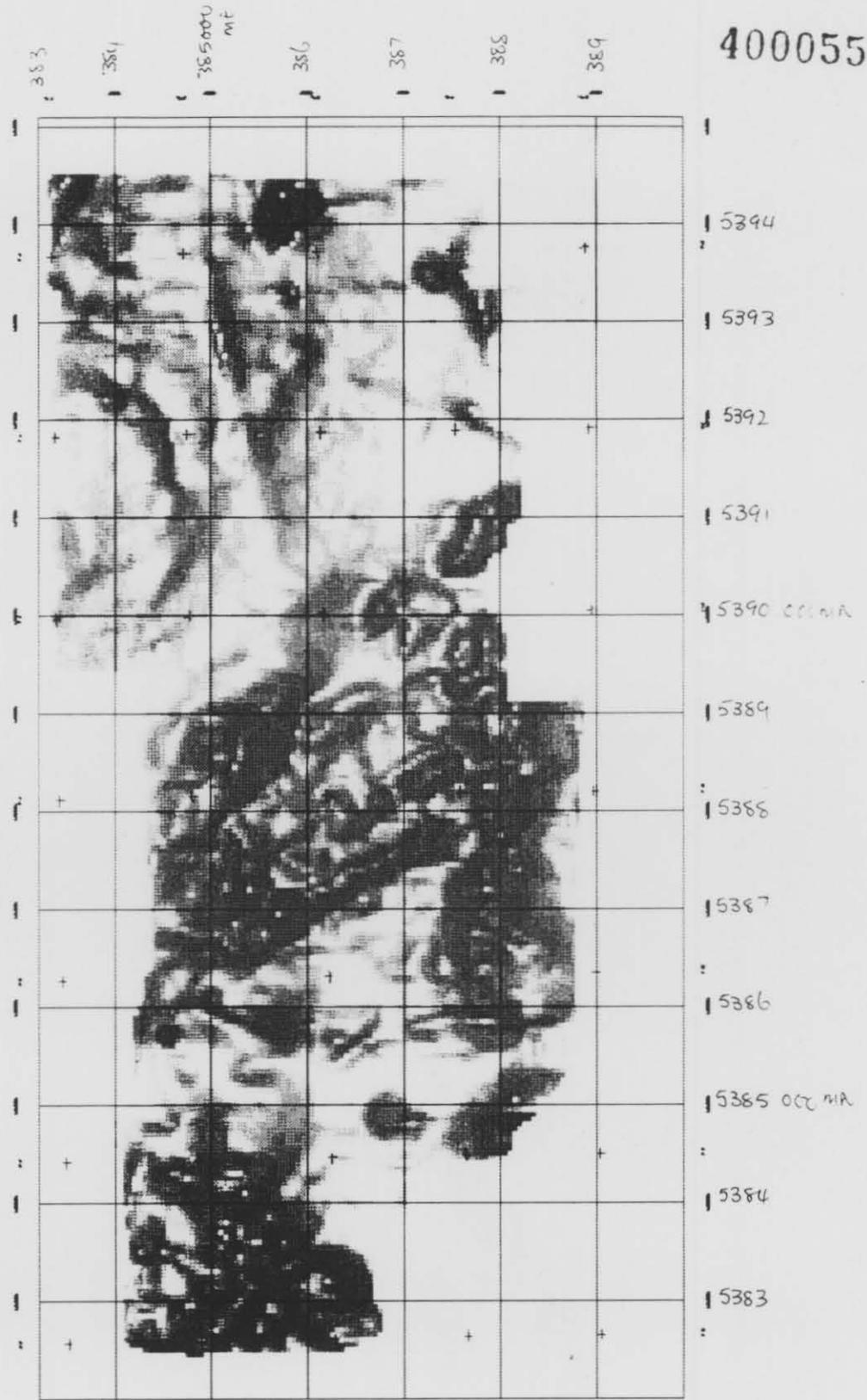
FIGURE 5B



TMI - BULGOBAC

Processed: PIH Research

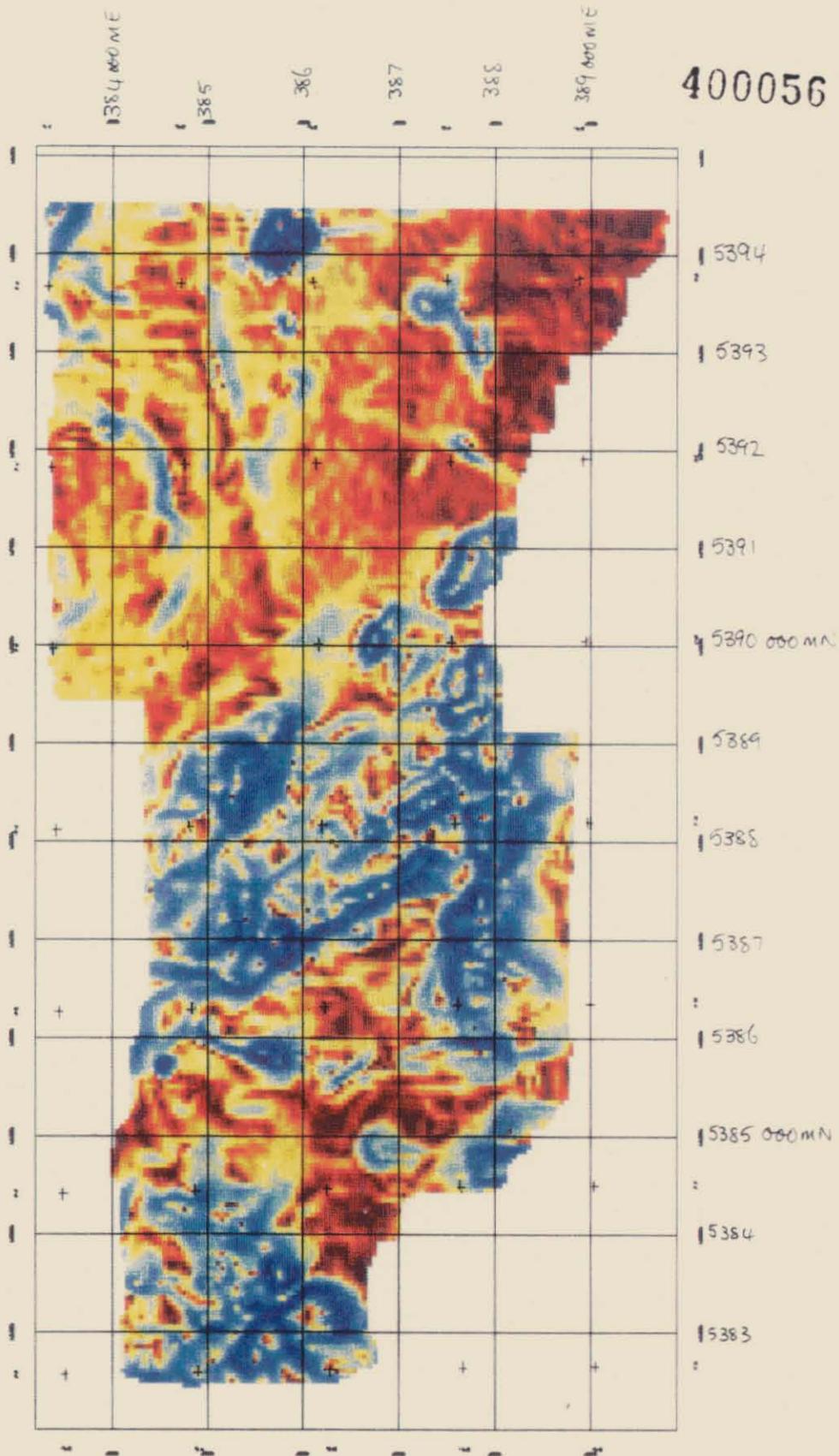
FIGURE 5C



TMI GRADIENT - BULGOBAC

Processed: Pitt Research

FIGURE 6A

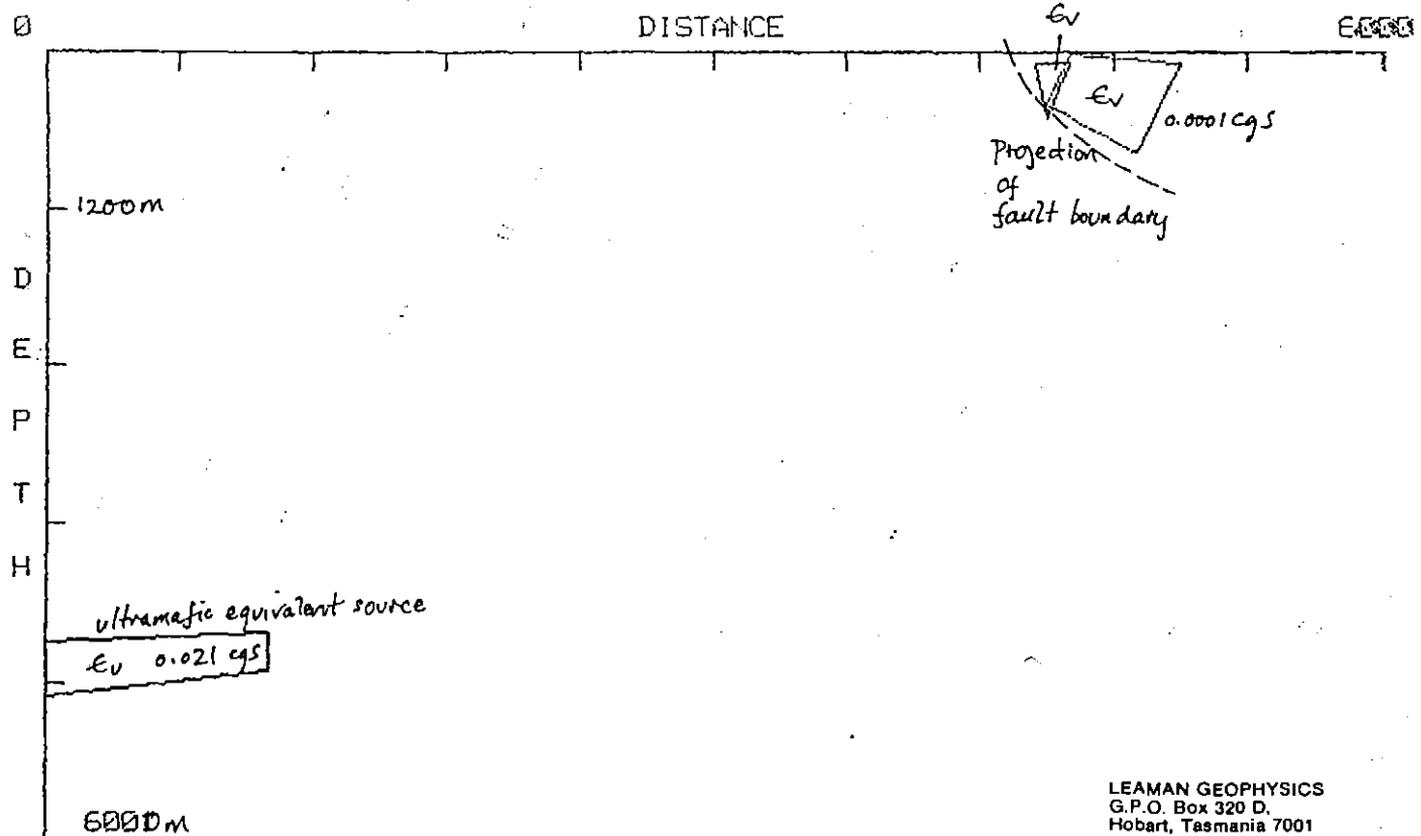
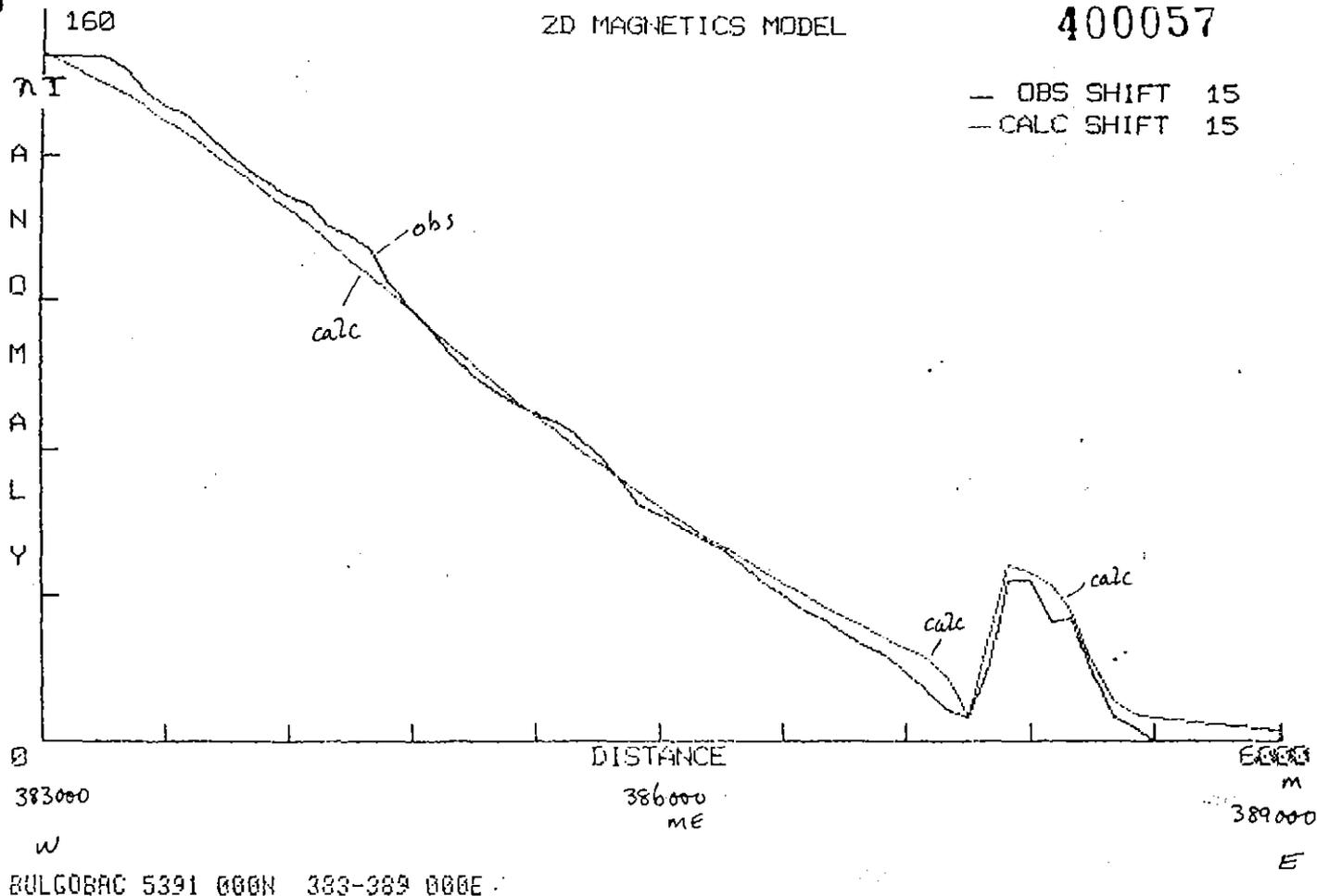


TMI GRADIENT - BULGOBAC

Processed: PHT Research

FIGURE 6B

— OBS SHIFT 15
— CALC SHIFT 15

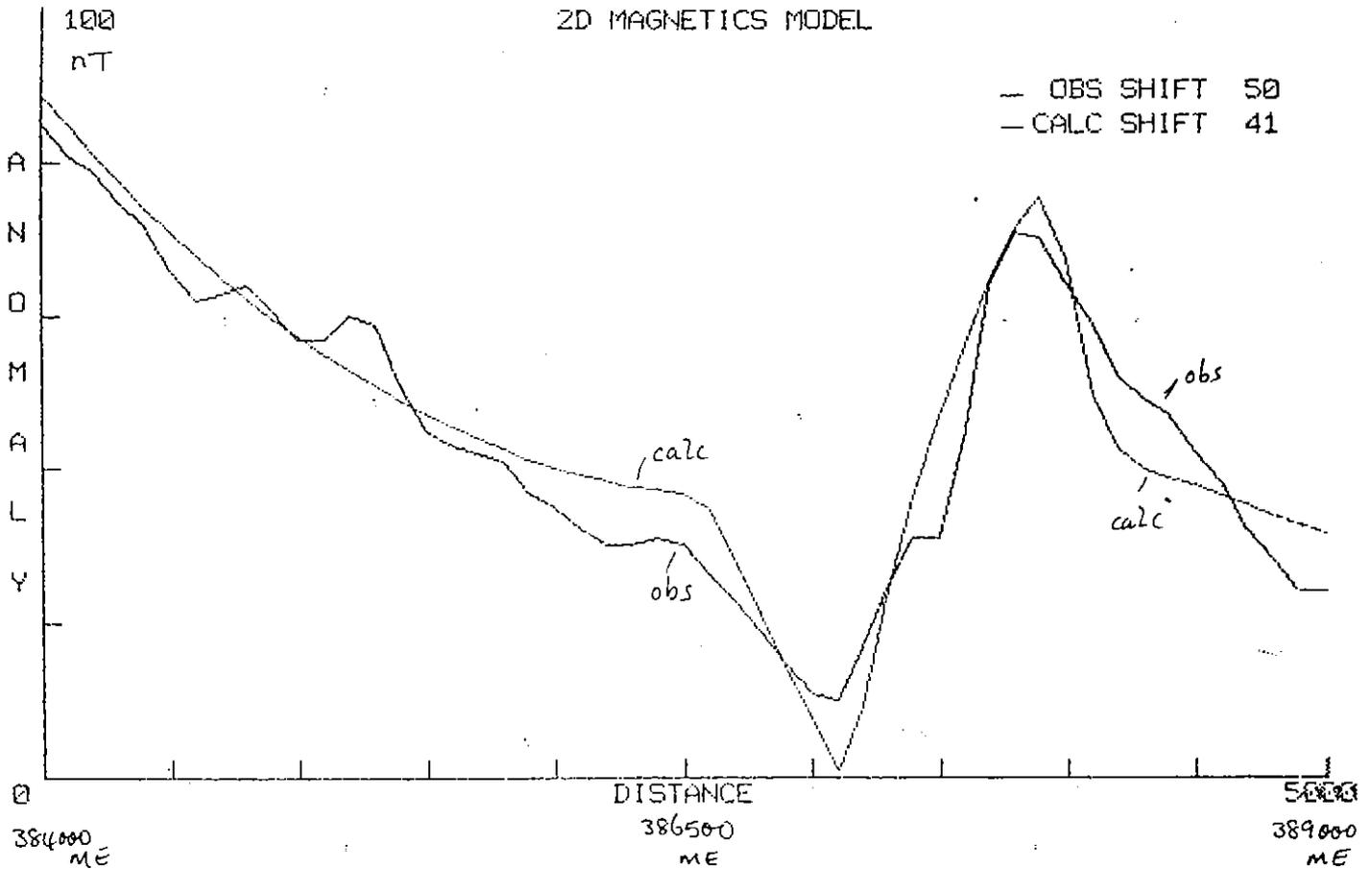


PROFILE 1. 5391 000 MN 383-389 000 ME.

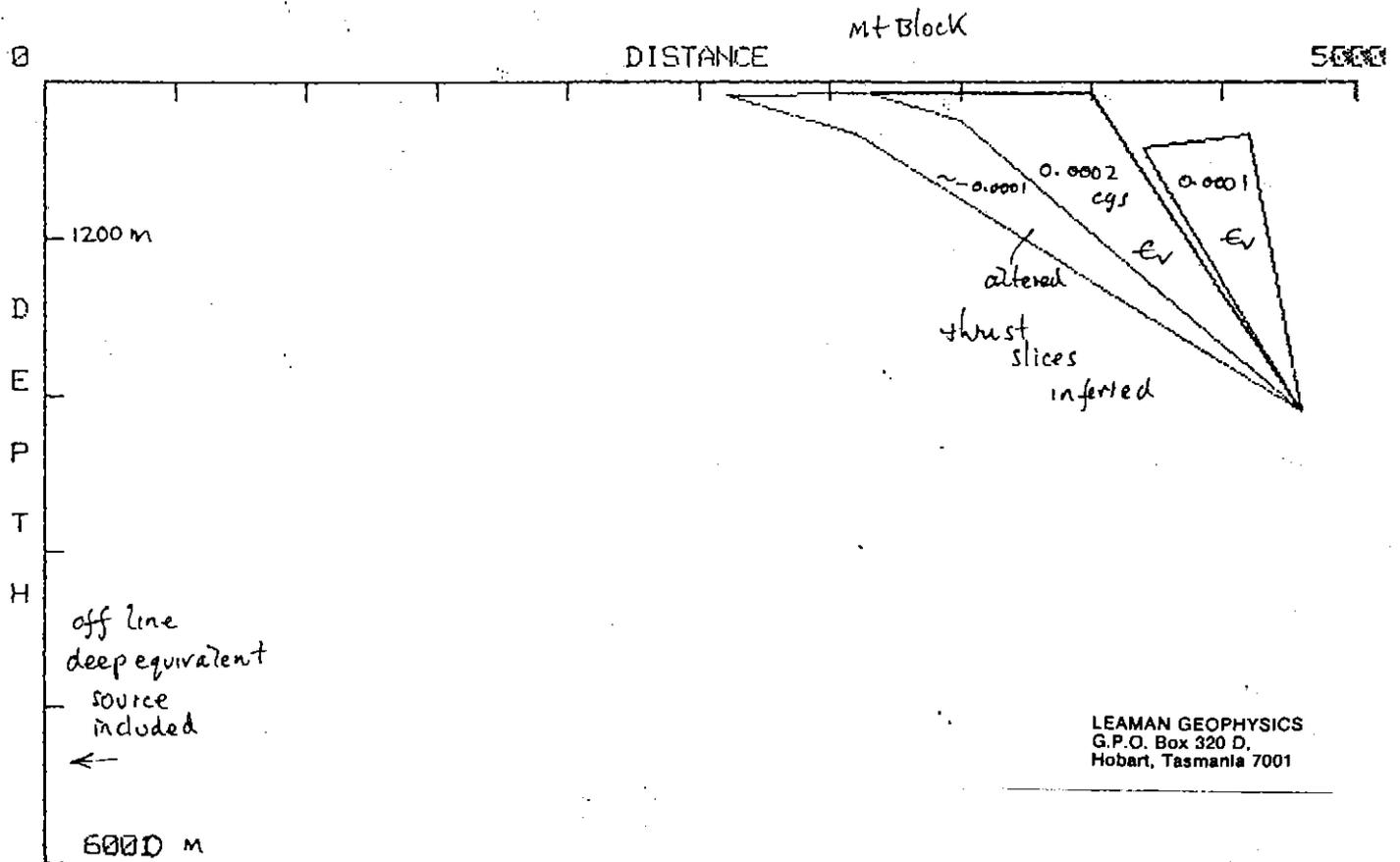
FIGURE 7

BULGOBAC 5386 400N 384-389 000E

2D MAGNETICS MODEL

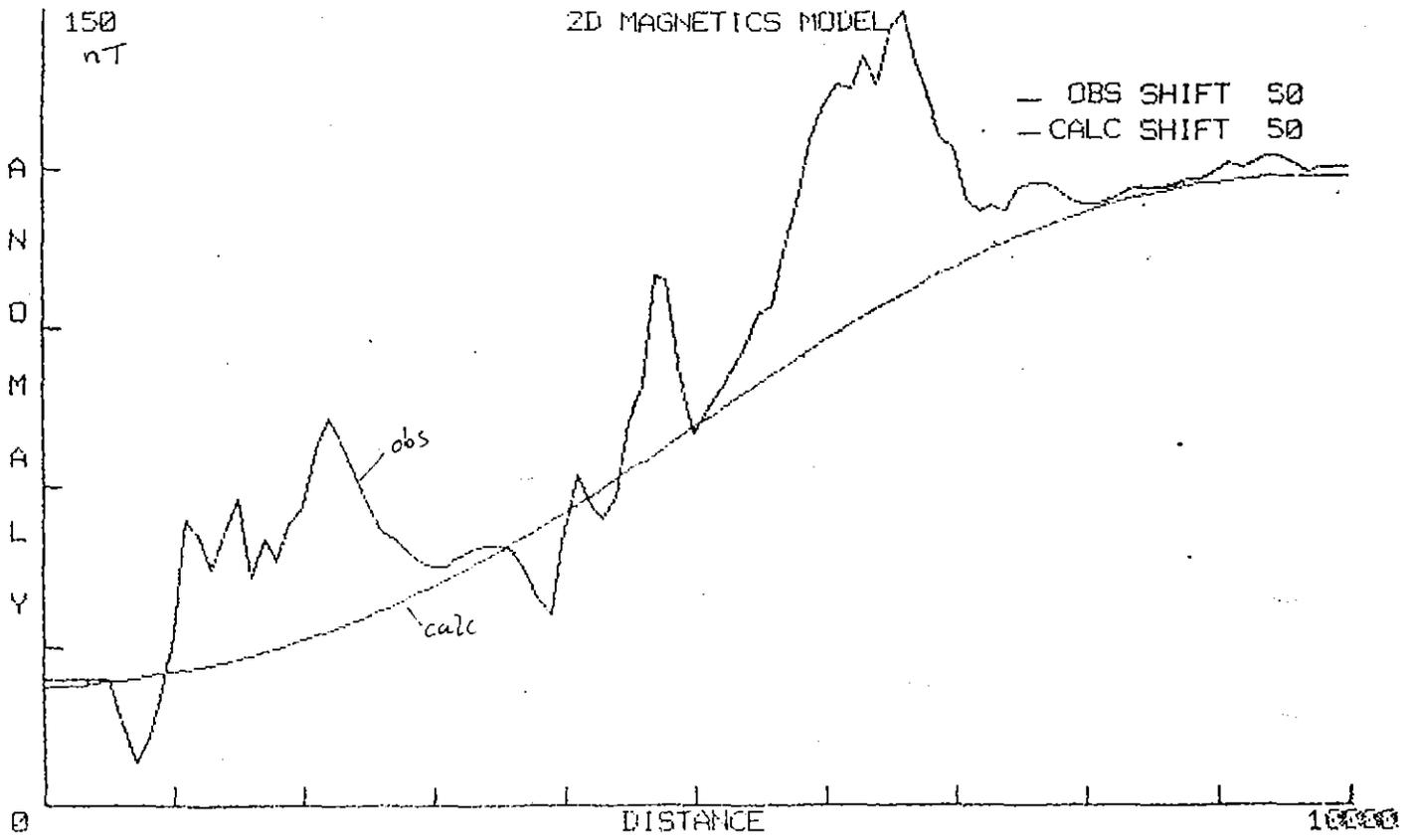


BULGOBAC 5386 400N 384-389 000E

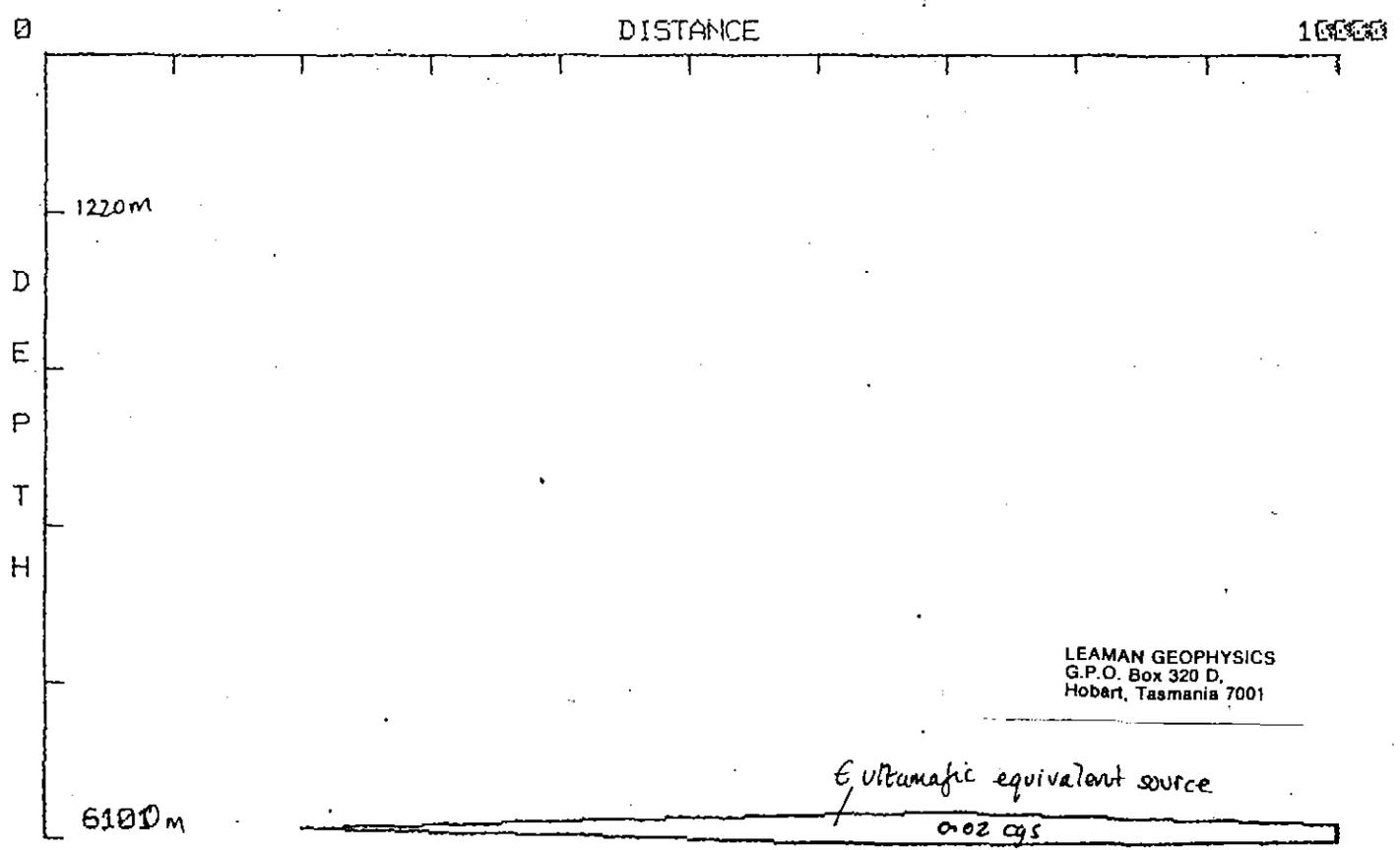


PROFILE 2. 5386 400 MN 384-389 000 ME

FIGURE 8



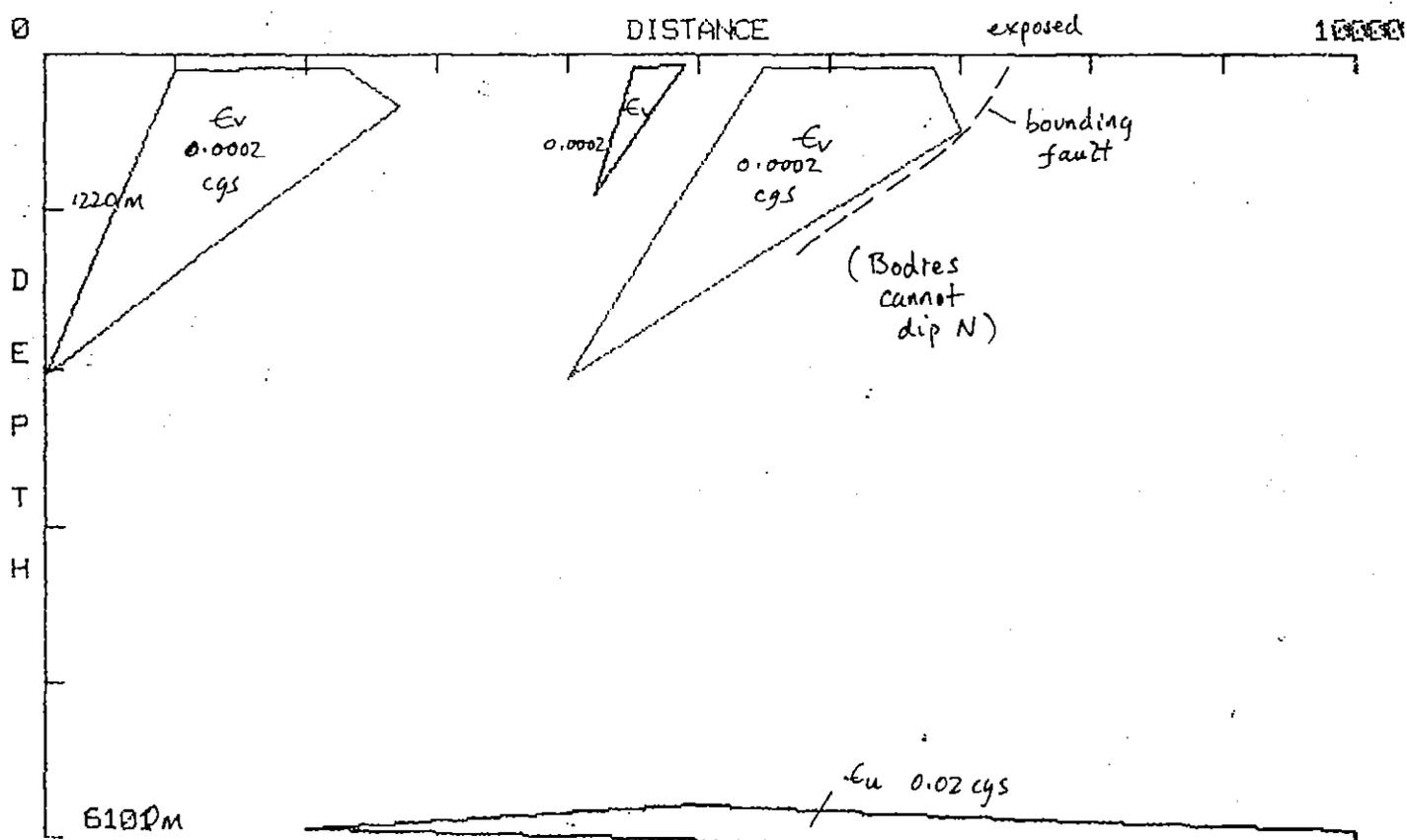
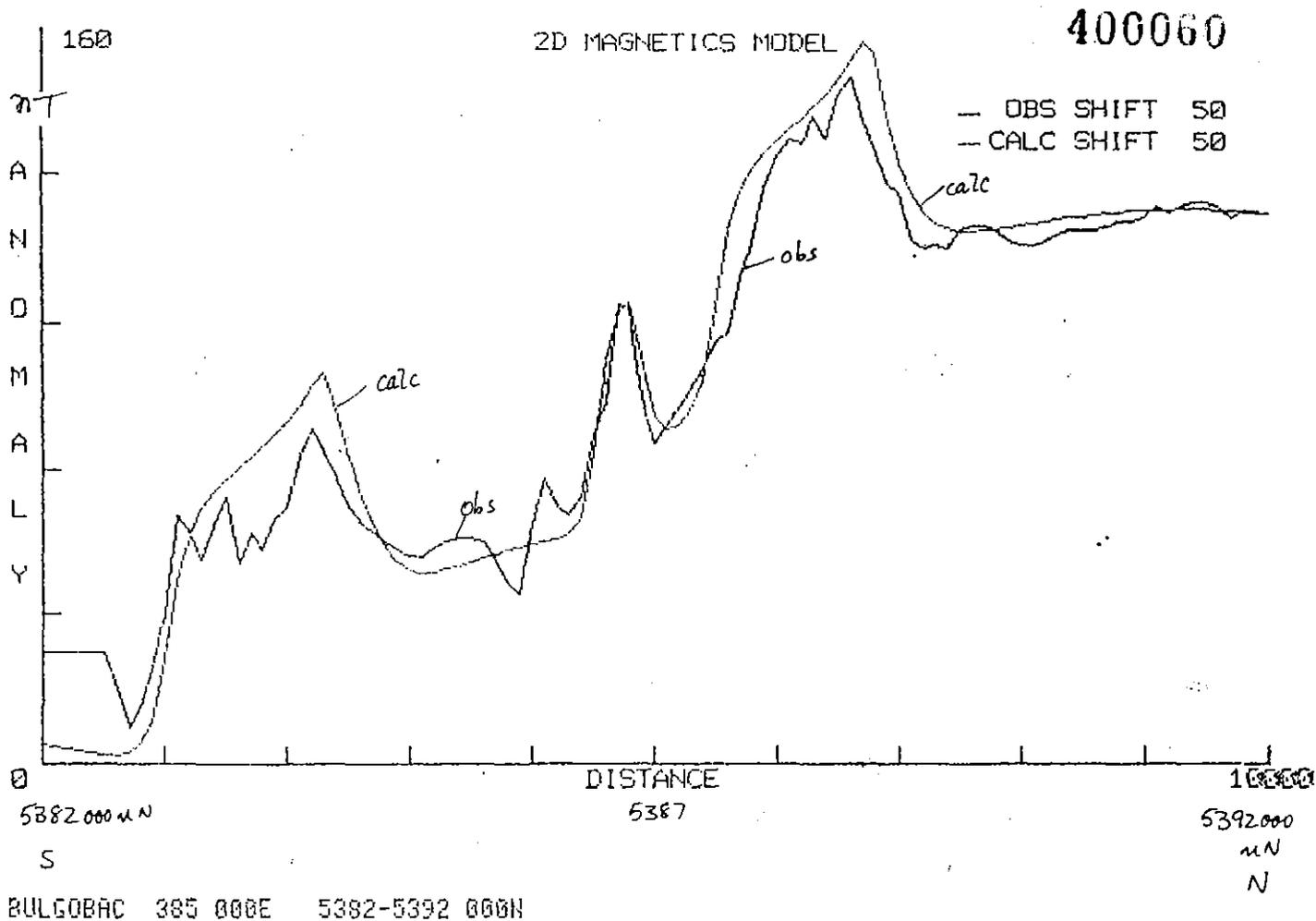
BULGOBAC 385 000E 5382-5392 000H S



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

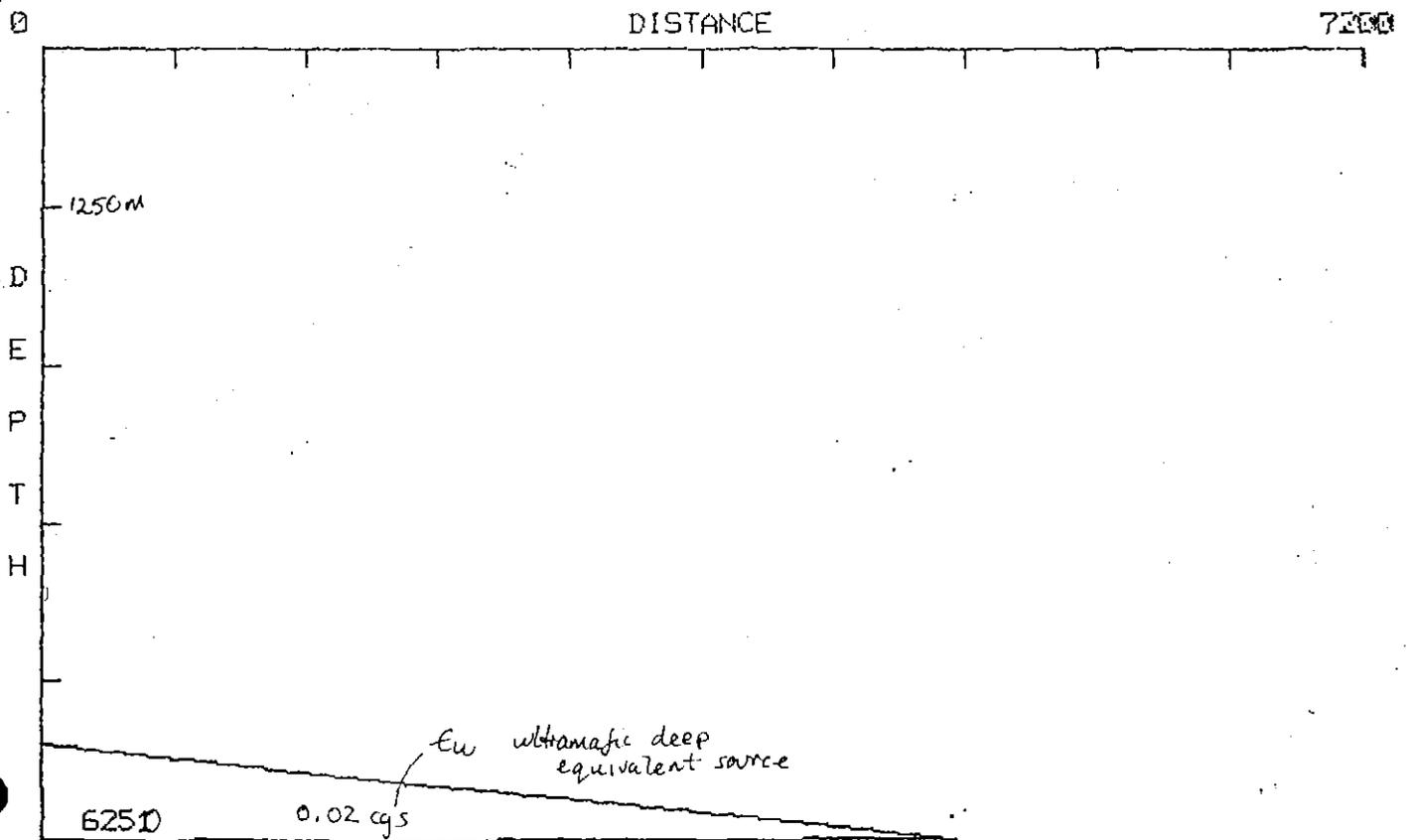
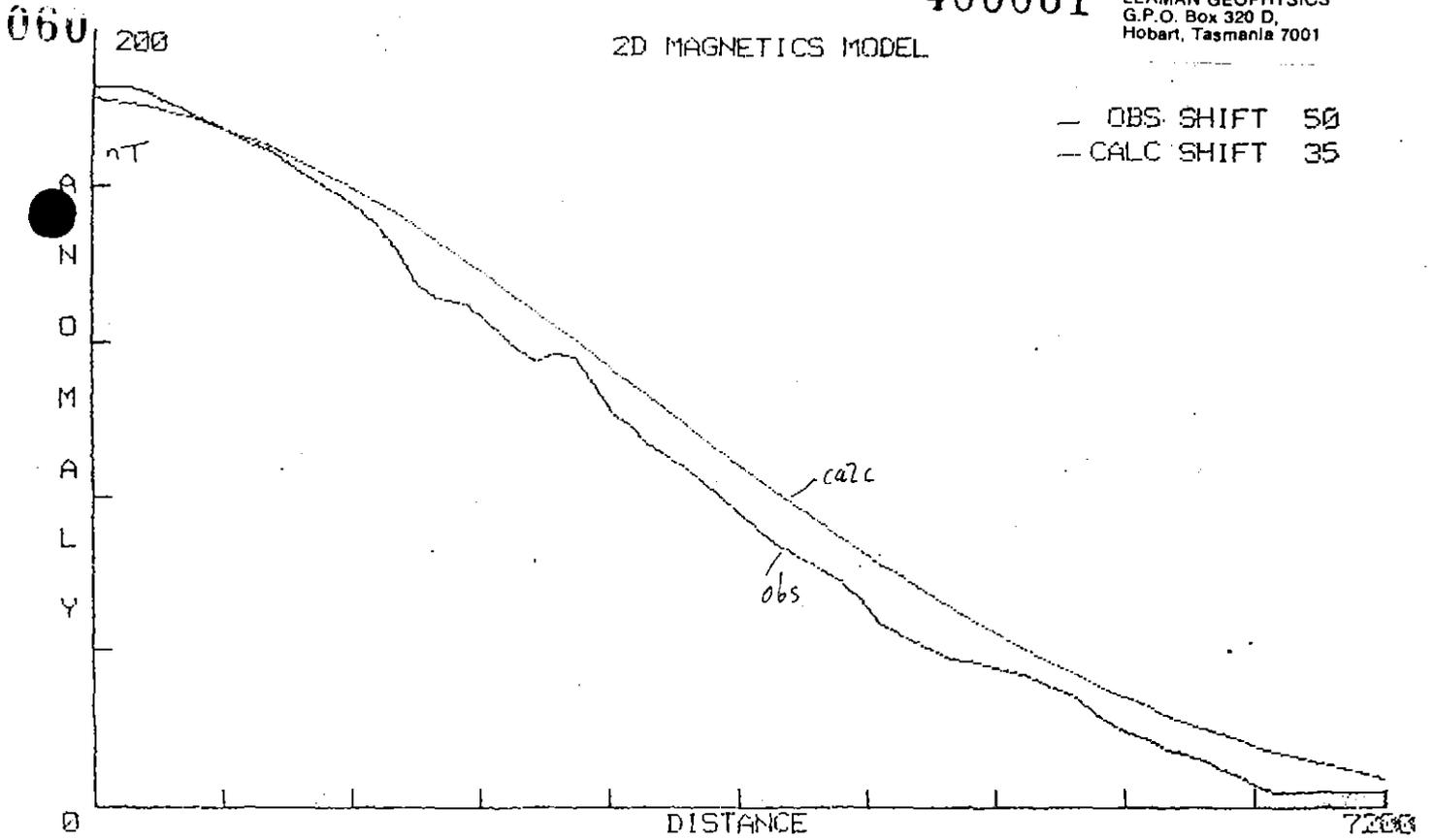
PROFILE 3. 385 000 ME 5382-5392 000 MN REGIONAL EFFECT
FIGURE 9

LINE PARAMETERS - ORIGIN, LIMIT, INCR : 0 10000 100



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

FIGURE 10

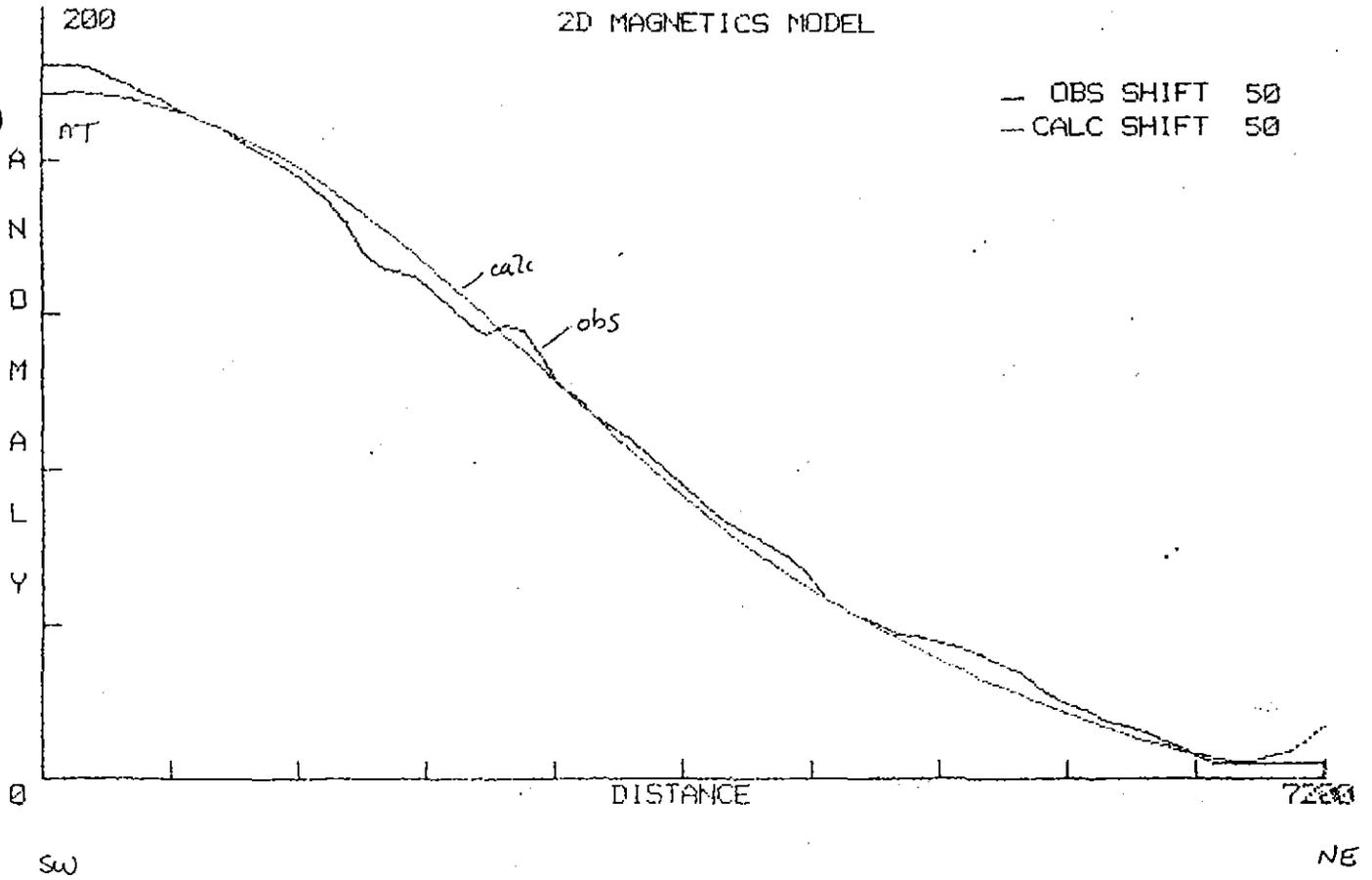


061

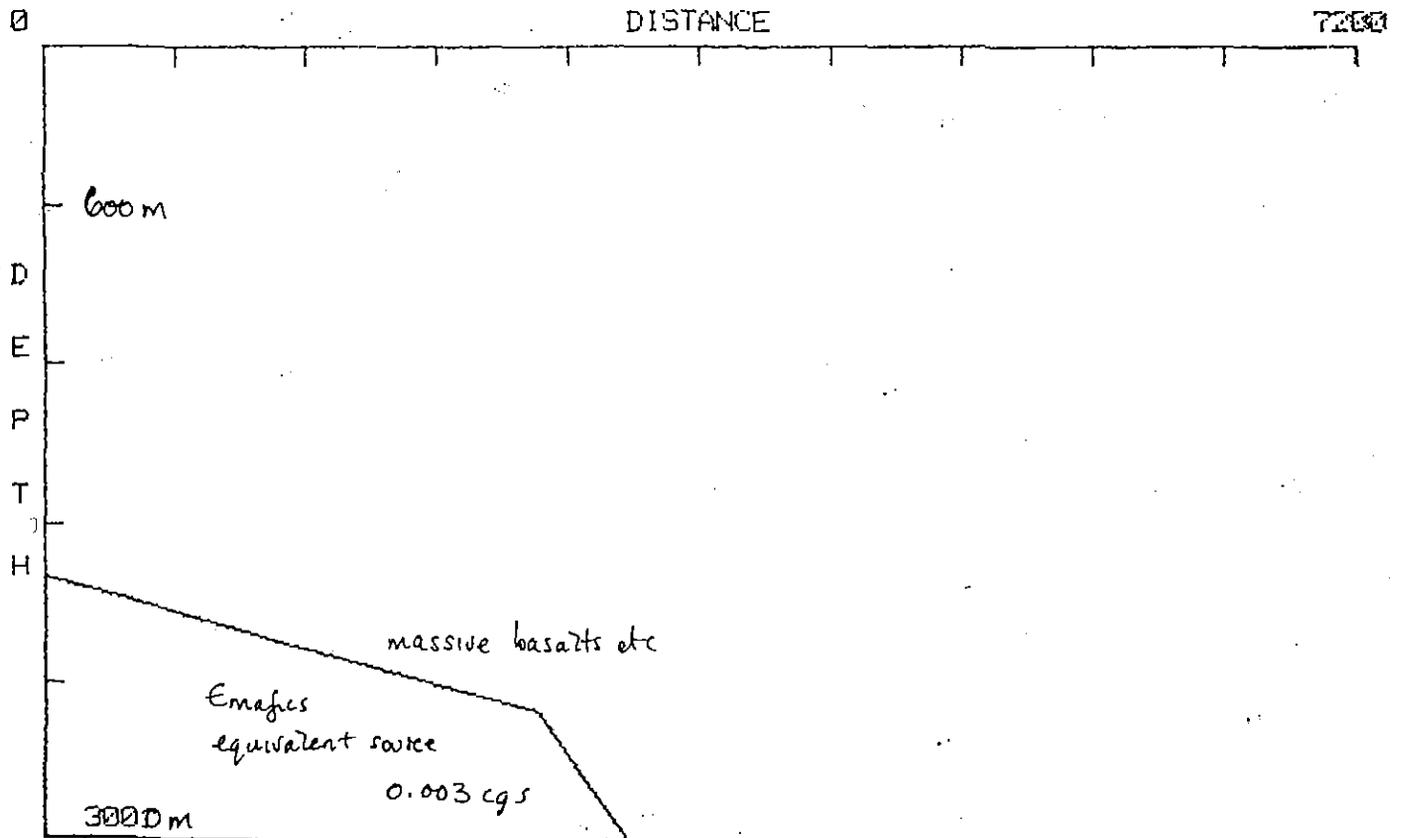
7250 1150 9000 1000 9000 2000 7201 1000

LINE PARAMETERS - ORIGIN, LIMIT, INCR : 0 7200 100

400062



BULGOBAC 4 383/5391-389/5395

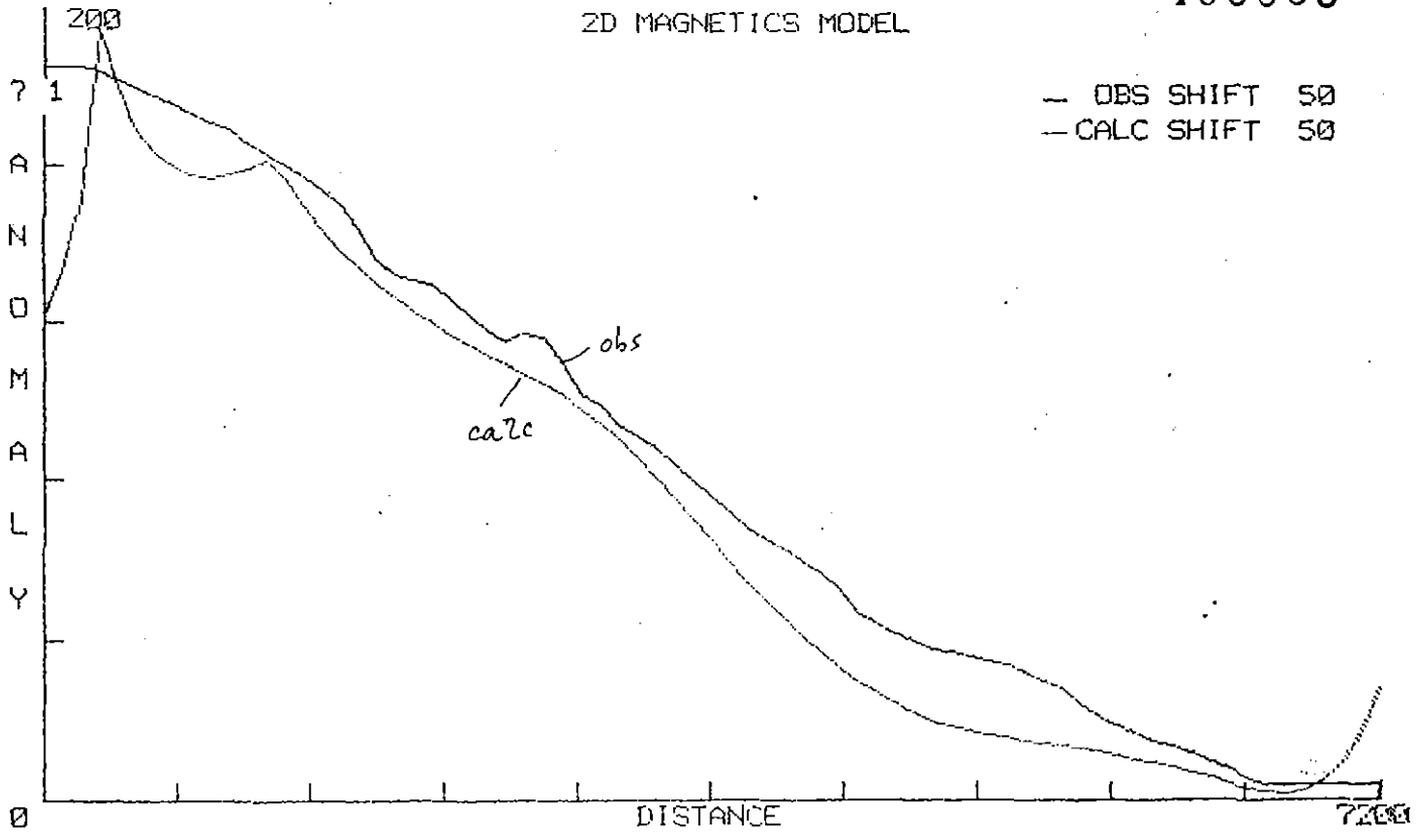


PROFILE 4. 383/5391 000 - 389/5395 000 SHALLOW MAFIC SOURCE
FIGURE 12

062

400063

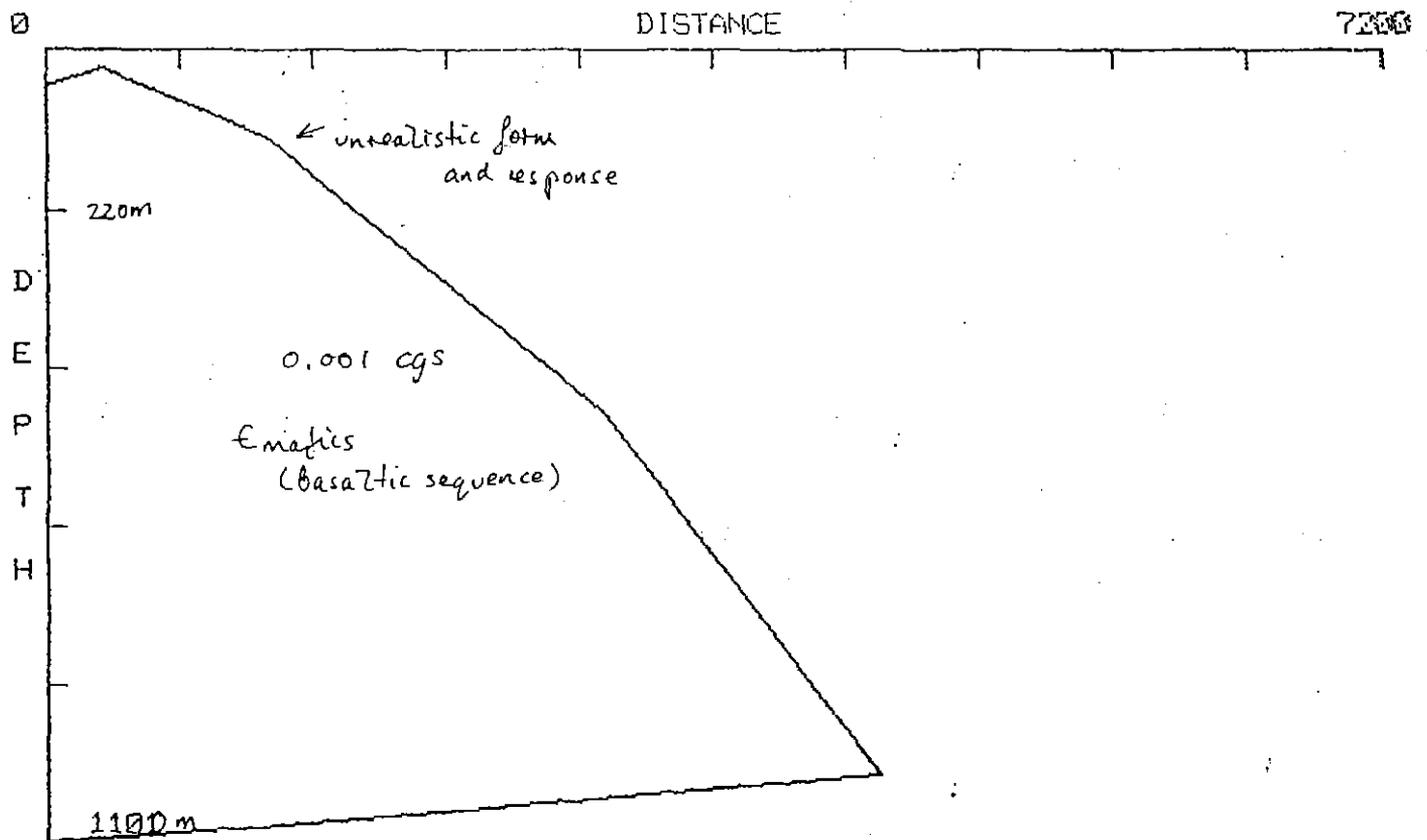
2D MAGNETICS MODEL



SW

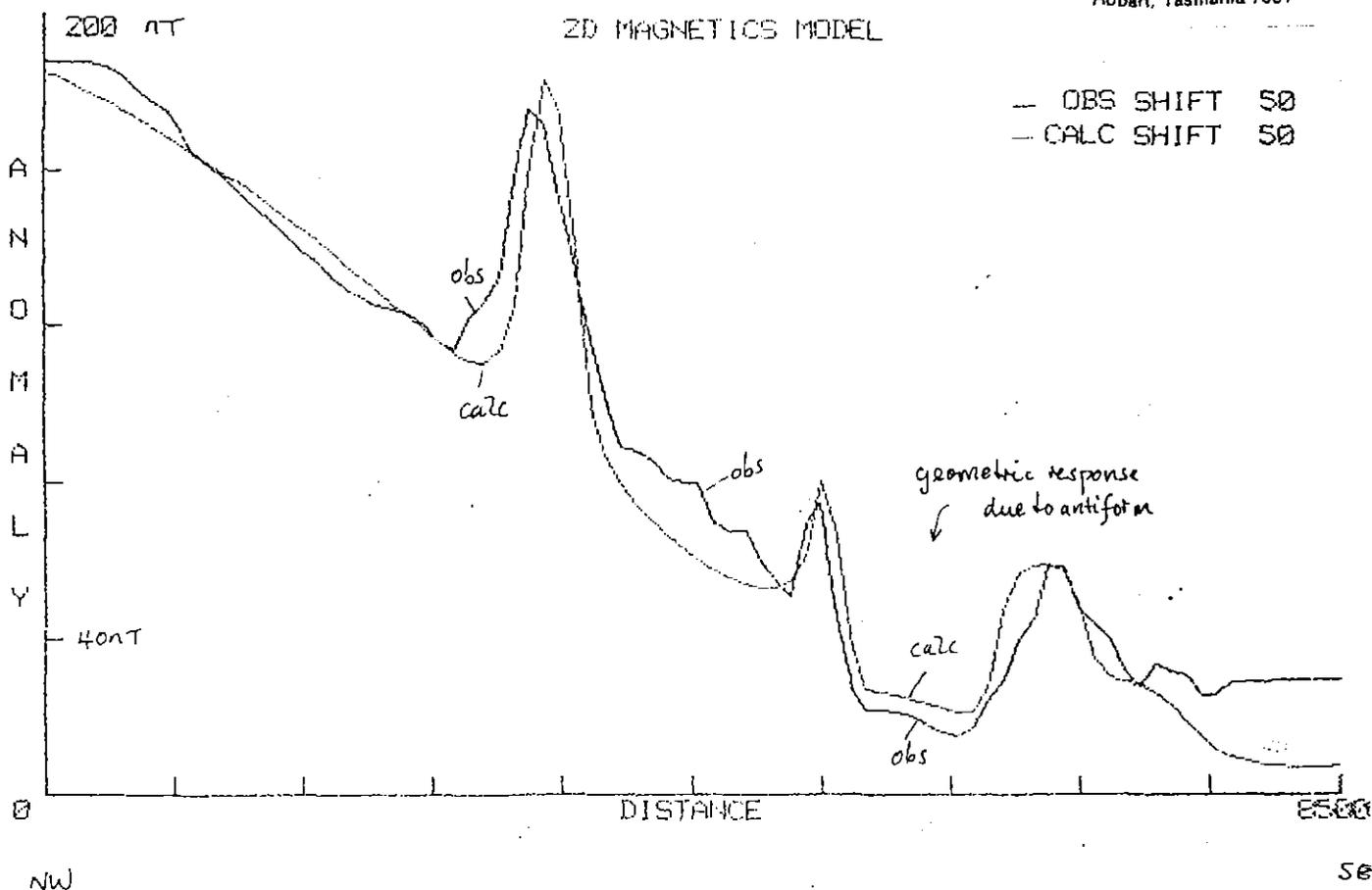
NE

BULGOBAC 4 383/5391-389/5395

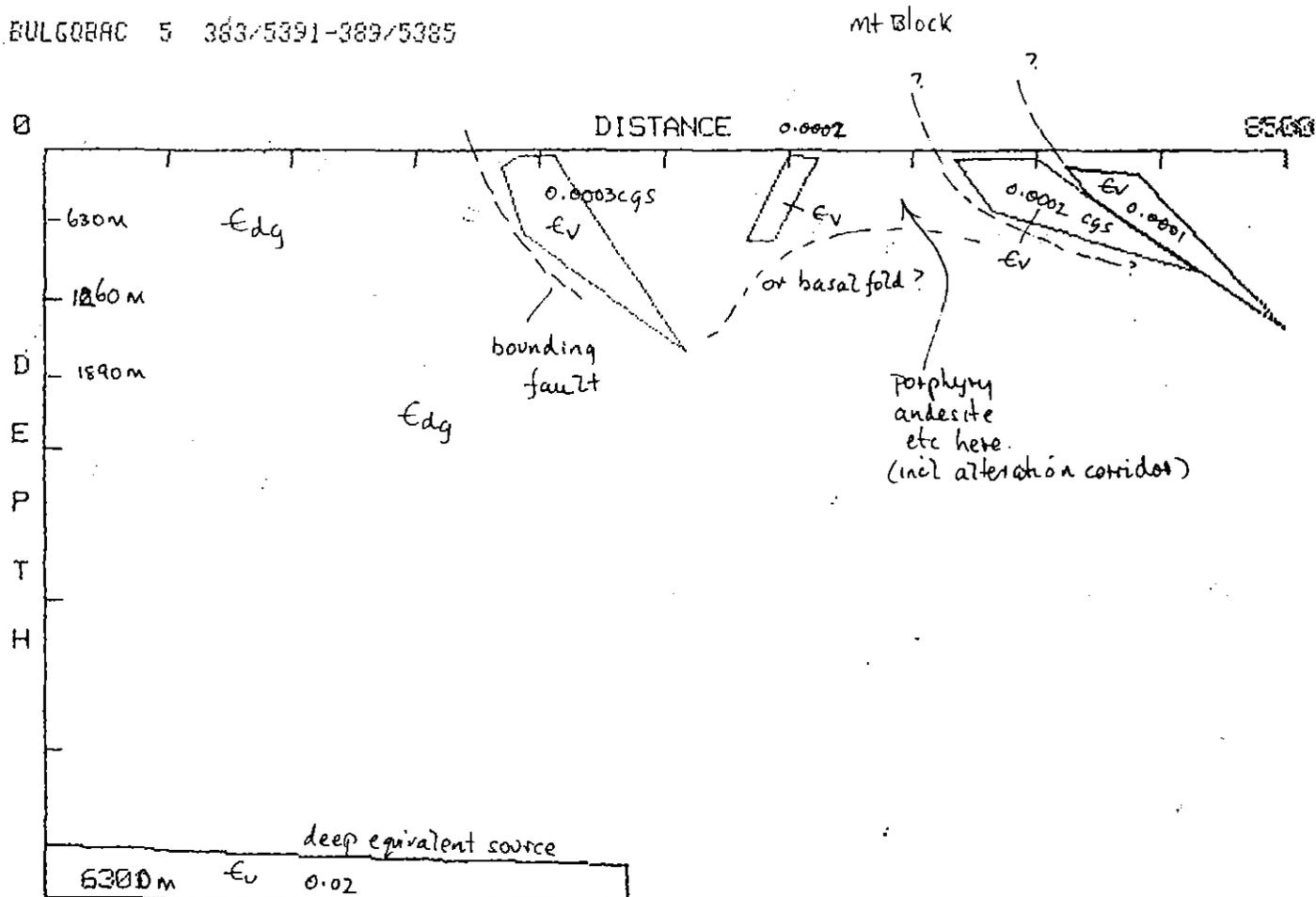


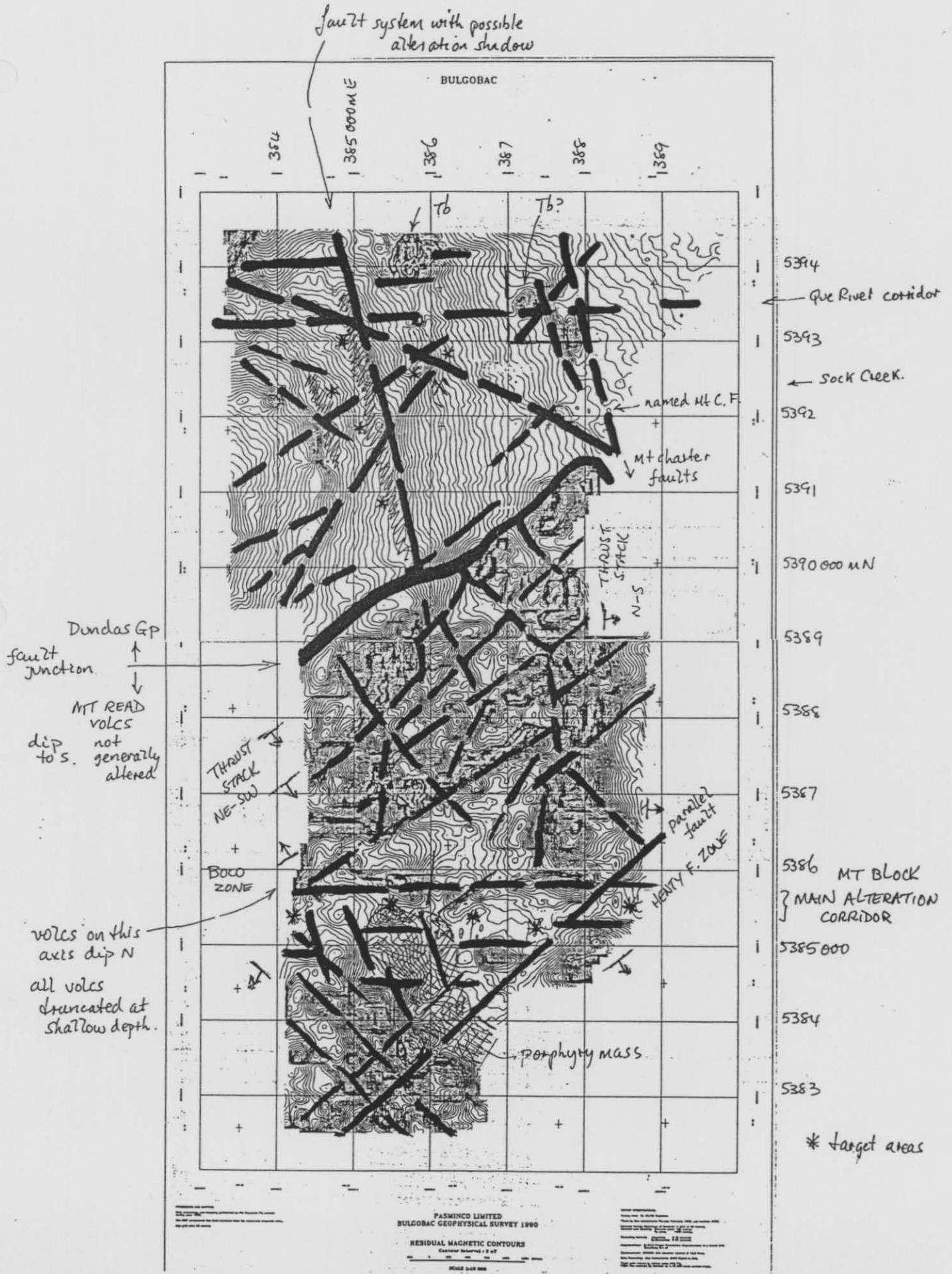
PROFILE 4. 383/5391 000 - 389/5395 000 VERY SHALLOW MAFICS
FIGURE 13

063



BULGOBAC 5 383/5391-389/5385





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 8,800 bytes/record block.

CONSTRUCTION OF LOCATED DATA RECORDS:

	+---	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									
9	"	(F8.0)	"	1	15	7	*	Fiducial									
10	"	(F7.0)	"	1	22	6	*	Time (samm)									
18	"	(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)									
16	"	(F5.0)	"	1	45	4	*	Radar altimeter									
17	"	(F6.0)	"	1	49	5	*	Barometric altimeter									
11	"	(F9.2)	"	1	54	9	*	Total Mag Field (raw)									
12	"	(F6.0)	"	1	63	5	*	Total count (raw)									
13	"	(F5.0)	"	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									

Note: The relevant data field is filled with spaces where an observation is undefined.

STATISTICS INCLUDING VARIABLES OF FILE 2 :

STATISTICS INCLUDING VARIABLES OF FILE 4 :

060

File Title : GEONSTRUMENTS - PASHINCO - BULGABAC (TAS)

GLOBAL STATISTICS

No.	p/s	n	Fwa	Typ	Name of Variable	No. of Def.	Obs.	Minimum	Mean	Maximum	Star Devi
11	P	1	1	N4	Line	49661	40010	44777.295	94070	1440	
21	P	2	3	N4	Flight	49661	8	11.660559	16	2.25	
31	P	3	5	N4	YYDDD	49661	90057	90061.361	90077	5.51	
41	P	4	7	N2	Line type (0=trav,i=tie)	49661	0	0.0787338	1	0.26	
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	2437	
81	P	8	14	N4	Fid no. of last obs	49661	130	32645.589	75850	2439	
91	S	1	1	N4	Fiducial	49661	1	32468.245	75850	2438	
101	S	2	3	N4	Time (samn)	49602	35950	48720.06	60437	7151	
111	S	3	5	N4	Total Mag Field (raw)	49602	59483.402	62067.307	62190.359	44.5	
121	S	4	7	N2	Total count (raw)	49602	244	577.71812	1456	129.	
131	S	5	8	N2	Potassium count (raw)	49602	2	28.866961	105	9.80	
141	S	6	9	N2	Uranium count (raw)	49602	2	21.680376	77	7.37	
151	S	7	10	N2	Thorium count (raw)	49600	1	15.25629	56	5.95	
161	S	8	11	N4	Radar altimeter	49602	45	100.1915	337	26.2	
171	S	9	13	N4	Barometric altimeter	49597	239	526.4787	1661	102.	
181	S	10	15	N2	Recovery pt flag	49661	0	0.0359236	1	0.18	
191	S	11	16	N8	AMG Easting (m)	42229	383209	386122.9	389844	1434	
201	S	12	20	N8	AMG Northing (m)	42229	5382056	5389070	5395051	3401	
211	S	13	24	N4	IGRF Corr mag (m)	42175	4745.4653	4868.4492	4992.6992	42.1	
221	S	14	26	N4	IGRF Corr lev mag (m)	42175	4750.4653	4868.5483	4987.8692	41.0	

END OF HEADER FILE DATA

400067

APPENDIX II
SPECIFIC GRAVITY
AND
MAGNETIC SUSCEPTIBILITY READINGS

Box 1, ie 1st 21m not retrieved from hole!

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 3	21.00	21.40	0.14	HQ WHOLE CORE
	24.50	24.90	0.11	
	28.40	28.50	0.13	
	31.30	31.40	0.58	
	34.90	35.10	0.207	
	35.10	35.50	0.20	
	37.50	37.70	0.14	HQ WHOLE CORE WHOLE CORE
	40.40	40.70	0.10	HQ SPLIT CORE
	43.40	43.50	0.17	
	46.40	46.55	0.10	
	49.40	49.90	0.14	
	52.40	52.50	0.11	
	57.00	57.15	0.15	
160.75, →	60.75	61.25	0.06	HQ WHOLE
	66.80	67.10	0.14	
	72.30	72.50	0.08	
	74.85	75.30	0.09	
	79.40	79.50	0.14	
	82.40	82.80	0.17	
	85.80	86.10	0.20	
	88.40	89.10	0.06	
	91.75	92.15	0.15	
	94.90	95.10	0.08	
	98.00	98.15	0.15	
	100.40	100.55	0.27	
	103.5	103.6	0.16	
	106.15	106.25	0.09	
	109.4	109.5	0.12	
	112.4	112.55	0.17	
	115.2	115.4	0.09	
	118.4	118.7	0.06	
	121.45	121.65	0.12	
	124.2	124.4	0.16	
	127.4	127.7	0.20	
	131.00	131.25	0.23	
	133.60	133.75	0.14	
	136.3	136.4	0.20	
	140.95	141.20	0.26	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
443	145.0	145.10	0.14	HQ WHOLE CORE
	148.4	148.9	0.24	" "
	150.8	151.4	0.15	NQ WHOLE
	155.15	155.25	0.18	
	160.1	160.5	0.17	
	166.4	166.7	0.19	
	171.85	172.0	0.15	
	175.1	175.25	0.12	
	179.9	180.0	0.10	
	184.6	185.3	0.05	
	189.85	190.0	0.04	
	193.0	193.65	0.05	
	197.9	198.05	0.02	
	202.25	202.35	0.04	
	205.4	205.1	0.08	
	209.9	210.3	0.08	
	216.25	216.40	0.03	
	220.4	220.6	0.02	
	224.50	225.30		← DAVE'S MISTAKE
	225.3	225.45	0.03	NO WHOLE
	229.4	229.7	0.03	
	232.4	232.6	0.03	
	235.4	235.5	0.02	
	241.3	241.4	0.05	
	245.6	246.2	0.03	
	250.3	250.4	0.02	
	253.4	253.6	0.02	
	257.9	258.2	0.03	NQ SPLIT
	261.05	261.2	0.02	NQ WHOLE
	267.9	268.0	0.08	
	272.9	273.2	0.13	
	275.8	276.0	0.10	
	280.45	280.75	0.08	
	284.75	284.85	0.11	
	290.45	290.60	0.09	
	294.4	294.7	0.11	
	298.75	299.40	0.09	
	302.9	303.20	0.12	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4	4.33	4.5	0.07	HQ whole
	7.6	8.4	0.12	-
	10.8	11.0	0.08	-
	15.3	15.5	0.14	-
	13.2	13.5	0.07	-
	19.4	19.5	0.08	-
	21.7	22.1	0.15	-
	24.4	24.5	0.09	-
	26.9	27.4	0.08	-
	30.2	30.4	0.11	-
	34.3	34.5	0.15	-
	37.5	37.65	0.11	-
	40.5	40.85	0.14	-
	44.8	45.0	0.27	-
	46.25	46.4	0.24	-
	48.6	49.0	0.17	-
	52.35	52.5	0.23	-
	55.5	55.6	0.17	-
	58.4	58.5	0.15	NQ whole
	61.5	61.6	0.44	-
	63.5	63.7	0.23	-
	68.9	69.3	0.18	-
	70.30	70.5	0.31	-
	73.35	73.5	0.21	-
	75.65	75.8	0.22	-
	78.6	78.7	0.25	-
	81.8	81.9	0.24	-
	85.3	85.5	0.29	-
	88.25	88.5	0.12	-
	91.1	91.5	0.05	-
	94.0	94.1	0.02	-
	96.1	96.25	0.07	-
	100.5	100.6	0.02	-
	102.5	102.6	0.02	-
	105.5	105.8	0.05	-
	108.2	108.3	0.03	-
	111.0	112	0.17	-
	113.0	113.3	0.12	-

07c

400073

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4	115.6	115.8	0.01	NQ whole
	121.5	127.6	0.03	- (fault zone).
	130.1	130.2	0.03	- "
	138.5	138.6	0.03	- "
	144.0	144.1	0.01	- "
	152.85	152.85	0.02	- "
	148.?	150.?	0.03	- " 3rd zone
	152.0	153.2	0.05	- "
	157.0	157.1	0.11	- "
	158.9	159.15	0.07	- Split
	162.4	162.6	0.02	- "
	166.4	166.6	0.09	- "
	171.7	171.8	0.00	- "
	174.4	174.5	0.07	- "
	177.6	177.75	0.42	- "
	181.5	181.6	0.15	- "
	183.7	183.8	0.16	- "
	186.8	186.9	0.07	- "
	187.5	187.6	0.05	HQ whole
	191.1	191.25	0.21	" "
	192.2	192.5	0.08	- "
	195	195.15	0.15	- "
	198.4	198.5	0.14	- "
HP 4A	196.5	198.65	0.12	NQ whole
	199.5	199.6	0.16	- "
	203.1	203.2	0.06	- "
	208.4	208.5	0.06	- "
	211.4	211.4	0.14	- "
	214.1	214.2	0.26	- "
	218.8	218.8	0.08	- "
	221.2	221.5	0.08	- "
	224.6	224.8	0.27	- Split
	226.7	227.0	0.24	- whole
	229.85	230	0.09	- "
	232.8	233	0.29	- "
	235.2	235.4	0.22	- "
	238.15	238.3	0.17	- "
	241.3	241.5	0.20	- "

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4A.	243.2	243.5	0.24	NQ whole
	246.3	246.4	0.27	"
	249.5	249.5 250.0	0.20	"
	253.4	253.7	0.36	"
	258.0	258.1	0.23	"
	260.0	260.5	0.05	" V
	263.0	263.1	0.22	"
	265.35	265.6	0.16	"
	269.0	269.15	0.24	"
	271.35	271.55	0.17	"
	274.4	275.4	0.13	"
	280.75	280.95	0.11	"
	284.3	284.5	0.16	"
	286.0	286.2	0.19	"
	290.0	290.15	0.26	"
	292.0	292.7	0.18	"
	295.80	296.55	0.15	"
	297.45	297.6	0.19	" V
	300.0	300.2	0.58	NQ split
	300.9	302.1	0.36	"
	303.6	303.8	0.28	"
	306.7	307.1	0.34	"
	311.0	311.15	0.60	"
	314.31	314.3	0.33	"
	318.9	319.0	0.39	"
	322.2	322.45	0.48	"
	325.6	325.9	0.32	"
	332.2	333.35	0.29	"
	338.0	338.2	0.26	"
	340.5	340.7	0.26	"
	342.3	342.5	0.27	"
	346.3	346.9	0.48	"
	349.2	349.5	0.33	"
	351.65	351.7	0.21	"
	354.7	355.0	0.33	"
	355.8	355.9	0.25	"
	359.8	360.1	0.39	"
	365.6	365.7	0.20	" V

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4A	386.0	386.15	0.26	NQ split
	371.2	371.35	0.29	
	376.3	376.5	0.35	
	382.4	382.51	0.31	
	389.3	389.5	0.37	
	391.9	392.0	0.30	
	397.0	397.1	0.17	
	398.0	398.1	0.33	
	402.8	402.9	0.29	
	403.9	404.0	0.32	
	408.5	408.9	0.24	
	409.9	410.0	0.2	
	414.25	414.7	0.31	
	416.1	416.3	0.18	
	420.25	420.5	0.27	
	421.7	422.0	0.30	
	425.0	425.1	0.33	NQ Not split
	431.0	431.7	0.17	
	433.1	433.2	0.22	
	438.7	439.0	0.23	
	441.6	441.9	0.32	
	447.6	448.0	0.34	
	449.6	450.2	0.15	
	454.1	454.2	0.15	
	458.8	459.0	0.26	
	463.5	464.0	0.27	
	469.9	470.0	0.29	
	473.1	473.8	0.30	
	476.0	476.8	0.18	
	479.0	479.8	0.27	
	485.0	485.3	0.21	
	489.8	490.1	0.33	
	493.9	494.0	0.30	
	497.65	497.85	0.30	
	502.0	502.5	0.25	NQ Not split
	505.5	505.6	0.25	
	506.4	508.5	0.13	
	511.5	511.7	0.23	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
S4 1	10.06	10.15	0.00	NQ	whole.
	13.60	13.72	0.00	↓	↓
	17.25	17.37	0.00	↓	↓
	29	29.15	0.06	BQ	split
	32.50	32.61	0.03	↓	↓
	34.4	34.5	0.03	↓	↓
	37.95	38.1	0.09	↓	↓
	46.65	46.8	0.01	↓	↓
	49.9	50	0.00	↓	↓
	52.9	53	0.04	↓	↓
	54.7	54.86	0.05	↓	↓
	55.9	56	0.02	↓	↓
	57.25	57.35	0.02	↓	↓
	60.35	60.56	0.05	↓	↓
	63.90	64	0.1	↓	↓
	67.87	68	0.08	↓	↓
	68.65	68.75	0.00	↓	↓
	71.1	71.25	0.13	↓	↓
	74	74.1	0.02	↓	↓
	76.95	77.05	0.00	↓	↓
	79.60	79.87	0.05	↓	↓
	82.6	82.85	0.05	↓	↓
	87.5	87.6	0.00	↓	↓
	90	90.15	0.05	↓	↓
	92	92.1	0.00	↓	↓
	95.1	95.25	0.00	↓	↓
	99.1	99.2	0.06	↓	↓
	101.65	102	0.08	↓	↓
	105.7	105.8	0.00	↓	↓
	109.9	110	0.00	↓	↓
	115.4	115.5	0.00	↓	↓
	115.85	115.95	0.05	↓	↓
	121	121.15	0.09	↓	↓
	125.4	125.5	0.07	↓	↓
	129.7	129.84	0.04	↓	↓
	135.15	135.3	0.07	↓	↓
	144.0	144.17	0.10	↓	↓
	150.45	150.57	0.05	↓	↓

- min Porphyry

- 1/4 BQ - massive Grt + Spl.

Split

unmineralized

Whole Core.

078

400079

①

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
SK 5	4.4	4.5	0.08	NQ WHOLE CORE
	19.8	19.9	0.16	NQ SPLIT
	20.95	21.03	0.15	NQ SPLIT
	23.95	24.08	0.14	BQ SPLIT
	28.88	28.98	0.12	" "
	31.90	32.00	0.12	" "
	34.95	35.05	0.08	BQ WHOLE
	40.35	40.50	0.18	
	42.55	42.65	0.07	
	47.21	47.31	0.17	
	50.75	50.85	0.13	
	53.23	53.33	0.11	
	56.30	56.38	0.14	
	59.45	59.55	0.11	
	65.35	65.45	0.13	
	68.53	68.63	0.02	
	71.63	71.73	0.10	
	74.58	74.68	0.11	
	78.3	78.4	0.11	SPLIT
	79.13	79.23	0.17	WHOLE
	80.67	80.77	0.14	
	83.8	83.9	0.06	
	86.86	86.96	0.07	
	90.4	90.5	0.06	SPLIT
	93.0	93.1	0.04	SPLIT
	96.90	96.01	0.07	WHOLE
	100.1	100.2	0.06	
	102.00	102.11	0.15	
	105.00	105.1	0.07	
	108.1	108.2	0.08	SPLIT
	111.25	111.35	0.06	WHOLE
	114.2	114.3	0.17	
	118.04	118.14	0.07	
	119.38	119.48	0.05	
	120.5	120.6	0.06	SPLIT
	123.4	123.5	0.14	
	125.5	125.6	0.05	
	129.83	129.83	0.19	

● MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
S49.	0.90	1.00	0.05	NQ WHOLE CORE
	4.45	4.55	0.05	↓
	7.45	7.55	0.04	
	10.85	11.00	0.08	BQ WHOLE
	15.10	15.20	0.11	
	18.3	18.45	0.09	
	21.35	21.5	0.05	
	24.40	24.5	0.08	
	27.45	27.55	0.11	
	31.28	31.40	0.12	
	33.55	33.65	0.16	
	36.9	37.0	0.11	
	39.5	39.6	0.12	
	47.8	47.9	0.1	
	51.75	51.85	0.09	
	53.64	53.8	0.11	
	59.18	59.30	0.14	
	63.25	63.25	0.08	
	65.35	65.45	0.06	
	70.85	70.95	0.08	
	74.55	74.65	0.11	BQ split
	82.10	82.25	0.05	
	90.45	90.55	0.17	
	96.2	96.3	0.14	
	100.5	100.6	0.10	
	110.4	110.5	0.13	
	121.2	121.6	0.09	
	112.65	112.75	0.12	
	127.75	127.85	0.05	BQ WHOLE
	133.75	133.85	0.13	
	135.05	135.15	0.06	
	137.05	137.15	0.08	
	140.50	140.60	0.10	
	145.25	145.35	0.10	
	145.9	146.0	0.14	EOH

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
SK12	3.43	3.53	0.11	NQ	whole
	6.20	6.30	0.11		
	10.4	10.55	0.12		
	14.7	14.8	0.14		
	18.5	18.6	0.16		
	20.3	20.4	0.14		
	23.4	23.5	0.09		
	25.9	26.0	0.08		
	29.0	29.1	0.05	↓	↓
	33.3	33.4	0.04		
	36.3	36.4	0.02		
	40.4	40.5	0.08		
	44.0	44.15	0.09		
	48.1	48.2	0.07		
	51.0	51.1	0.06		
	54.05	54.2	0.08		
	59.95	59.05	0.18		
	62.9	63.0	0.09		
	68.0	68.1	0.12		
	72.0	72.1	0.10		
	75.85	76.0	0.14	↓	↓
	81.1	81.2	0.08		
	85.3	85.4	0.02		
	88.6	88.7	0.10		
	91.8	91.7	0.03		
	96.0	96.1	0.11		
	99.0	99.15	0.09		
	101.9	102.0	0.16		
	104.8	104.9	0.18		
	109.85	110.0	0.11		
	113.95	114.05	0.15		
	113.85	115.95	0.22		
	118.8	118.9	0.08		
	121.8	121.9	0.10		
	124.8	124.9	0.04		
	129.6	129.7	0.12		
	132.8	132.9	0.11		
	135.9	136.0	0.25	↓	↓

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	4.6m		0.02	HQ
	8.2	8.3m	0.03	"
	11.15	11.25	0.08	"
	12.8	12.9	0.07	0.07
	15.4	15.5	0.04	"
	17.68	17.80	0.03	"
	20.7	20.8	0.03	" Split.
	29.55	29.7	0.04	" "
	31.15	31.25	0.04	" "
	34.1	34.25	0.02	" "
	36.4	36.55	0.10	" "
	37.5	37.6	0.03	" "
	38.7	38.9	0.12	" "
	42.3	42.38	0.10	" "
	43.3	43.4	0.12	" "
	45.1	45.25	0.25	" "
	46.4	46.5	0.10	" "
	47.6	47.8	0.07	" "
	47.8	48.0	0.06	" "
	48.6	48.7	0.05	" "
	49.3	49.5	0.08	" "
	50.1	50.25	0.06	" "
	52.4	52.5	0.06	" "
	54.9	55.05	0.06	" "
	56.8	56.9	0.05	" "
	58.6	58.7	0.03	" "
	59.6	59.7	0.05	" "
	60.6	60.7	0.06	" "
	61.6	61.75	0.07	" "
	62.3	62.4	0.09	" "
	64.45	64.55	0.02	" (not split)
	67.4	67.5	0.04	" Split.
	68.35	68.45	0.05	" "
	69.70	69.8	0.11	" "
	71.5	71.6	0.24	" "
	73.8	74.0	0.16	" "
	74.55	74.7	0.15	" "
	76.0	76.2	0.11	" "

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	78.40	78.5	0.14	HQ split
	79.35	79.45	0.08	" "
	82.75	82.85	0.02	" "
	82.80	82.90	0.06	" "
	83.5	84.5	0.04	" "
	84.95	85.05	0.07	HQ Not split
	85.6	85.7	0.05	" " "
	87.7	87.8	0.03	HQ split
	90.32	90.40	0.06	" "
	90.8	90.9	0.08	" "
	91.8	91.9	0.07	HQ Not split
	94.4	94.5	0.06	" split
	95.2	95.3	0.00	HQ split
	96.3	96.4	0.04	" "
	97.0	97.1	0.07	" "
	98.9	99.0	0.14	" "
	99.6	99.65	0.17	" "
	100.75	100.85	0.10	" "
	102.9	102.95	0.03	" "
	106.1	106.15	0.09	" "
	106.55	106.6	0.11	" "
	107.25	107.35	0.11	" "
	110.5	110.6	0.05	" "
	116.2	116.3	0.09	" "
	118.35	118.45	0.08	" "
	120.4	120.5	0.04	" "
	122.4	122.5	0.11	" Non split
	123.4	123.45	0.03	" " "
	125.1	125.2	0.01	" split
	126.45	126.55	0.08	" Not split
	127.8	127.85	0.06	" " "
	129.2	129.3	0.15	" " "
	130.1	130.2	0.08	" " "
	133.0	133.1	0.08	" split
	134.9	135.0	0.10	" "
	137.1	137.2	0.13	" "
	139.0	139.1	0.11	" "
	140.25	140.3	0.11	" "

087

3

400088

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
4P1	141.7	141.8	0.06	Split HQ.
	143.8	143.95	0.14	" "
	145.0	145.2	0.22	" "
	146.35	146.45	0.21	" "
	147.05	147.20	0.29	" "
	148.6	148.7	0.08	" "
	152.65	152.8	0.13	" "
	154.0	154.1	0.23	" "
	168.6	168.7	0.28	" "
	168.8	168.9	0.22	" "
	160.5	160.6	0.16	" "
	162.9	163.0	0.09	" "
	164.2	164.3	0.07	" "
	165.9	166.0	0.14	" "
	167.0	167.1	0.12	" "
	169.1	169.3	0.1	" "
	172.8	172.9	0.1	" "
	174.7	174.85	0.13	" "
	176.6	176.6	0.05	" "
	178.6	178.7	0.11	" "
	181.6	181.7	0.14	" "
	184.6	184.8	0.17	" "
	186.8	186.8	0.09	Split NQ.
	189.20	189.4	0.17	" "
	190.4	190.5	0.13	" "
	193.4	193.5	0.1	" "
	194.1	194.2	0.11	" "
	195.4	195.5	0.11	" "
	196.35	196.5	0.12	" "
	198.3	198.4	0.03	" "
	200.7	200.55	0.12	" "
	203.1	203.5	0.17	" "
	204.4	204.5	0.18	" "
	205.5	205.6	0.19	" "
	207.45	207.55	0.14	" "
	209.9	210.0	0.09	" "
	214.6	214.95	0.24	" "
	216.1	216.2	0.49	" "

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	221.6	221.7	0.30	NQ split
	223.7	223.8	0.20	" "
	226.8	226.9	0.22	" "
	227.8	227.9	0.29	" "
	230.10	230.4	0.30	" "
	233.35	233.50	0.40	" "
	234.4	234.7	0.28	" "
	235.3	235.4	0.28	" "
	238.4	238.9	0.47	" "
	241.3	241.4	0.19	" "
	242.6	242.7	0.27	" "
	245.6	246.1	0.35	" "
	248.3	248.6	0.21	NQ non split
	251.1	251.6	0.27	" "
	254.6	254.7	0.27	" "
	257.5	257.6	0.20	" "
	260.4	260.5	0.17	" " " Did SG on it also.
	263.45	263.55	0.16	" " "
	265.1	265.2	0.25	" split
	266.3	267.0	0.26	" "
	270.1	270.2	0.20	" "
	271.8	271.9	0.35	" "
	272.45	272.55	0.29	" "
	274.8	274.9	0.33	" "
	275.8	275.9	0.16	" "
	278.5	278.6	0.17	" NOT SPLIT
	280.7*	281.4	0.25	" "
	284.5	284.6	0.12	" " " Did SG on it
	287.6	288.0	0.09	" " "
	290.6	290.8	0.20	" " "
	293.3	293.6	0.30	" " "
	296.5	296.6	0.25	" " "
	299.5	299.6	0.15	NQ split
	302.6	302.8	0.27	" "
	305.3	305.6	0.20	NQ not split
	308.6	308.8	0.09	" " "
	311.6	311.8	0.28	" "
	314.5	314.6	0.11	" " " Did SG on it



MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP1 HP1	317.6	318.2	0.15	HR Not split
	323.6	322.9	0.11	" " "
	326.4	326.6	0.17	" " "
	329.4	329.6	0.07	" " " Did SG on it.
	332.5	333.2	0.24	" " "
	335.0	335.6	0.21	" " "
	338.4	338.6	0.10 0.10	" " "
	341.6	341.7	0.23	" " "
	344.6 344.8	344.8	0.26	" " "
	347.5	347.6	0.27	" " " Did SG on it
	350.5	350.6	0.27	" split
	351.3	351.4	0.39	" "
	353.4 353.4	353.6	0.32	" "
	356.3	356.6	0.36	" "
	359.6	360.1	0.40	" "
	362.5	362.6	0.33	" "
	363.6	363.7	0.23	" "
	366.0	366.6	0.37	" "
	369.2	369.6	0.24	" "
	372.65	372.8	0.25	" "
	374.2	374.6	0.36	" "
	377.6	377.95	0.39	" "
	380.6	380.2	0.41	" "
	383.25	383.55	0.38	" "
	386.6	386.9	0.41	" "
	389.3	389.6	0.19	" " Qtz - carbonate vein
	392.6	392.9	0.36	" "
	395.2	395.6	0.38	" "
	398.7	398.9	0.39	" "
	401.4	401.6	0.34	" "
	406.6	406.8	0.11	" "
	409.6	409.9	0.09	" "
	411.9	412.6	0.48	" "
	415.8	415.6	0.19	" "
	418.65	418.9	0.40	" "
	421.6	421.7	0.13	" Not split
	424.6	424.9	0.20	" split
	427.6	427.9	0.24	" #"

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	430.5 430.6	430.6	0.4	SPLIT NQ.
	433.5	433.6	0.46	" "
	436.5	436.6	0.33	" "
	439.4	439.6	0.34	" "
	442.6	442.7	0.36	" "
	443.45	443.6	0.27	" "
	446.6	446.75	0.29	" "
	449.3	449.55	=>	" " - 0.12 in Qtz-carb vein - 0.37 in host rock.
	452.6	452.7	0.1	" " - Qtz-carb vein.
	455.6	455.85	0.31	" "
	457.0	457.1	0.25	" "
	460.0	460.1	0.12	" "
	462.95	463.1	0.24	" " - Qtz-carb vein
	465.9	466.1	0.05	" "
	471.6	471.7	0.44	" "
	474.35	474.65	0.29	" "
	477.7	477.85	0.17	" "
	480.75	480.1	0.20	" "
	483.55	483.7	0.35	" "
	489.6	489.7	0.20	" " - SG reading
	494.6	494.85	0.20	" "
	497.7	497.8	0.36	" "
	500.5	500.6	0.41	" "
	503.45	503.6	0.28	" "
	506.5	506.6	0.42	" "
	509.45	509.6	0.34	" "
	512.6	513.15	0.18	" "
	515.45	515.6	0.33	" "
	518.6	518.7	0.19	" "
	521.6	521.7	0.14	" "
	524.5	524.6	0.35	" "
	527.6	527.8	0.32	" "
	530.65	530.8	0.25	" "
	533.6	533.85	0.34	" "
	536.5	536.6	0.27	" "
	539.2	539.6	0.23	" "
	542.6	542.85	0.36	" "
	545.6	545.8	0.21	" "

091

400092

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP1	548.6	549.7	0.35	* NA split core
	551.0	551.6	0.18	" " "
	554.2	554.6	0.23	↓
	557.6	557.9	0.26	
	560.6	560.8	0.06	
	563.6	563.9	0.32	
	566.6	566.8	0.13	
	569.6	570.0	0.18	
	572.6	572.9	0.24	
	575.4	575.6	0.31	
	578.3	578.5	0.31	
	581.4	581.6	0.19	
	584.7	584.9	0.16	
	587.6	587.8	0.27	
	590.6	591.1	0.16	
	593.4	593.6	0.21	
	595.0	595.2	0.20	BQ split core
	597.8	598.0	0.14	" " "
	600.5	600.7	0.18	" " "
	602.0	602.2	0.11	↓
	608.0	608.1	0.19	
	610.1	610.2	0.26	
	614.2	614.35	0.16	
	617.0	617.2	0.22	
	620.0	620.2	0.17	
	622.9	623.0	0.15	
	626.9	626.0	0.19	
	629.0	629.1	0.17	
	632.0	632.3	0.41	
	633.2	633.3	0.15	↓
	636.3	636.5	0.18	BQ Not split
	639.3	639.5	0.16	" " "
	641.6	641.8	0.18	↓
	643.3	643.5	0.53	
	643.35	643.35	0.15	
	649.0	649.3	0.12	
	650.6	650.9	0.12	
	655.2	655.5	0.17	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 2	5.3	5.4	0.12	HQ whole
	9.4	9.5	0.08	"
	10.8	11.05	0.14	"
	13.4	13.5	0.09	"
	15.9	16.0	0.10	"
	19.7	19.8	0.06	"
	22.8	22.9	0.08	"
	24.45	24.7	0.18	"
	28.4	28.5	0.04	Whole.
	30.0	30.1	0.09	Split
	33	33.3	0.1	whole
	34.5	34.7	0.09	"
	36.2	36.5	0.1	Split
	38.8	38.9	0.16	"
	42.1	42.5	0.09	NQ Whole
	45.35	45.5	0.12	"
	48.7	49.4	0.1	"
	51.3	51.45	0.09	"
	54.3	54.5	0.09	"
	56.9	57.4	0.1	"
	61.6	61.7	0.1	"
	65.2	65.35	0.13	"
	69.95	70.1	0.08	Split
	74.0	74.7	0.12	whole
	77.8	77.9	0.09	"
	80.8	81	0.08	"
	83.1	83.35	0.08	"
	86.1	86.2	0.07	"
	89.1	89.5	0.08	"
	94.8	94.95	0.12	split
	97.5	97.6	0.29	"
	99.5	99.7	0.12	"
	103.55	103.7	0.11	"
	108.5	108.6	0.13	whole
	111.3	111.4	0.11	"
	115.6	115.7	0.07	"
	120.15	120.3	0.15	"
	123.95	124.1	0.08	"

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 2	127.7	128.4	0.13	NQ whole.
	130.15	130.24	0.14	
	134.7	134.8	0.13	
	137.4	137.5	0.14	
	141.2	141.35	0.17	
	144.7	144.9	0.13	
	147.15	147.25	0.14	
	150.3	150.4	0.37	
	152.8	153.0	0.09	
	157.0	157.25	0.22	
	161.6	161.7	0.11	
	164.8	164.9	0.13	
	167.4	167.5	0.25	
	172.30	172.65	0.15	
	176.9	177.0	0.20	
	180.6	180.8	0.16	
	186.0	186.1	0.22	
	189.2	189.4	0.21	
	192.3	192.5	0.14	
	196.0	196.2	0.19	
	200.4	200.5	0.22	
	204.2	204.3	0.15	
	207.3	207.7	0.16	
	211.3	211.45	0.12	
	214.7	214.8	0.19	
	217.5	217.6	0.10	
	220.0	220.1	0.01	
	227.3	227.4	0.07	
	228.4	228.6	0.01	
	232.7	232.9	0.02	
	236.9	237.1	0.05	
	240.3	240.7	0.04	
	243.8	244.1	0.03	
	248.5	248.6	0.04	
	252.9	253.0	0.03	
	256.4	256.8	0.03	
	259.6	259.7	0.02	
	263.1	263.2	0.03	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
4P2	266.4	266.7	0.03	NQ	whole.
	270.6	270.9	0.04		
	273.6	273.75	0.04		
	276.6	276.7	0.03		
	279.6	279.7	0.04		
	282.6	282.95	0.05		
	285.35	285.5	0.04		
	290.8	290.9	0.04		
	295.7	295.8	0.04		
	298.7	298.85	0.05		
	302.5	302.65	0.06		
	306.0	306.15	0.04		
	310.7	311.1	0.04		
	313.7	313.95	0.04		
	317.3	317.6	0.07		
	322.7	322.85	0.06		
	325.7	325.8	0.04		
	328.7	328.9	0.09		
	334.85	334.6	0.05		
	338.3	338.4	0.11		
	340.45	340.6	0.11		
	345.2	345.3	0.12		
	348.2	348.3	0.10		
	352.6	352.7	0.10		
	355.7	356.0	0.18		
	358.7	359.1	0.11		
	362.65	362.8	0.1		
	367.6	367.7	0.09		
	372.8	373.1	0.09		
	378.55	378.7	0.13		
	381.65	381.8	0.12		
	385.10	385.45	0.09		
	388.5	388.6	0.22		
	391.7	391.95	0.27		
	394.45	394.7	0.29		
	400.7	400.85	0.27		
	403.7	403.85	0.30		
	406.7	406.95	0.31		

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading		Comment
HP 2	409.7	409.9	0.26	NQ	whole
	413.8	413.9	0.26		
	415.75	415.95	0.29		
	419.3	419.65	0.28		
	421.7	421.85	0.30		
	424.7	424.9	0.23		
	427.7	427.85	0.26	↓	
	430.7	430.8	0.19		
	433.4	433.6	0.17 (0.17)		(Good one Jess)
	437.85	438.0	0.17		
	442.7	443.1	0.09		
	448.55	448.7	0.08		
	451.0	451.6	0.09		
	454.3	454.7	0.09		
	459.0	459.2	0.10		↓
	463.7	464.05	0.26		↓
	466.6	466.75	0.03	↓	split atz - eb. vein
	469.6	469.7	0.23		whole
	472.5	472.7	0.17		↓
	477.3	477.6	0.25		↓
	482.45	482.8	0.22		
	484.7	484.8	0.25		↓
	487.3	487.5	0.21		↓
	490.45	490.6	0.11		split
	494.0	494.2	0.22		↓
	499.1	499.3	0.19		↓
	502.5	502.8	0.24		whole
	505.4	505.5	0.10		↓
	509.7	510.0	0.25	↓	↓
	514.6	514.7	0.14		
	517.6	517.75	0.20		
	521.35	521.5	0.16		
	524.5	524.7	0.16		
	528.7	528.85	0.21		
	531.3	531.6	0.14		
	535.3	535.6	0.08		
	540.1	540.2	0.08		↓
	544.7	544.9	0.09	↓	SPLIT

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
SK 5	4.4	4.5	0.08	NQ WHOLE CORE
	19.8	19.9	0.16	NQ SPLIT
	20.95	21.03	0.15	NQ SPLIT
	23.95	24.08	0.14	BQ SPLIT
	28.88	28.98	0.12	" "
	31.90	32.00	0.12	" "
	34.95	35.05	0.08	BQ WHOLE
	40.35	40.50	0.18	
	42.55	42.65	0.07	
	47.21	47.31	0.17	
	50.75	50.85	0.13	
	52.23	53.33	0.11	
	56.30	56.38	0.14	
	59.45	59.55	0.11	
	65.35	65.45	0.13	
	68.53	68.63	0.02	
	71.63	71.73	0.10	
	74.58	74.68	0.11	
	78.3	78.4	0.11	SPLIT
	79.13	79.23	0.17	WHOLE
	80.67	80.77	0.14	
	83.8	83.9	0.06	
	86.86	86.96	0.07	
	90.4	90.5	0.06	SPLIT
	93.0	93.1	0.04	SPLIT
	96.90	96.01	0.05	WHOLE
	100.1	100.2	0.06	
	102.00	102.11	0.15	
	105.00	105.1	0.07	
	108.1	108.2	0.08	SPLIT
	111.25	111.35	0.06	WHOLE
	114.2	114.3	0.17	
	118.04	118.14	0.07	
	119.38	119.48	0.05	
	120.5	120.6	0.06	SPLIT
	123.4	123.5	0.14	
	125.5	125.6	0.05	
	129.83	129.83	0.19	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
S49.	0.90	1.00	0.05	NQ WHOLE CORE
	4.45	4.55	0.05	↓
	7.45	7.55	0.04	
	10.85	11.00	0.08	BQ WHOLE
	15.10	15.20	0.11	
	18.3	18.45	0.09	
	21.35	21.5	0.05	
	24.40	24.5	0.08	
	27.45	27.55	0.11	
	31.28	31.40	0.12	
	33.55	33.65	0.16	
	36.9	37.0	0.11	
	39.5	39.6	0.12	
	47.8	47.9	0.1	
	51.75	51.85	0.09	
	53.64	53.8	0.11	
	59.18	59.30	0.14	
	63.25	63.25	0.08	
	65.35	65.45	0.06	
	70.85	70.95	0.08	✓
	74.55	74.65	0.11	BQ split
	82.10	82.25	0.05	
	90.45	90.55	0.17	
	96.2	96.3	0.14	
	100.5	100.6	0.10	
	110.4	110.5	0.13	
	121.2	121.6	0.09	↓
	112.65	112.75	0.12	
	127.75	127.85	0.05	BQ WHOLE
	133.75	133.85	0.13	
	135.05	135.15	0.06	
	137.05	137.15	0.08	
	140.50	140.60	0.10	
	145.25	145.35	0.10	
	145.9	146.0	0.14	FOH

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
SK12	3.43	3.53	0.11	NO	whole
	6.20	6.30	0.11		
	10.4	10.55	0.12		
	14.7	14.8	0.14		
	18.5	18.6	0.16		
	20.3	20.4	0.14		
	23.4	23.5	0.09		
	25.9	26.0	0.08		
	28.0	29.1	0.05	↓	↓
	33.3	33.4	0.04		
	36.3	36.4	0.02		
	40.4	40.5	0.08		
	44.0	44.15	0.09		
	48.1	48.2	0.07		
	51.0	51.1	0.06		
	54.05	54.2	0.08		
	58.95	59.05	0.18		
	62.9	63.0	0.09		
	68.0	68.1	0.12		
	72.0	72.1	0.10		
	75.85	76.0	0.14	↓	↓
	81.1	81.2	0.08		
	85.3	85.4	0.03		
	88.6	88.7	0.10		
	91.8	91.7	0.03		
	96.0	96.1	0.11		
	99.0	99.15	0.09		
	101.9	102.0	0.16		
	104.8	104.9	0.18		
	109.85	110.0	0.11		
	113.95	114.05	0.15		
	113.85	115.95	0.22		
	118.8	118.9	0.08		
	121.8	121.9	0.10		
	124.8	124.9	0.04		
	129.6	129.7	0.12		
	132.8	132.9	0.11		
	135.9	136.0	0.25	↓	↓

Box 1, ie 1st 21m not retrieved from hole!

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 3	21.00	21.40	0.14	HQ WHOLE CORE
	24.50	24.90	0.11	
	28.40	28.50	0.13	
	31.30	31.40	0.58	
	34.90	35.10	0.207	
	35.10	35.50	0.20	
	37.50	37.70	0.14	HQ WHOLE CORE WHOLE CORE
	40.40	40.70	0.10	HQ SPLIT CORE
	43.40	43.50	0.17	
	46.40	46.55	0.10	
	49.40	49.90	0.14	
	52.40	52.50	0.11	
	57.00	57.15	0.15	
160.75 →	60.75	61.25	0.06	HQ WHOLE
	66.80	67.10	0.14	
	72.30	72.50	0.08	
	74.85	75.30	0.09	
	79.40	79.50	0.14	
	82.40	82.80	0.17	
	85.80	86.10	0.20	
	88.40	89.10	0.06	
	91.75	92.15	0.15	
	94.90	95.10	0.08	
	98.00	98.15	0.15	
	100.40	100.55	0.27	
	103.5	103.6	0.16	
	106.15	106.25	0.09	
	109.4	109.5	0.12	
	112.4	112.55	0.17	
	115.2	115.4	0.09	
	118.4	118.7	0.06	
	121.45	121.65	0.12	
	124.2	124.4	0.16	
	127.4	127.7	0.20	
	131.00	131.25	0.23	
	133.60	133.75	0.14	
	136.3	136.4	0.20	
	140.95	141.20	0.26	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 3	145.0	145.10	0.14	HQ WHOLE CORE
	148.4	148.9	0.24	" "
	150.8	151.4	0.15	NQ WHOLE
	155.15	155.25	0.18	
	160.1	160.5	0.17	
	166.4	166.7	0.19	
	171.85	172.0	0.15	
	175.1	175.25	0.12	
	179.9	180.0	0.10	
	184.6	185.3	0.05	
	189.85	190.0	0.04	
	193.0	193.65	0.05	
	197.9	198.05	0.02	
	202.25	202.35	0.04	
	205.4	206.1	0.08	
	209.9	210.3	0.03	
	216.25	216.40	0.03	
	220.4	220.6	0.02	↓
	224.50	225.30		← DAVE'S MISTAKE ! XXXXXXXXXX
	225.3	225.43	0.03	NQ WHOLE
	229.4	229.7	0.03	
	232.4	232.6	0.03	
	235.4	235.5	0.02	
	241.3	241.4	0.05	
	245.6	246.2	0.03	
	250.3	250.4	0.02	
	253.4	253.6	0.02	↓ get Carb vein
	257.9	258.2	0.03	NQ SPLIT
	261.05	261.2	0.02	NQ WHOLE
	267.9	268.0	0.08	
	272.9	273.2	0.13	
	275.8	276.0	0.10	
	280.45	280.75	0.08	
	284.75	284.85	0.11	
	290.45	290.60	0.09	
	294.4	294.7	0.11	
	298 75	299.40	0.09	
	302.9	303.20	0.12	↓

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4	4.35	4.5	0.07	HQ whole
	7.6	8.4	0.12	-
	10.8	11.0	0.08	-
	15.3	15.5	0.14	-
	13.2	13.5	0.07	-
	19.4	19.5	0.08	-
	21.7	22.1	0.15	-
	24.4	24.5	0.09	-
	26.9	27.4	0.08	-
	30.2	30.4	0.11	-
	34.3	34.5	0.15	-
	37.5	37.65	0.11	-
	40.5	40.85	0.14	-
	44.8	45.0	0.27	-
	46.25	46.4	0.24	-
	48.6	49.0	0.17	-
	52.35	52.5	0.23	-
	55.5	55.6	0.17	-
	58.4	58.5	0.15	NQ whole
	61.5	61.6	0.44	-
	63.5	63.7	0.23	-
	68.9	69.3	0.18	-
	70.30	70.5	0.21	-
	72.35	73.5	0.21	-
	75.65	75.8	0.22	-
	78.6	80.7	0.25	-
	81.8	81.9	0.24	-
	85.3	85.5	0.29	-
	88.35	88.5	0.12	-
	91.1	91.5	0.05	-
	94.0	94.1	0.02	-
	96.1	96.25	0.07	-
	100.5	100.6	0.02	-
	102.5	102.6	0.02	-
	105.5	105.8	0.05	-
	108.2	108.3	0.03	-
	111.8	112	0.17	-
	113.0	113.3	0.12	-

400116

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4	115.6	115.8	0.01	NQ whole
	121.5	127.6	0.03	" " (fault zone).
	130.1	130.2	0.03	" "
	138.5	138.6	0.03	" "
	144.0	144.1	0.01	" "
	152.85	152.8	0.02	" "
	148.?	^{70cm} 152.2	0.03	" "
	152.0	153.2	0.05	" "
	157.0	157.1	0.11	" "
	158.9	159.15	0.07	" Split
	162.4	162.6	0.02	" "
	166.4	166.6	0.07	" "
	171.7	171.8	0.00!	" "
	174.4	174.5	0.07	" "
	177.6	177.75	0.42	" "
	181.5	181.6	0.15	" "
	183.7	183.8	0.16	" "
	186.8	186.9	0.07	" "
	187.5	187.6	0.05	HQ whole
	191.1	191.25	0.31	" "
	192.2	192.5	0.08	" "
	195	195.15	0.15	" "
	198.4	198.5	0.14	" "
HP 4A	196.5	196.65	0.12	NQ whole
	199.5	199.6	0.16	" "
	203.1	203.2	0.06	" "
	208.4	208.5	0.06	" "
	211.4	211.4	0.14	" "
	214.1	214.2	0.26	" "
	218.8	218.8	0.08	" "
	221.2	221.5	0.08	" "
	224.6	224.8	0.27	" Split
	226.7	227.0	0.24	" whole
	229.85	230	0.09	" "
	232.8	233	0.29	" "
	235.2	235.4	0.22	" "
	238.15	238.3	0.17	" "
	241.3	241.5	0.20	" "

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 4A.	243.2	243.5	0.24	NG whole
	246.3	246.4	0.27	"
	249.5	249.5 250.0	0.20	"
	253.4	253.7	0.36	"
	258.0	258.1	0.23	"
	260.0	260.5	0.05	"
	263.0	263.1	0.22	"
	265.35	265.6	0.16	"
	269.0	269.15	0.24	"
	271.35	271.55	0.17	"
	275.4	275.4	0.13	"
	280.75	280.95	0.11	"
	284.3	284.5	0.16	"
	286.0	286.2	0.19	"
	290.0	290.15	0.26	"
	292.0	292.7	0.18	"
	295.80	296.55	0.15	"
	297.45	297.6	0.19	"
	300.0	300.2	0.58	NG split
	303.9	302.1	0.36	"
	303.6	303.8	0.28	"
	306.7	307.1	0.34	"
	311.0	311.15	0.60	"
	314.31	314.3	0.33	"
	318.9	319.0	0.39	"
	322.2	322.45	0.48	"
	325.6	325.9	0.32	"
	332.2	333.35	0.29	"
	338.0	338.2	0.26	"
	340.5	340.7	0.26	"
	342.3	342.5	0.27	"
	346.3	346.9	0.48	"
	349.2	349.5	0.33	"
	351.65	351.7	0.21	"
	354.7	355.0	0.33	"
	355.8	355.9	0.25	"
	359.8	360.1	0.39	"
	365.6	365.7	0.20	"

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
HP 4A	386.0	386.15	0.26	NA split	
	371.2	371.35	0.29	↓	
	376.3	376.5	0.35		
	382.4	382.51	0.31		
	389.3	389.5	0.37		
	391.9	392.0	0.30		
	397.0	397.1	0.17		
	398.0	398.1	0.33		
	402.8	402.9	0.29		
	403.9	404.0	0.32		
	408.5	408.9	0.24		
	409.9	410.0	0.2		
	414.25	414.7	0.31		
	416.1	416.3	0.18		
	420.25	420.5	0.27		
	421.7	422.0	0.30		↓
	425.0	425.1	0.33	NA Not split	
	431.0	431.7	0.17	↓	
	433.1	433.2	0.22		
	438.7	439.0	0.23		
	441.6	441.9	0.32		
	447.6	448.0	0.34		
	449.6	450.2	0.15		
	454.1	454.2	0.15		
	458.8	459.0	0.26		
	463.5	464.0	0.27		
	469.9	470.0	0.29		
	473.1	473.8	0.30		
	476.0	476.8	0.18		
	479.0	479.8	0.27		
	485.0	485.3	0.21		
	489.8	490.1	0.33		
	493.9	494.0	0.30	↓	
	497.65	497.85	0.30	↓	
	502.0	502.5	0.25		NA Not split
	505.5	505.6	0.25		
	508.4	508.5	0.13		
	511.5	511.7	0.23	↓	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
54.1	10.06	10.15	0.00	NQ	whole.
	13.60	13.72	0.00	↓	↓
	17.25	17.37	0.00	↓	↓
	29	29.15	0.06	BQ	split
	32.50	32.61	0.03	↓	↓
	34.4	34.5	0.03	↓	↓
	37.95	38.1	0.09	↓	↓
	46.65	46.8	0.01	↓	↓
	49.9	50	0.00	↓	↓
	52.9	53	0.04	↓	↓ - min. Fe ₂ P ₂ O ₇
	54.7	54.86	0.05	↓	↓
	55.9	56	0.02	↓	↓ - 1/4 BQ - massive Grt + Spl.
	57.25	57.35	0.02	↓	↓ Split.
	60.35	60.56	0.05	↓	↓ unrecrystallized
	63.90	64	0.1	↓	↓
	67.87	68	0.08	↓	↓
	68.65	68.75	0.00	↓	↓
	71.1	71.25	0.13	↓	↓
	74	74.1	0.02	↓	↓
	76.95	77.05	0.00	↓	↓
	79.60	79.67	0.05	↓	↓
	82.6	82.85	0.05	↓	↓
	87.5	87.6	0.00	↓	↓
	90	90.15	0.05	↓	↓
	92	92.1	0.00	↓	↓
	95.1	95.25	0.00	↓	↓
	99.1	99.2	0.06	↓	↓
	101.65	102	0.08	↓	↓
	105.7	105.8	0.00	↓	↓
	109.9	110	0.00	↓	↓
	115.4	115.5	0.00	↓	↓
	115.85	118.95	0.05	↓	↓
	121	121.15	0.09	↓	↓
	125.4	125.5	0.07	↓	↓
	129.7	129.84	0.04	↓	↓
	135.15	135.3	0.07	↓	↓ whole Core.
	144.0	144.17	0.10	↓	↓
	150.45	150.57	0.05	↓	↓

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 2	5.3	5.4	0.12	HQ whole
	9.4	9.5	0.08	"
	10.8	11.05	0.14	"
	13.4	13.5	0.09	"
	15.9	16.0	0.10	"
	19.7	19.8	0.06	"
	22.8	22.9	0.08	"
	24.45	24.7	0.18	"
	28.4	28.5	0.04	Whole.
	30.0	30.1	0.09	Split
	33	33.3	0.1	whole
	34.5	34.7	0.09	"
	36.2	36.5	0.1	Split
	38.8	38.9	0.16	"
	42.1	42.5	0.09	NQ Whole
	45.35	45.5	0.12	"
	48.7	49.4	0.1	"
	51.3	51.45	0.09	"
	54.3	54.5	0.09	"
	56.01	57.4	0.1	"
	61.6	61.7	0.1	"
	65.2	65.35	0.13	"
	69.95	70.1	0.08	Split
	74.0	74.7	0.12	whole
	77.8	77.9	0.09	"
	80.8	81	0.08	"
	83.1	83.35	0.08	"
	86.1	86.2	0.07	"
	89.1	89.5	0.0	"
	94.5	94.95	0.12	Split
	97.5	97.6	0.29	"
	99.5	99.7	0.12	"
	103.55	103.7	0.11	"
	108.5	108.6	0.13	whole
	111.3	111.4	0.11	"
	115.6	115.7	0.07	"
	120.15	120.3	0.15	"
	123.95	124.1	0.08	"

MAGNETIC SUSCEPTIBILITY READINGS

②

DDH No	From	To	Reading	Comment
HP 2	127.7	128.4	0.13	NQ whole.
	130.15	130.24	0.14	
	134.7	134.8	0.13	
	137.4	137.5	0.14	
	141.2	141.35	0.17	
	144.7	144.9	0.13	
	147.15	147.25	0.14	
	150.3	150.4	0.37	
	152.8	153.0	0.09	
	157.0	157.25	0.22	
	161.6	161.7	0.11	
	164.8	164.9	0.13	
	167.4	167.5	0.25	
	172.30	172.65	0.15	
	176.9	177.0	0.20	
	180.6	180.8	0.16	
	186.0	186.1	0.22	
	189.2	189.4	0.21	
	192.3	192.5	0.14	
	196.0	196.2	0.19	
	200.4	200.5	0.22	
	204.2	204.3	0.15	
	207.3	207.7	0.16	
	211.3	211.45	0.12	
	214.7	214.8	0.19	
	217.5	217.6	0.10	
	220.0	220.1	0.01	
	227.3	227.4	0.07	
	228.4	228.6	0.01	
	232.7	232.9	0.02	
	236.9	237.1	0.05	
	240.3	240.7	0.04	
	243.8	244.1	0.03	
	248.5	248.6	0.24	
	252.9	253.0	0.03	
	256.4	256.8	0.03	
	259.6	259.7	0.02	
	263.1	263.2	0.03	

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
482	266.4	266.7	0.03	NQ	whole.
	270.6	270.9	0.04		
	273.6	273.75	0.04		
	276.6	276.7	0.03		
	279.6	279.7	0.04		
	282.6	282.95	0.05		
	285.35	285.5	0.04		
	290.8	290.9	0.04		
	295.7	295.8	0.04		
	298.7	298.85	0.05		
	302.5	302.65	0.06		
	306.0	306.15	0.04		
	310.7	311.1	0.04	↓	↓
	313.7	313.95	0.04		
	317.3	317.6	0.07		
	322.7	322.85	0.06		
	325.7	325.8	0.04		
	328.7	328.9	0.09		
	334.35	334.6	0.05		
	337.3	338.4	0.11		
	340.45	340.6	0.11		
	345.2	345.3	0.12		
	348.2	348.3	0.10		
	352.6	352.7	0.10		
	355.7	356.0	0.15		
	358.7	359.1	0.11	↓	↓
	362.65	362.8	0.1		
	367.6	367.7	0.09		
	372.8	373.1	0.09		
	378.55	378.7	0.13		
	381.65	381.8	0.12		
	385.10	385.45	0.09		
	388.5	388.6	0.22		
	391.7	391.95	0.27		
	394.45	394.7	0.29		
	400.7	400.85	0.27		
	403.7	403.85	0.30		
	406.7	406.95	0.31	↓	↓

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 2	409.7	409.9	0.26	NQ whole
	413.8	413.9	0.26	
	415.75	415.95	0.29	
	419.3	419.65	0.28	
	421.7	421.85	0.30	
	424.7	424.9	0.23	
	427.7	427.85	0.26	↓
	430.7	430.8	0.19	
	433.4	433.6	0.17	(0.17) (Good one J=2)
	437.85	438.0	0.17	
	442.7	443.1	0.09	
	448.55	448.7	0.08	
	451.0	451.6	0.09	
	454.3	454.7	0.09	
	459.0	459.2	0.10	↓
	463.7	464.05	0.26	↓
	466.6	466.75	0.03	split
	469.6	469.7	0.23	whole
	472.5	472.7	0.17	
	477.3	477.6	0.25	↓
	480.45	482.5	0.22	
	484.7	484.8	0.25	
	487.3	487.5	0.21	↓
	490.45	490.6	0.11	split
	494.0	494.2	0.22	
	499.1	499.3	0.19	↓
	502.5	502.8	0.24	whole
	505.4	505.5	0.10	
	509.7	510.0	0.25	↓
	514.6	514.7	0.14	
	517.6	517.75	0.20	
	521.35	521.5	0.16	
	524.5	524.7	0.16	
	528.7	528.85	0.21	
	531.3	531.6	0.14	
	535.3	535.6	0.08	
	540.1	540.2	0.08	↓
	544.7	544.9	0.09	split

127

400127

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	4.6m		0.02	HQ
	8.2	8.3m	0.03	"
	11.15	11.25	0.08	"
	12.8	12.9	0.07	0.07
	15.4	15.5	0.04	"
	17.68	17.80	0.03	"
	20.7	20.8	0.03	" Split.
	29.55	29.7	0.04	" "
	31.15	31.25	0.04	" "
	34.1	34.25	0.02	" "
	36.4	36.55	0.10	" "
	37.5	37.6	0.03	" "
	38.7	38.9	0.12	" "
	42.3	42.38	0.10	" "
	43.3	43.4	0.12	" "
	45.1	45.25	0.25	" "
	46.4	46.5	0.10	" "
	47.6	47.8	0.07	" "
	47.8	48.0	0.06	" "
	48.5	48.7	0.05	" "
	49.3	49.5	0.08	" "
	50.1	50.25	0.06	" "
	52.4	52.5	0.06	" "
	54.9	55.05	0.06	" "
	56.8	56.9	0.05	" "
	58.6	58.7	0.03	" "
	59.6	59.7	0.05	" "
	60.6	60.7	0.06	" "
	61.6	61.75	0.07	" "
	62.2	62.4	0.09	" "
	64.45	64.55	0.02	" (not split)
	67.4	67.5	0.04	" split.
	68.35	68.45	0.05	" "
	69.70	69.8	0.11	" "
	71.5	71.6	0.24	" "
	73.8	74.0	0.16	" "
	74.55	74.7	0.15	" "
	76.0	76.2	0.11	" "

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	78.40	78.5	0.14	HQ split
	79.35	79.45	0.08	" "
	82.75	82.85	0.02	" "
	82.80	82.90	0.06	" "
	83.5	84.5	0.04	" "
	84.95	85.05	0.07	HQ Not split.
	85.6	85.7	0.05	" " "
	87.7	87.8	0.03	HQ split.
	90.32	90.40	0.06	" "
	90.8	90.9	0.08	" "
	91.8	91.9	0.07	HQ Not split.
	94.4	94.5	0.06	" split.
	95.2	95.3	0.00	HQ split
	96.3	96.4	0.04	" "
	97.0	97.1	0.07	" "
	98.9	99.0	0.14	" "
	99.6	99.65	0.17	" "
	100.75	100.85	0.10	" "
	102.9	102.95	0.03	" "
	106.1	106.15	0.09	" "
	106.55	106.6	0.11	" "
	107.25	107.35	0.11	" "
	110.5	110.6	0.05	" "
	116.2	116.3	0.09	" "
	118.35	118.45	0.08	" "
	120.4	120.5	0.04	" "
	122.4	122.5	0.11	" Non split.
	123.4	123.45	0.03	" " "
	125.1	125.2	0.01	" split
	126.45	126.55	0.08	" Not split
	127.8	127.85	0.06	" " "
	129.2	129.3	0.15	" " "
	130.1	130.2	0.08	" " "
	133.0	133.1	0.08	" split.
	134.9	135.0	0.10	" "
	137.1	137.2	0.13	" "
	139.0	139.1	0.11	" "
	140.25	140.3	0.11	" "

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
4P1	141.7	141.8	0.06	Split Aq.
	143.8	143.95	0.14	" "
	145.0	145.2	0.22	" "
	146.35	146.45	0.21	" "
	147.05	147.20	0.29	" "
	148.6	148.7	0.08	" "
	152.65	152.8	0.13	" "
	154.0	154.1	0.23	" "
	168.6	168.7	0.28	" "
	168.8	168.9	0.22	" "
	160.5	160.6	0.16	" "
	162.9	163.0	0.09	" "
	164.2	164.3	0.07	" "
	165.9	166.0	0.14	" "
	167.0	167.1	0.12	" "
	169.1	169.3	0.1	" "
	172.8	172.9	0.1	" "
	174.7	174.85	0.13	" "
	176.6	176.6	0.05	" "
	177.7	177.7	0.11	" "
	181.6	181.7	0.14	" "
	184.6	184.8	0.17	" "
	186.8	186.8	0.09	Split NQ
	189.20	189.4	0.17	" "
	190.4	190.5	0.13	" "
	193.4	193.5	0.1	" "
	194.1	194.2	0.11	" "
	195.4	195.5	0.11	" "
	196.35	196.5	0.12	" "
	198.3	198.4	0.03	" "
	200.7	200.55	0.12	" "
	203.1	203.5	0.17	" "
	204.4	204.5	0.18	" "
	205.5	205.6	0.19	" "
	207.45	207.55	0.14	" "
	209.9	210.0	0.09	" "
	214.5	214.95	0.24	" "
	216.1	216.2	0.49	" "

400130

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	221.6	221.7	0.30	NQ split
	223.7	223.8	0.20	" "
	226.8	226.9	0.22	" "
	227.8	227.9	0.29	" "
	230.10	230.4	0.30	" "
	233.35	233.50	0.40	" "
	234.4	234.7	0.28	" "
	235.3	235.4	0.28	" "
	238.4	238.9	0.47	" "
	241.3	241.4	0.19	" "
	242.6	242.7	0.27	" "
	245.6	246.1	0.35	" "
	248.3	248.6	0.21	NQ non split
	251.1	251.6	0.27	" "
	254.6	254.7	0.27	" " "
	257.5	257.6	0.20	" " "
	260.4	260.5	0.17	" " " Did SG on it also
	263.45	263.55	0.16	" " "
	265.1	265.2	0.25	" split
	266.3	267.0	0.26	" "
	270.1	270.2	0.20	" "
	271.8	271.9	0.35	" "
	272.45	272.55	0.29	" "
	274.8	274.9	0.33	" "
	275.8	275.9	0.16	" "
	278.5	278.6	0.17	" NOT SPLIT
	280.7	281.4	0.25	" "
	284.5	284.6	0.12	" " " Did SG on it
	287.6	288.0	0.09	" " "
	290.6	290.8	0.20	" " "
	293.3	293.6	0.36	" " "
	296.5	296.6	0.25	" " "
	299.5	299.6	0.15	NQ split
	302.6	302.8	0.27	" "
	305.3	305.6	0.20	NQ not split
	308.6	308.8	0.09	" " "
	311.6	311.8	0.28	" "
	314.5	314.6	0.11	" " " Did SG on it

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP1 HP1	317.6	318.2	0.15	HR Not split
	323.6	322.9	0.11	" " "
	326.4	326.6	0.17	" " "
	329.4	329.6	0.07	" " " Did SG on it.
	332.5	333.2	0.24	" " "
	335.0	335.6	0.21	" " "
	338.4	338.6	0.10 0.10	" " "
	341.6	341.7	0.23	" " "
	344.6 344.8	344.8	0.26	" " "
	347.5	347.6	0.27	" " " Did SG on it
	350.5	350.6	0.27	" split
	351.3	351.4	0.39	" "
	353.4 353.4	353.6	0.32	" "
	356.3	356.6	0.36	" "
	359.6	360.1	0.40	" "
	362.5	362.6	0.33	" "
	363.6	363.7	0.23	" "
	366.0	366.6	0.37	" "
	369.2	369.6	0.22	" "
	372.65	372.8	0.25	" "
	374.2	374.6	0.36	" "
	377.6	377.95	0.39	" "
	380.6	380.2	0.41	" "
	383.25	383.55	0.38	" "
	386.6	386.9	0.41	" "
	389.3	389.6	0.19	" " Qtz - carbonate vein
	392.6	392.9	0.36	" "
	395.2	395.6	0.38	" "
	398.7	398.9	0.39	" "
	401.4	401.6	0.34	" "
	406.6	406.8	0.11	" "
	409.6	409.9	0.09	" "
	411.9	412.6	0.48	" "
	415.9	415.6	0.19	" "
	418.65	418.9	0.40	" "
	421.6	421.7	0.13	" Not split
	424.6	424.9	0.20	" split
	427.6	427.9	0.24	" #11

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
HP 1	430.5	430.6	0.4	Spl. L NQ.
	433.5	433.6	0.46	" "
	436.5	436.6	0.33	" "
	439.4	439.6	0.34	" "
	442.6	442.7	0.36	" "
	443.45	443.6	0.27	" "
	446.6	446.75	0.29	" "
	449.3	449.55	=>	" " - 0.12 in Qtz-carb vein - 0.37 in host rock.
	452.6	452.7	0.1	" " - Qtz-carb vein.
	455.6	455.85	0.31	" "
	457.0	457.1	0.25	" "
	460.0	460.1	0.12	" "
	462.95	463.1	0.24	" " - Qtz-carb vein
	465.9	466.1	0.05	" "
	471.6	471.7	0.44	" "
	474.35	474.65	0.29	" "
	477.7	477.85	0.17	" "
	480.75	480.1	0.20	" "
	483.55	483.7	0.35	" "
	489.6	489.7	0.20	" " - SG reading
	494.6	494.85	0.20	" "
	497.7	497.8	0.36	" "
	500.5	500.6	0.41	" "
	503.45	503.6	0.28	" "
	506.5	506.6	0.42	" "
	509.45	509.6	0.34	" "
	512.6	513.15	0.18	" "
	515.45	515.6	0.33	" "
	518.6	518.7	0.19	" "
	521.6	521.7	0.14	" "
	524.5	524.6	0.35	" "
	527.6	527.8	0.32	" "
	530.65	530.8	0.25	" "
	533.6	533.85	0.34	" "
	536.5	536.6	0.27	" "
	539.2	539.6	0.23	" "
	542.6	542.85	0.36	" "
	545.6	545.8	0.21	" "

133

400133

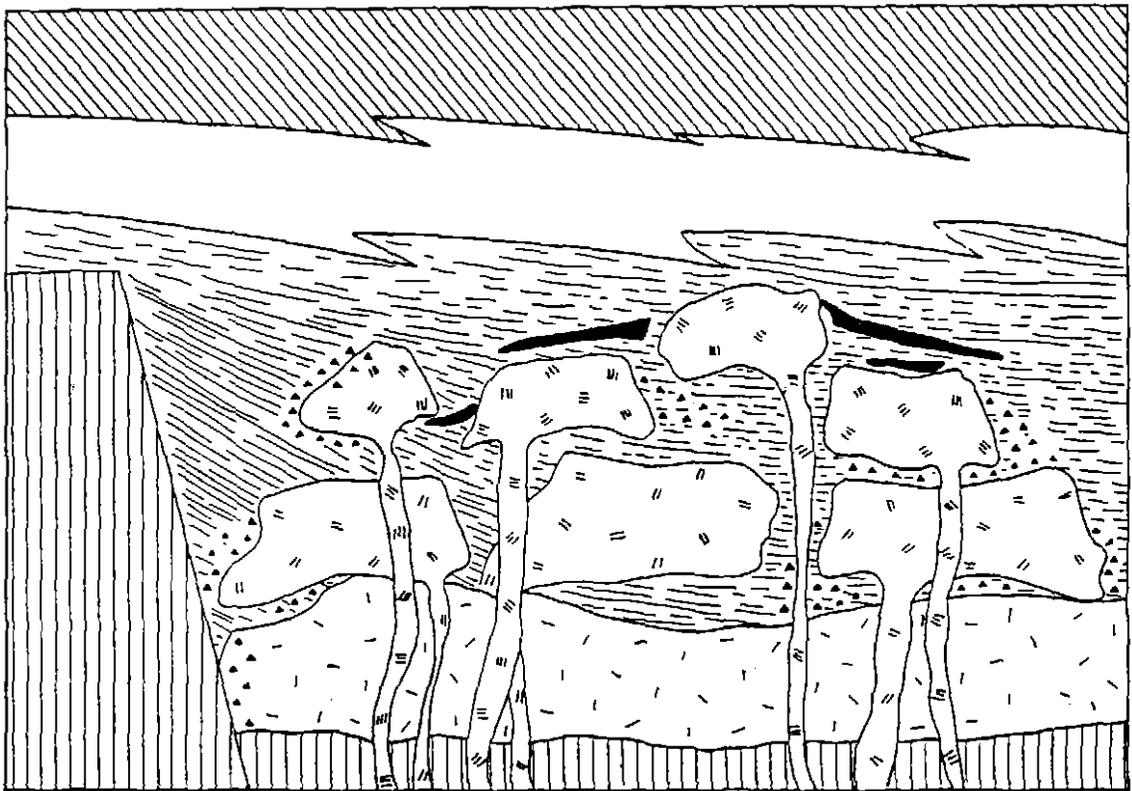
MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment	
HP 1	548.6	548.7	0.35	* NQ split core	
	551.0	551.6	0.18	" " "	
	554.2	554.6	0.23	↓	
	557.6	557.9	0.26		
	560.6	560.8	0.06		
	563.6	563.9	0.32		
	566.6	566.8	0.13		
	569.6	570.0	0.18		
	572.6	572.9	0.24		
	575.4	575.6	0.31		
	578.3	578.5	0.31		
	581.4	581.6	0.19		
	584.7	584.9	0.16		
	587.6	587.8	0.27		
	590.6	591.1	0.16		
	593.4	593.6	0.21		↓
	595.0	595.2	0.20	BQ split core	
	597.8	598.0	0.14	" " "	
	600.5	600.7	0.18	" " "	
	602.0	602.2	0.11	↓	
	608.0	608.1	0.19		
	610.1	610.2	0.26		
	614.2	614.35	0.16		
	617.0	617.2	0.22		
	620.0	620.2	0.17		
	622.9	623.0	0.15		
	625.9	626.0	0.19		
	629.0	629.1	0.17		
	632.0	632.3	0.41		
	633.2	633.3	0.15		
	636.3	636.5	0.18		BQ Not split
	639.3	639.5	0.16		" " "
	641.6	641.8	0.18		↓
	643.3	643.5	0.53		
	643.35	643.35	0.15		
	649.0	649.3	0.12		
	650.6	650.9	0.12		
	655.2	655.5	0.17		

APPENDIX III
SOCK CREEK SOUTH
STUDY OF DRILL CORE
S R HUNNS
PASMINCO MINING
NOVEMBER 1990



PASMINCO MINING-ROSEBERY
PROJECT : BULGOBAC E.L.37/89
SOCK CREEK SOUTH



Copies: T.K. Coombe
G.D. Iliff
Pasminco Exploration (3)
File

S.R.HUNNS
Nov. 1990

TABLE OF CONTENTS

	Page
<u>INTRODUCTION</u>	1
<u>WORK COMPLETED</u>	4
<u>GEOLOGY</u>	8
<u>MINERALISATION</u>	26
<u>STRUCTURE</u>	30
<u>WHOLE ROCK GEOCHEMISTRY</u>	31
- <u>Major and Trace Element</u>	37
- <u>Rare Earth Element Geochemistry</u>	39
- <u>Discussion</u>	32
<u>DISCUSSION/CONCLUSIONS</u>	42
<u>RECOMMENDATIONS</u>	43
<u>REFERENCES</u>	

LIST OF APPENDICES

APPENDIX A	-	Whole rock geochemical data base. References: T.C. - Crawford, 1989 C & K - Corbett & Komyshan, 1989 AMIRA - Stolz & Large, 1988
APPENDIX B	-	Whole rock assays for samples 81611 81613 81614 81628 81633 81644 81635 81636

		Page	
Figure	1	Location Map	2
	2	Section of DDH SCS2	Sleeve
	3	Section of DDH SCS3	Sleeve
	4	Section of DDH SCS4	Sleeve
	5	Section of DDH MCH-1	Sleeve
	6	Stratigraphic columns of the Sock Creek South Diamond Drill Holes.	9
	7	Twinned augite phenocrysts	11
	8	'Fresh' and altered twinned augites	11
	9	Altered plagioclase phenocryst	13
	10	Quartz, feldspar phyric pumiceous breccia	13
	11	Randomly oriented, sericite altered pumice clasts	14
	12	Uncollapsed pumice fragment	14
	13	Collapsed pumice fragments	16
	14	Plagioclase phenocrysts in a groundmass of microlitic plagioclases and cryptocrystalline quartz.	16
	15	Facies model for relatively deep marine felsic volcanic centres	19
	16a	Spherulites in a dacite lava	22
	16b	Spherulites in a dacite lava	22
	17	Plagioclase glomerocrysts in a dacite/andesite lava	23
	18	Perlitic cracks in a dacite lava	23
	19	Animal Creek Greywacke	24
	20	A log of fO_2 -temperature diagram illustrating zone of possible sphalerite mineralisation at Sock Creek South. From Large, 1977	27

LIST OF FIGURES (Cont.)

400145

		Page
Figure 21	Relationship between trends in the formation of proximal ores, distant ores, and volcanogenic chemical sediments	28
22	TiO ₂ versus Ti/Zr variation diagram	32
23	SiO ₂ versus Ti/Zr variation diagram	34
24	Na ₂ O versus Ti/Zr variation diagram	35
25	K ₂ O versus Ti/Zr variation diagram	36
26	Zr/TiO ₂ versus Nb/Y variation diagram	38
27	REE plot for the Sock Creek South and Que-Hellyer basalts	40
28	REE plot for the Sock Creek South rhyolites and Que-Hellyer dacites	41

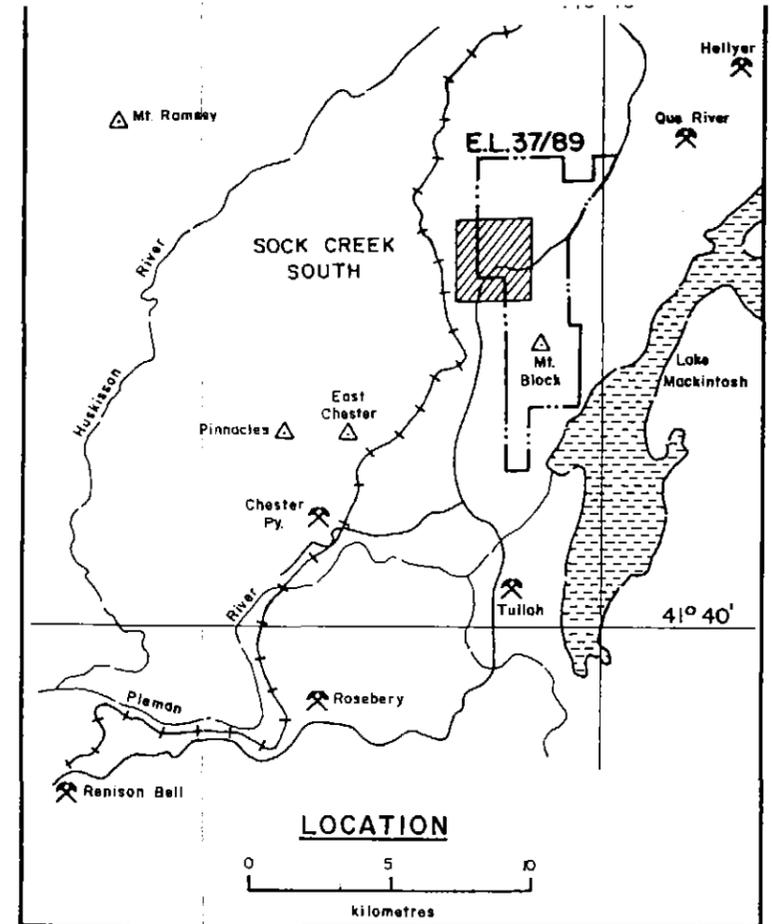
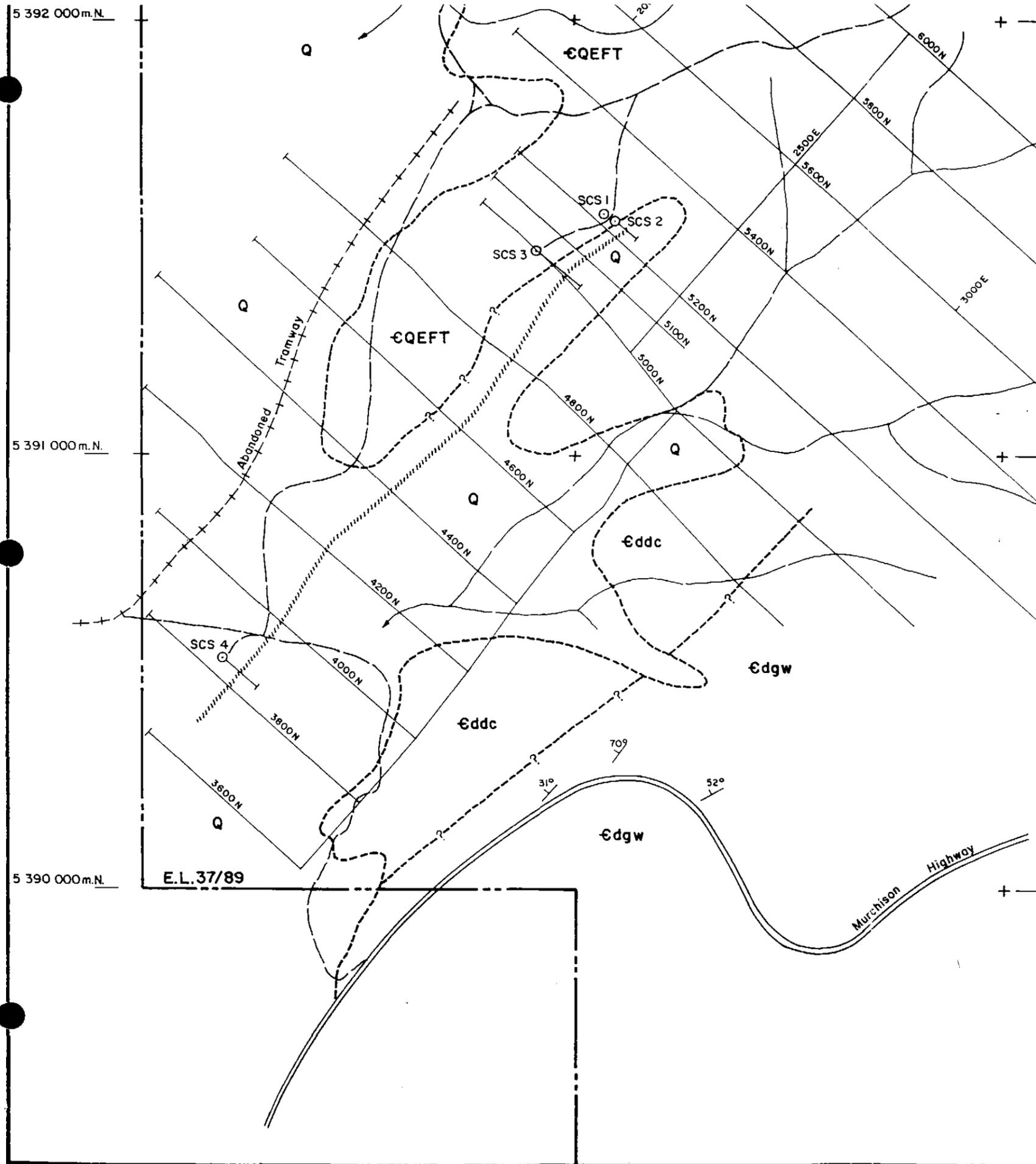
As part of the initial investigation of the Bulgobac Hill E.L. (EL 37/89, won by successful tender by PASMINGO MINING - ROSEBERY), three B.H.P. diamond drill holes were re-logged (DDH's SCS 1 - 3, from the Sock Creek South 'Propsect'), plus one Tasmanian Mines Department drill hole (DDH MCH-1). The Sock Creek South area lies SSW of the Sock Creek Prospect (Fig. 1), within the Dundas Group of the Mt. Read Volcanics (Corbett & Komysan 1989).

The Sock Creek South "Prospect" was delineated by a UTEM survey conducted by B.H.P. over the E.L. (formerly EL5/63) during the period September - December 1987. This programme was carried out by Lamontagne Geophysics Ltd. An anomalous response was obtained (Anomaly G) in the Sock Creek South area. A follow up fixed loop Sirotem II TEM survey was conducted over anomaly G. This survey confirmed the presence of the conductor identified by the earlier UTEM survey. The following interpretation of the anomaly was inferred by B.H.P. The subsequent discussion comes from B.H.Ps' Annual Report for 1988

- 1) The anomaly strikes grid north -south, centred at grid 2315mE (Note: all grid references refer to B.H.P's local grid).
- 2) The conductor plunges to the south.
- 3) The estimated depth to the top of the conductor on line 5200mN is 25m, increasing to 50m on line 5000mN.
- 4) The anomaly has a near vertical dip on line 5200mN.

During April 1988 a 50m time domain dipole-dipole I.P. survey was conducted over anomaly G. The I.P. data suggested that the chargeability anomaly had a depth of <20m and was centred at approximately 2325mE on line 5200mN. This centre corresponds to a topographic low reflecting a zone of weathered basalt.

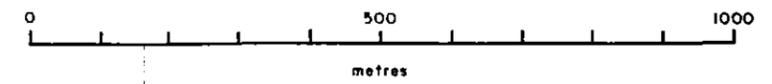
The anomalous zone was tested initially by two diamond drill holes 200m apart along the strike of the conductor. DDH SCS1 was collared at 2270mE, on line 5200mN to test the anomaly 50m below the surface., but was abandoned at 25m



LEGEND

- Q Glacial Sediments.
- EQEFT Sock Creek Porphyry
- Eddc Sock Creek Lava Sequence.
- Edgw Animal Creek Greywacke.
- Geological Boundary.
- | Diamond Drill Hole.
- ////// UTEM Conductor.
- Vehicular Track (F.W.D.)

Figure 1



PASMINCO EXPLORATION		
PROJECT: BULGOBAC E.L.37/89		
SOCK CREEK SOUTH		
GEOLOGY and DETAILS from B.H.P. REPORTS		
SCALE = 1:10,000	COMPILED = S.R.H.	REF. No.
DRAWN = N.W.D.S.	DATE = 28-8-'90	

due to poor ground conditions. The re-drill (DDH SCS 2) was collared at 2282mE, 5200mN, and tested the anomalous zone to a depth of 148m. DDH SCS 3 was drilled for 178.5m to test the southwesterly extension of the anomalous zone.

400148

A UTEM survey was conducted during 1989, and extended Anomaly G to line 3600mN and beyond. The interpreted depth to the top of the anomaly decreases to 30m on line 4600mN, before increasing in depth to 110m on line 3800mN. DDH SCS 4 was collared at 3837mN to test the UTEM anomaly. A downhole TEM survey was carried out using EM 37 equipment. A downhole response was inferred to be due to thickening glacial sediments, while the surface UTEM anomaly was related to a fault intersected in DDH SCS4 (Wilde & Kerr 1989).

WORK COMPLETED

DDH's SCS 3 and 4 were logged by the author, while DDH SCS2 was logged by Rod Allen for B.H.P. and DDH MCH 1 was logged by both the author and Rod Allen. A number of core samples were sent for whole rock, trace and rare earth element geochemistry to aid in the correlation between the Sock Creek Lavas and the lavas of the Que- Hellyer Sequence. Summary logs for these holes are listed below.

DDH SCS2 (Figure 2)

0 - 14.8m	Massive, pale green, quartz, feldspar intrusive porphyry.
14.8 - 29.2m	Massive, graded, granular, very coarse grained feldspar, quartz crystal rich volcanic sandstone to fine breccia.
29.2 - 75.6m	Massive, green, plagioclase porphyritic basalt, with a flow base hyaloclastite breccia.
75.6 - 85.3m	Graded, granular, lithic sandstones, interbedded with grey siltstones and very fine grained sandstones.
85.3 - 89.5m	Granular sandstone to fine breccia of rhyolite debris. Interpreted as a resedimented hyaloclastite breccia.
89.5 - 95.5m	Massive, matrix rich, fine rhyolite breccia, interpreted as a resedimented rhyolite hyaloclastite.
95.5 - 99.2m	Massive insitu rhyolite hyaloclastite breccia.
99.2 - 102.8m	Massive and weakly to strongly flow banded rhyolite.
102.8 - 106.9m	Massive insitu rhyolite hyaloclastite breccia.
106.9 - 114.3m	Faintly to strongly flow banded moderately quench \pm hydraulic brecciated rhyolite.
114.3 - 121.7m	Massive rhyolite breccia with local black siltstone matrix. Interpreted as a rhyolite hyaloclastite intrusive into wet sediments.
121.7 - 123.5m	Thin graded beds of brown perlitic dacite/rhyolite + pumice breccias, grading into black very fine grained sandstone/siltstone.

- 123.5 - 13.0m Massive pumice breccia with scattered denser (brown) rhyolite lithic clasts.
- 134.0 - 148.5m Medium sized felsic volcanic breccia of brown rhyolite clasts in a finer pumice clast matrix. Interpreted as a coarse dense-clast base of a density graded subaqueous mass flow.
- E.O.H.

DDH SCS3 (Figure 3)

- 0 - 7.5m Pre-collar.
- 7.5 - 29.6m Strongly weathered quartz, feldspar, hornblende porphyry.
- 29.6 - 49.9m Polymict, graded, v.c.g., pumiceous, feldspar, quartz crystal rich breccia to fine sandstone.
- 49.9 - 85.7m Vesicular pillow basalts.
- 85.7 - 86.2m Lithic, feldspar phyric volcanic sandstone.
- 86.2 - 139.2m Black mudstone supported feldspar phyric rhyolite breccias (hyaloclastite), within a black mudstone volcanic sandstone sequence.
- 139.2 - 151.15m Thick density graded tube pumice and dacite/rhyolite lava clast breccia.
- 151.15 - 153.4m Pumice rich lithic breccia.
- 153.4 - 170.4m Massive grey/green and pink mottled feldspar poor vesicular dacite/rhyolite.
- E.O.H.

DDH SCS4 (Figure 4)

- 0 - 48.05m Tricone.
- 48.05 - 50.3m Badly weathered, oxidised, orange brown zone.
- 50.3 - 86.2m Tricone.
- 86.2 - 128.0m Massive vesicular grey/brown basalt.
- 128.0 - 130.2m Interbedded medium grained volcanic sandstone and black siltstone.
- 130.2 - 134.2m Feldspar crystal rich pumice breccia with finely laminated sandstone /siltstone graded tops.
- 134.2 - 138.2m Very coarse grained rhyolite breccia, that grades uphole.

138.2 - 142.85m	Feldspar phyric rhyolite with a fine grained volcanic sandstone top.
142.85 - 145.2m	Black siltstone.
145.2 - 147.4m	Vesicular, fine grained brown basalt.
147.4 - 153.13m	Black siltstone.
153.13 - 156.4m	Lithic rich matrix supported rhyolite breccia.
156.4 - 157.4m	Silica altered, massive feldspar crystal rich rhyolite (?).
157.4 - 161.35m	Lithic rich matrix supported rhyolite breccia.
161.35 - 162.5m	Fine grained massive dark grey sandstone.
162.5 - 167.5m	Lithic rich rhyolite mega breccia.
167.5 - 168.5m	Feldspar, quartz, lithic sandstone.
168.5 - 176.5m	Series of graded volcanic sandstones, siltstones and rhyolite breccias.
176.5 - 178.6m	Pumice rich lithic breccia.
178.6 - 181.5m	rhyolite breccias with mudstone stringers.
181.5 - 182.0m	Carbonate spheroids.
182.0 - 195.23m	Massive feldspar phyric rhyolite.
195.23 - 201.4m	Pumice rich lithic breccia.
E.O.H.	

DDH MCH-1 (Figure 5)

0 - 10.6m	QUE RIVER SHALE. Massive to laminated black mudstone with siltstone.
10.6 - 57.0m	Grey/green finely feldspar porphyritic rhyolite.
57.0 - 114.95m	Massive fine to coarse grained dark green basal/dolerite.
114.95 - 122.5m	Strongly amygdaloidal, weathered, green basalt.
122.5 - 124.5m	Massive, poorly sorted dacitic hyaloclastite breccia.
124.5 - 125.5m	Volcanic sandstone with feldspar phyric, sericite altered pumice clasts.
125.5 - 178.0m	Massive feldspar porphyritic, locally flow banded dacite/andesite. The upper and lower contacts are characterised by instu jigsaw fit hyaloclastite breccias.
178.0 - 179.0m	Diffusively bedded(?), possible resedimented hyaloclastite

- breccia.
- 179.0 - 187.5m Massive, insitu hyaloclastite breccia.
- 187.5 - 196.0m Two definitely bedded units of breccias with graded sandstone tops.
- 196.0 - 354.63m Dark green fine grained basalt.
- 354.63 - 359.67m Grey, fine to coarse grained, massive to diffusively bedded quartz, feldspar, mica sandstone. Very similar to the Animal Creek Greywacke.
- 359.67 - 378.7m Pervasive, fine to medium hyaloclastite breccia.
- 378.7 - 407.7m Massive, dark green, fine grained moderately amygdaloidal basalt.
- 407.7 - 491.4m Grey/green feldspar porphyritic siliceous dacite/andesite.
- 491.4 - 497.5m Andesitic siltstone to fine sandstone that grades uphole into a black mudstone.
- 497.5 - 518.1m Massive to moderately insitu quench brecciated andesite, with abundant silicified/baked black mudstone stringers.
- 518.1 - 561.6m Andesitic volcanic sandstone.
- 561.6 - 606.3m ANIMAL CREEK GREYWACKE. Graded very fine grained to coarse grained quartz, feldspar, micaceous sandstone beds.
- E.O.H.

GEOLOGY

The geology of the Sock Creek South area exposed in the the three diamond drill holes (Figure 6) is dominated by eight major lithologies. Not all eight lithologies are represented in all three diamond drill holes. In figure 6, stratigraphic columns of the three Sock Creek South diamond drill holes are illustrated. The columns are drawn so that they approximate the true thickness of each individual unit.

Working down the stratigraphy, **Unit 1** is an intrusive quartz, feldspar phyrlic porphyry. The porphyry is composed of euhedral sericitised plagioclase crystals, corroded and embayed quartz crystals. The groundmass has been extensively altered to sericite and silica. The porphyry has been mapped as an intrusive by various workers, due to its sub-concordant nature, and at the Sock Creek Prospect the porphyry has intruded into the black shales. Whilst at the Sock Creek South Prospect the porphyry appears to have intruded the stratigraphy at very late stage, as it appears above the basalts intersected in DDH SCS2 and SCS3. Corbett & Komysan (1989) consider that the porphyries that have intruded into the Sock Creek Sequence, maybe part of a larger composite body that extends south into the Buigobac- Boco area.

Unit 2 is composed of a massive, graded, granular very coarse grained feldspar, quartz crystal rich volcanic sandstone to fine breccia that immediately overlies the basalts intersected in DDH SCS2 and SCS3. The sandstone is composed of matrix supported, angular (non juvenile), scattered lithic clasts. The lithic fragments are composed of sandstone &/or basalt, feldspar, quartz porphyritic felsic volcanic(?) and black siltstone. In thin section the sandstones are composed of sericite altered (partially - wholly) euhedral and broken plagioclases. Angular/broken, embayed, strained quartz grains are ubiquitous. The strained quartz grains have possibly been derived from a metamorphic source .i.e. the Precambrian basèment to the Mount Read Volcanics. The quartz grains may exhibit secondary growths of silica along their margins. Fractured quartz grains maybe annealed by later cryptocrystalline silica. The quartz grains tend to contain arcuate trails of fluid

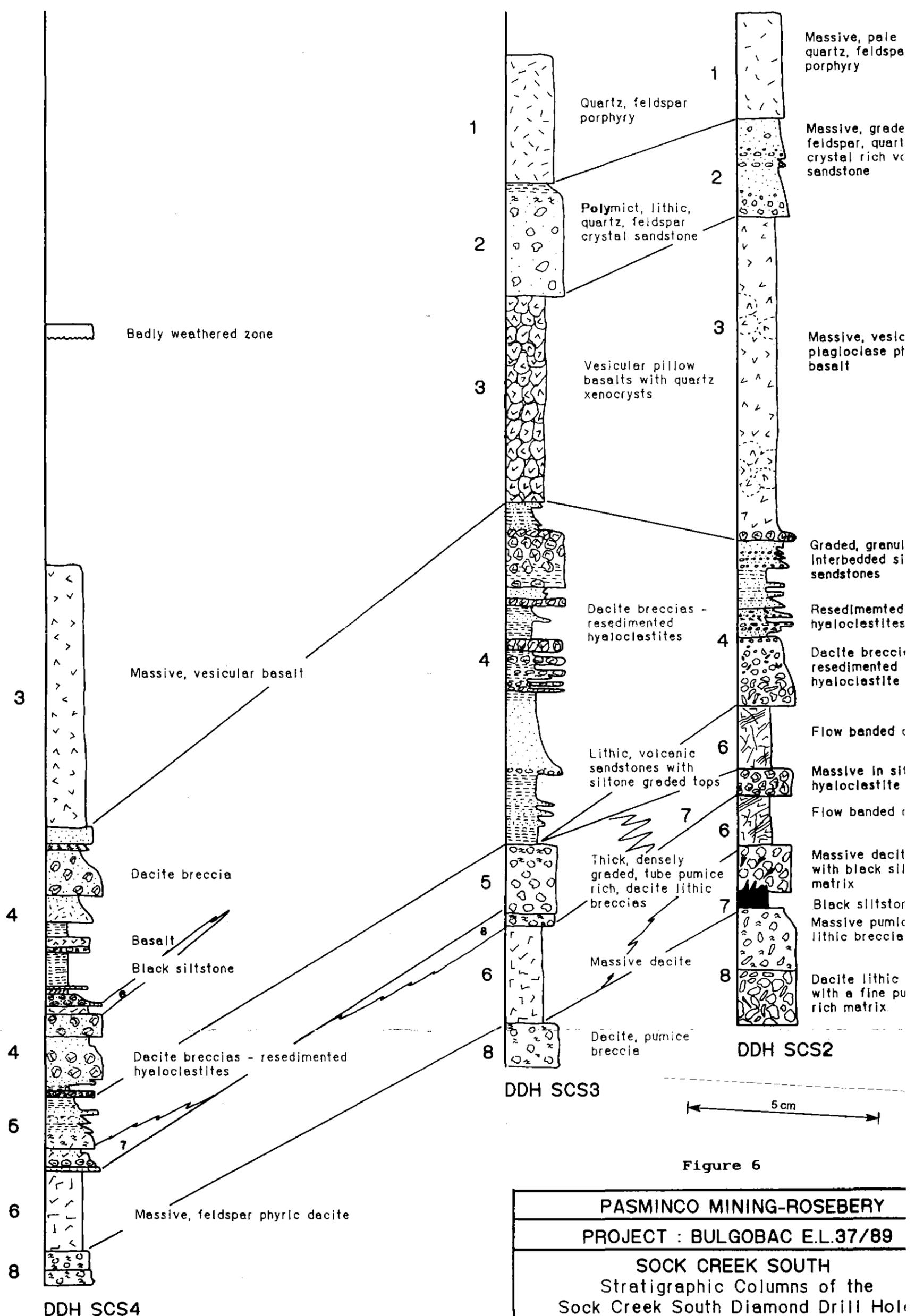


Figure 6

PASMINGO MINING-ROSEBERY		
PROJECT : BULGOBAC E.L.37/89		
SOCK CREEK SOUTH		
Stratigraphic Columns of the		
Sock Creek South Diamond Drill Hole		
Vert. Scale = 1:500	Compiled = S.R.H.	REF.
Drawn = S.R.H.	Date 29-10-'90	

Note: Thickness of units approximates true thickness

inclusions. Possible green chlorite altered pumice fragments were also noted. The lithics vary from quartz sandstone clasts of variable grain size to quartz, feldspar phytic lava(?) clasts. The overall texture is one of a matrix supported, poorly sorted coarse sandstone to fine breccia. R. Allen considers that the bed form implies that the sandstone/fine breccia was rapidly emplaced as thick, coarse, subaqueous massflows. R. Allen also considers that these units are identical to the base of the Dundas Group at Pinnacles.

Immediately underlying Unit 2 is a thick sequence of vesicular pillow basalts (Unit 3). The vesicles may comprise up to 10 - 20% of the basalts. The pillows are recognised by their chilled margins and inter-pillow silicified/baked sediments. The pillows are best preserved in DDH SCS3. The basalts may have brecciated flow bases composed of matrix supported angular basalt clasts, with some mixing with the underlying sediments (see DDH SCS2). The basalts may also have irregular flow tops, with the fractures infilled by the overlying sandstone. No pillow margins were noted in the basalts intersected in DDH SCS4. This might imply a source for the basalts somewhere to the south of the Sock Creek South area. The basalts are composed of augite + plagioclase + olivine phenocrysts set in a groundmass of plagioclase and augite crystals. The augites are up to 1.5mm across, and may occur singularly or as glomerocrysts and are invariably twinned (Figures 7 & 8). The augites have a bimodal size distribution, those occurring as phenocrysts and those within the groundmass. The plagioclases are generally lathe shaped, but the phenocrysts can display a prismatic form. The lathe shaped feldspars display multiple twinning, and like the augites have a bimodal size distribution. The plagioclase phenocrysts are generally altered to sericite, and have later overgrowths of secondary plagioclase defining the crystal form (Figure 9). The feldspar illustrated in figure 9, maybe displaying relict sieve texture i.e. the core of the phenocryst originally was composed of glass and alkali feldspar (subsequently altered to sericite) and armoured by a narrow rim of plagioclase. The olivines display variable degrees of alteration, but are generally have been altered to a pale green chlorite. The vesicles are infilled by carbonate. Quartz xenocrysts displaying undulose extinction were also noted. These quartz xenocrysts may have been captured from the metamorphic Precambrian basement by the basalt

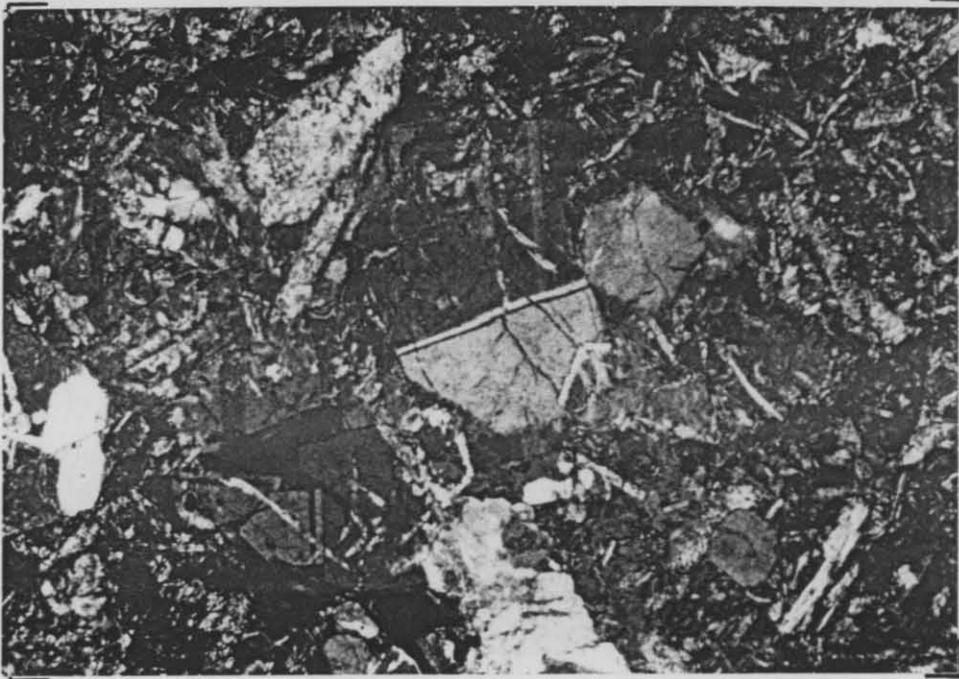


Figure 7. Twinned augite phenocrysts in a groundmass of microlitic feldspars and pyroxenes. T.S. No. 81628

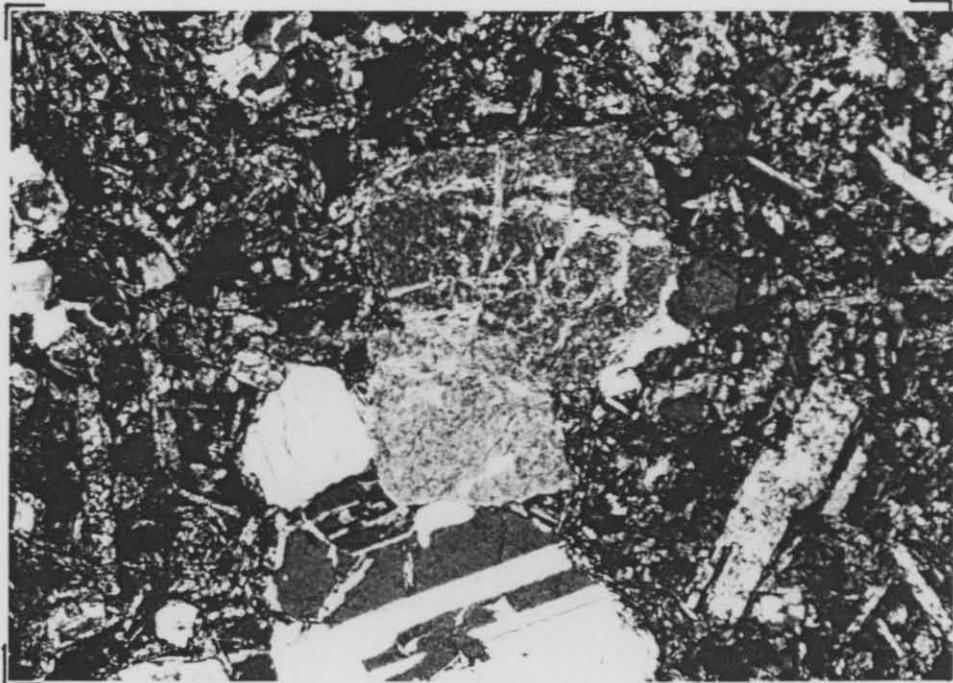


Figure 8. 'Fresh' and altered twinned augite phenocrysts. T.S. No. 81629

conduits. A narrow basalt intrusion also occurs in DDH SCS4.

Unit 4 immediately underlies the basalts and is composed of a thick sequence of reworked rhyolite hyaloclastite breccias, graded volcanic sandstones with siltstone tops. The reworked hyaloclastites are composed of matrix supported angular feldspar phyric clasts, that grade uphole into fine sandstones and siltstones. The matrix is generally composed of very fine grained dark grey siltstone. The lithics within the sandstones have a variable provenance, ranging from a sedimentary to a volcanic source. The sediments near all display uphole grading, but two narrow sandstone beds intersected in DDH SCS3 (100.1 - 101.4m) display downhole grading. The coarser grained sandstones are composed of quartz and feldspar crystals. Soft sediment deformation occurs sporadically throughout. The base of some of the coarser sandstone units contain rip up clasts of the underlying black siltstones.

Unit 5 is composed of a series of graded, tube pumice rich, rhyolite lithic breccias. The pumice clasts are randomly oriented and uncollapsed, indicating that the pumice is not welded. As the welded zones of ignimbrites display flattened juvenile clasts (fiamme), and glass shards defining a planar foliation or eutaxitic texture (Cas & Wright 1987). In thin section the pumice rich segments of the breccias are composed of randomly oriented uncollapsed and collapsed pumice clasts (Figures 11, 12, & 13). The pumice clasts vary from sub millimetre in size to tens of millimetres, and are altered either to sericite and/or pale green chlorite. The pumices may contain lathe shaped plagioclase crystals subparallel to the tube structures. The tubes in the uncollapsed pumices generally have a core of pale green chlorite, rimmed by cryptocrystalline amorphous silica. Volcanic lithics within the pumice rich parts of the breccias are strongly vesicular, feldspar phyric (altered to silica) and spherulitic. The groundmass of these clasts is strongly altered to pale green chlorite and silica. Unaltered plagioclase lathes occur within the groundmass and average ≤ 0.15 mm in size. In thin section the breccias are composed of sericite altered (simple twinned and multiple twinned) plagioclases, that exhibit undulose extinction. The plagioclases vary from broken crystals to euhedral crystals (Figure 10) in form. They may also have substantial overgrowths



Figure 9. Altered plagioclase phenocryst with possible relic sieve texture and a rim of secondary feldspar. T.S. No.81629.

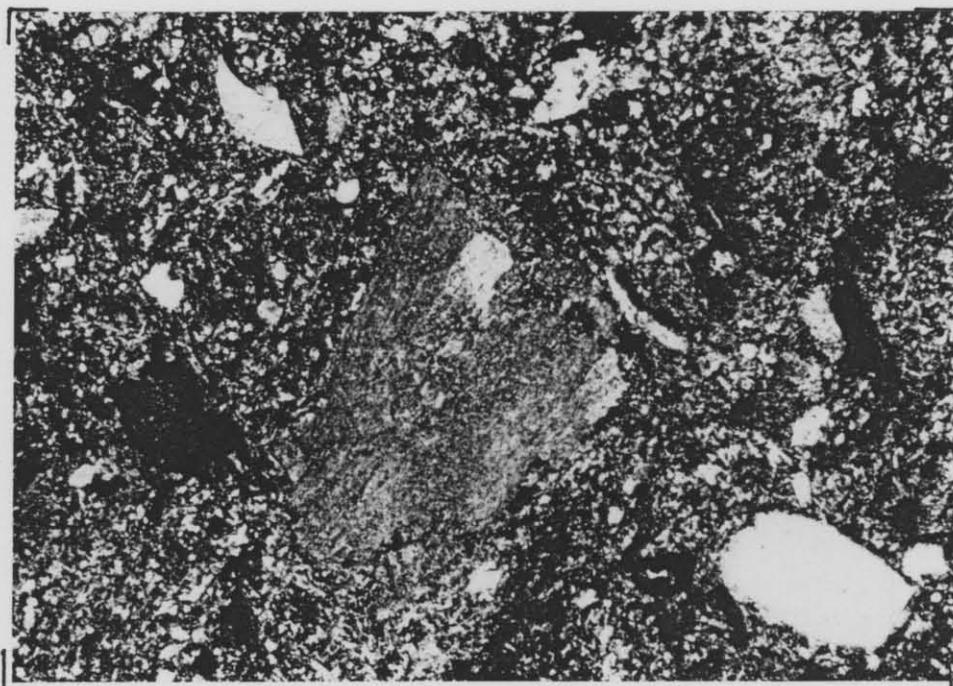


Figure 10. Quartz, feldspar phenocrystic pumiceous breccia. The feldspars have been altered to sericite and broken quartz grains are evident. T.S. No. 81637.

400159



Figure 11. Randomly oriented, sericite altered pumice clasts. T.S. No. 81631.

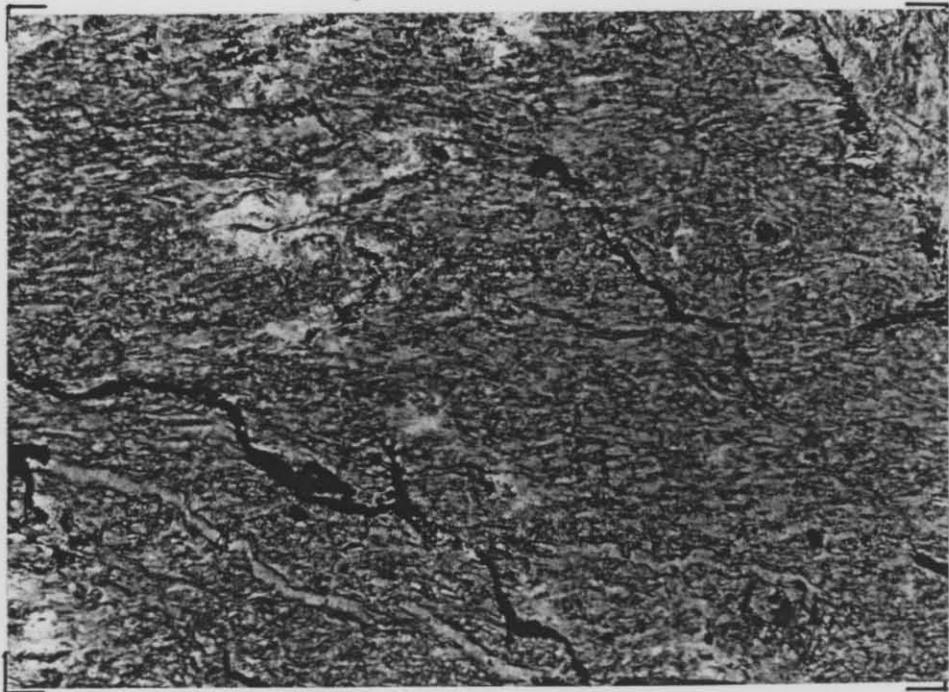


Figure 12. Uncollapsed pumice fragment. T.S. No. 81631

of secondary silica rimming them. Quartz grains are generally broken (Figure 10), and like the plagioclases may exhibit undulose extinction. A number of spherulites were also noted. These are represented by orbicular growths of radiating silica within the groundmass, indicating that the groundmass originally had a glassy component. The pumice fragments are uncollapsed, contain feldspar crystals and the tube structures are infilled by secondary K-feldspar(?). Both volcanic and sedimentary lithics were noted. This unit probably represents density graded, subaqueous mass flows.

The massive rhyolite lavas and intrusives define Unit 6, and were intersected in all three drill holes. The rhyolite lavas are massive and poorly to strongly feldspar phytic. The lavas are hydraulically fractured by later chlorite veins. Devitrification textures, such as perlitic cracking and the development of spherulites were also noted. The lavas may contain elongated vesicles, possibly indicating that there was movement of the lavas after the vesicles had formed. R. Allen has interpreted the rhyolite lavas in DDH SCS2 to represent the core of an emerging cryptodome. In this section the rhyolites are composed of an intratelluric assemblage of individual phenocrysts and glomeroporphyritic plagioclases (Figure 14). The presence of a porphyritic texture with an aphanitic groundmass is generally indicative of a period of slow cooling, followed by rapid quenching of the volcanic. This texture is normally ascribed to lavas (Cox *et.al.* 1979). The plagioclases have an An content between An₅₆ to An₆₄, as determined by the Michel-Le'vy method. This gives the plagioclases a labradorite composition, which is highly unusual for rhyolites/dacites, as labradorites normally occur in rocks of basaltic or near basaltic composition. The plagioclases are generally euhedral in form, but also display evidence of thermal disequilibrium. That is the plagioclases have rounded forms and corroded margins. Further possible evidence of remelting is indicated by the presence probable internal melt textures (bleb like texture) along the cleavage planes (Figure 14). This thermal disequilibrium may explain the unusual composition of the plagioclases. In that the plagioclases were probably once more sodic in composition, but due to the sinking of the crystals back down into the lower parts of the magma chamber, they reacted with the more calcic rich liquid to give the current apparent composition. The groundmass is composed of a



Figure 13. Collapsed pumice fragments. T.S. No. 81630

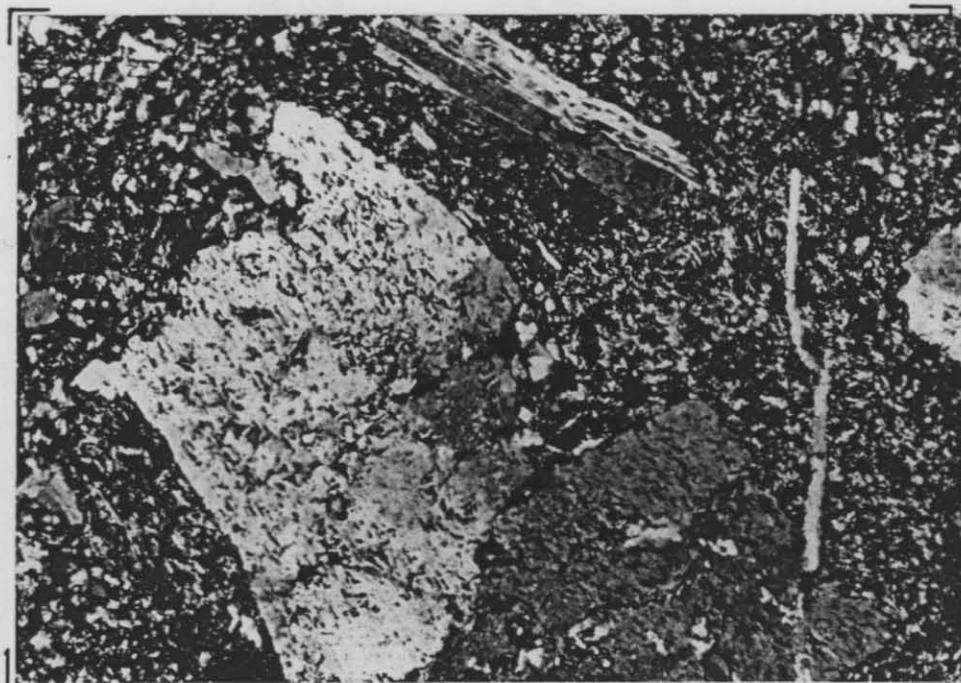


Figure 14. Plagioclase phenocrysts in a groundmass of microlitic plagioclases and cryptocrystalline quartz. T.S. No. 81644.

cryptocrystalline mosaic of interlocking quartz and K-feldspar. In plane polarise light, relic perlitic cracks are strongly evident, and are enhanced by pale green chlorite alteration along them.

Associated with the rhyolite lavas are a series of brecciated rhyolites/ dacites with black mudstone matrix representing massive *in situ* hyaloclastite or pepperitic sequences i.e. the extrusive margins of a cryptodome (Unit 7). This unit appears to only occur in DDH's SCS2 and SCS4. The rhyolite clasts are angular, with planar to broadly arcuate to finely serrate margins, and are poorly sorted. In DDH SCS 2 the base of the dacite intersected between 106.9 - 114.3m has intruded into wet sediments, producing pepperitic textures. Relict translucent and perlitic glassy textures are very common within the rhyolite clasts. A similar unit occurs in DDH SCS4 between 179.3 - 181.1m. The debris flows resulted from the down slope movement of reworked hyaloclastite material as the cryptodome was emerging.

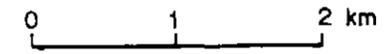
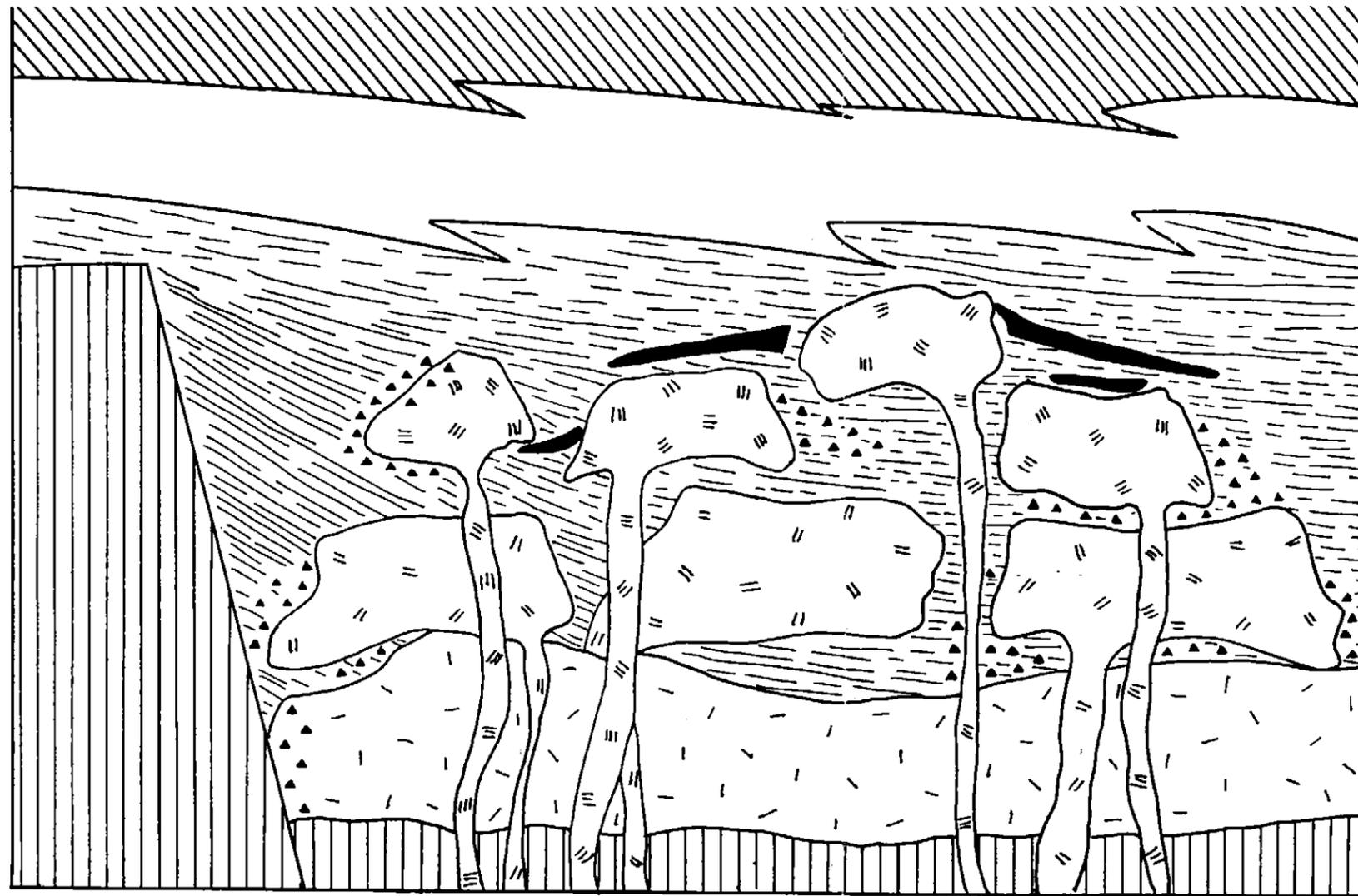
The base of the sequence intersected in the three drill holes is composed of thick, graded rhyolite and tube pumice breccias (Unit 8). The rhyolite breccias are matrix supported in a fine tube pumice matrix, and have graded tops composed of fine volcanic sandstones and tube pumice. In DDH SCS2 the base of this unit becomes demonstrably lithic rich and changes from a matrix supported breccia to a clast supported breccia. The tube pumices are very well preserved, with no evidence for welding of the tube structures noted. Some of the pumices are collapsed and moulded around lithics due to compaction loading. The pumices in the upper part of the unit may comprise up to 70 percent of the breccia. The rhyolite clasts are very angular and are up to 60mm across in size. The clasts range from dense, intensely finely quench ± prelitic fractured clasts to moderately vesicular clasts with elongated stretched vesicles. In thin section the tube structures of the pumice clasts are both collapsed and uncollapsed. The collapsed pumice fragments are probably the result of differential compaction within the beds, and also by loading of lithics during diagenetic compaction. R. Allen has interpreted this sequence as representing very juvenile pyroclastic debris and is probably near to the vent source. The presence of near vent juvenile pyroclastic material is often associated with the extrusion of Pele'an domes (Williams and McBirney 1979). The lack of

welding suggests that the pyroclastic debris was deposited in a submarine environment.

The base of the stratigraphy at the Sock Creek South 'Prospect' is defined by the Animal Creek Greywacke. This unit was not intersected in any of the three diamond drill holes at Sock Creek South, but was mapped by Komysan (1986).

The presence of possible chemical precipitates is marked by a narrow zone of very fine grained interlocking carbonate spheroids in DDH SCS4 (181.5 - 182.0m). The spheroids are composed of dirty brown micrite with interstitial sericite sheaves and an equigranular mosaic of cryptocrystalline silica. The interstices between the spheroids are composed of cryptocrystalline silica.

The type of submarine volcanic environment that the Sock Creek South volcanics and sediments were formed is illustrated in figure 15 (after Cas & Wright 1987). Cas and Wright (1987) suggest, (based on studies of the Kuroko deposits) that the lavas and cryptodomes in the setting illustrated in figure 15 were emplaced in very deep water (>3000m). This depth and confining pressure would also preclude explosive volcanic activity. As at pressures exceeding 315 bars i.e. critical point (1bar = 10m, in sea water) the growth of bubbles is significantly retarded, thereby precluding explosive volcanism. But vesiculation can occur at greater depths, but the growth rate of such vesicles will be insignificant. Only below the critical point will growth rates be rapid enough to cause explosive expansion and disruption (Cas and Wright 1987). Moore et.al. (1977, in Williams and McBirney 1979) found that in basalts dredged from depths of greater than 2000m that CO₂ was the main component of vesicles. The vesicles in the Sock Creek South basalts are predominantly infilled by carbonate. If we assume that the carbonate is primary, then the basalts at Sock Creek South were probably extruded at or near the same depth as the acid volcanics. Such confining pressures are also envisaged to stop or preclude metal bearing hydrothermal fluids from boiling, and thereby significantly increasing the possibility of massive sulphide deposits forming (Franklin et.al. 1981).



-  Basement or pre-volcanic succession
-  Early, extensive submarine felsic lava
-  Felsic submarine lavas/intrusive cryptodome
-  Youngest felsic lava domes or intrusive cryptodomes
-  Hyaloclastites
-  Bedded, redeposited contemporaneous hyaloclastite and or pyroclastic debris, pelagic, hemi-pelagic sediments, chemical sediments, ore horizons (black)
-  Post-volcanic epiclastic volcanic sediment
-  Post-volcanic succession

Figure 15

PASMINCO MINING-ROSEBERY		
PROJECT : BULGOBAC E.L.37/89		
SOCK CREEK SOUTH Facies Model for Relatively Deep Marine Felsic Volcanic Centres After Cas & Wright (1987)		
Scale = N.A.	Compiled = S.R.H.	REF. No.
Drawn = S.R.H.	Date 29-10-'90	

In this type of deep submarine environment Cas and Wright (1987) state that *in situ* hyaloclastites will be important elements, associated with both surface domes and shallow cryptodomes intruding water saturated sediments. The hyaloclastites associated with the cryptodomes maybe dynamically mixed with the sediments they have intruded by boiling induced fluidisation of the interstitial pore fluids, producing peperitic textures (Cas and Wright 1987).

The economic importance of such volcanic settings cannot be ignored. Massive sulphide deposits could form during periods of volcanic quiescent or in quiescent settings associated with pelagic-hemipelagic sediments, or both (Cas and Wright 1987).

DDH MCH-1

DDH MCH-1 was drilled by the Tasmania Department of Mines between July and September 1986. The objective of the hole was to obtain a stratigraphic section of the Que-Hellyer Volcanics and to test the Hellyer ore position west of Mt. Charter. Corbett & Komysan (1989) subdivided the Que-Hellyer Volcanics in this drill hole into four units, (1) upper basalts and andesites (10.6 - 115.1m), (2) mixed sequence of felsic to mafic lava, epiclastic breccia, tuff and minor sedimentary rocks (115.1 - 188.6m), (3) lower andesites and basalts (188.6 - 491.5m), (4) lower tuff and lava, comprising interbedded tuff, tuffaceous sandstone and siltstone with minor intercalated, basaltic, andesitic and felsic lavas (491.5 - 559.0m).

DDH MCH-1 was logged by R. Allen & S. Hunns in order to get a direct comparison between the Que-Hellyer Volcanics and the Sock Creek Sequence. The approximate subdivision of the Que-Hellyer Volcanics as outlined above will be used in the following discussion. Between 10.6 - 114.95m (upper basalts and andesites) DDH MCH-1 intersected a sequence of feldspar porphyritic rhyolite and basalt/dolerite lavas. The rhyolite represents a lava flow with a quench brecciated hyaloclastite upper part. Black mudstone stringers penetrate the rhyolite down hole for approximately 12 metres. The basalt/dolerite contains black mudstone

stringers, and the lack of internal boundaries suggests that this is a sheet flow lava. From 114.95 - 187.5m (*mixed sequence*) is characterised by strongly amygdaloidal basalts, dacitic hyaloclastite (diffusively bedded?) breccias, feldspar phyrlic, sericite altered pumiceous volcanic sandstones and massive feldspar porphyritic, locally flow banded dacite/andesite. Between 187.5 - 491.5m (*lower andesites and basalts*) comprises a sequence of amygdaloidal basalt lavas and feldspar porphyritic dacite/andesite lavas. In thin section the dacite/andesite lavas are dominated by devitrification textures, namely the development of spherulites. The spherulites have cores of cryptocrystalline quartz, surrounded by altered glassy material (Figures 16a & 16b). The feldspars impart a porphyritic texture and may form glomerocrysts. The plagioclases are partially to wholly altered to sericite. Where the sericite alteration is less intense, multiple twinning of the plagioclases is evident (Figure 17). Perlitic cracking of the dacite/andesite lavas is evident in the more massive parts of the lavas (Figure 18). Graded breccias with sandstone tops, hyaloclastite breccias and a micaceous quartz. feldspar sandstone very similar to the Animal Creek Greywacke are also present in this sequence.. Between 491.4 - 518.1m (*lower tuff and lava*) is comprised of andesitic siltstones to fine sandstones that grade uphole into a black mudstone, with a basal massive to moderately insitu quench brecciated andesite.

The bottom of DDH MCH-1 intersected the Animal Creek Greywacke. This greywacke is comprised of a series of graded very fine grained to coarse grained quartz-mica sandstone beds. interbedded with thin black mudstone beds. The graded beds range from 10 centimetres to 3 metres in thickness (drill hole thickness), and show many features of turbidites. Namely massive sharp bases, graded laminated tops, black mudstone intraclasts and flame structures. The sandstones are very well sorted with a granular texture. In thin section the Animal Creek Greywacke is composed of well sorted angular (juvenile) quartz grains, with an average grain size of 1 -1.5 millimetres. All the quartz grains display undulose extinction (Figure 19), indicating that they were probably derived from metamorphic Precambrian basement material. Interstitial to the quartz grains is pervasive carbonate alteration. The carbonate can be seen to be replacing the quartz grains along their margins, evident by the corroded margins to the quartz

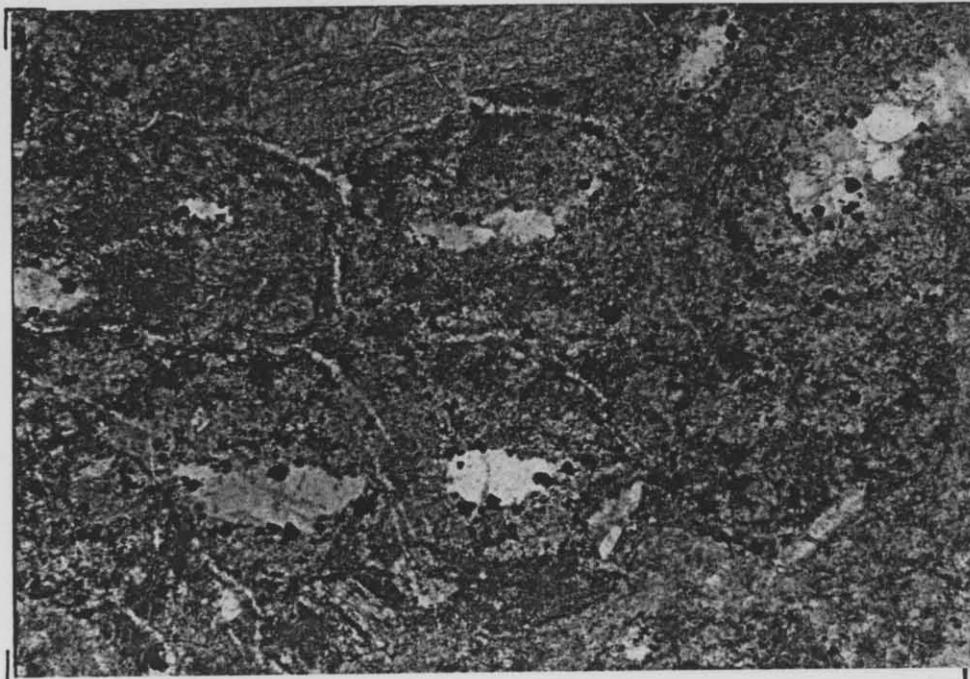


Figure 16a. Spherulites in a dacite lava. T.S. No. 81610

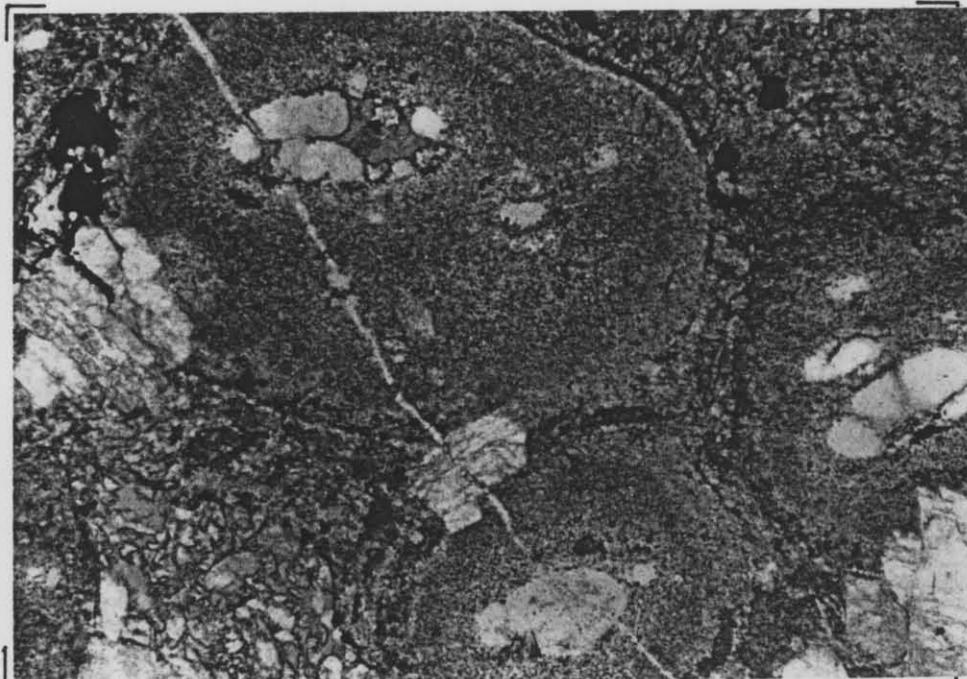


Figure 16b. Spherulites in a dacite lava. T.S. No. 81617.



Figure 17. Plagioclase glomerocrysts in a dacite/andesite lava. T.S. No.81612.

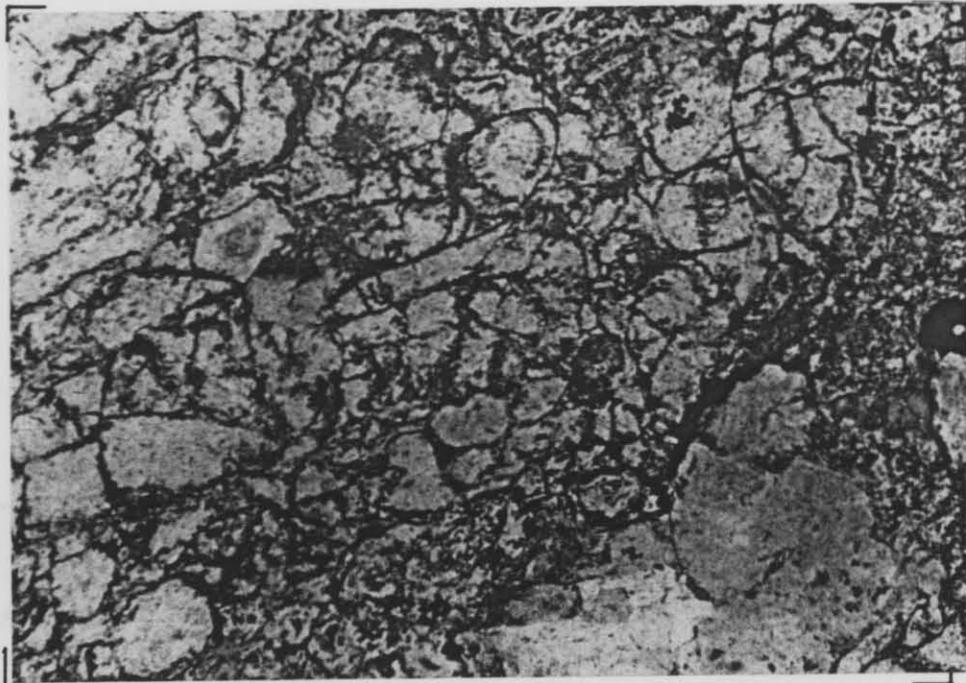


Figure 18. Perlitic cracks in a dacite lava. T.S. No. 81612.



Figure 19. Animal Creek Greywacke. T.S. No.81626.

grains. The carbonate comprises up to between 15 - 20 percent of the greywacke. Sheaths and blades of muscovite are also very prominent. They have highly birefringent colours (yellows and blue), and have a mottled texture. The muscovites define two cleavages approximately 15 - 20° apart.

A comparison with the Sock Creek Sequence intersected in DHH's SCS2 - 4 shows that there is some common ground between the two sequences. Namely the presence of the rhyolite lavas, hyaloclastite breccias, and probable volcanically derived sediments. The major inconsistency is the presence of basalt lavas throughout the Que-Hellyer Volcanics. Whereas in the Sock Creek Sequence the basalts are present at the top of the stratigraphy at Sock Creek South but do not outcrop to the north (Sock Creek Prospect).

MINERALISATION

The mineralisation intersected in the diamond drill holes at the Sock Creek South "Prospect" is composed predominantly of finely disseminated sphalerite (\pm pyrite) blebs or veinlets. The unusual feature about this style of mineralisation is that there does not appear to be any significant alteration associated with it. This lack of significant alteration is also reflected in the low values of the Alteration Index used by Date *et.al.* (1983). This index ($100(K_2O+MgO)/(Na_2O+CaO+K_2O+MgO)$) is a measure of the formation of sericite, K-feldspar and chlorite to the amount of plagioclase surviving. Values greater than 92 imply the total destruction of plagioclase (Green 1990). The A.I. values for the Sock Creek South basalts and rhyolites are all below 45 (Appendix A), indicating that there has been only minor sericite and/or chlorite formation at the expense of the plagioclases. This lack of significant might be implying that a "dry" hydrothermal system was operating at the time or possibly that the sequence may have been very close to the land water interface and any mineralising hydrothermal fluids may have been of sufficiently low temperature and near neutral pH. The conditions under which the disseminated sphalerite mineralisation may formed are illustrated in figure 20 (highlighted in yellow). For only sphalerite and pyrite to have formed then the fluid temperatures would have to have been at temperatures less than 175°C and decreasing fO_2 conditions (ie. reducing conditions). The disseminated mineralisation may also be part of a distal volcanogenic massive sulphide system. If we assume that the above fluids conditions illustrated in figure 20 were responsible for the mineralisation, then these conditions would be applicable to those that Large (1977) predicts would form distal massive sulphides (Fig. 21). Although in a distal volcanogenic massive sulphide we should be expecting to see banding within the ore and possibly higher concentrations of lead. The lack of substantial base metal mineralisation may also be attributed to the possible lack of sulphur available to form base metal sulphides. This may be a possibility as there is less than 5 percent pyrite reported from the three drill holes. Or alternatively the hydrothermal fluids may have already been boiled off deeper down within the stratigraphy to have caused very little, if any alteration. Hunns (1989) plotted the

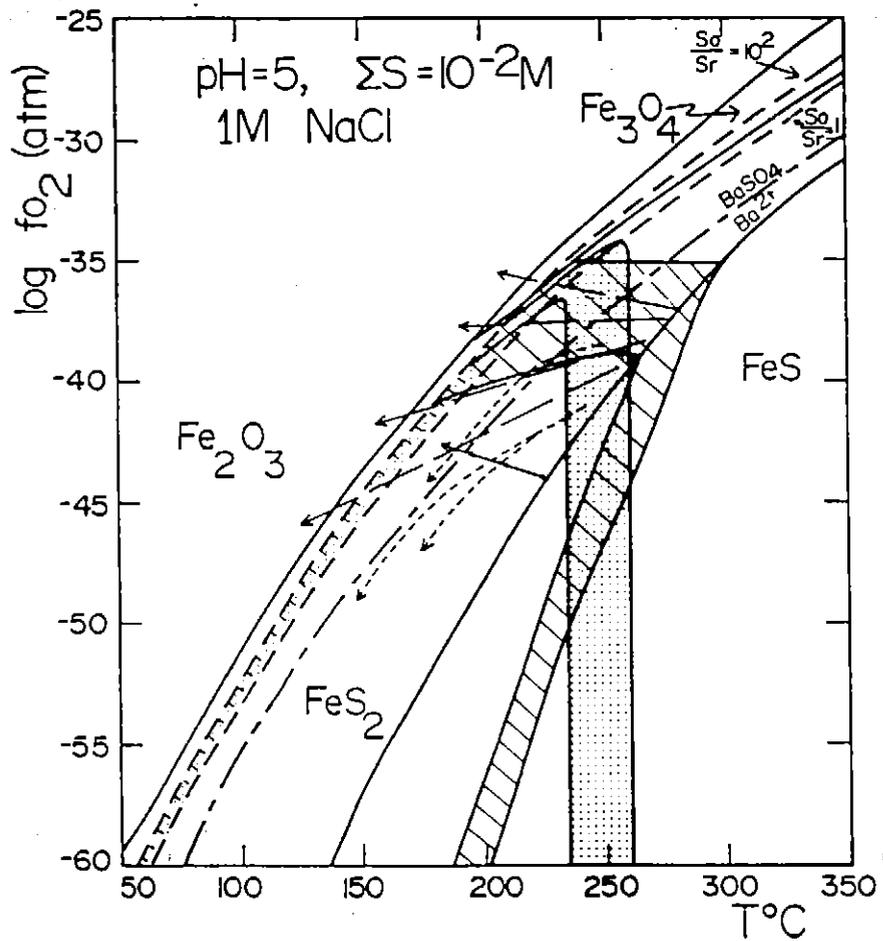


Figure 20. Log f_{O_2} -temperature diagram illustrating zone of possible sphalerite mineralisation at the Sock Creek South 'Propsect' (Highlighted in yellow). From Large (1977).

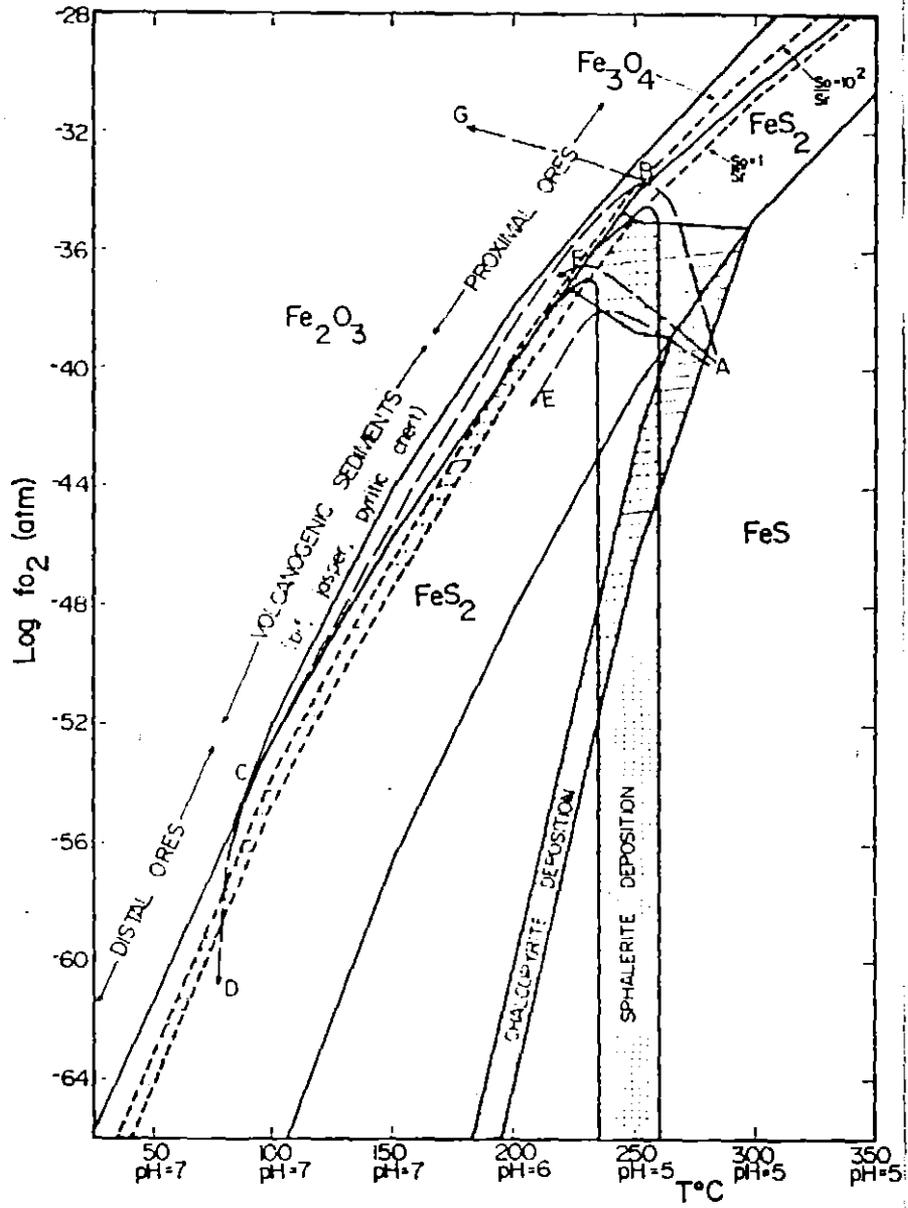


Figure 21. Relationship between trends in the formation of proximal ores, distant ores, and volcanogenic chemical sediments. Area highlighted in yellow indicates zone of possible sphalerite mineralisation at the Sock Creek South 'Prospect'. From Large (1977).

174

zinc ratio for the mineralisation intersected in the Sock Creek South diamond drilling, and concluded that the zinc ratio for the Sock Creek South mineralisation is more akin to that of vein style mineralisation, than a volcanogenic massive sulphide. All these hypotheses suggest that any significant mineralisation at Sock Creek South possibly lies deeper in the stratigraphy.

400174

STRUCTURE

The structure of the Sock Creek South area and the E.L. as a whole is poorly understood. The E.L. was previously mapped by Barton *et.al.* (1966) of the then Tasmanian Mine Department, as part of the 1 mile map series (Mackintosh Quadrangle). This mapping was reported in Collins *et.al.* (1981). Collins (1980) inferred a north-west, south-east trending fault displacing the the Sock Creek Sequence. This fault occurs to the immediate north of the the Sock Creek Prospect, and was not mapped by Komyshan (1986). This structure was delineated by Leaman (1990) in the aeromagnetic survey flown by Pasmenco Mining - Rosebery. The most important structural feature mapped by Komyshan (1986) within the E.L. was the Mt. Charter Fault. Leaman (1990) downgrades the importance of the Mt. Charter Fault as a major structural feature, and suggests that the Mt. Charter Fault as mapped by Komyshan (1986) is misnamed.

WHOLE ROCK GEOCHEMISTRY

Eight samples were taken from DDH's SCS 3 & 4 for whole rock geochemical analysis. The samples were analysed for major, trace and rare earth elements (REE). These analyses were then combined with all of the analyses from Crawford (1989), and selected analyses from Corbett and Komysan (1989) and Stolz and Large (1988) (see Appendix A)

Major and Trace Element Geochemistry

The Ti/Zr variation diagrams used by Large *et.al.* (1986) were used to determine the degree of geochemical alteration and differentiation trend(s) if any between the Sock Creek Lava Sequence and the Que-Hellyer Volcanics. Previous work (eg. Winchester and Floyd 1977) has indicated that both Ti and Zr behave as relatively immobile elements under varying conditions of alteration. Therefore the Ti/Zr ratio, which is a good indicator of magmatic differentiation, remains relatively constant during alteration associated with mineralisation. Therefore the Ti/Zr ratio can be used to distinguish between magmatic differentiation trends and those due to hydrothermal alteration, as a vertical spread of analyses at a constant Ti/Zr ratio indicates hydrothermal alteration of a constant primary composition. A sub-horizontal trend in the Ti/Zr ratio is indicative of a primary differentiation trend unrelated to alteration (Large *et.al.* 1986). In the following discussion the differentiation trends for unaltered Mount Read Volcanics for SiO₂, TiO₂, K₂O and Na₂O as determined by (Large *et.al.* 1986) are used.

TiO₂ v. Ti/Zr (Figure 22)

The Sock Creek South basalts have distinctly higher Ti/Zr values than the Que-Hellyer basalts. Crawford (1989) also showed that the Sock Creek South basalts have significantly higher Ti/Zr values than the Mount Read as a whole and further concluded that the Sock Creek South basalts are transitional between typical island arc tholeiites and arc calc-alkaline basalts. The Sock Creek South basalts

177

400177

Figure 22 - TiO_2 versus Ti/Zr variation diagram

Solid line indicates the differentiation trend for unaltered Mt. Read Volcanics.

From Large et.al. 1986

Dashed lines inferred differentiation trend.

fill a compositional gap between the Miners Ridge arc tholeiites south of Queenstown, and the Western Volcanic Sequence high calc-alkaline basalts from Lynchford and the Que-Hellyer Volcanics (Crawford 1989).

The Que-Hellyer basalts and andesites and the Sock Creek Volcanics appear not to fall within the differentiation trend to that defined by the Mount Read Volcanics. Instead they appear to follow a potentially different differentiation trend normal to that defined by the Mount Read Volcanics. This difference could be indicating that the Que-Hellyer and the Sock Creek Volcanics were erupted in a different tectonic environment to the remainder of the Mount Read Volcanics or that the basaltic magmas were enriched in Ti relative to Zr compared to other basalts from the Mount Read Volcanics. In either case the Que-Hellyer and Sock Creek basalts are significantly different in their TiO₂ and Ti/Zr ratio compared to the Mount Read differentiation trend.

SiO₂ v. Ti/Zr (Figure 23)

The majority of the samples fall within the limits of the differentiation trend for the Mount Read Volcanics. The Sock Creek rhyolites are depleted in SiO₂, in contrast the Que-Hellyer dacites are marginally enriched in SiO₂. Three of the Que-Hellyer basalts show some depletion in SiO₂. This depletion in SiO₂ also occurs in the altered volcanics at the Que River Mine, despite evidence for silicification, including phenocryst replacement and the development of hydrothermal chert (Whitford *et al.* 1989).

Na₂O v. Ti/Zr (Figure 24) and K₂O v. Ti/Zr (Figure 25)

This plot shows that there has been very little addition or depletion of Na₂O within the analysed Que-Hellyer and Sock Creek Volcanics. The Sock Creek rhyolites show some depletion in K₂O. This depletion in potassium might be reflecting minor hydrothermal alteration of the Sock Creek rhyolites. The lack of significant K₂O and Na₂O depletion or addition further illustrates the lack of significant alteration within the Sock Creek South volcanics.

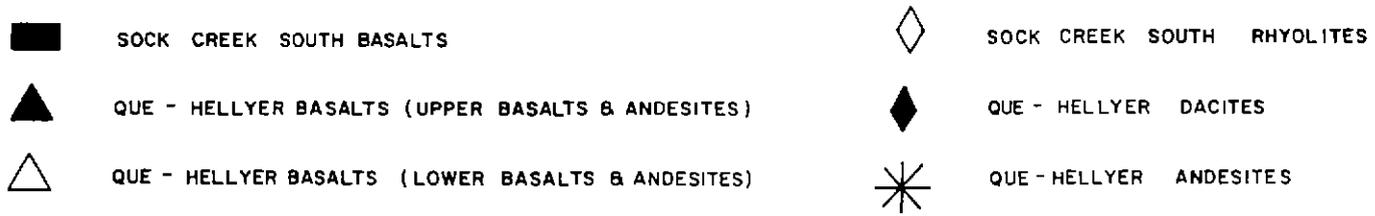
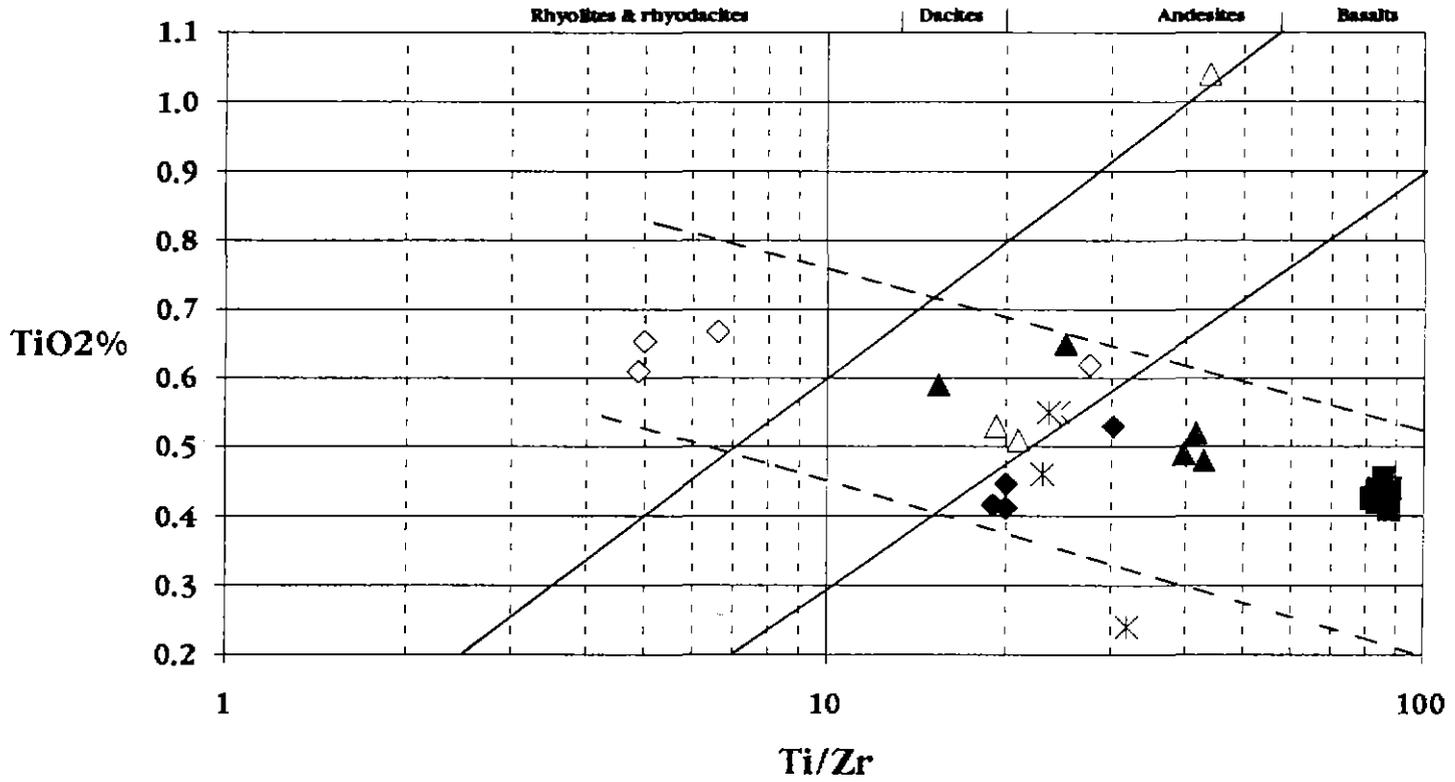
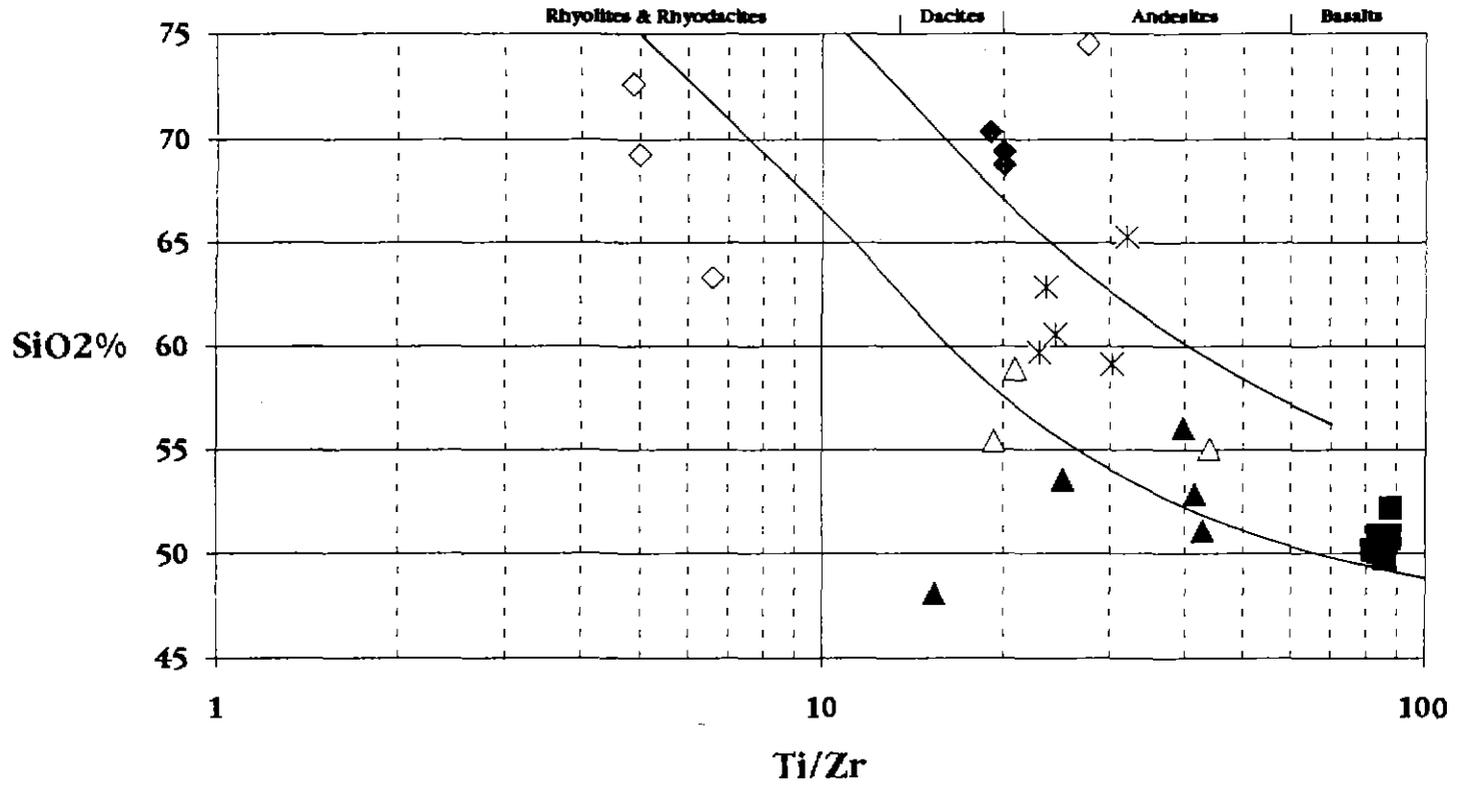


Figure 22

180

400180

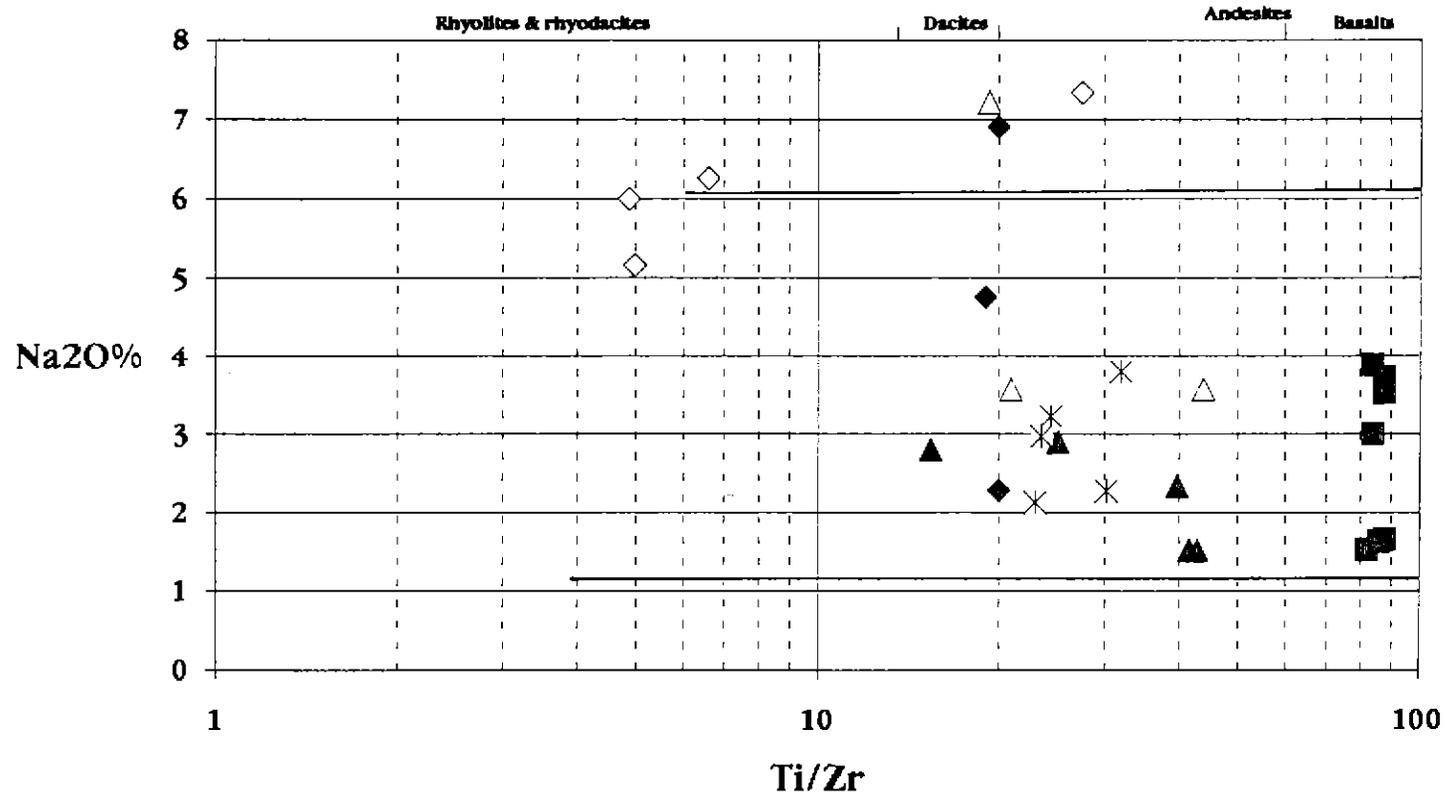
Figure 23 - SiO₂ versus Ti/Zr variation diagram



- SOCK CREEK SOUTH BASALTS
- QUE - HELLYER BASALTS (UPPER BASALTS & ANDESITES)
- QUE - HELLYER BASALTS (LOWER BASALTS & ANDESITES)
- SOCK CREEK SOUTH RHYOLITES
- QUE - HELLYER DACITES
- QUE - HELLYER ANDESITES

Figure 23

Figure 24 - Na₂O versus Ti/Zr variation diagram



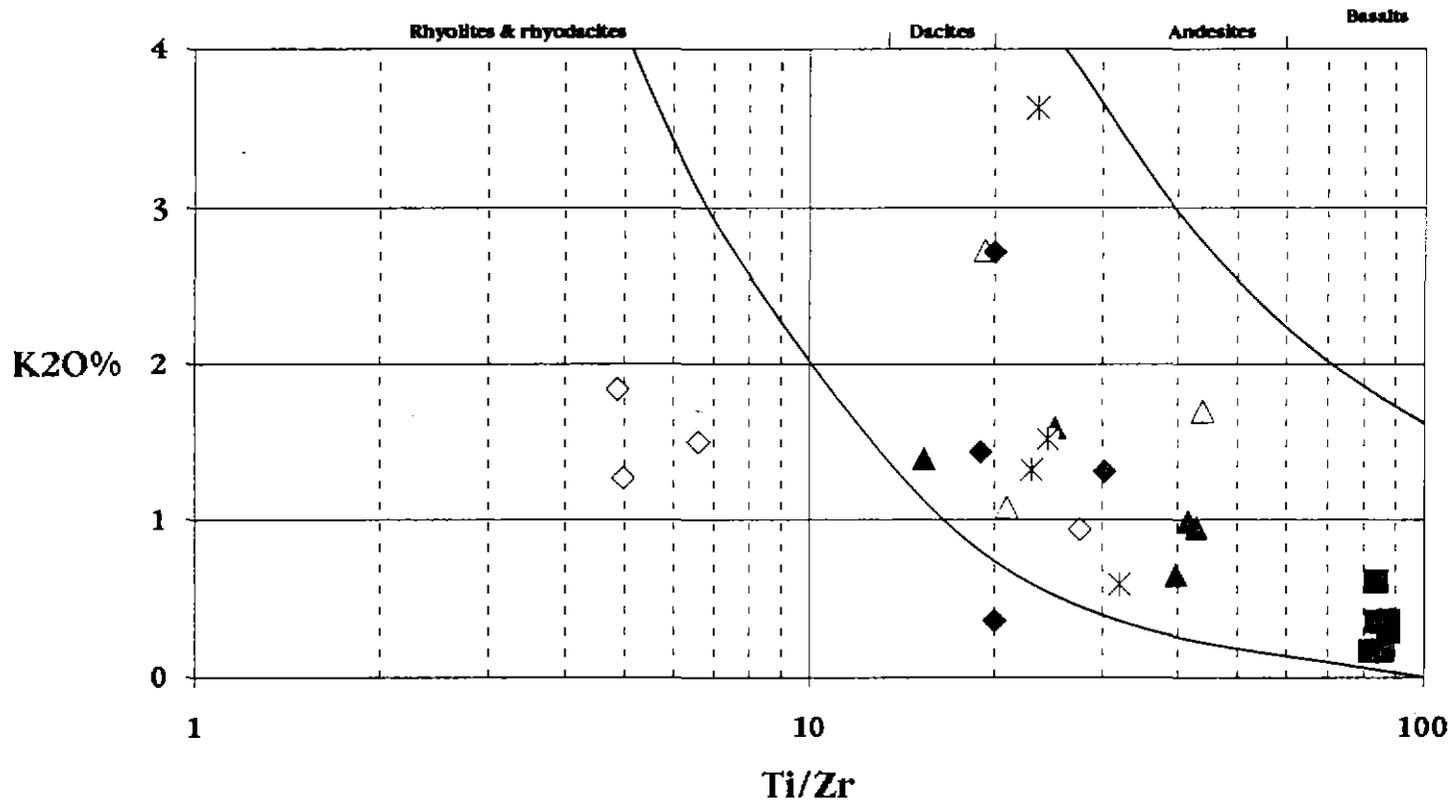
- SOCK CREEK SOUTH BASALTS
- QUE - HELLYER BASALTS (UPPER BASALTS & ANDESITES)
- QUE - HELLYER BASALTS (LOWER BASALTS & ANDESITES)
- SOCK CREEK SOUTH RHYOLITES
- QUE - HELLYER DACITES
- QUE - HELLYER ANDESITES

Figure 24

184

400184

Figure 25 - K_2O versus Ti/Zr variation diagram



- | | | | |
|---|---|---|----------------------------|
|  | SOCK CREEK SOUTH BASALTS |  | SOCK CREEK SOUTH RHYOLITES |
|  | QUE - HELLYER BASALTS (UPPER BASALTS & ANDESITES) |  | QUE - HELLYER DACITES |
|  | QUE - HELLYER BASALTS (LOWER BASALTS & ANDESITES) |  | QUE - HELLYER ANDESITES |

Figure 25

Figure 26 is a plot of Zr/TiO_2 versus Nb/Y for the geochemical data base tabulated in Appendix A. Also plotted are the partial fields defined by Recent lavas by Winchester and Floyd (1977). The Sock Creek South basalts again form a distinctive elongated cluster that straddles the andesite-basalt and the sub-alkaline basalt fields. The Que-Hellyer basalts, andesites and dacites and the Sock Creek rhyolites plot as a broad field that straddles the boundary between the andesite and rhyodacite-dacite fields.

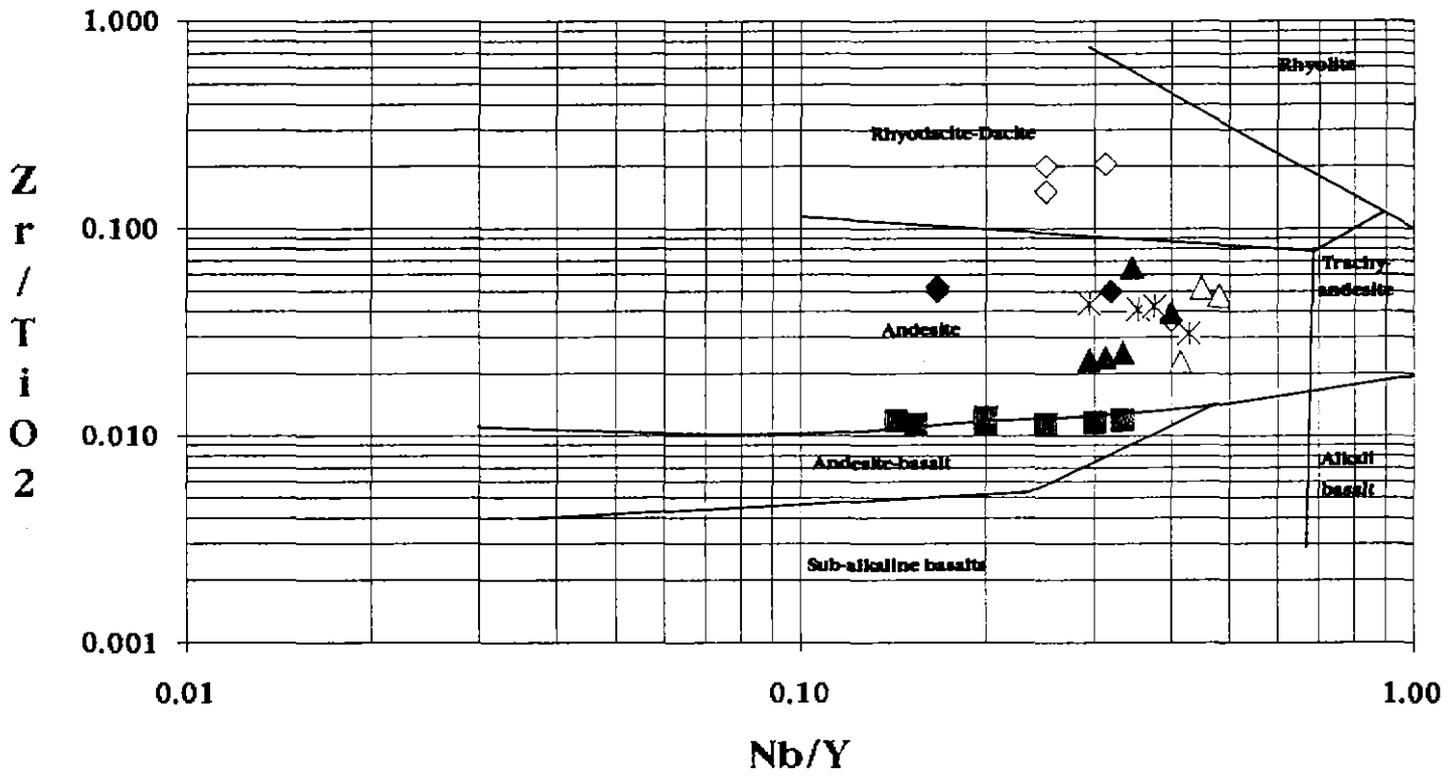
The Ti/Zr variation diagrams (Figs. 22 -25) and the Zr/TiO_2 versus Nb/Y (Fig. 26) illustrate that geochemically the Sock Creek South basalts are the only true basalts between the two volcanic suites. The Que-Hellyer basalts plot within the field for andesites, even though petrographically and geologically they are basalts. This discrimination might be indicating the limitations of trace geochemistry as means of establishing a rocks affinities, without significant petrological and geological input. The basalts from the upper basalts and andesites of the Que-Hellyer Volcanics appear to show some depletion in zirconium relative to titanium with respect to other basalts from the Que-Hellyer Volcanics. Another alternative is that andesites have been misidentified as basalts.

Rare Earth Element Geochemistry

Crawford (1989) analysed two basalts from DDH's SCS2 and SCS3 and one from DDH HP2 for rare earth elements (REE). A further six REE basalt samples from DHH's SCS3 and SCS4 were analysed for REE as part of the initial investigation into the Sock Creek geology. All the REE value were chondrite normalised according to the values quoted by Haskins *et.al.* (1968) and Nakamura (1974). A further three basalts from DDH's SCS3 and SCS4 were analysed for their REE contents. These were then plotted and compared to the REE analyses of Crawford (1989) for basalts from DDH's SCS2, SCS3 and MCH-1.

Figure 27 illustrates the REE patterns for four Sock Creek South basalts and one basalt from DDH HP2, which Crawford (1989) concluded is equivalent to basalts

Figure 26 - Zr/TiO₂ versus Nb/Y variation diagram



- | | | | |
|---|---|---|----------------------------|
|  | SOCK CREEK SOUTH BASALTS |  | SOCK CREEK SOUTH RHYOLITES |
|  | QUE - HELLYER BASALTS (UPPER BASALTS & ANDESITES) |  | QUE - HELLYER DACITES |
|  | QUE - HELLYER BASALTS (LOWER BASALTS & ANDESITES) |  | QUE - HELLYER ANDESITES |

Figure 26

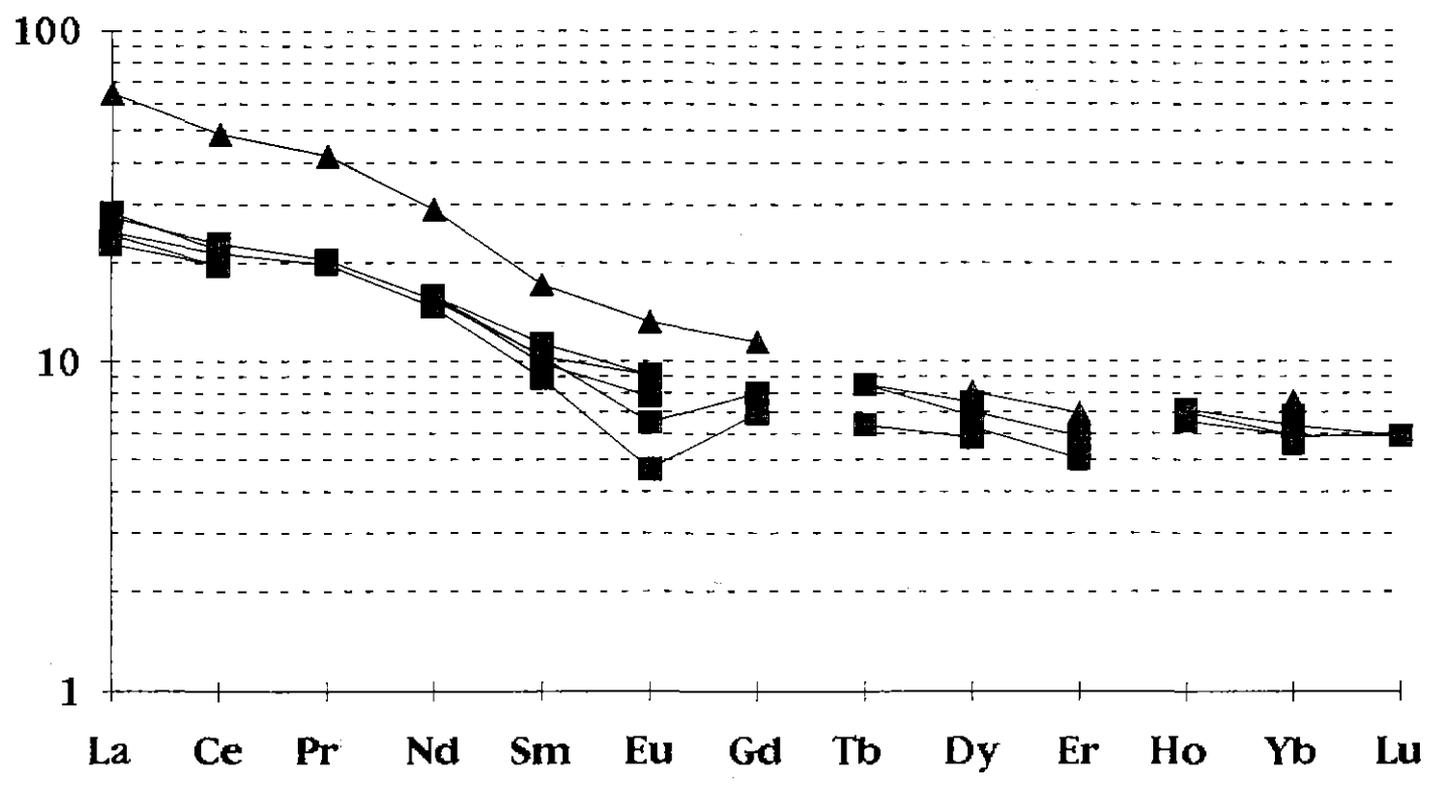
from the upper basalts and andesites sequence of the Que-Hellyer Volcanics. The Sock Creek South basalts are depleted in the LREE compared to the basalt from DDH HP2. Two of the Sock Creek South basalts have negative Eu anomalies, but overall there is very good similarity between the two basaltic suites in the shape of their REE patterns. This similarity is possibly indicating that the two basaltic suites maybe genetically related, and that the Sock Creek basalts are the more primitive of the two suites.

The REE patterns for the Sock Creek rhyolites and the dacites from DDH MCH-1 are illustrated in figure 28. The dacites the rhyolites have identical REE patterns, with the dacite being marginally enriched in the LREE relative to the rhyolites. This implies that there is a very strong genetic link between the Sock Creek rhyolites and the *dacites from the Que-Hellyer Volcanics*.

Discussion

The Sock Creek Sequence has been postulated by Corbett and Komysan (1988) to be the equivalent of the Que-Hellyer Volcanics, but lacking in the basaltic component. The three diamond drill holes at the Sock Creek South "Prospect" have indicated that the basaltic component is not missing. The rhyolites from Sock Creek South give almost identical geochemical signatures to those from the Que-Hellyer Volcanics. This suggests that the rhyolites intersected in the Sock Creek South diamond drill holes are contemporaneous with the Que-Hellyer Volcanics, or at least formed in a similar tectonic environment. A genetic link between the Sock Creek South basalts and the Que-Hellyer basalts is implied not only from the trace element plots but also from the REE plots. The Sock Creek South basalts are noticeably depleted in the LREE, but have very similar REE patterns to those of the Que-Hellyer basalts. Crawford (1989) considers that the Sock Creek South basalts are transitional between the typical island tholeiites and arc calc-alkaline basalts, and further predicts that the Sock Creek South basalts must slightly predate the Que-Hellyer basalts, based on an apparent temporal increase in P_2O_5 , Ba and LREE enrichment, between the Sock Creek South basalts and the Que-Hellyer basalts.

Figure 27 - REE plot for the Sock Creek South and Que-Hellyer basalts.



- SOCK CREEK SOUTH BASALTS
- ▲ QUE - HELLYER BASALTS (UPPER BASALTS & ANDESITES)
- △ QUE - HELLYER BASALTS (LOWER BASALTS & ANDESITES)
- ◇ SOCK CREEK SOUTH RHYOLITES
- ◆ QUE - HELLYER DACITES
- * QUE - HELLYER ANDESITES

Figure 27

Figure 28 - REE plot for the Sock Creek South rhyolites and Que-Hellyer dacites.

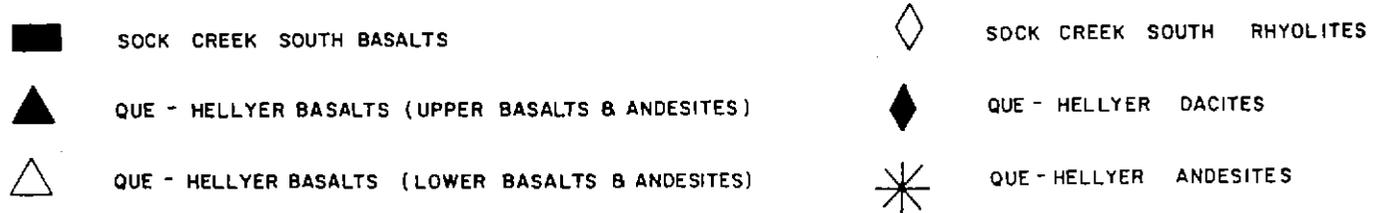
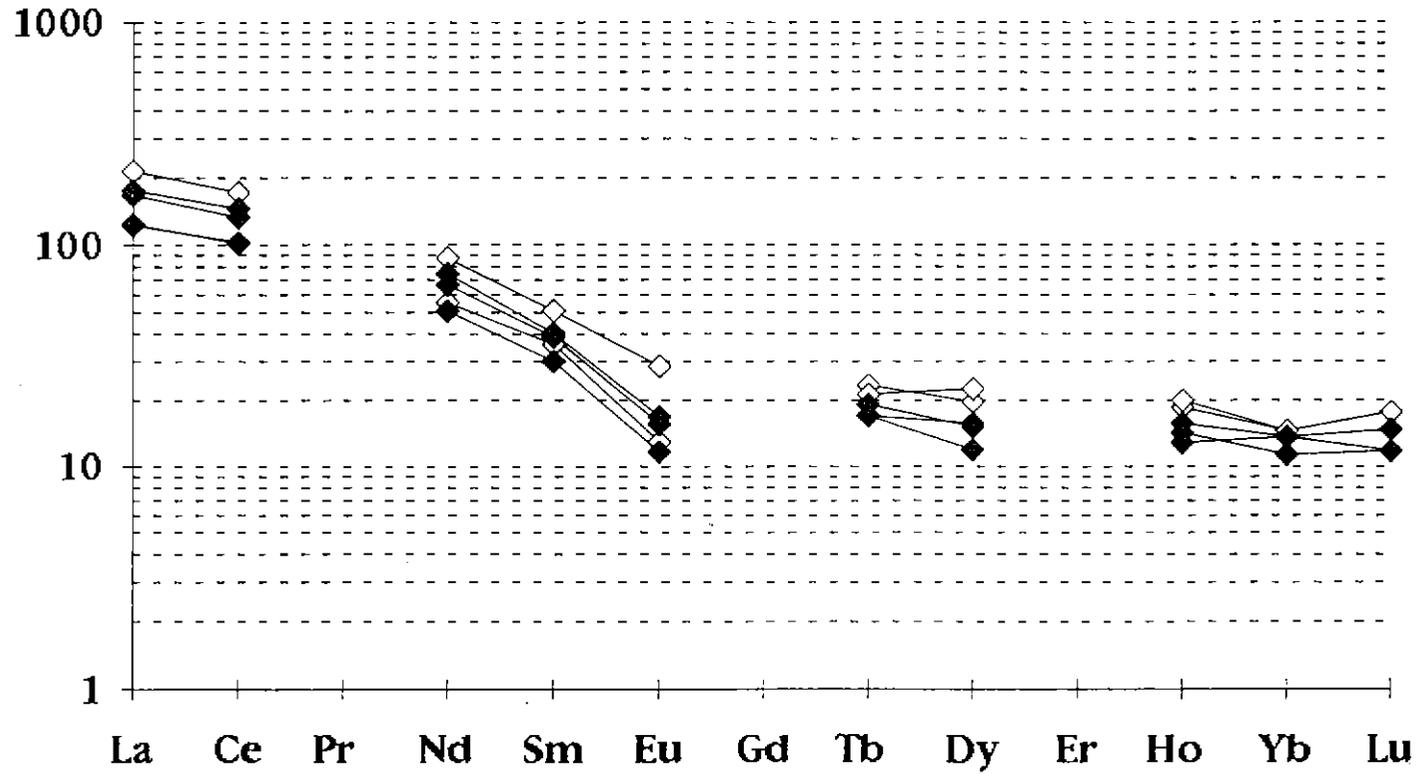


Figure 28

400133

DISCUSSION/CONCLUSIONS

The geology and mineralisation at the Sock South "Prospect" suggests that the volcanics and sediments were deposited in a deep active submarine environment, related to emerging rhyolitic/dacitic cryptodomes. The epiclastics were deposited rapidly as debris flows of variable volcanic material. The sediments all have graded tops indicating that the stratigraphy is the right way up i.e. dipping and facing west and is not overturned. The volcanics are bimodal in source. The rhyolite cryptodome(s) intruded into unconsolidated wet sediments. These dacites have very close geochemical affinities to the dacites within the Que-Hellyer Volcanics. Indicating that they were possibly formed at the same time and within similar tectonic environments, as the Que-Hellyer Volcanics. The basalts are an enigma in that no other basalts so far analysed from the Mt. Read volcanics have a similar composition. But a possible genetic link between the Sock Creek South basalts and the Que-Hellyer basalts is inferred, based on the trace element and REE plots. This supports the conclusions of Corbett and Komysan (1989) that the Sock Creek Volcanic Sequence is equivalent to the Que-Hellyer Volcanics. Crawford (1989) suggests that these basalts are transitional between the Que-Hellyer basalts and the basalts at Miners Ridge, south of Queenstown.

The disseminated sphalerite and pyrite mineralisation has very little alteration associated with it, and was possibly precipitated from low temperature, neutral pH fluids moving through the volcanic pile. The mineralisation could possibly be related to a distal massive sulphide, either along strike or further down dip in the stratigraphy at Sock Creek South.

RECOMMENDATIONS

The following recommendations are dependent on the Sock Creek Volcanics being equivalent to the Que-Hellyer Volcanics. The geochemistry of both volcanic sequences indicate that there is a strong genetic link between the two sequences. The massive sulphide mineralisation at the Hellyer Mine is located at the interface between the footwall feldspar phyric sequence and the hangingwall pillow lava sequence (McArthur 1986 and Drown 1990). Based on the Hellyer stratigraphy, then the horizon to test for any possible mineralisation in the Sock Creek Volcanics must be along the strike and/or down or up dip of the contact between the Sock Creek South basalts and the underlying rhyolite volcanics. The basalts of the pillow lava sequence at the Hellyer Mine are characterised by a bright emerald green colouration, due to pervasive calcite - fuchsite alteration. Suggesting that the hydrothermal system that formed the Heller massive sulphide was still active when the basalts were extruded (Jack 1990). This style of alteration could well prove to be a very useful exploration tool within the basalts of the Sock Creek Volcanics. At least one diamond drill should be collared to the west of the Sock Creek South 'Prospect' to test the potential of any down dip mineralisation. The hole should be so designed if possible to finish in the Animal Creek Greywacke, thereby providing a stratigraphic section. A number of shallow diamond drill holes positioned along strike between the Sock Creek Prospect and the Sock Creek South 'Prospect' should also be considered. These holes would test the possibility of Hellyer type mineralisation between the two prospects, along the contact between the rhyolites and the overlying basalts. The south west extension of this contact likewise should be investigated, for similar reasons.

The Comstaff diamond drill holes from the Sock Creek Propsect should also be relogged in order to better establish the stratigraphy of the Sock Creek Volcanics. Core samples wherever appropriate should be sent for major and trace element analysis. The cost of six to eight samples would be insignificant to the overall cost of the exploration and drilling budget. These assays would aid considerably in providing possible further genetic links between the volcanics at the Sock Creek

Prospect, the Sock Creek South Prospect and the Que-Hellyer Volcanics. Ore samples should also be submitted to SIROTOPE for Pb isotope analysis. The Pb isotopes would enable whether the Sock Creek mineralisation has any affinities with Devonian type mineralisation (thereby downgrading its' importance as an exploration target), or more importantly whether there are any similarities between the Pb isotopes for Hellyer and the Sock Creek Prospect (thereby enhancing its' exploration potential). About five samples would be required for the results to be statistically valid.

REFERENCES

- Barton, C.M., Burns, K.L., Gee, R.G., Groves, D.I., Guilline, A.B., Jennings, D.J., Longman, M.J., Marshall, B., Matthews, W.L., Moore, W.R., Naqvi, I.H., & Pike, G.P., 1966. *Mackintosh, Tasmania*. Tasm. Dep. Mines. Geol. Atlas 1 Mile Series, Sheet 44 (8014N).
- Cas, R.A.F. & Wright, J.V. 1987. *Volcanic Successions Modern and Ancient* Allen & Unwin.
- Crawford, A.J., 1989. Petrographic and Compositional Affinities of the Sock Creek South Basalts. Rept. to B.H.P. Minerals Exploration. (Unpubl).
- Collins, P.L.F., 1980. *Geology of the Pinnacles - Que River Area*. Publ. map included in Collins *et.al.*1981.
- Collins, P.L.F., Guilline, A.B. & Williams, E., 1981. *Mackintosh, Tasmania*. Tasm. Dep. Mines. Geol. Atlas 1 Mile Series Explan. Rep., Sheet 44 (8014N).
- Corbett, K.D. & Komyshan, P., 1989. *Geology of the Hellyer - Mt Charter area*. Tasm. Dep. Mines. Mt. Read Volcanics Project Report 1.
- Date, J., Watanabe, Y. & Saeki, Y., 1983. Zonal alteration around the Fukazawa Kuroko deposits, Akita Prefecture, northern Japan. *Econ. Geol. Monogr.* 5. 365 -386.
- Drown, C.G., 1990. The Hellyer massive sulphide deposit. *In The Mount Read Volcanics and Related Ore Deposits*. 10th Australian Geol. Conv., Hobart 1990. Geol. Soc. Aust. Excursion Guide E1: 34 - 41
- Franklin, L.M., Sangster, D.M. & Lydon, J.W. 1981. Volcanic- Associated Massive Sulphide Deposits. *In Skinner, B.J. ed. Economic Geology Seventy - Fifth Anniversary Volume 1905 - 1980*. *Econ. Geol.* 485 - 627.
- Haskin, L.A., Haskin, M.A., Frey, F.A. & Wildeman, T.R. 1968. Relative and absolute terrestrial abundances of the rare earths. *In Ahrens, L.H. ed. Origin and Distribution of the Elements*, 1. Pergamon, Oxford. 889 - 911
- Hunns, S.R., 1989. *Tender Document for E.T.A. 118* Rept. to Pasminco Mining - Rosebery. (Unpubl).
- Jack, D.J., 1990. Geochemistry and alteration of the hangingwall basalts to the Hellyer massive sulphide deposit, Tasmania. *In Gondwana: Terranes and*

Resources. 10th Australian Geol. Conv., Hobart 1990. Geol. Soc. Aust. 400198

Abst. 25: 7

- Komyshan, P., 1986. *Geology of the Mt Charter - Hellyer area*. Tasm. Dep. Mines. Mt Read Volcanics Project. 1:25,000 Geol. Map.
- Large, R.R., 1977. Chemical evolution and zonation of massive sulfide deposits in volcanic terrains. *Econ. Geol.* 72: 549 - 572.
- Large R.R., Crawford, A., & Adrichem, S. (1986). Primary and alteration chemistry of the Mount Read Volcanics. *In: Controls on gold and silver grades in volcanogenic sulphide deposits (84/P210)*. University of Tasmania. Progress Report to Amira August 1986 (Unpubl).
- Leaman, D.E., 1990. *Aeromagnetic Survey EL 37/89 Bulgobac Hill. Acquisition Report (Including Preliminary Interpretation) for Pasminco Mining*. Rep. to Pasminco Exploration. (Unpubl).
- McArthur, G.J., 1986. The Hellyer massive sulphide deposit. *In* Large R.R. ed. *The Mount Read Volcanics and Associated Ore Deposits. A Symposium*. Geol. Soc. Aust. (Tasm. Div.), Hobart: 11 - 20.
- Moore, J.G., Phillips, R. L., Grigg, R.W., Peterson, D.W., & Swanson, D.A., 1973. Flow of lava into the sea, 1969-1971, Kilauea Volcano, Hawaii. *Geol. Soc. Amer. Bull.* 84: 537 - 546.
- Nakamura, N., 1974. Determination of REE, Ba, Fe, Mg, Na and K in carbonaceous and ordinary chondrites. *Geochim. Cosmochim. Acta.* 38: 757 - 775.
- Stolz, J., & Large, R.R., 1988. The source of gold in the western Tasmania VMS deposit. *In: Controls on gold and silver grades in volcanogenic sulphide deposits (84/P210)*. University of Tasmania. Final Report to Amira, August 1988 (Unpubl).
- Winchester, J.A., & Floyd, P.A., 1977. Geochemical discrimination of different series and their differentiation products using immobile elements. *Chem. Geol.* 20: 325 - 344.
- Whitford, D.J., McPherson, W.P.A., & Wallace, D.B., 1989. Geochemistry of the host rocks of the volcanogenic massive sulphide deposit at Que River, Tasmania. *Econ. Geol.* 84: 1 - 21.
- Williams, H., & McBirney, A.R., 1979. *Volcanology*. Freeman, Cooper and Co.

APPENDIX A

- Whole rock geochemical data base.

References:

T.C. - Crawford, 1989

C & K - Corbett & Komyshan, 1989

AMIRA - Stolz & Large, 1988

SAMPLE	P209	Z7251	Z7252	MC1/B	HL55/A	HL55/B	MC1/D	MC2A/A	MC2A/B	81611
Location	CP868928 Sack Creek	DDH HP 2 390.0m	DDH HP2 392.0m	DDH MCH-1 69.5m	DDH HL 55 144 -159.7m	DDH HL 55 183.5 - 199m	DDH MCH -1 265.0m	DDH MCH 2A 352.0M	DDH MCH 2A 312.0m	DDH MCH-1 429.4m
Rock Type	Spher Lava	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Corrected Dacite
Sequence		Que, Hellyer U. And/Bas	Que, Hellyer L. And/Bas	Que, Hellyer L. And/Bas	Que, Hellyer L. And/Bas					
Reference	C & K	T.C	T.C	C & K	AMIRA	AMIRA	C & K	C & K	C & K	
SiO2	74.51	52.90	56.10	48.07	53.58	51.13	55.06	58.99	55.44	69.44
TiO2	0.62	0.52	0.49	0.59	0.65	0.48	1.04	0.51	0.59	0.45
Al2O3	14.92	13.60	12.30	17.96	12.85	14.21	16.58	13.68	14.67	14.80
FeO	1.52	8.51	7.28	11.28	9.06	9.11	10.27	7.68	1.45	6.08
MnO	0.04	0.14	0.14	0.28	0.15	0.19	0.24	0.27	6.84	0.09
MgO	0.27	15.22	11.50	8.98	9.67	11.47	4.71	6.69	0.37	3.15
CaO	0.31	6.50	9.11	8.12	9.04	10.76	6.47	7.95	8.42	0.90
Na2O	7.34	1.53	2.34	2.80	2.90	1.52	3.57	3.57	7.22	2.28
K2O	0.94	0.99	0.65	1.39	1.59	0.95	1.70	1.08	2.73	2.72
P2O5	0.13	0.12	0.15	0.55	0.31	0.17	0.38	0.24	2.09	0.08
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOI	0.89	5.37	4.58	3.59	3.69	6.28	2.52	6.11	3.77	
Ti	3717	3117	2997	3537	3897	2878	6235	3057	3177	208
Zr	135	75	74	230	155	67	142	146	165	10
Nb	12	5	6	10	10	5	12	12	13	36
Y	30	16	18	29	25	17	29	25	29	114
Sr	7	183	272	788	559	320	562	347	310	135
Rb	105	27	22	33	27	21	44	25	43	10
Ni	3	380	337	.	.	.	.	.	130	156
Cr	62	1133	1084	.	.	.	.	.	600	26
V	6	223	201	.	.	.	.	.	180	12
Sc	10	28	29	.	.	.	.	.	27	592
Ba	250	1337	1059	.	.	.	.	.	1350	18
Th										9
U										

SAMPLE	Z7247	Z7248	Z7249	Z7250	91628	91635	91636	91633	91644	P188
Location	DDH SCS 2	DDH SCS 3	DDH SCS 3	DDH SCS 3	DDH SCS 3	DDH SCS 4	DDH SCS 4	DDH SCS 3	DDH SCS 4	CP871928
	69.0m	84.4m	80.7m	82.4m	80.7m	107.25m	112.6m	164.0m	189.0m	Sock Creek
Rock Type	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Dacite	Dacite	Dacite
Sequence										
Reference	T.C	T.C	T.C	T.C						C & K
SiO2	52.20	50.90	50.70	50.90	50.07	50.19	49.72	69.29	63.32	72.65
TiO2	0.44	0.42	0.41	0.41	0.44	0.43	0.45	0.65	0.67	0.81
Al2O3	15.90	15.10	14.70	14.50	14.76	13.93	15.02	14.56	19.30	15.62
FeO	9.20	8.45	8.87	8.78	10.44	10.69	10.20	6.06	5.69	2.39
MnO	0.26	0.30	0.22	0.24	0.22	0.30	0.25	0.19	0.24	0.04
MgO	8.66	8.14	9.43	9.22	9.53	8.95	8.46	1.77	1.93	0.55
CaO	11.24	12.15	11.51	12.11	11.12	13.67	14.03	0.93	1.00	0.19
Na2O	1.66	3.89	3.73	3.53	3.00	1.53	1.64	5.16	6.26	6.00
K2O	0.34	0.61	0.36	0.29	0.35	0.17	0.17	1.27	1.50	1.84
P2O5	0.06	0.07	0.08	0.07	0.05	0.15	0.06	0.11	0.09	0.11
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOI	3.34	5.52	5.23	5.36	4.29	3.61	5.41	1.89	2.38	2.16
Ti	2638	2518	2458	2458	2627	2554	2727	3921	4005	3657
Zr	30	30	28	28	31	31	32	787	606	750
Nb	3	2	2	3	5	3	3	10	10	10
Y	15	14	13	12	16	16	11	41	41	32
Sr	374	377	324	307	396	405	360	133	463	145
Rb	8	19	10	9	16	8	6	41	87	65
Ni	120	126	127	137	124	143	141	12	10	3
Cr	370	436	433	497	469	613	635	133	72	40
V	271	260	257	263	250	249	275	41	72	41
Sc	43		36	39	41	142	40	15	13	15
Ba	328		341	323	271	145	127	634	463	880
Th					2	2	3	21	28	
U					1	1	1	4	5	

201

400201

SAMPLE	Z7247	Z7248	Z7249	Z7250	81628	81635	81636	81633	81644	P186
Location	DDH SCS 2 69.0m	DDH SCS 3 84.4m	DDH SCS 3 80.7m	DDH SCS 3 82.4m	DDH SCS 3 80.7m	DDH SCS 4 107.25m	DDH SCS 4 112.6m	DDH SCS 3 164.0m	DDH SCS 4 189.0m	CP871928 Sock Creek
Rock Type Sequence	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Dacite	Dacite	Dacite
TvZr	87.90	89.90	87.80	87.80	89.93	81.93	85.93	4.98	6.60	4.88
Zr/Y	2.00	2.14	2.15	2.93	2.00	2.00	3.00	19.25	14.75	23.44
Zr/Nb	11.11	15.79	13.33	11.20	6.00	10.00	10.00	77.00	59.00	75.00
Y/Nb	5.56	7.37	6.19	4.80	3.00	5.00	3.33	4.00	4.00	3.20
A.I.	41	35	39	38	41	37	36	33	32	28
La	9.0			8.2	9.3	7.5	8.0	40.2	70.7	
Ce	19.8			18.5	19.0	17.0	17.0	89.0	149.0	
Pr	2.3			2.2	-	-	-	-	-	
Nd	9.8			9.3	10.0	10.0	10.0	35.0	55.0	
Sm	2.1			1.8	2.3	2.0	2.1	7.3	10.4	
Eu	0.5			0.4	0.7	0.6	0.7	1.0	2.2	
Gd	2.2			1.9	-	-	-	-	-	
Tb	-			-	0.4	0.3	0.4	1.1	1.0	
Dy	2.4			2.2	2.6	2.0	2.3	6.8	7.7	
Er	1.5			1.3	-	-	-	-	-	
Ho	-			-	0.5	0.5	0.5	1.3	1.4	
Tm	-			-	-	-	-	-	-	
Yb	1.5			1.2	1.4	1.3	1.3	3.2	3.2	
Lu	-			-	0.2	0.2	0.2	0.6	0.6	

SAMPLE	P209	Z7251	Z7252	MC1/B	HL55/A	HL55/B	MC1/D	MC2A/A	MC2A/B	81611
Location	CP868928 Sock Creek	DDH HP 2 390.0m	DDH HP2 392.0m	DDH MCH-1 69.5m	DDH HL 55 144 - 159.7m	DDH HL 55 189.5 - 199m	DDH MCH -1 265.0m	DDH MCH 2A 352.0M	DDH MCH 2A 312.0m	DDH MCH-1 429.4m
Rock Type	Spher Lava	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Corrected
Sequence		Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Dacite
Ti/Zr	27.53	41.60	39.70	15.38	25.10	42.90	43.91	20.94	19.26	20.00
Zr/Y	4.50	4.69	4.11	7.93	6.20	3.90	4.90	5.84	5.69	0.09
Zr/Nb	11.25	19.89	19.21	23.00	15.50	19.40	11.83	12.17	12.69	0.29
Y/Nb	2.50	2.96	3.21	2.90	2.50	3.40	2.42	2.08	2.23	3.14
A.I.	14	67	51	49	49	50	39	42	17	64.79
La		21.3								55.1
Ce		42.1								115.0
Pr		4.7								-
Nd		18.2								42.0
Sm		9.5								7.9
Eu		1.0								1.2
Gd		9.2								-
Tb		-								0.8
Dy		2.8								5.4
Er		1.8								-
Ho		-								1.1
Tm		-								-
Yb		1.7								9.0
Lu		-								0.5

SAMPLE	81613	81614	P193	P195	P160	P149	P150	P186
Location	DDH MCH-1 454.8m Corrected	DDH MCH-1 457.0m Corrected	CP901923 Mt. Charter	CP929941 Switchback	CP905915 Mt. Charter	CP915933 Que R. Portal	CP918932 Que R. Portal	CP914921 Mt. Charter
Rock Type	Dacite	Dacite	Basalt	Andesite	Andesite	Andesite	Andesite	Andesite
Sequence			Que. Hellyer L. And/Bas C & K					
Reference								
SiO ₂	68.79	70.39	55.96	59.19	59.69	60.58	62.84	65.31
TiO ₂	0.41	0.42	0.50	0.53	0.46	0.55	0.55	0.24
Al ₂ O ₃	14.97	14.28	16.20	15.48	16.34	15.28	13.53	11.76
FeO	4.37	5.98	8.25	7.67	7.37	7.43	4.90	5.50
MnO	0.10	0.10	0.34	0.16	0.16	0.26	0.16	0.15
MgO	1.06	1.41	4.88	4.10	5.59	4.38	4.04	5.47
CaO	2.95	1.17	9.50	9.12	6.66	6.50	6.96	7.09
Na ₂ O	6.91	4.76	3.68	2.28	2.13	3.23	2.97	3.80
K ₂ O	0.36	1.44	0.39	1.31	1.32	1.52	3.63	0.59
P ₂ O ₅	0.08	0.08	0.30	0.17	0.28	0.27	0.42	0.09
Total	#REF!	#REF!	100.00	100.00	100.00	100.00	100.00	100.00
LOI			3.72	3.44	3.55	2.60	2.27	1.91
Ti	206	198	2987	3177	2758	3297	3297	1439
Zr	10	10	125	105	120	135	140	45
Nb	31	31	6	5	5	6	6	3
Y	185	187	67	19	17	17	16	7
Sr	21	62	590	400	560	650	390	200
Rb	16	14	28	58	46	67	130	32
Ni	216	208	115	32	49	52	35	99
Cr	31	26	560	280	220	210	210	520
V	11	12	250	240	230	250	195	210
Sc	124	604	34	27	25	28	32	27
Ba	18	17	690	510	1100	910	1600	330
Th	1	3						
U								

SAMPLE	81613	81614	P193	P135	P160	P149	P150	P166
Location	DDH MCH-1 454.8m	DDH MCH-1 457.0m	CP901923 Mt. Charter	CP929041 Switchback	CP905915 Mt. Charter	CP915933 Que R. Portal	CP918932 Que R. Portal	CP914921 Mt. Charter
Rock Type	Corrected Dacite	Corrected Dacite	Basalt	Andesite	Andesite	Andesite	Andesite	Andesite
Sequence			Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer	Que, Hellyer
T/Zr	20.00	19.00	23.98	30.26	22.98	24.42	23.55	31.97
Zr/Y	0.06	0.06	1.87	5.53	7.06	7.94	8.75	6.43
Zr/Nb	0.33	0.33	20.83	21.00	24.00	22.50	23.33	15.00
Y/Nb	6.00	6.00	11.17	3.80	3.40	2.83	2.67	2.33
A.I.	12.60	32.42	29	32	44	38	44	36
La	40.7	57.9						
Ce	88.0	126.0						
Pr	-	-						
Nd	32.0	47.0						
Sm	6.1	8.2						
Eu	0.9	1.3						
Gd	-	-						
Tb	0.8	0.9						
Dy	4.1	5.2						
Er	-	-						
Ho	0.8	1.0						
Tm	-	-						
Yb	3.0	2.5						
Lu	0.4	0.4						

APPENDIX B - Whole rock assays for samples

81611
81613
81614
81628
81633
81644
81635
81636

ANALABS

Phone (09) 458 7999

52 Murray Road, Warragul, VIC 3106

Telex AA92560

ANALYTICAL REPORT No. 27.1.08.06782

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

Pasminco Mining Rosebery
 P.O. Box 21
 Rosebery
 Tasmania 7470

ORDER No.	901339	PROJECT	421000
DATE RECEIVED	90/1/11	RESULTS REQUIRED	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
4	14/03/90	1	5

STATE OF SAMPLES	REFER BELOW	SAMPLE NUMBERS	PRE-TREATMENT							ANALYSIS			
			DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD	

RESULTS TO

Pasminco Mining Rosebery
 P.O. Box 21
 Rosebery
 Tasmania 7470

RESULTS TO

MINES LEASES GEOLOGIST
 PASMINCO MINING - ROSEBERY
 P O BOX 21
 ROSEBERY
 TAS 7470

REMARKS

STATE OF SAMPLES	ANALYSIS - PREPARATION	ANALYSIS - METHOD
whole core WC	perchloric acid A1	atomic absorption AAS
split core SC	hydrochloric acid A2	x-ray fluorescence XRF
cutting CU	nitric acid A3	spectrophotometry SPEC
rock Ro	aqua regia A4	colorimetry COL
soil SO	nitric-perchloric A5	gravimetry GRA
slip PU	HF mixture A6	titrimetry TIT
water WA	HF under pressure A7	chemical means CHEM
		MISC
		FLUO
		ICP

AUTHORISED OFFICER

ANALABS

A Division of Incharge Inspection and Testing Services Australia Pty Ltd.

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

27.1.08.06782

14/03/90

901339

1 OF 4

TUBE No	SAMPLE No.	Sc	V	Cr	Ni	Rb	Sr	Y	Zr	Nb
1	B1611	12	25	150	10	130	110	35	200	10
2	B1613	11	30	210	16	20	180	30	200	10
3	B1614	12	25	200	13	60	180	30	190	10
4	B1628	39	240	450	119	15	380	15	30	<
5	B1633	15	40	130	12	40	130	40	770	10
6	B1644	13	70	70	<10	85	450	40	590	10
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	1	5	5	10	5	5	5	5	5
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	201	401	401	201	401	401	401	401	401

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER

Eferkin

ANALABS

A Division of Incepta Inspection and Testing Services Australia Pty Ltd

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No

PAGE

27.1.08.06792

14/03/90

901339

2 OF 4

TUBE No.	SAMPLE No.	Ba	La ✓	Ce ✓	Nd ✓	Sm ✓	Eu ✓	Tb ✓	Dy ✓	Hf ✓
1	81511	570	55.1	115	42	7.9	1.2	0.8	3.39	1.1
2	81513	120	40.7	98	32	6.1	0.9	0.8	4.10	0.9
3	81514	580	57.9	126	47	8.2	1.3	0.9	5.20	1.0
4	81528	260	9.3	19	10	2.3	0.7	0.4	2.57	0.8
5	81533	620	40.2	89	35	7.3	1.0	1.1	6.77	1.1
6	81544	450	70.7	149	55	10.4	2.2	1.0	7.74	1.1
7	REE Normalised								*	*
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	10	0.2	1	2	0.5	0.2	0.2	0.01	0.1
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	401	1806	1806	1806	1806	1806	1806	1806	1806

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER

Gentkin

ANALABS

400210

A Division of Incharge Inspection and Testing Services Australia Pty Ltd.

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

		27.1.08.06782				14/03/90	901339	3 OF 4		
TUBE No.	SAMPLE No.	Tm	Yb ✓	Lu ✓	Th	U	Na2O	Al2O3	CaO	Fe2O3
1	S1611	<1.0	3.0	0.5	17.2	2.6	2.200	14.26	0.87	5.66
2	S1613	<1.0	2.5	0.4	17.0	1.0	6.710	14.54	2.86	4.24
3	S1614	<1.0	2.5	0.4	16.5	3.3	4.570	13.72	1.12	5.74
4	S1628	<1.0	1.4	0.2	2.3	1.0	2.880	14.15	10.66	10.01
5	S1633	<1.0	3.2	0.6	20.9	4.4	5.050	14.25	0.91	5.93
6	S1644	<1.0	3.2	0.6	27.1	5.6	6.090	18.78	0.97	5.54
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	1.0	0.1	0.1	0.1	0.5	0.007	0.01	0.01	0.0
24	UNITS	PPM	ppm	ppm	ppm	ppm	%	%	%	
25	METHOD	1806	1806	1806	1806	1806	201	408	408	401

Results in ppm unless otherwise specified
 T = element present, but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER

Genkin

ANALABS

400211

A Division of Incharge Inspection and Testing Services Australia Pty Ltd.

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

27.1.08.06782

14/03/90

901339

4 OF 4

TUBE No.	SAMPLE No.	K2O	MgO	MnO	P2O5	SiO2	TiO2	LOI		
1	81611	2.62	3.03	0.09	0.081	66.9	0.43	3.39		
2	81613	0.35	1.03	0.10	0.074	66.8	0.40	2.52		
3	81614	1.38	1.35	0.10	0.073	67.6	0.40	2.51		
4	81628	0.34	9.14	0.21	0.045	48.0	0.42	4.29		
5	81633	1.24	1.73	0.19	0.109	67.8	0.64	1.09		
6	81644	1.46	1.83	0.23	0.088	61.6	0.65	2.36		
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.01	0.01	0.01	0.005	0.1	0.01	0.01		
24	UNITS	%	%	%	%	%	%	%		
25	METHOD	408	408	408	408	408	408	615		

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER

Gentman

ANALABS

Phone (09) 458 7999

A division of Macdonald Hamilton & Co. Pty. Ltd.
52 Murray Road, Wembley, W.A. 6106

Telex AA92560

ANALYTICAL REPORT No. 27.1.08.06791

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

ORDER No. PROJECT

Fasminco Mining Rosebery
P.O. Box 21
Rosebery
Tasmania 7470

901340

DATE RECEIVED RESULTS REQUIRED

90/01/12

ASAF

No. OF PAGES OF RESULTS

DATE REPORTED

No. OF COPIES

TOTAL No. OF SAMPLES

4

14/03/90

1

2

STATE OF SAMPLES	REFER BELOW	SAMPLE NUMBERS	PRE-TREATMENT						ANALYSIS				
			DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	ANALYSIS SECTION	PREPARATION	METHOD	

RESULTS

TO

Fasminco Mining Rosebery
P.O. Box 21
Rosebery
Tasmania 7470

RESULTS

TO

CHIEF GEOLOGIST
FASMINCO MINING - ROSEBERY
P O BOX 21
ROSEBERY
TAS 7470

REMARKS

STATE OF SAMPLES	ANALYSIS - PREPARATION	ANALYSIS - METHOD
whole core WC	perchloric acid A1	atomic absorption AAS
split core SC	hydrochloric acid A2	neutron activation XRF
cutting CU	nitric acid A3	neutron activation SPEC
rock Ro	aqua regia A4	neutron activation COL
soil SO	nitric-perchloric A5	neutron activation CHR
PU	HF mixture A6	neutron activation TTN
WA	HF under pressure A7	neutron activation CHEM
II	fusion A8	neutron activation MISC
SS		neutron activation FLUOR
HW		
	cold acid CA	atomic absorption AAS
	specific sulphide SS	neutron activation XRF
	other mixed acids Ma	neutron activation SPEC
	alkaline attack AA	neutron activation COL
	volatilisation VO	neutron activation CHR
	ignition IG	neutron activation TTN
	pressed powder (XRF) PP	neutron activation CHEM
	glass fusion (XRF) GF	neutron activation MISC

AUTHORISED OFFICER

ANALABS

A Division of Incharge Inspection and Testing Services Australia Pty Ltd

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

27.1.08.06791

14/03/90

901340

1 OF 4

TUBE No.	SAMPLE No.	Sc	V	Cr	Ni	Rb	Sr	Y	Zr	Nb
1	B1635	137	240	590	138	8	390	15	30	<3
2	B1636	38	260	600	133	6	340	10	30	<3
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	1	5	5	10	5	5	5	5	
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	pp
25	METHOD	201	401	401	201	401	401	401	401	40

Results in ppm unless otherwise specified.
 T = element present, but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER

Gentini

ANALABS

A Division of Incharge Inspection and Testing Services Australia Pty. Ltd.

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

27.1.08.06791

14/03/90

901340

2 OF 4

TUBE No.	SAMPLE No.	Ba	La	Ce	Nd	Sm	Eu	Tb	Dy	Hg
1	81635	140	7.5	17	10	2.0	0.6	0.3	2.00	<0.5
2	81636	120	8.0	17	10	2.1	0.7	0.4	2.33	<0.5
3										
4			2.47	14.71	6.3	0.46	0.646	0.014	0.69	-
5			2.63	14.71	6.3	0.48	0.054	0.019	0.80	-
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	10	0.2	1	2	0.5	0.2	0.2	0.01	0.1
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	401	1806	1806	1806	1806	1806	1806	1806	1806

Results in ppm unless otherwise specified.
 T - element present but concentration too low to measure
 X - element concentration is below detection limit
 - element not determined

AUTHORISED OFFICER

Genkin

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

27.1.08.06791

14/03/90

901340

3 OF 4

TUBE No.	SAMPLE No.	Tm	Yb	Lu	Th	U	Na20	Al2O3	CaO	Fe2O3
1	B1635	<1.00	1.3	0.2	2.3	1.0	1.470	13.50	13.15	10.29
2	B1636	<1.00	1.3	0.2	2.7	1.0	1.550	14.20	13.26	9.64
3										
4			0.29	0.007						
5			0.29	0.007						
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	1.00	0.1	0.1	0.1	0.5	0.007	0.01	0.01	0.0
24	UNITS	ppm	ppm	ppm	ppm	ppm	%	%	%	
25	METHOD	1806	1806	1806	1806	1806	201	40B	40B	40

* Results in ppm unless otherwise specified.
 * element present, but concentration too low to measure.
 * element concentration is below detection limit.
 * element not determined.

AUTHORISED OFFICER

Gentini

ANALABS

A Division of Incharge Inspection and Testing Services Australia Pty Ltd.

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

27.1.08.06791

14/03/90

901340

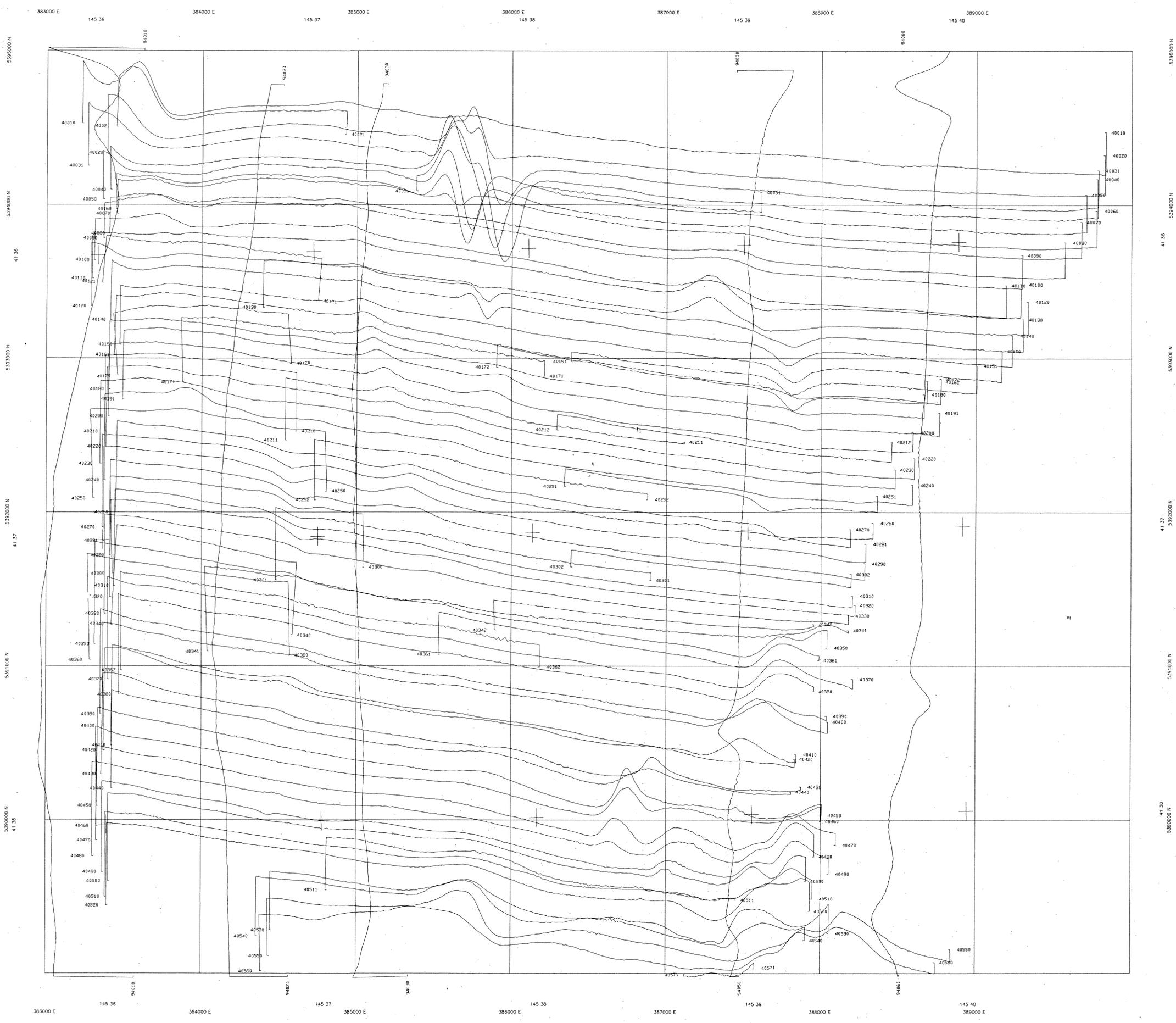
4 OF 4

TUBE No.	SAMPLE No.	K2O	MgO	MnO	P2O5	SiO2	TiO2	LOI		
1	81635	0.16	8.61	0.29	0.146	48.3	0.41	3.61		
2	81636	0.16	8.00	0.24	0.056	47.0	0.43	5.41		
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.01	0.01	0.01	0.005	0.1	0.01	0.01		
24	UNITS	%	%	%	%	%	%	%		
25	METHOD	408	408	408	408	408	408	515		

* Results in parentheses otherwise specified
 T = element present but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER *Jenkins*

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.

91-3225.
PASMINCO LIMITED
BULGOBAC GEOPHYSICAL SURVEY 1990

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

250 0 250 500 1000 1250 Metres

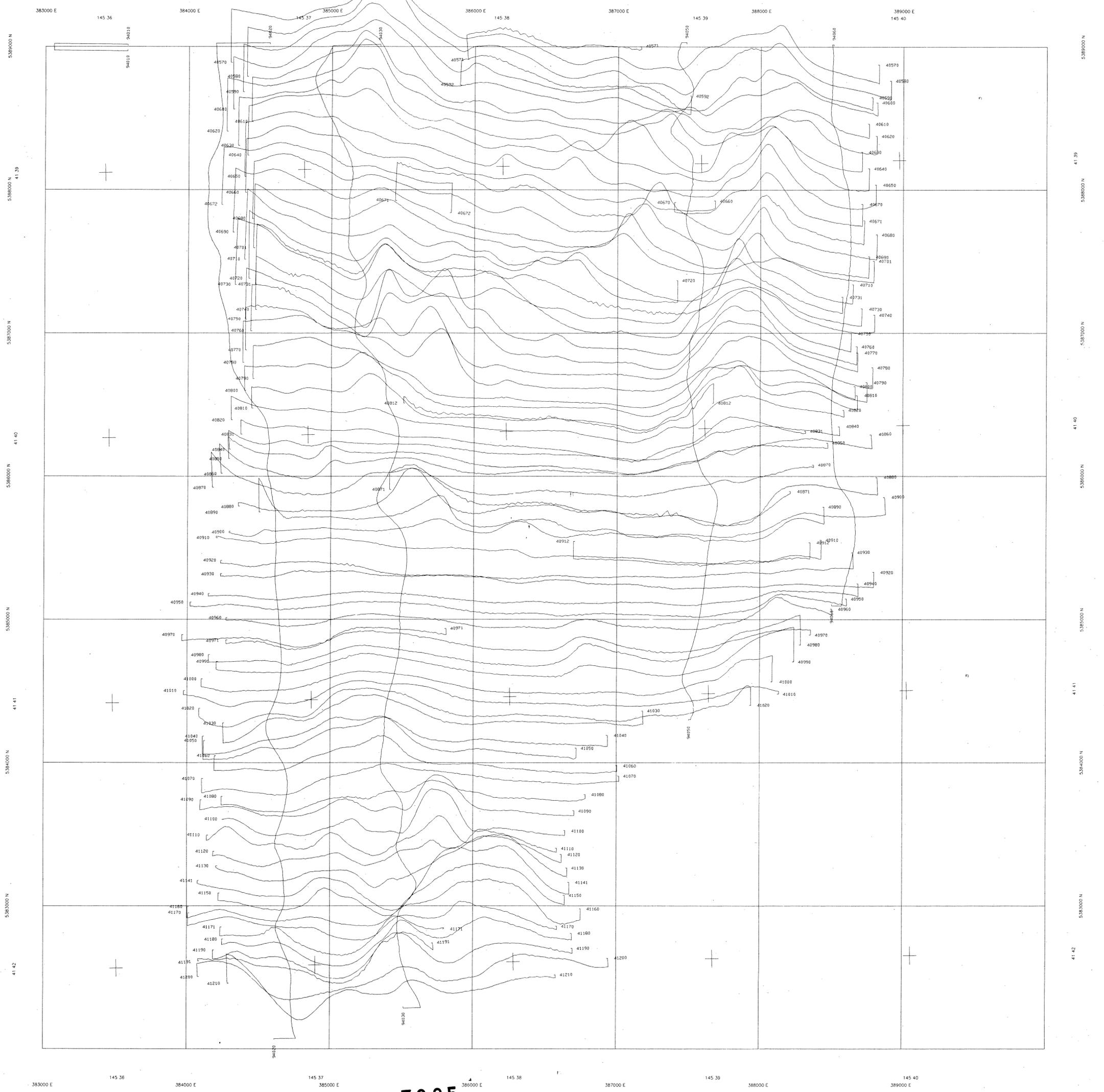
SCALE 1:10 000



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.

400217

BULGOBAC



91-3225.

PASMINCO LIMITED
 BULGOBAC GEOPHYSICAL SURVEY 1990

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



SCALE 1:10 000

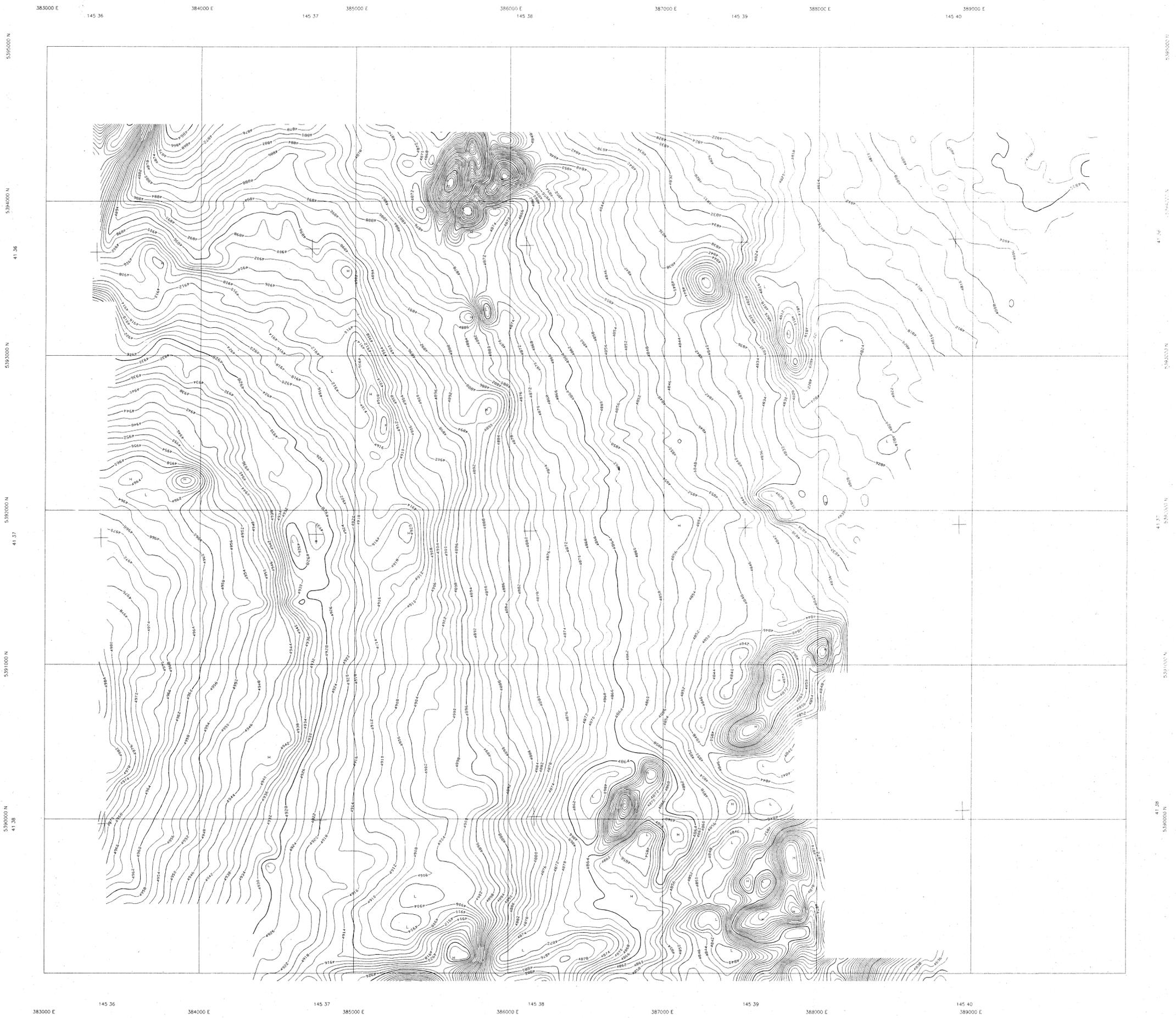


400218

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.

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: C-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

91-3225.
 PASMINGO LIMITED
 BULGOBAC GEOPHYSICAL SURVEY 1990

RESIDUAL MAGNETIC CONTOURS
 Contour Interval : 2 nT

250 0 250 500 750 1000 1250 Metres

SCALE 1:10 000

5 cm

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.

400219

BULGOBAC

383000 E 145 36 384000 E 145 37 385000 E 145 38 386000 E 145 39 387000 E 145 40 388000 E 145 41 389000 E 145 42

N 000485

N 000490

N 000495

N 000500

N 000505

N 000510

N 000515

N 000520

N 000525

N 000530

N 000485

N 000490

N 000495

N 000500

N 000505

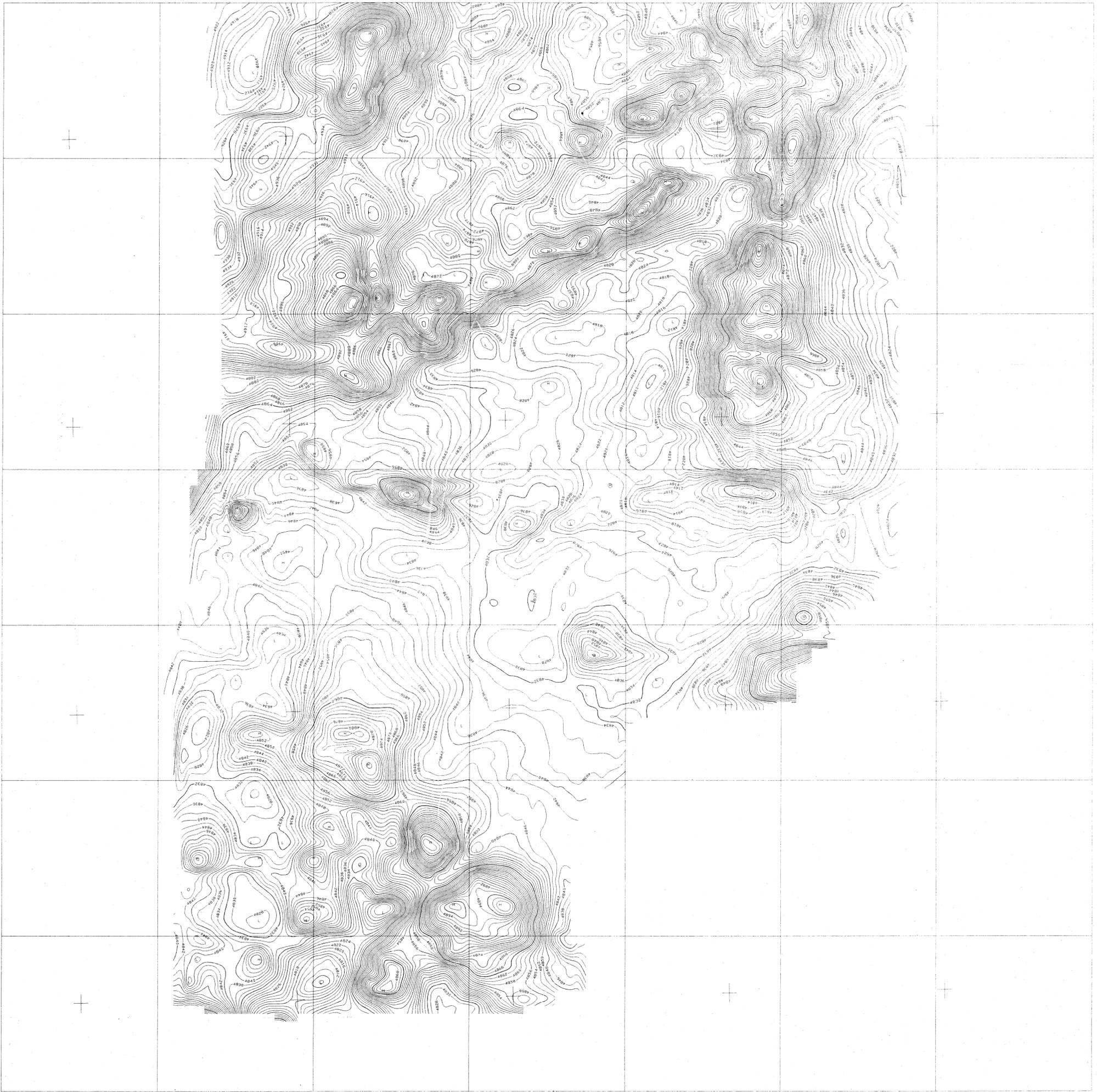
N 000510

N 000515

N 000520

N 000525

N 000530



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

91-3225.
PASMINCO LIMITED
BULGOBAC GEOPHYSICAL SURVEY 1990

RESIDUAL MAGNETIC CONTOURS
 Contour Interval : 2 nT



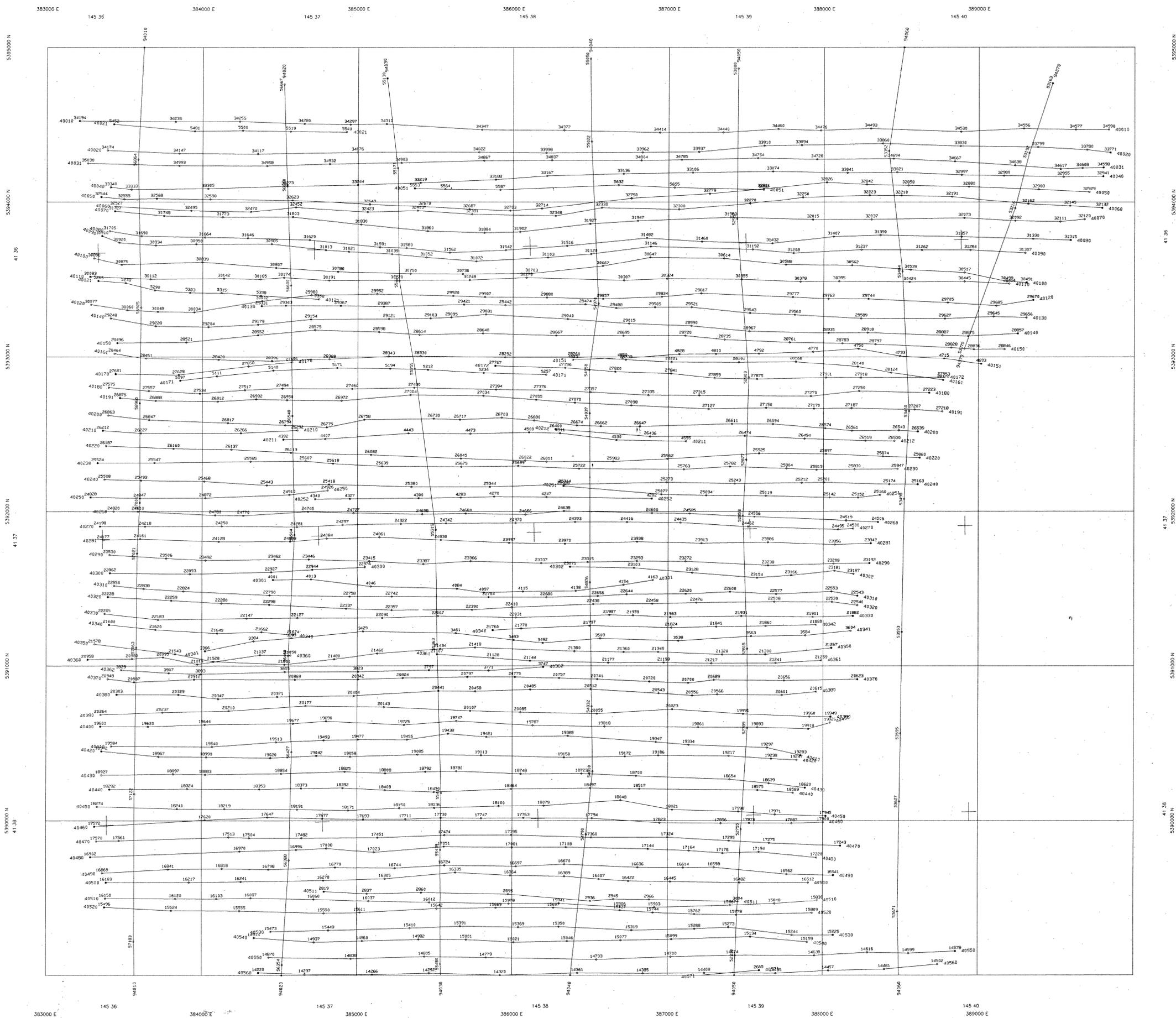
SCALE 1:10 000



400220

SURVEY SPECIFICATION:
 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: Magnetica 0.48 seconds
 Spectrometer 0.96 seconds
 Magnetometer: G-813 Protom Precision Magnetometer in a towed bird
 Sensitivity 0.1 nT
 Spectrometers: CR3001 with detector volume of 16.8 litres
 Data Recording: Geo Instruments 2000 Digital to Disk
 Flight path record by colour video VHS Plus
 Flight file recovery by transfer to 1:16,000 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.

PASMINCO LIMITED BULGOBAC GEOPHYSICAL SURVEY 1990

FLIGHT PATH **91-3225.**

250 0 250 500 750 1000 1250 Metres

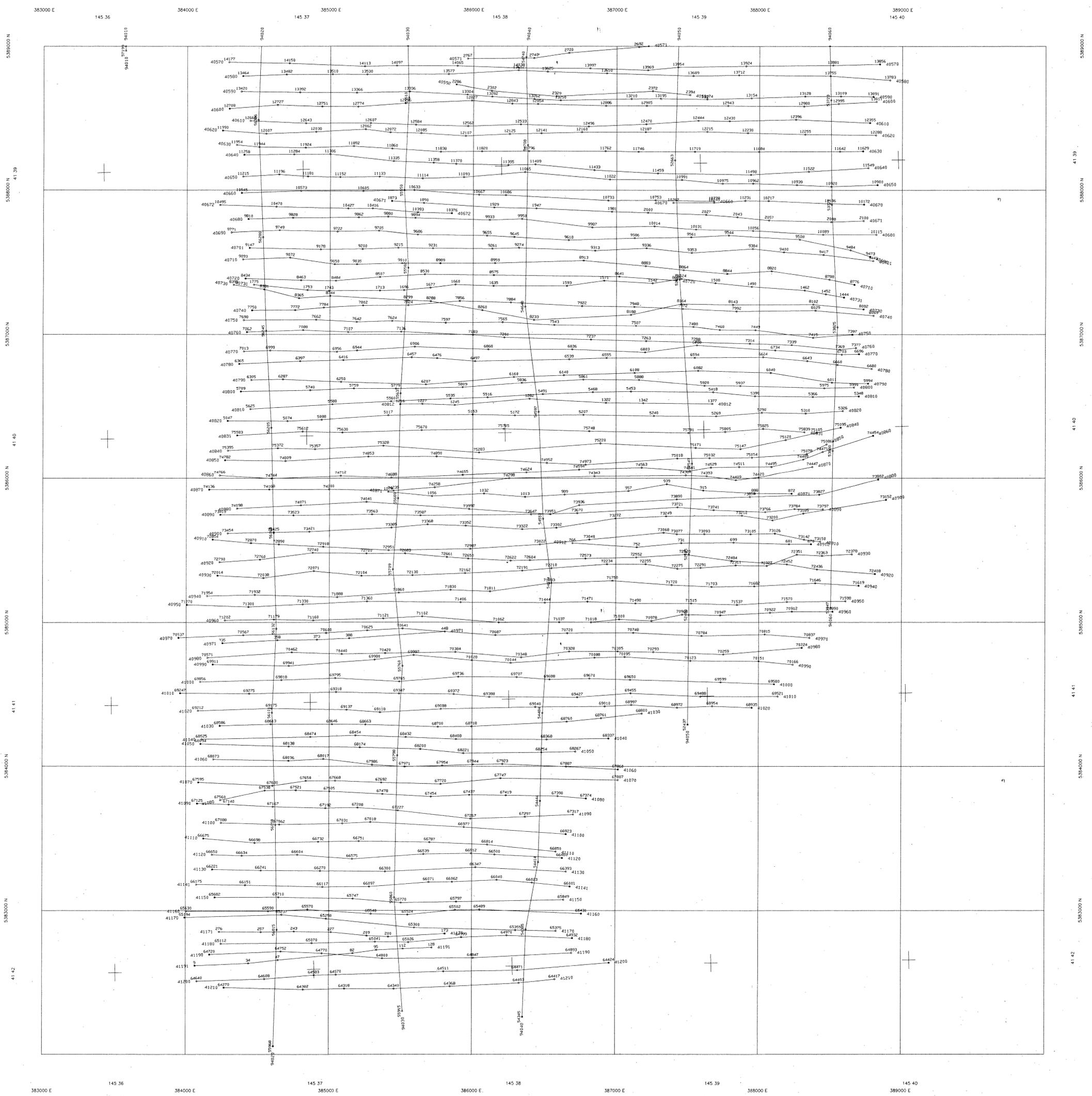
SCALE 1:10 000

5 cm

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.

400221

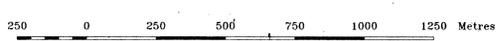
BULGOBAC



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.

**PASMINCO LIMITED
 BULGOBAC GEOPHYSICAL SURVEY 1990**

FLIGHT PATH



91-3225.

400222

SURVEY SPECIFICATIONS:
 Survey Area: EL 37/89 Bulgobac
 Flown by Geo Instruments Pty Ltd, February 1990, Job Number 8003.
 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.

