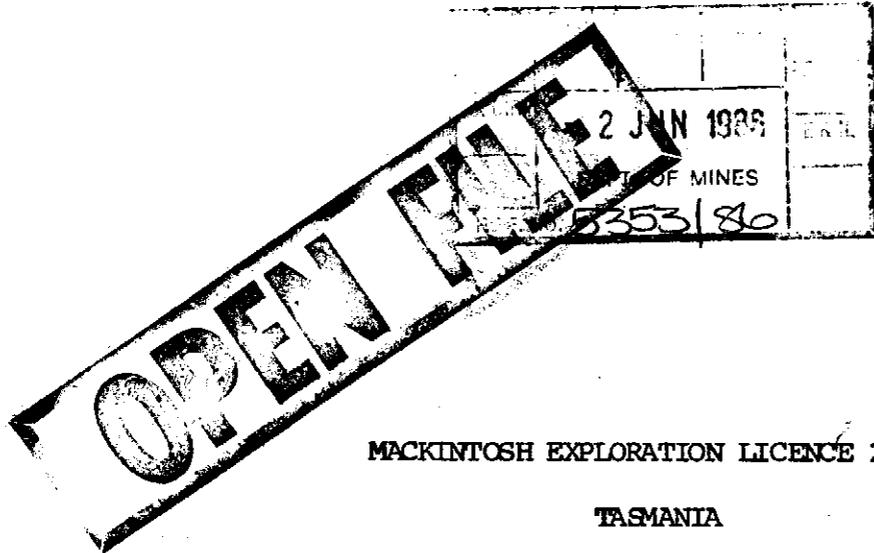


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MACKINTOSH EXPLORATION LICENCE 2/70

TASMANIA

PROGRESS REPORT

FOR THE PERIOD

MAY 1984 TO DECEMBER 1985

Distribution

Hawthorn	(1)
Burnie	(1)
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TABLE OF CONTENTS

	AUTHOR	PAGE
1. SUMMARY	A M Hesper	1
2. INTRODUCTION	A M Hesper	2
3. HELLYER DEPOSIT	G J McArthur D J Jack A M Hesper	2
3(i) Introduction		2
3(ii) Drilling Programme		3
3(iii) Deposit Geometry		3
3(iv) Lithology and Stratigraphy		3
(i) Summary		3
(ii) Upper Epiclastic Sequence		4
(iii) Que River Shale		5
(iv) Pillow Lava Sequence		5
(v) Hangingwall Volcaniclastic Sequence		5
(vi) Hellyer Mineralised Sequence		6
(vii) Feldsparphyric Sequence		6
(viii) Lower Epiclastic Sequence		6
(ix) Lower Andesitic Tuff Sequence		6
3(v) Structure		7
(i) General		7
(ii) Faulting		7
(iii) Jointing		8
(iv) Other Structural Features		8
3(vi) Alteration		8
(i) Weathering		8
(ii) Regional Metamorphism		8
(iii) Hangingwall Alteration		9
(iv) Footwall Stringer Alteration		9
3(vii) Mineralisation		11
(i) Main Ore Position		11
(ii) Stringer Zone		13
3(viii) Geological Resource and Exploration Potential		14
3(ix) Alteration Study		15
3(x) 'Borehole Geophysics Study		15

4.	NEW MAP SERIES AND LEGENDS	A M Hespe	16
	4(i) Introduction		16
	4(ii) New Geological Mapping & Drill Hole Legends		16
	4(iii) New 1:2500 Map Series		17
	4(iv) New 1:10000 Map Series		19
	4(v) Mackintosh/Hatfield Drilling Data Base		19
5.	GEOLOGICAL MAPPING	A M Hespe D J Jack	20
	5(i) Introduction		20
	5(ii) 1:2500 Scale Mapping		20
	5(iii) 1:10000 Scale Mapping		22
6.	GEOPHYSICS	A M Hespe	23
	6(i) February 1984 UTEM Survey		23
	6(ii) January 1985 UTEM Survey		23
	6(iii) Borehole EM Surveys		23
7.	DIAMOND DRILLING	A M Hespe	24
	7(i) DDH MACD001 Geology, Geochemistry, Geophysics		24
	7(ii) DDH HL80 " "		27
	7(iii) DDH MACD004 " "		29
8.	GEOCHEMISTRY	A M Hespe R G Paterson	31
	8(i) Pb-isotope Survey		31
	8(ii) Soil Geochemical Data Processing		32
	8(iii) Lithochemical Sampling Programme		33
	8(iv) Core Grind Sampling Programme		34
9.	CONCLUSIONS		36
10.	RECOMMENDATIONS		36
11.	REFERENCES		38

FIGURES

FIG.	PLATE NO.	SCALE	REMARKS
1		1:500,000	Exploration Licence - Location Plan * (FT)
2			Hellyer 1:1000 Drill Hole Section Legend
3	HEL44/10200N	1:2500	Photoreduced 1:1000 Section, 10200N
4	HEL44/10300N	"	" " " 10300N
5	HEL44/10350N	"	" " " 10350N
6	HEL44/10400N	"	" " " 10400N
7	HEL44/10450N	"	" " " 10450N
8	HEL44/10500N	"	" " " 10500N
9	HEL44/10550N	"	" " " 10550N
10	HEL44/10600N	"	" " " 10600N
11	HEL44/10650N	"	" " " 10650N
12	HEL44/10700N	"	" " " 10700N
13	HEL44/10750N	"	" " " 10750N
14	HEL44/10800N	"	" " " 10800N
15	HEL44/10850N	"	" " " 10850N
16	HEL44/10900N	"	" " " 10900N
17	HEL44/10950N	"	" " " 10950N
18	HEL/4411000N	"	" " " 11000N
19	HEL44/11050N	"	" " " 11050N
20	HEL44/11100N	"	" " " 11100N
21	HEL44/11150N	"	" " " 11150N
22	HEL/4411350N	"	" " " 11350N
23	HEL44/3000RL	1:2000	Photoreduced 1:1000 Geological Interpretation 300RL
24	HEL44/4000RL	"	Photoreduced 1:1000 Geological Interpretation 400RL
25	HEL44/500RL	"	Photoreduced 1:1000 Geological Interpretation 500RL
26	HEL44/600RL	"	Photoreduced 1:1000 Geological Interpretation 600RL
27	HEL44/W	1:2000	Photoreduced 1:1000 Long Section West of Jack Fault
28	HEL44/E	1:2000	Photoreduced 1:1000 Long Section East of Jack Fault
29	HEL38F	1:2000	Structure Contours, Top of BMS
30	HEL38G	"	" " Base of BMS
31	HEL49	1:2500	Hellyer Stratigraphic Column (FT)

Appendix A

APPENDIX B

APPENDIX C

APPENDIX D

* (FT) - FOLLOWING TEXT

FIG.	PLATE NO.	SCALE	REMARKS	
32	HEL38A	1:2000	Structure Contours, Base Upper Epiclastic Sequence	} APPENDIX E
33	HEL38B	"	Structure Contours, Base Que River Shale	
34	HEL38C	"	Structure Contours, Base Pillow Lava Sequence	
35	HEL38D	"	Structure Contours, Base Hanging- wall Volcaniclastics	
36	HEL38E	"	Structure Contours, top Barite	
37	HEL62	1:4000	Long Section on Jack Fault Plane	(FT)
38	HEL51		Hellyer Fracture Survey, QRS 10800N	(FT)
39	HEL50		Footwall Alteration Zoning	(FT)
40	HEL59		Hellyer Ore Zones	(FT)
41	HEL41A	1:2000	Plan Projection, Ore Intersections, GSP	} APPENDIX F
42	HEL41B	"	Plan Projection, Ore Intersections, Barite	
43	HEL41C	"	Plan Projection, Ore Intersections, Ba/EMS	
44	HEL41D	"	Plan Projection, Ore Intersections, EMS	
45	MAC114		Mackintosh/Hatfield Surface Geological Mapping Legend	(FT)
46	MAC115		Mackintosh/Hatfield Geological Legend, 1:1000 Scale DDH Sections	(FT)
47			Mackintosh/Hatfield Geological Abbreviations	
48			Index Map of New 1:2500 Sheet Coverage, Mackintosh/Hatfield	(FT)
49	MAC118	1:100,000	Index Map of New 1:10,000 Sheet Coverage, Mackintosh/Hatfield	(FT)
50			Mackintosh/Hatfield Drilling Data Base Format	(FT)
51			Mackintosh/Hatfield Drilling Data Base Status	(FT)
52			Summary of Results of Detailed Logging of Switchback volcaniclastics in DDH MACD001	(FT)
53			Mackintosh/Hatfield Litho- geochemical Samples Cr vs Mn, Ti, V	(FT)

FIG.	PLATE NO.	SCALE	REMARKS
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54			Mackintosh/Hatfield Lithogeochemical (FT) Samples - Cr vs Zr/Ti
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TABLES

- TABLE 1 Samples collected for the Mackintosh/Hatfield lithogeochemical programme.
- TABLE 2 Mean values for major rock types, lithogeochemical sampling programme.
- TABLE 3 Explanations for discrepancies in Cr content of samples from Table 1.

PLATES

PLATE	SCALE	TITLE
MAC122	1:10,000	Mackintosh EL, Exploration Activity Map, May 1984-December 1985
MAC108A	1:1000	Cross Section, DDH MACD001 - Geology
MAC108B	1:1000	Cross Section, DDH MACD001 - Geochemistry
MAC89 WW	1:2500	Surface Geology
MAC89 XX	1:2500	" "
MAC89 GG	1:2500	" "
MAC89 HH	1:2500	" "
MAC97A	1:10,000	Cross Sections
MAC97B	1:10,000	" "
MAC97C	1:10,000	" "
MAC97D	1:10,000	" "
MAC111B	1:10,000	Surface Geology
MAC111C	1:10,000	" "
MAC106A	1:1000	Cross Section, DDH HL-80 - Geology
MAC106B	1:1000	Cross Section, DDH HL-80 - Geochemistry
MAC120A	1:1000	Cross Section, DDH MACD004 - Geology
MAC104	1:2500	UTEM Loop 25, Channel 5 Data
MAC103	1:2500	" " " " 4 "
MAC119	1:2500	Switchback Area - Soil and Rock Chip Analyses - Chromium
MAC120B	1:2500	Cross Section, DDH MACD004, Geochemistry.

Interpretive

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PHOTOGRAPHS

- 355079 Andesitic lava. Non-feldsparphyric and weakly vesicular.
- 355085 Quartz porphyry (pink-khaki) in contact with fine arkosic sandstone (grey). Margin of quartz porphyry is sericite altered.
- 355081 Switchback Volcaniclastic intersected in DDH MACD001. Pink to grey fragments of dacite and wispy fragments of illite-sericite in grey matrix of ash and chert.
- 355082 Polymict basaltic medium lapilli volcaniclastic. Note pale green spots of fuchsite alteration.
- 355090,
355091 Tuffaceous siltstone from interpreted Hellyer Ore Position, HL-80.
- 355089 Glassy andesite lava. Apparent fragmental texture due boudinage of its perlitic texture. HL-80.
- 355093 Andesite lava breccia with shaley matrix. Pale yellow flecks within black shale are sphalerite HL-80.
- 355462 Basaltic volcaniclastic within hangingwall basalt lavas, MAC-4.
- 355463,
355464 Polymict basaltic volcaniclastic, MAC-4. Equivalent to HVS at Hellyer. Andesite fragments in a cherty matrix visible in 355463.
- 355465 Andesite lava breccia interpreted to be footwall to Hellyer Ore Position in MAC-4.

APPENDICES

- APPENDIX A 1:2500 scale sections of the Hellyer Deposit.
(Reduced from 1:1000 scale)
- APPENDIX B 1:2000 interpretive level plans, Hellyer Deposit.
(Reduced from 1:1000 scale)
- APPENDIX C 1:2000 interpretive long sections, east and west of Jack
Fault.
(Reduced from 1:1000 scale)
- APPENDIX D 1:2000 structure contours, top and base of B.M.S, Hellyer
Deposit.
(Reduced from 1:1000 scale)
- APPENDIX E 1:2000 structure contours, main stratigraphic units,
Hellyer Deposit.
(Reduced from 1:100 scale)
- APPENDIX F 1:2000 plan projections of sulphide and sulphate
intersections, Hellyer Deposit.
(Reduced from 1:1000 scale)
- APPENDIX G ✓ Interpretation of downhole electromagnetic data from the
Hellyer Deposit - Report 1 by E T Eadie.
Aberfoyle internal report, November 1984.
- APPENDIX H ✓ Report on the 1985 UTEM survey on the Mackintosh-Hatfield
Licences by E T Eadie.
Aberfoyle internal report, July 1985.
- APPENDIX I Geological log, DDH MACD001.
- APPENDIX J Petrological descriptions, MACD001.
- APPENDIX K Geological log, DDH-HL-80.
- APPENDIX L Petrological descriptions, DDH-HL-80.
- APPENDIX M Geological log, DDH MACD004.
- APPENDIX N Petrological description DDHMACD004.
- APPENDIX O ✓ "UTEM Survey South of Mt Charter" by E T Eadie.
Aberfoyle internal report, March 1984.
- APPENDIX P ✓ "Downhole Electromagnetics on the Mackintosh and Hatfield
Licences to August 1985" by E T Eadie.
Aberfoyle internal report, August 1985. (ABRIDGED)

APPENDIX Q

Report to Aberfoyle Exploration Pty Ltd on the significance of Lead Isotopic Compositions of samples from the Hellyer area, Western Tasmania.

G R Carr, B L Gulson, CSIRO, May 1985.

APPENDIX R

Summary of Expenditure for period 1 May 1984 to 12 November 1985.

1. SUMMARY

Areas of exploration activity on the Mackintosh Licence for the period April 1984 to December 1985 are shown on Plate MAC122.

Work completed included:

- i 21000m of ore reserve delineation drilling on the Hellyer deposit. The geological resource of the deposit as at 30/6/85 was:

Indicated 15mt @ 0.42% Cu, 6.9% Pb, 13.0% Zn, 156 g/t Ag, 2.3 g/t Au.

Inferred 4mt grade indeterminate.
- ii Completion of 29.4 line km of gridding for 20 line km of UTEM surveying during the 1984/5 summer season. One anomaly was detected and tested by DDH MAC-D-004.
- iii Extensive 1:2500 scale mapping of the area between Hellyer and Que River and eastwards to locate the ore horizon (the "Hellyer Ore Position") defined by delineation drilling at Hellyer. High grade base metal sulphide fragments occur in this unit. Determining the source of these fragments is an important exploration objective.
- iv Re-compilation and interpretation of 1:10000 scale licence geology in plan and section. The continuation of the Hellyer ore position grid south east of Que River is recommended.
- v Drilling of three holes (1100m) to test the Hellyer ore position and associated geophysical and geochemical anomalies. The ore position was definitely intersected in two holes (MAC-D-001 MAC-D-004), both of which contained BMS fragments, including 1.4m @ 0.35% Cu, 5.3% Pb, 4.5% Zn, 35 g/t Ag, 1.43 g/t Au in MAC-D-001.
- vi Introduction of several new map series at 1:2500 and 1:1000 scale, drafting of a new legend and creation of a drilling data base.
- vii An investigation into methods of identifying rock types by trace element analysis. It is likely that the Hellyer ore position can be identified indirectly because of its position footwall to a distinctively chromium rich basalt.

2. INTRODUCTION

Exploration Licence 2/70 (Mackintosh River) is divided into two parts, Mackintosh (90km²) and Mackintosh East (35km²) (Fig. 1).

The Mackintosh Licence is subject to a joint venture between Aberfoyle (90%) and Paringa Mining and Exploration Company P.L.C. (10%). The licence encloses OML 68M/84 (3km²) surrounding the Que River Mine and subject to the Que River Joint Venture, and six 1km² MLA's (86, 87, 88, 89, 90, 109M/84) over the Hellyer deposit and environs. Development at Hellyer is managed by Mackintosh Mining, a wholly owned subsidiary of Aberfoyle, on behalf of a joint venture between Aberfoyle (90%) and Paringa (10%). The location of the mining leases is shown on Plates 89GG, 89HH, 89WW, 89XX.

The Mackintosh East Licence is reported on separately by the joint venture partners, Cyprus Minerals Australia Company and Geopeko Ltd..

This report records exploration completed on the Mackintosh Licence, including the Hellyer MLA's, for the period May 1984 to December 1985.

3. HELLYER DEPOSIT

3(i) Introduction

Ore reserve delineation drilling of the Hellyer deposit was completed between February and November 1984. A report on the results was prepared in June 1985 (McArthur, 1985). Sections of this report dealing with drilling strategy and deposit geology have been edited and included here as sections 3(ii) to 3(viii). Discovery and initial drilling of the deposit were described by Jack (1984).

Results of borehole EM tests and a continuing study of the host rock alteration at Hellyer are also reported.

3(ii) Drilling Programme

Between February and November 1984 an intensive diamond drilling programme of the Hellyer deposit was undertaken with the aim of infilling a large proportion of the known mineralisation and extending the resource by broad spaced step-out drilling. The first hole in this programme was HL-19. DDH's HL-3 to HL-18 had broadly defined the deposit and confirmed the flat lying stratigraphy (see Jack, 1984).

From experience at Que River, it was judged that infill drilling on a 50m square grid pattern was necessary to define the metal content to + 30% at an 80% confidence interval adopted for an "indicated resource". Stepout drilling at 100m spacings was undertaken where the deposit was open to the west (early) and north (later) at appropriate times during the programme. Stepout drilling was not undertaken in the south and east due to negative drilling results and lack of encouraging downhole SIROTEM response.

Holes were generally drilled at an inclined angle as a compromise between ideal intersection of the sub-horizontal base metal sulphides and ideal intersection of the sub-vertical footwall stringer zone and major faults. Inclined holes also enabled unique solutions to core orientation data.

In selected holes, ore intersections were duplicated by setting a casing wedge about 50m above the ore and deflecting off using smaller size gear.

The total meterage for the infill and northern stepout programme was 21697m in 74 holes (including wedge deflections).

A computer data base for all drilling information was established by Aberfoyle.

3(iii) Deposit Geometry

The base metal sulphide deposit was correlated in 1:1000 cross-sections and interpreted in long section and on 100m plans, (Fig. 2 to 28). To enable construction of detailed 20m cross-sections for resource calculation, structure contours were drawn for hangingwall and footwall (Fig. 29, 30).

The overall orebody shape is a single irregular base metal sulphide pod known to be at least 740m in north-south extent, a maximum 150m east-west at 10750N and known vertically between 200RL and 600RL (general surface RL680). East and west terminations are rapid and tend not to "finger" with the country rock. The Jack Fault sub-horizontal displacement results in large apparent vertical displacements up to 150m (10800N hanging wall) because of variable orebody dip. Complex displacement configurations are likely in multiplanar feathering faults. Average vertical thickness is approximately 35m.

3(iv) Lithologies and Stratigraphy

3(iv)(i) Summary

The volcanostratigraphic pile at Hellyer is subdivided into eight sequences according to fairly definitive lithological boundaries. The lower two sequences are recognized in only a few early holes and their geographic distribution is unknown. Fig. 31 is a detailed stratigraphic column plotted to scale for all drilling at the Hellyer deposit.

Stratigraphic Summary

<u>Sequence</u>	<u>Thickness (m)</u>		<u>Lithologies Represented</u>
	<u>Min.</u>	<u>Max.</u>	
Upper Epiclastic Sequence	-	110+	Rhyolitic epiclastic, shale, rhyolite, siltstone, polymict breccia.
Que River Shale	40	140	Shale, siltstone
Pillow Lava Sequence	35	250	Pillowed vesicular basalt, non-pillowed non-vesicular basalt, quench tuff & breccia, shale, siltstone, polymict lapilli tuff.
Hangingwall Volcaniclastic Sequence	0	40	Polymict lapilli tuff & breccia, ash tuff, shale.
Hellyer Mineralised Sequence	-	70	Base Metal Sulphide rock, barite rock, glassy silica-colloform pyrite cap rock.
Feldspar Phyric Sequence	60	170+	Feldspar phyric andesite lava and autobreccia.
Lower Epiclastic Sequence	-	35	Polymict epiclastic
Lower Andesite Tuff Sequence	-	65+	Andesite lapilli tuff & breccia, andesite lava.

Units below the Hellyer Mineralised Sequence when observed beneath base metal sulphides, can be highly altered to various Stringer Zone products as discussed under section 3(vi)(iv).

3(iv)(ii) (Upper Epiclastic Sequence)

Because of the north plunging anticline, this sequence was only intersected in holes north of 10850N and best seen in HL23 and HL54 at the extreme north end of Hellyer. Although variable in lithologic character, it shows remarkable continuity with excellent correlation over large distances. The lower unit of massive rhyolite tends to occur only in the east and north but has an equivalent rhyolitic epiclastic to the west. An extremely coarse polymict epiclastic rock always occurs at the basal contact of the sequence.

3(iv)(iii) Que River Shale

The Que River Shale occurs on the surface in a general antiform exposure north of 10600N. Thickness is variable but tends to thin to the east. Mapping east of Hellyer indicates this sequence lenses out altogether at 10100N, 6150E where the overlying rhyolitic rocks of the Upper Epiclastic Sequence are in contact with the Pillow Lava Sequence. Monotonous poorly bedded black shale predominates with silty units prevalent at the basal contact particularly west of the Jack Fault. A central zone is typically very massive. The basal few metres is also generally mineralized in the form of framboidal or coarse euhedral pyrite. Several holes show distinctive rhythmic pyrite layers in this basal zone, increasing in density towards the pillow lavas.

3(iv)(iv) Pillow Lava Sequence

The Pillow Lava Sequence covers the Hellyer deposit throughout but tends to thicken to the north-east. It exemplifies many features of basaltic volcanism extruding on the sea floor. Lithologic character is varied; most textural variation is interpreted to be due to quench fragmentation taking place at the lava/seawater interface. (NB. At the time of logging and section drafting, basalts in this sequence were described as andesites).

Peperitic and variolitic textures and variation in amygdale content are sufficiently distinctive to enable correlation from hole to hole in some areas.

Occasional quiescent intervals within this period of active volcanism are evidenced by either :

- (i) up to 5m shale or siltstone in the upper part of the sequence north of 10750N
- (ii) up to 2m polymict lapilli tuff in the lower part of the sequence south of 10600N.

Between the individual pillows of basalt, narrow bands of chert represent baked pelitic sediment. Broader interpillow areas frequently show induration proximal to the pillow margin only.

Because the "Pillow Lava Sequence" is not always pillowed away from Hellyer, it has been renamed the "Hellyer Basalt Sequence" for purposes of surface exploration mapping (see section 4(ii)).

3(iv)(v) Hanging Wall Volcaniclastic Sequence

This sequence, as the name implies, lies conformably on the hanging wall of the base metal sulphides over most of the deposit. Thickness can vary dramatically from zero (10600N-10650N immediately west of the Jack Fault, 10700-10900N immediately east of the fault) to 40 metres at the extreme

014

southern end of the deposit. The complete absence of this sequence in the areas described above is probably due to the ore deposit forming local topographic highs and steep slopes on the sea floor (see Fig. 29). Similarly, local increases in thickness (e.g. 10800N west of Jack Fault) appear to generally coincide with topographic lows on the sea floor.

Two main lithologies are evident within this sequence : bedded ash tuff and polymict lapilli-tuff/breccia/epiclastic. The ash tuff can occur anywhere within the sequence and is widespread over the deposit. It appears to consist almost entirely of devitrified shard material. The polymict units are much coarser, occasionally angular fragments up to 30 cm in size are seen. The dominant fragment lithology is a flow banded(?) dacite of unknown origin, since it has never been seen at Hellyer in-situ.

In the north-west, drill holes HL19, HL30 and HL54B intersected black massive shale at this stratigraphic position.

The basal contact of this sequence is termed the "Hellyer ore position". Although a narrow unit, its distinctive polymict and textural features should enable easy recognition during surface mapping.

3(iv)(vi) Hellyer Mineralised Sequence

This stratigraphic sequence represents the accumulation of base metal sulphides to form the deposit per se. Detail of ore types and metal zoning within the orebody are discussed under section 3(vii).

3(iv)(vii) Feldspar Phyric Sequence

The andesite making up the Feldspar Phyric Sequence is widespread at Hellyer forming the immediate footwall to the ore horizon. Beneath base metal sulphides this sequence is variably altered by the Stringer Zone hydrothermal system, generally obliterating primary textures.

3(iv)(viii) Lower Epiclastic Sequence

This sequence is known only in 4 deep drill holes on 10400N and 10500N and its extension under northern parts of the deposit is unlikely given 170 m of uninterrupted feldspar phyric andesite was intersected in HL30 on 10900N.

3(iv)(ix) Lower Andesitic Tuff Sequence

As for the unit above, this sequence is known only in a few drill holes in the south of the deposit. It is the lower most sequence yet drilled at Hellyer.

3(v) Structure3(v)(i) General

Because of the sub-horizontal attitude of the Hellyer deposit and its overlying country rocks, analysis of overall structure has been achieved by the use of structure contour methods. Appendix D, E contain 1:1000 structure contour maps for the 4 major stratigraphic horizons.

The overall picture reveals a broad anticline plunging 20° to the north-north-east with a shallow dipping western limb and a steeper east dipping eastern limb. The anticline axial plane is cut acutely by a major north-south trending vertical fault, named the Jack Fault.

South of 10300N the plunge reverses to south trending but since the ore horizon is exposed at 9720N south of Hellyer, the south plunging feature can only be a local fluctuation probably representing weak 2nd generation cross folding (this is supported by surface mapping to the east).

3(v)(ii) Faulting

The Jack Fault is the most significant fault interpreted at Hellyer. Despite being poorly exposed at the surface in weathered basalts, it is a clearly defined feature in drill holes with up to 3m of leached gouge. Some holes on 10700N-10750N and 10450N-10550N indicate a feathering or an echelon multiplanar feature is more likely.

Overall displacement in the Jack Fault can be determined graphically by construction of long sections of mineralisation abutment on the fault plane itself (Fig. 37). The displacement is east block 130 m north and 30 m up. This estimate is considered reasonably accurate and was used in the resource calculation to transform sample co-ordinates either side of the Jack Fault. The fact that the deposit can be matched so well either side of the fault indicates that the last fault movement was definitely post ore mineralisation.

The Photo Fault (named from its clear photo lineament) is interpreted, from limited surface mapping on 10950N and the aerial photo trace, to sub-parallel the Jack Fault north of 10900N. Since mineralisation does not occur east of the Photo Fault at the northern limit of data, the inferred movement is east block north by an unknown distance. Its strike tends to converge to the north towards the Jack Fault, thus limiting potential for mineralisation between the two structures.

Other faults logged from drill core are difficult to correlate. Surface mapping on the 10800N line indicates that faults dipping 45° to the north-east occur. Their significance will be further understood once underground exposure is available.

The Que River Shale is very often intensely faulted and sheared particularly in the proximity of the Jack and Photo Faults. Many of these faults appear to parallel bedding and have a very shallow dip to the north and north-east.

3(v)(iii) Jointing

Jointing within the Que River Shale is closely spaced and a fracture survey over 10800N indicated two distinct sets, (Fig. 38). Whether these joint sets occur throughout is difficult to say as little work has been done orienting core from within the shale unit.

Other units at Hellyer appear to be joint-free apart from siliceous varieties of feldspar phyric andesite which often shows strong sub-horizontal jointing filled with quartz-chlorite.

3(v)(iv) Other Structural Features

Within the chlorite-sericite rich areas of the Stringer Zone, a strong vertical "schistosity" is developed.

Veining is well developed at Hellyer particularly in the hanging wall basalts. The veins are typically <25 mm in width but can be concentrated particularly in the pillow basalts where carbonate is the dominant vein mineral. Within the non-pillowed uniform basalts veining intensity drops off and quartz-chlorite are dominant. Concentration is greatest near the upper Que River Shale contact and the basal tuff contact. Veinlets can occur in the Que River Shale where carbonate is predominant. Quartz-chlorite sub-horizontal veins, occasionally quite large, are found in the Feldspar Phyric Sequence.

3(vi) Alteration

3(vi)(i) Weathering

Oxidation is found to be shallow (<1m) over the Que River Shale and 10-20 m over the Upper Epiclastic Sequence. Over the Pillow Lava Sequence the base of oxidation although sharp, is quite irregular and varies between 10 and 60 m. Leaching is common below the water table in faulted and sheared ground in all rocks.

3(vi)(ii) Regional Metamorphism

Low grade greenschist facies regional metamorphism is widely evident at Hellyer in the form of ubiquitous chloritisation particularly in the basic rocks. Albite-carbonate-quartz and rare pumpellyite alteration are all interpreted as regional metamorphic events not associated with the Hellyer mineralising system. For this reason, the chloritic nature of the rocks at Hellyer has been considered the base composition and has therefore not been logged as weak pervasive alteration. However strongly chloritic zones are noted.

017

3(vi)(iii) Hanging Wall Alteration

Various types of alteration are evident in the hanging wall basalts at Hellyer, some of which appear to be direct mineralogic indicators of base metal sulphides below.

Fuchsite (Fu)

Fuchsite, a chromium-rich illite-hydromuscovite is present at Hellyer in the Pillow Lava Sequence and commonest above base metal sulphides. It was recognized as a significant feature during surface mapping of the HEC line 10600N-10900N before the discovery of base metal sulphides. When weak, the fuchsite appears nodular probably replacing phyric feldspar laths. But as intensity increases it becomes all-pervasive and the rock takes on a brilliant green colour.

Fuchsite also is found as a narrow vertical layer immediately west of the Jack Fault when sulphides occur opposite, east of the fault, (see 10750N-10850N). This would suggest that at least one generation of fuchsite alteration is post-faulting.

Silica/K-Feldspar (SiKF)

Pink silica/K-feldspar/carbonate is common in the lower part of the Pillow Lava Sequence as discontinuous patchy zones of alteration. There is a tendency for it to show an antipathetic relationship with fuchsite alteration. For this reason, pink alteration in the basalts tends to increase away from the deposit (see 10750N).

Silica/K-Feldspar/Chlorite/Pyrite (SiKFClPy)

Pink-red/green alteration of this composition is recorded mainly in brecciated non-pillowed basalts east of the Jack Fault south of 10500N. It has also been recognized on the surface at 9800N on the HEC line.

Sericite (Se)

Pale green alteration logged as sericite occurs throughout the Pillow Lava Sequence in discontinuous zones. It reaches greatest intensity on 10500-10550N west of the Jack Fault in the central part of the pillow lavas. The significance of its geographic relationship to base metal sulphides is unknown.

3(vi)(iv) Footwall Stringer Alteration

The large hydrothermal alteration system beneath the base metal sulphides at Hellyer is an excellent example of a large fissure controlled mineralising feeder system venting on the sea floor. It is known to exist from 10200N-11150N and is open at both ends. It reaches a maximum width of ~200 m at 10700N, while a vertical extent of 300m+ is indicated at 10850N; but again the system is open at depth. As would naturally be expected, the maximum accumulation of base metal sulphides occurs above the widest extent of footwall

alteration: similarly, the thinnest ore (e.g. 10500N) is underlain by the narrowest extent of alteration. A diagrammatic section of the footwall alteration zones is shown in Fig. 39.

Silica-Barite (SiBa)

Quartz-barite-pyrite + (sphalerite+galena) represents the core of the stringer zone on 10800N east of the Jack Fault. It coincides with a thickened accumulation of base metal sulphides above (which incidentally shows porous, leached textures). This zone includes the highest grade stringer mineralisation - HL 39 (10800N 238.5m - 287.0m, 48.5m x 4.15 S.G., 0.09% Cu, 2.63% Pb, 3.09% Zn, 35 g/t Ag, 1.02 g/t Au, 3.0% Ba, 0.11% As. A small occurrence is also noted in HL 29 (10500N) west of the Jack Fault.

Silica-Sericite (SiSe)

Quartz-sericite-pyrite + (sphalerite + galena) occurs peripheral to the core and in places is well mineralised. A good example is HL 46 on 10850N.

Chlorite-Carbonate (ClCo)

Chlorite-carbonate-pyrite + (sphalerite + galena) is a distinctive alteration type with pale carbonate nodules in a black massive chlorite matrix. At the north end of Hellyer, it is located immediately below the footwall in a layer sub-parallel to the footwall (see 10950N). In other areas it occurs as rare discontinuous pods. This alteration type is identical to that at Que River.

Chlorite (ClPy)

Chlorite-pyrite + (sphalerite + galena) is an uncommon alteration type generally located at the north end of the deposit. HL18 on 10900N is a good example.

Chlorite-Sericite (ClSe)

Chlorite-sericite-pyrite + (sphalerite + galena) is by far the most common footwall alteration type. Typically it occurs as alternating bands of sericite and chlorite with base metal veins congregating in the chloritic portions.

Sericite-Pyrite (SePy)

Sericite-pyrite + (chalcopyrite + sphalerite + galena) is a common alteration type that represents the outermost zone of the so-called Stringer Zone (STZ). It is well developed at the southern end of the deposit south of 10550N. Massive chalcopyrite veins associated with this alteration type occur in HL6 and HL29 on 10500N. Sphalerite and galena are rare.

Stringer Envelope Zone (SEZ)

The peripheries of the footwall alteration system are distinctively altered by sericite to form a pale green sericite-quartz-pyrite rock that until recently was classified as "porphyritic dacite" (PD) and its fragmental equivalents and subsequently stratigraphically named as the Dacite Vent Unit (DVU) or Footwall Volcaniclastic Sequence (FVS).

The present interpretation is that this rock represents in-situ altered footwall andesite, and the contrived name "quellite" is now recommended for this rock.

3(vii) Mineralisation

The description of mineralisation present at Hellyer focuses on macroscopic features.

3(vii)(i) Main Ore PositionMineralogy

Minerals present within the deposit are tabulated below:

<u>Mineral</u>	<u>Ave. % by Weight</u>	<u>Range</u>
Pyrite	56	5 - 95
Sphalerite	20	0 - 50
Galena	8	0 - 25
Barite	5	0 - 70
Arsenopyrite	2	0 - 20
Chalcopyrite	1	0 - 5
Fahlerz Series	0.3	0 - 1
Sericite)		
Chlorite)	8	0 - 75
Quartz)		
Calcite)		

The very high pyrite content results in a high average S.G. of 4.56.

Texture

Macroscopic textures generally fall into the following types :

- (i) Glassy silica/colloform pyrite (GSP) - well preserved delicate colloform pyrite (30-40% by weight) in a glassy almost chalcedonic quartz matrix. Known only as a local hanging wall capping.
- (ii) Massive barite - massive crystalline barite, sometimes banded with occasional base metal sulphide aggregates. Restricted to the barite zone on the hanging wall.
- (iii) Banded - contorted and discontinuous but occasionally planar bands of plainly visible sphalerite, galena and pyrite. Normally restricted to the hanging wall areas.

- (iv) Massive - featureless pyrite, sometimes showing delicate colloform textures under the hand lens with sphalerite and galena only barely visible to the trained eye. Normally occurs in the lower half of the sulphide pile.
- (v) Fragmental - sub-angular to sub-rounded reworked fragments of base metal sulphides in a fine pyrite matrix. Can occur anywhere in the orebody stratigraphy but more common at the footwall.
- (vi) Porous recrystallized - easily recognizable recrystallized pyrite euhedra with obvious voids (core soaks up water). Little or no galena/sphalerite visible. Occurs in the footwall area above the core of the Stringer Zone.
- (vii) Sericitic - highly micaceous low grade ore with minor recrystallization of all sulphides. Occurs near the western margin between 10700-10900N.

Ore Zone Classification

From an analysis of metal distribution and variation of texture from hangingwall to footwall the following orebody stratigraphy was recognized.

Zone	Strat. No.	S.G.	Cu %	Pb %	Zn %	Ag g/t	Au g/t	Ba %	As %	Py %	Ga* %	Predm. texture#
Glassy silica-colloform pyrite	0-3	4.01	.28	3.8	6.1	130	3.0	10.6	.42	41	43	(i)
Barite Zone	3-13	4.23	.33	5.0	7.1	165	2.6	19.9	.61	32	40	(ii) (iii)
Hanging Wall Rich Zone (iii) (iv) (v)	13-46	4.58	.35	8.0	15.0	210	2.7	2.4	1.4	52	12	
Central poor Zone	46-87	4.59	.51	5.9	11.4	80	1.7	1.4	.44	64	10	(iv)(v)(vi) (vii)
Footwall rich zone	87-99	4.65	.44	7.0	14.4	200	2.5	.74	1.2	59	7	(iii)(v)
Total	0-99	4.56	.42	6.9	13.0	156	2.3	3.0	.97	56	13	

- * Ga% refers to gangue % by weight (all non-sulphides, including barite)
By type no. from section above.

Fig. 40 schematically portrays variation in mineralogy across the stratigraphy.

The boundaries between some of these zones are difficult to pick without assay information. The glassy silica-colloform pyrite and barite zones have clearly defined textures but division between the others is not really defined by sharp textural changes. Although intensity of banding is generally correlatable with high metal content, banding tends to decrease irregularly down into the central zone.

Geographic Distribution of Ore Zones

- (i) Glassy silica-colloform pyrite capping occurs only in a few holes around 10700N near the Jack Fault (Fig. 41).
- (ii) Massive barite caps the base metal sulphides in a zone 50-70m wide adjacent to the Jack Fault in the west and as a narrow "shoot" capping the ore east of the Jack Fault between 10800 and 10900N (see Fig. 36, 42). Attains its greatest thickness of 15m on 10600N.
- (iii) The hanging wall rich zone is recognised throughout the deposit apart from small areas around 10850N west of the Jack Fault. Maximum thickness of 45m occurs on 10450N.
- (iv) The central low grade zone occurs throughout the deposit except between 10500N and 10600N. Maximum thickness of 60m occurs on 10800N east of the Jack Fault. Again, this coincides with the highest grade Stringer Zone below.
- (v) The footwall rich zone is recognised from 10600-10750N west of Jack Fault and 10800-10950N east of the fault. It attains a maximum thickness of 15m on 10700N.

3(vii)(ii) Stringer Zone

Veins and veinlets of pyrite, galena and sphalerite occur throughout the stringer zone but are concentrated on 10800N east of the Jack Fault. To date nothing is known of any metal zoning within the veins individually and within the stringer system in toto.

The galena and sphalerite within the veins is very coarse and is in stark contrast with the massive fine grained ore above. Core axis to vein angles suggest that the veins are predominantly vertical.

On 10500N two drill holes intersected large veins of chalcopyrite/pyrite with galena/sphalerite on the margins. No other occurrence of chalcopyrite veining has been recorded.

3(viii) Geological Resource and Exploration Potential

The Geological Resource of the Hellyer deposit as at 30 June 1985 was:

(i) Indicated 10280N - 10980N

15 million tonnes

0.42% Cu

6.9% Pb

13.0% Zn

156 g/t Ag

2.3 g/t Au

3.0% Ba

0.97% As

All base metal sulphide and barite mineralisation in the Hellyer Mineralised Sequence at zero cutoff.

(ii) Inferred 10980N - 11150N

4 million tonnes

Grade indeterminate

Limits on the Geological Resource calculation are 10280N to 11150N. Potential to the east and west within the immediate environs of the existing deposit appears limited by numerous barren drill holes. However, potential for small additions exists:

- (i) South of 10280N, although geophysics is not supportive.
- (ii) 10500N - 10550N east of the Jack Fault, as the faulted equivalent of large widths on 10350 - 10400N west of the fault.

Because the converging Jack and Photo Faults have limited the inferred resource north of 10980N, the only potential at the north end is east of the Photo Fault. Drill holes HL79 and HL45 on 11050N and 11150N respectively have tested this area without finding any mineralisation at the ore position or any stringer alteration in the footwall andesites. However, if movement on the Photo Fault is large the mineralised system may not "daylight" from the fault until much further north. There is no evidence, even at 11150N between the two faults, that the footwall alteration system is decreasing in intensity. This is in contrast to the widespread sericite alteration and converging Stringer Envelope Zone that characterizes the southern end of the deposit.

3(ix)

Alteration Study

A study of the mineralogic and geochemical character of the alteration around Hellyer is being undertaken. 10900N has been selected as a section for concentrated attention. Both continuous core grind samples over macroscopically distinctive intervals and split core samples are being analysed for major elements, a suite of trace elements, and rare earth elements. All samples analysed have been thin sectioned and a glossary of photo micrographs is being compiled to go with the macroscopic photographs and analyses. A programme of microprobe work is also being undertaken to check optical identifications and to obtain analytical data on specific minerals.

All analyses will be entered in the data base to enable use of graphical plotting programmes. A series of graphs are being produced and numerous geochemical relationships identified.

Development to date include:

- (i) The identification of two separate lavas in the hangingwall pillow lavas at Hellyer with a different alteration style in the older lava close to the ore body.
- (ii) Distinctive element distribution in the Footwall.
- (iii) Identification of unusual K-feldspar-chlorite alteration mineralogy (microprobe).
- (iv) A start to separating alteration due to spilitization and metamorphism from that associated with the Hellyer ore forming system.

In 1986 it is planned to extend this study away from 10900N to analyse and thin section further unaltered samples as a basis for comparison.

3(x)

Borehole Geophysics Study

Between May and September 1984, seven Hellyer drill holes were surveyed with the Sirotem system to help in designing the Hellyer drilling programme. Four holes were also surveyed with the Newmont EMP system for comparison with the Sirotem results. A report on these tests is included as Appendix G.

The Sirotem results indicated that the deposit did not extend south to 10200N and were influential in limiting drilling in this direction. However in other cases where a response was recorded, full use could not be made of the results either because drilling had already proceeded on geological reasoning, or EM interpretation was not precise enough to aid a detailed drilling programme on 50m centre. Borehole EM is most effective when applied to basic exploration drilling.

024

Results from the test of the Newmont EMP system indicate that it has no technical advantage over the Sirotek system.

4. NEW MAP SERIES AND LEGENDS

4(i) Introduction

The discovery of the Hellyer deposit has generated new ideas on licence geology and increased the pace of exploration. New legends, maps and data systems have been developed to manage the increased data flow and to mark a division between pre and post Hellyer exploration.

The new maps, legends, and data base apply to surface exploration on the Mackintosh and Hatfield licences and the Que River and Hellyer mining leases. It is convenient to describe them in this report as a matter of record. The Mackintosh Mining legend for underground development and drilling of the Hellyer deposit is largely compatible with those presented here. Application of the Que River Mine legend is restricted to underground mapping at that mine.

4(ii) New Geological Mapping and Drill Hole Legends

The new geological mapping and drill hole legends are shown in Fig. 45 and 46.

The surface mapping legend is divided into "fact" and "interpretive" sections corresponding to the new 1:2500 and 1:10000 scale map series.

Fact mapping data are recorded using a description format and a set of abbreviations. The prompts provided by the description format are intended to indicate the minimum description required. Other comment can be added and distinguished by enclosing in brackets. Examples of the format are given in the legend with the current versions shown in Fig. 47.

The interpretive mapping legend consists of a lithology classification, a standard colour scheme, a partial stratigraphic column and a series of symbols to represent alteration.

An attempt has been made to eliminate terms with genetic implications from the lithology classification, especially those applied to volcanic fragmentals. The general term "volcaniclastic" is used instead of its sub-terms "tuff" and "pyroclastic". Reliable determination of the mode of formation and deposition of fragmental volcanics in the licence area is

not yet possible because of the poor quality and scarcity of outcrop.

Alteration rock types specifically classified are "Quellite" (defined in section 3(vi)(iv) and "HA" (for "highly altered"). "HA" is used for any rock where primary texture is obliterated by hydrothermal alteration. At Que River Mine the term refers to intense quartz/sericite/pyrite alteration. In this scheme it can be used for all types of alteration, with alteration mineralogy shown by overprint of a combination of the eight alteration symbols.

The drill hole legend (Fig. 46) is based on the surface mapping legend and is self explanatory.

4(iii) New 1:2500 Scale Map Series

Basic surface exploration data is recorded at 1:2500 scale. Up until January 1983 (ie. pre-Hellyer) geological mapping was recorded on the QR81 plan series. Soil geochemical data were recorded on corresponding overlays (MAC 45, 46, 47 series).

Following discovery of Hellyer, a new series of 1:2500 scale maps was developed for the following reasons:

- there are significant differences between pre and post Hellyer terms and concepts. These differences needed to be separated by introduction of a new map series.
- to differentiate more clearly between fact and interpretive mapping.
- map sheet boundaries needed to be re-positioned to locate the Hellyer deposit centrally on one sheet.

There are now six types of 1:2500 scale maps covering the licence. Coverage and completion as at November 1985 and shown on Fig. 48.

4(iii)(i) Pre-1983 Fact Geological Maps (QR81 Series)

These sheets record geological mapping prior to 1983. No further mapping will be added to this series.

4(iii)(ii) Soil Geochemical Maps (MAC45, MAC46, MAC47 Series)

These map series have the same sheet boundaries as the QR81 series. They record Cu, Pb and Zn value for soil geochemical samples collected to date. Because all soil geochemical data is now on computer data base and because recent soil sampling includes analyses for more elements a new series of soil geochemical maps with sheet boundaries coinciding with the MAC79 series will be produced.

4(iii)(iii) Post 1983 Fact-Geological Maps (MAC79 Plan Series)

These maps record geological fact mapping completed since 1983. New legends and abbreviations, discussed in section 4(ii), apply. These maps are to show:

- location of outcrop and float, and rock name.
- structural geology symbols.
- geographic data.
- survey data.
- tenement information.
- location of petrological samples.

They do not show:

- interpreted geology.
- geophysical, soil geochemical or rock chip geochemical values.

The purpose of these maps is to preserve as a unit all fact geology influenced by the Hellyer model.

4(iii)(iv) Interpretive Geological Maps (MAC89 Series)

Base maps for this series are the MAC79 maps. Selected pre-1983 mapping is added where there has been no recent mapping, and is distinguished by italic lettering. This combination of data is used for geological interpretation. The new legend and abbreviation set described in section 4(i) apply. These maps are working maps, for the interpretation and reinterpretation of fact data.

4(iii)(v) Geophysical Maps (MAC91 Plan Series)

These maps have the sheet boundaries of the MAC79 series. They show interpretive details of UTEM anomalies and filtered IP/resistivity data. Ground magnetic data is currently being edited and will be plotted on a separate series of plans.

4(iii)(vi) Rock Chip Geochemical Maps (MAC88 Plan Series)

These maps have the sheet boundaries of the MAC79 series and have been developed to record all rock chip and weathered rock geochemical data. These sample types include those from outcrop, road cuttings and costeans which are therefore definitely in-situ.

4(iv) New 1:100000 Map Series (MAC109, 110, 111 Series)

Coverage of a new set of 1:100000 geological maps is shown in Fig. 49. Plan titles in this series are:

MAC109 Base plan
MAC110 Fact geology plan
MAC111 Fact and interpretive geology plan.

Information on these maps is compiled from 1:2500 scale mapping in gridded areas and 1:100000 scale mapping from airphotos in ungridded areas. Legends described in section 4(ii) apply.

4(v) Mackintosh/Hatfield Exploration Drilling Database

Information from surface exploration drilling on the Mackintosh and Hatfield E.L's, Hellyer M.L.A's and Que River OML is now stored on the database. The form of this database is shown in Fig. 50 with the current status shown in Fig. 51. So far five sets have been assigned which contain hole survey and identification data, and geochemical data. A further set is reserved for analyses of ore grade mineralisation. An additional 3 sets are planned to store data on lithology, alteration and structure.

To conform with database requirements previous drill hole names have had to be changed. They now have the form:

MACD005

- Where: The first three letters indicate the exploration licence;
- : The fourth letter indicated whether the hole is diamond (D) or percussion (P). (Coastal data may also be entered as if it were a drill hole, in which case the letter (T) will appear in the fourth position).
 - : The last three characters are the drill hole number.

Old and new names for drill holes are listed below:

OLD	NEW
H.1	HATD001
H.2	HATD002
H.2A	HATD002A
H.A1	HATD003
MAC-1	MACD001
MAC-2	MACD002
MAC-3	MACD003
DA-1	XDAD001
DA-2	XDAD002
DA-3	XDAD003
DA-4	XDAD004
DA-5	XDAD005
HL-80	XHLD080
MC-1	XMCD001
To	To
MC-13	XMCD013

Future surface exploration holes on the Mackintosh Licence (including Hellyer and Que River Leases) will be pre-fixed by "MAC", and on the Hatfield Licence by "HAT". Prefixed "MC" and "DA" have been reluctantly retained for ease of reference to historical plans. The x in the prefix for certain holes is required by the computer format.

5. GEOLOGICAL MAPPING

5(i) Introduction

1:2500 scale mapping during the reporting period has concentrated on the area between Hellyer and Que River and eastwards. The aim of the mapping has been to determine the stratigraphic relationship of the two deposits. Trenching and new roadworks associated with the development of the Hellyer deposit have created much new exposure in the area.

At 1:10000 scale, mapping and re-interpretation of previous mapping continued. The aim of his programme has been to improve understanding of the structural geology of the licence and to predict the location of the stratigraphic position in which the Hellyer mineralisation occurs.

5(ii) 1:2500 Scale Mapping

Mapping completed during the reporting period is shown on plates MAC89-GG, HH, WW, XX. Mapping has been influenced by

the well preserved stratigraphy at Hellyer where mineralisation occurs as a sulphide mound within a polymict ash to breccia volcanoclastic, the hangingwall volcanoclastics (HVS). A distinctive chrome rich basalt occurs above the HVS. The ore position is underlain by a feldsparphyric andesite lava which is strongly altered in a stringer zone below the sulphide deposit. The following comments relate the 1:2500 scale mapping to the concept of a Hellyer Ore Position (HOP).

- (a) The hangingwall basalt is mapped throughout the sheet areas except around 9500N/5800E where it thins rapidly. A thin tongue of basalt extending grid SSW towards Que River Mine from 8900N/5700E apparently forms a shallow grid NNE plunging syncline overturned to the east. The syncline is possibly complimentary to the broad anticline which closes over the Hellyer deposit. It is possible that the outcrop pattern of the basalt is due to deposition on an irregular surface, which would complicate interpretation of fold patterns. The basalt unit is important because the HOP is located at its base and because it is one of the more readily recognizable rocks in outcrop.
- (b) The HOP is correlated with the polymict unit well exposed in road cuttings in the Switchback Area (8850N/6150E) and in costeans within the Que River Mine Lease around 8500N/5650E. The correlation is based on its consistent position immediately below basalt and the occurrence of sulphide clasts, assumed to be shed from a massive sulphide deposit. The base of this unit is usually gradational over several metres, and the footwall is not always feldsparphyric andesite as at Hellyer (see section 7(i), 7(iii)). The unit has not been identified at surface on the western side of the syncline described in (a). It may be faulted out. A small outcrop lithologically similar to the polymict unit at the Switchback has been mapped in approximately the right stratigraphic position at 9720N/5390E. No other outcrops of the HOP have been located.
- (c) Intense pyrite sericite alteration with chloritic zones has been mapped on portal road exposures around 9550N/5450E. This zone continues grid SSW towards Que River, (the "D Zone"). This trend is on strike with the Jack Fault and the associated alteration zone below the Hellyer deposit, and is interpreted to be a continuation of it.

Mapping is continuing to:

- follow the HOP eastwards into the Southwell River area.
- better define the HOP within the Que River Lease where it appears to be interbedded with basalt.
- trace the HOP east and west from the outcrop at 9720N/5390E.

- explain the thinning of the basalt around 9500N/5800E.
- locate the HOP to the grid south-east of Que River Mine.

5(iii)

1:10,000 Scale Mapping

A series of 1:2500 and summary 1:10000 sections have been drawn using old and new data. The 1:10,000 section and plans are presented here as a basis for further ideas (MAC97A, 97B, 97C, 97D, MAC111B, 111C).

Some comments on these sections follow:

1. Major thickening and thinning of basalts and andesite-basalts over short lateral distances. Note the thickening of the pillow basalt above the Hellyer ore body.
2. The Jack Fault can be extended southwards to the exposure of the Hellyer stringer zone on the portal road and northwards to its possible expression in sheared shales at the Longyear camp 2km north of Hellyer.
3. There is a major disconformity at the Hellyer ore position.
4. The Que River synform can be traced northwards, with fault offsets. The 18 degree N plunge at Que River Mine is not maintained. Recent drilling has confirmed the prospectivity of this zone.
5. Hellyer hangingwall pillow basalts may exist in the south-east. This implies that the Hellyer ore position exists here too.
6. Sheared rocks in the east may represent the Henty Fault Zone. Barite mapped here is encouraging. Regionally the Henty Fault Zone is a gold target.
7. Structures become more complex as the Henty Fault Zone is approached. Beds have been mapped as overturned in the east to accommodate westerly dips and young rocks to the east. Limited facing evidence does not always support overturning and more data needs to be collected. Overturning adjacent to the Henty Fault is documented regionally south of our licences.
8. Folding is gentle especially in the west becoming more intense as the Henty Fault is approached. A basic structure is proposed near the portal road.
9. A second basalt exists below the Hellyer ore position and new data is required to fit it into our understanding of the geology.

10. Faulting occurs in the region of the interpreted host rocks in the north-west and this may be significant if it localizes a buried feeder system.

6. GEOPHYSICS

6(i) February 1984 UTEM Survey

Approximately 20 line kilometres of UTEM data were collected over the southern sections of the Mackintosh and Hatfield Licences during February 1984 (Plate MAC122). This survey was mentioned in the previous Mackintosh technical report (Jack, 1984). A report on the survey, not available at the time, is included here as Appendix O.

Two anomalous areas were detected on the Mackintosh Licence. Zone H7 is a broad weakly conductive response with a coincident IP anomaly, and is attributed to pyritic alteration. No detailed follow-up has been completed on this zone. A bulldozer access track and geological mapping planned for the 1985-86 summer season may locate its source.

A second zone (anomalies K1 to K4, Plate MAC122) was detected between 1800N and 3200N around 6000E. All responses are very weak, and of low priority. Mapping and lithogeochemical sampling planned for summer 1985-86 may help to explain their origin.

6(ii) January 1985 UTEM Survey

Another UTEM survey was completed on the Mackintosh and Hatfield Licences in January 1985. Results relevant to the Mackintosh Licence are included as Appendix H.

The target for the survey was mineralisation at the Hellyer ore position, which is interpreted to run parallel to the shale-volcanic contact and dip under it at a shallow angle around the licence. Transmitter loops were positioned to give maximum response to this geometry.

One anomaly was detected, within loop 25. This anomaly was the target of DDH MACD004 (see section 7(iii)). No massive sulphides were intersected.

6(iii) Borehole EM Surveys

Drill holes on the Mackintosh and Hatfield Licences are routinely surveyed with borehole EM. A report on surveys in DDH's HL-2 and HL-80 is included as Appendix P.

No anomalous responses were detected in HL-80. A response in the near-by HL-2 has not been explained and will be kept under review.

7. DIAMOND DRILLING

7(i) DDH MACD001

Geology

DDH MACD001 (MAC-1) was designed to test for massive base metal sulphide mineralisation below a volcanoclastic breccia exposed by roadworks in the Switchback Area (8800N/6200E). This breccia, informally named the Switchback Volcanoclastics, contains base metal sulphide fragments and is interpreted to be stratigraphically equivalent to the Hellyer mineralisation. Scattered Pb and Zn soil anomalies occur along the strike of the unit and a weak UTEM anomaly (no. C3) is coincident in the Switchback Area (at around 8750N/6100E). The sulphide fragments were interpreted to be shed from a massive sulphide source down-dip of the Switchback Volcanoclastics. Absence of a strong UTEM response from the proposed mineralisation was accounted for by assuming that the top of the body was at least 200m below surface.

A detailed log of the hole is included as Appendix I, petrological samples are described in Appendix J. A section of the hole is included as Plate MAC108A, and a plan projection on Plate MACC89GG.

A summary log is as follows:

0-9.8m	Rhyolite vesicular lava.
9.8-17.7m	Black shale.
17.7-45.2m	Basalt vesicular lava.
45.2-50.2m	Black shale, conformable contacts.
50.2-115.9m	Basalt lava and breccia.
115.9-173.0	Andesite lava and lava breccia. Low chromium, non-feldspar-phyric, weakly vesicular (Photo 355079).
173.0-202.2m	Basalt vesicular lava, patches of strong fuchsite alteration.
202.0-206.0m	Rhyolite quartz porphyry (203.0-205.7), chilled sericitic margins, intruding fine grained arkosic sandstone (Photo 355085).
206.0-249.0m	Polymict breccia volcanoclastic. Fragments of dacite (leucoandesitic?), basalt and sulphides in a matrix of ash and impure chert. BMS boulder, (5.3% Pb, 4.5% Zn, 35 g/t Ag) from 225.2 to 226.6 (Photo 355081).

249.0-295.3m	Flow banded dacite lava.
295.3-296.4m	Polymict basaltic medium lapilli volcaniclastic (Photo 355082).
296.4-319.0m	Andesite lava similar to 115.9-173.0.
319.0-326.0	Polymict basaltic medium lapilli volcaniclastic.
326.0-346.0m	Andesite lava.
346.0-358.0m (FoH)	Basaltic medium lapilli volcaniclastic.

Contact relationships within the hole and evidence from outcrop support the interpretation that the sulphides at 225.2-226.6 are part of a fragment or boulder and not a discrete lens.

The polymict breccia volcaniclastic (206.0-249.0) is readily correlated with the outcrop of the Switchback Volcaniclastics at surface (Plate MAC108A). Despite differences in enclosing stratigraphy compared with Hellyer (discussed below), the Switchback Volcaniclastic sequence (SWB) is correlated with the Hellyer Hangingwall Volcaniclastic Sequence (HVS) since:

- (i) it occurs immediately below a distinctive basalt lava which can be traced back to Hellyer (MAC89, GG, HH, XX).
- (ii) it contains base metal fragments which have the Hellyer Pb isotope signature (see section 8(i)).
- (iii) the predominant clast type, pink-buff dacite, also occurs in the HVS (see section 3(iv)(v)).

The basalt sequence hangingwall to the SWB includes an andesite lava (115.9-173.0) not known at Hellyer. Its identification as an andesite is based on two thin section descriptions and its low chromium content. It is vesicular and non-feldsparphyric and can only be distinguished in hand specimens from enclosing basalts by the irregular shape of its vesicles. It does not resemble the footwall feldsparphyric andesites at Hellyer; it is correlated with two low chromium samples (see section 8(v)), Table 1, samples 355016, 355017) from within weathered basalt outcrop along the Portal road east of the MAC-1 collar.

At Hellyer the ore position is underlain by feldsparphyric andesite lava. The unit in this position in MAC-1 (249.0-295.3) is logged as dacite lava, based on colour, fine grain size and presence of flow banding. This unit may have contributed many of the pink-buff coloured clasts in the overlying Switchback Volcaniclastics, and the contact between the two appears gradational. Andesite lavas further downhole are similar to the lava from 115.9 to 173.0; that is vesicular and non-feldsparphyric, and are also interspersed with basaltic volcaniclastics; these features are not seen in the Hellyer footwall. This degree of stratigraphic variation is

to be expected in the environment of deposition associated with the HVS and SWB, and has been allowed for in making the correlation between these two units.

An unexpected result from MAC-1 was the shallow north dip of SWB (see Plate MAC108A). The hole was designed for a dip of 60-65 degrees, based on measurements in sediments along the Portal road. The drill hole section (MAC108A) shows an apparent dip of 42 degrees north. This problem has not yet been resolved.

During the reporting period a programme was begun to geologically characterise the SWB/HVS type rocks intersected at Hellyer, in MAC-1 and elsewhere, with the ultimate aim of trailing the sulphide boulders back to their source. Characteristics expected to be of use are variation in fragment and matrix composition, variation in fragment size and matrix proportions, variation in metal ratios of sulphide fragments.

Work completed to date consists of an orientation programme of detailed logging of the SWB in MAC-1. Thirteen descriptive field names were chosen to represent all fragment and matrix compositions; (see Fig. 52(c)). A reference line was then drawn along the top of the core and each discrete section greater than 5mm in length was assigned one of the names and its length measured. A total of 775 observations were accumulated and entered on the data base. A programme was then used to draw plots of fragment and matrix composition and size versus depth, and frequency distributions of fragment size for each composition. A summary of the results is shown in Fig. 52. Fig. 52(a) in which fragment composition is plotted against down hole depth shows, surprisingly, stronger stratification of matrix types rather than clast types. Group 2 (grey fuchsite matrix), and Group II (chlorite fuchsite matrix) are strongly stratified at the top and bottom of the intersection, while Group 13 (cream matrix) is antipathetic to them. The predominant clast type is by far the Dacite (Groups 3,4,5) which occurs throughout the intersection. Sulphide fragments (Group 8) are clustered in two groups around the major BMS boulder at 226m and at the bottom of the intersection. Fig. 52(b) shows fragment size to be fairly evenly distributed through the intersection. Interpretation of these results continues. Further work of this type on other intersection of HVS/SWB units is planned.

Geochemistry

The complete length of MAC-1 was core ground and samples analysed for Cu, Pb, Zn, Ag, As, Ba, Au. The samples were selected on lithological boundaries or over 10m intervals in

areas of uniform lithology. Results are displayed on Plate MAC108B.

Chromium values are good indicators of the basaltic rocks in the hole. Discrepancies occur where the lithological boundary is difficult to pick and does not coincide with the sample boundary. Chromium values up to 200ppm within the Switchback Volcaniclastics are due to fuchsite alteration and the occurrence of some basalt fragments. High base and precious metal values in the Switchback Volcaniclastic are associated with detrital base metal fragments.

Geophysics

A borehole EM survey was completed on MAC-1 with the Crone PEM system. Details are included in Appendix P. A response at the top of the hole is attributed to shale. No in-hole or off-hole response was associated with the HMS intersection (225.2-226.6), supporting the interpretation that it is a boulder.

7(ii)

DDH XHLD080

Geology

DDH XHLD080 (HL-80) was designed to test for massive base metal sulphides beneath strong fuchsite alteration in basalts in the vicinity of 10250N/6150E (see Plate 89 WW) and intersected in DDH HL-2 (Plate 106A). Strong fuchsite occurs in basalts immediately hangingwall to mineralisation at Hellyer.

A detailed log is included as Appendix K. Petrological samples are described in Appendix L. A section of the hole is included on plan MAC106A. Collar location is shown on plan MAC89 WW. (See also MAC97B for a regional cross-section at 1:10,000 scale).

A summary log is as follows:

0-6.5m	Black shale.
6.5-301.2	Basalt lava. Strongly fuchsite altered 6.5-99.8m. Weak to moderate fuchsite alteration 195.0-301.2.
301.2-303.0	Glassy andesite lava. (Photo 355089).
303.0-305.7	Tuffaceous laminated siltstone. Tuffaceous, shaley and sandy bands. (Photo's 355090, 355091).
305.7-308.3	Andesitic volcanic breccia with sericite/chloritic/pyritic shale matrix. Pb/Zn sulphides associated with Qtz/carb. veining. (Photo 355093).

- 308.3-331.0 Vesicular, weakly porphyritic andesite lava. Trace of sphalerite and galena in vesicles. Similar to DDH MACD 001, 15.9-173.0.
- 331.0-397.4(EoH) Vesicular basalt lava. Not fuchsite altered. Trace of sphalerite and galena in quartz/carbonate veins.

Strong fuchsite alteration was intersected between 6.5m and 99.8m and correlates well with alteration on surface and in HL-2. This intersection shows that fuchsite is not necessarily an indicator that mineralisation is close by, and experience elsewhere on the licence shows that it may be controlled by permeability. In HL-80 the shale seems to have acted as an aquiclude which has concentrated the fuchsite forming solutions in the underlying basalt. In other examples fuchsite is controlled by permeability along faults or in inter-pillow zones.

The tuffaceous siltstone unit at 303.0-305.7m is tentatively correlated with the Hellyer Ore Position because of its position below basalt and above andesite lava. This correlation is shown on Plate MAC97B. It requires a flexure in the ore position which could be achieved by projecting onto the section (10200N) the grid SE trending anticlinal cross fold at 10100N/6100E. However the re-appearance of Hellyer-type hangingwall basalt below the siltstone unit, the fact that shaley units occur in the hangingwall at Hellyer and the similarity between the andesite and the intrabasalt andesite in MACD001 suggest that the ore position may be deeper.

Core grind analyses show high base metal values in the tuffaceous siltstone. Syngenetic pyrite was logged in this unit but no base metal sulphides. Base metals are associated with quartz/carbonate veins in this unit and the underlying andesite, and elsewhere in the hole (142.5m, 171.5m, 341.4m). Anomalous values in the siltstone are therefore not an indication that this unit is distal to the Hellyer mineralisation, but since quartz/carbonate/sulphide veins are thought to be of Cambrian Age, they may indicate re-mobilization from a massive sulphide at depth.

Geochemistry

The complete length of HL-80 was core ground and samples analysed for Cu, Pb, Zn, Ag, As, Ba, Cr, Au. Results are shown on Plate MAC106B.

Anomalous base metal values are discussed in the previous section. This type of anomaly is typical of those on the licence associated with quartz/carbonate veining in which Zn >

Pb, and Cu, Ag, As, Ba are all low. Cr values clearly define basalt and andesite units.

Geophysics

A borehole EM survey was completed on HL-80. Details are included in Appendix P. No anomalies were detected.

7(iii)

DDH MACD004

Geology

DDH MAC-D-004 (MAC-4) was designed to test for base metal sulphides in the Hellyer Ore Position (HOP) south-east of Hellyer. The specific target was a deep response detected on loop 25 during the summer 1985 UTEM programme. This anomaly is discussed in detail in Appendix H. The UTEM response was interpreted as due to an east dipping body at about 300m below 5725E between 9700N-10000N and open to the north. Conductance was interpreted to be intermediate between that of the Que River and Hellyer deposits.

A detailed log of MAC-4 is included as Appendix M; petrological samples are described in Appendix N; a section of the hole is included as Plate MAC120A and a plan projection is shown on Plate MAC89XX.

A summary log is as follows:

0-83.5	Basalt lava.
83.5-90.0	Basaltic lapilli and ash volcanoclastics. Rare andesite clasts identified in thin section (Photo 355462).
90.0-138.1	Basalt lava.
138.1-172.2	Basaltic polymict breccia volcanoclastic (Photo 355463, 355464).
172.2-196.3	Feldsparphyric andesite lava breccia and volcanoclastic (Photo 355465).
196.3-275.1	Dacite lava.
275.1-348.0(ECH)	Feldsparphyric andesite lava breccias and volcanoclastics, minor dacite lava.

The interval from surface to 138.1m is correlated with the hangingwall basalts at Hellyer. However, low chrome values from 30.0-83.5 are at variance with this interpretation. Lapilli and ash volcanoclastics (83.5-90.0) also occur (in the hangingwall) above Hellyer (see section 3(iv)(iv)).

The polymict unit from 138.1-172.2 is correlated with the Hellyer Hangingwall Volcaniclastic Sequence. The correlation is based on:

- (i) the presence of pyrite and mixed base metal fragments, presumably shed from a massive sulphide source.
- (ii) the stratigraphic position of the unit, immediately below basalt.
- (iii) its polymict character and similarity with units intersected at the southern end of Hellyer.

Fragment types include basalt, feldsparphyric andesite, siltstone, pyrite and mixed base metal sulphides..

The polymict unit is underlain by a feldsparphyric andesite (172.2-196.3), as at Hellyer. The andesite is possibly a transported lava breccia as it has a similar matrix to the overlying polymict unit. The lower contact of the andesite is obscured by strong yellow sericite alteration.

The rest of the sequence encountered in MAC-4 consists of massive dacite lavas, feldsparphyric andesite lavas and andesitic volcaniclastics.

No massive base metal sulphides were intersected. The interpreted centre of the UTEM response lies about 20m off the end of the hole. The hole was stopped short of this point because it had already passed through the interpreted Hellyer Ore Position, and because of the lack of encouraging alteration at the bottom of the hole. Since the UTEM anomaly was obviously not associated with the Hellyer Ore Position it was decided to rely on routine borehole EM to determine its source.

Geochemistry

The complete length of MAC-4 was core ground and samples analysed for Cu, Pb, Zn, Ag, Au, Ba, As, Cr, Ni, Zr, Ti. Results are shown on Plate 120B.

As mentioned in the previous section several intervals logged as basalt (30.0-83.5; 120.0-138.1; 308.7-318.2) have lower chromium values than expected of this rock type. These intervals will be sampled for petrography.

Copper and zinc values are moderately anomalous throughout the hole, while Pb values are low. These metal ratios are unusual. Sulphide fragments contribute to the metal values in the interval 138.1-172.2.

Geophysics

Borehole EM was complete on MAC-4. A report has not yet been received. However field inspection indicated no anomalous results.

8. GEOCHEMISTRY8(i) Pb-isotope Survey

Five samples were submitted to the CSIRO for Pb-isotope analysis in December 1984. A report on the results is included as Appendix Q.

The samples were:

315461	8830N	6145E	Pyrite-rich fragments from the Switchback Volcaniclastics in the Hellyer Ore Position.
315629	8840N	6140E	Base metal sulphide-rich fragment from the Switchback Volcaniclastics.
315660	8840N	6140E	Silicified rock with disseminated base metals from the Switchback Volcaniclastics.
31569	9450N	5235E	Pyrite pod at outcrop of Hellyer Ore Position.
315625	9950N 9440N	5440E	Galena from chlorite-rich rock in outcrop of interpreted southern extension of the Hellyer footwall alteration zone.

see appendix

All samples except 31569 had Pb-isotope ratios comparable with those established for Cambrian mineralisation in the Que-Hellyer area. These results support the interpretation that the sulphide fragments in the Switchback Volcaniclastics have been shed from a Cambrian massive sulphide source, and that the alteration outcropping around sample 315625 is related to the Hellyer mineralising system.

Sample 315659 was significantly more radiogenic than the others. Field evidence indicates that this sample is of Cambrian age. The isotopic anomaly is most likely due to addition of radiogenic lead from contained uranium and thorium to a sample of initially low lead concentration. The sample was not analysed for lead.

8(ii)

Soil Geochemical Data ProcessingWork Completed

During the past twelve months all existing soil geochemical analyses from the Mackintosh licence were digitised and a data base designed for storing and manipulating this very large data set containing 21,000 samples/observations (each with Cu, Pb, Zn and scattered Fe, Ba, As).

Analysis of this data is still in progress. Work completed to date is as follows:

- 1(a) Rock type information from recent mapping was digitised and merged with analytical data.
- (b) Soil type data recorded during sample collection was plotted and soil type distribution maps prepared. This information is still to be merged with analytical data.
- (c) Vegetation types collected as above were also plotted in preparation for merging.
- 2(a) Basic statistics including means, standard deviations, coefficients of skewness and kurtosis, correlation coefficients and order statistics were computed for each element within the whole data set and for each element for each rock type.
- (b) Histograms and cumulative frequency distribution curves for both linear and log scales were constructed as above.
- (c) Statistics and cumulative frequency curves were analysed to determine an anomalous threshold for each element for each rock type.
3. Raw data was divided by the threshold for each element for each rock type. This allowed anomalies to be classified in (times threshold) terms.
4. Profiles of "times threshold" were plotted for each element over the whole Mackintosh area at 1:10,000 scale. This highlighted a number of anomalies not as yet thoroughly investigated, and a number of lithological and structural features of interest.

Work Proposed or in Progress

1. Cu, Pb, Zn data is being gridded (10mE x 30mN mesh) and contoured at 1:10,000 scale. Colour contour plots will be produced using an Applicon colour plotter.
2. All new analytical data (actual values) are to be plotted at 1:2500 scale.

3. Cluster analysis using image processing techniques will be carried out using the Cu, Pb and Zn data sets. This will aid classification of rock and anomaly types.
4. Rock type data will be redigitised as new information becomes available. Soil and vegetation types will be digitised, merged and their correlation with analytical data investigated.
5. A detailed report will be prepared presenting the full results and implications of this work.

8(iii) Lithochemical Sampling Programme

A reconnaissance lithochemical sampling programme was completed on the Mackintosh and Hatfield licences during February-March 1985. The aim of this programme was to determine whether andesitic, basaltic and dacitic volcanics could be reliably distinguished in weathered outcrop by their trace element geochemistry. Preliminary studies on fresh drill core had shown this was possible for basalt, which has a high chromium content.

Sample traverses were positioned across the stratigraphy including the Hellyer Ore Position (HOP) (see Fig. MAC122). Samples were taken from rock and weathered rock in road cuts and costeans. Analyses were by AMDEL using ICP/AES after lithium metaborate fusion. Results are shown in Table 1. Explanation of the rock type abbreviations is as follows:

- | | | |
|-----------------|---|--|
| Wth A | - | weathered andesite. Strongly weathered rock but retaining enough texture to identify it as andesite - i.e. green, feldspar phenocrysts. |
| A cy | - | clay after andesite - identified by proximity to recognizable andesite, and stratigraphic position. |
| Wth B | - | Weathered basalt, identified by vesicular texture, Mn staining and clay colour, and by stratigraphic position. |
| D, WthD, Dcy | - | Dacite, weathered dacite, dacite clay. Identified by cream-white colour, quartz phenocrysts, flow banding or by formation of distinctive white clay when thoroughly weathered. |
| bk Sh, Wth bkSh | - | black shale, weathered black shale. |

- R - Rhyolite.
- cg vcc - breccia volcanoclastic in the HOP on the portal road.

Shale and rhyolite are readily identified in the field. Geochemistry is mainly required to discriminate basalt, andesite and dacite.

Mean values of each element for specific rock types have been calculated and are shown in Table 2. The means indicate that, except for As and Zr, there are significant variations in trace element levels for all rock types. Since As, Ba and K are associated with alteration and mineralisation, they are not considered reliable indicators of primary rock type.

Basalt is the most readily distinguishable rock type because of its high Cr, Ni and Mn content. Andesite may be distinguished from dacite by higher V, Ti and Mn. When trying to identify basalt, andesite and dacite, initial division can be made on the basis of Cr content into basalt (high Cr) or andesite/dacite (low Cr). Discrimination of andesite from dacite may then be made on the basis of V, Ti or Mn content. Plots of Cr against the latter three elements are shown in Fig. 53, which shows that V is the best discriminator between andesite and dacite.

Recent analyses of core and fresh rock samples as part of the Hellyer alteration study have suggested that the three rock types may be distinguished by their Zr to Ti ratios. These ratios are plotted against Cr in Fig. 54, which shows poor discrimination based on Zr/ Ti. This may be due to the different sample types used in the two programmes.

In Fig. 54, 10 samples are numbered. These are samples which have high chromium and have not been identified as basalt or vice versa. Possible explanations for these discrepancies are listed in Table 3.

The results of the lithochemical sampling programme were applied in the Switchback area by re-analysing soil samples for chromium. The values are plotted on Plate MAC119. Lithological interpretation can be compared with chromium values by overlaying MAC119 on Plates MAC89 HH and MAC89 GG.

8(iv)

Core Grind Sampling Programme

Holes drilled on the Mackintosh and Hatfield Licences are now routinely sampled over their complete length by core grinding. Samples are selected on lithological boundaries, or over 10m intervals where lithology is uniform. To date, samples have

been pulverized in a chrome free bowl and submitted to Analabs for analysis as follows:

Cu, Pb, Zn, Ag, Ni	perchloric acid digest, AAS
Cr, Ba, As, Ti, Zr	pressed powder XRF
Au	fire assay fusion, AAS finish

Results are stored in the data-base, and are presented as overlays to drill hole sections (e.g. MAC106B). This programme commenced with DDH XMCD005.

CONCLUSIONS

The major achievements of the reporting period have been:

- (1) Drill delineation of the Hellyer deposit to prove up an indicated geological resource. The geological setting of the deposit, defined by the drilling programme, is now the reference for exploration on the licence.
- (2) A significant improvement in the understanding of the geology between Hellyer and Que River and eastwards to the Switchback Area. The stratigraphic position hosting the Hellyer mineralisation has been located in these areas and is a zone of intense exploration. Exposure created by development works for the Hellyer deposit has greatly accelerated geological mapping in this area. To improve the detail of mapping on the rest of the licence techniques must be found to create exposures in critical areas with minimum environmental damage.
- (3) An improvement in systematic recording of all exploration data on the property by introduction of new map series and legends, creation of drilling and soil geochemical data bases and routine petrology and core grind sampling on all drill holes.
- (4) The development of methods to reliably distinguish rock types by their trace element content. These methods seem to be applicable to weathered rocks. Basic and intermediate rocks on the licence are commonly weathered to 30 metres.

Three drill holes and 20 line km of UTEM surveying were also completed during the reporting period. No economic mineralisation was located as a result of these surveys.

RECOMMENDATIONS

The exploration programme for 1986 should be directed towards:

- (1) Developing drill targets at the stratigraphic position hosting the Hellyer deposit. This stratigraphy is known to trend eastwards into the Southwell area. A programme of gridding, mapping, trenching, soil sampling, ground magnetics and UTEM is proposed to produce drill targets in this area.
- (2) Collecting geological, geochemical and geophysical data in volcanic rocks to the east and south east of the Que River Mine where coverage is inadequate. There is potential to develop prospects in these areas in the medium term. Access tracks, gridding, soil sampling and mapping have been proposed for these areas.

(3) Continuation of 1:10,000 scale mapping of the licence to:

- (a) Improve understanding of the structure of the Que-Hellyer volcanics.
- (b) Assess the potential for mineralisation on areas of the licence outside the outcropping area of Que-Hellyer volcanics.

A programme involving new air photography and a new base map is proposed.

046

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047 Samp. No.	North	East	Ni	Cr	V	Zr	Ti	Ba	As	Mn	K
270700	4809	3794bk Sh	30	130	180	160	3350	680	12	120	2.52000
270701	4808	3799bk Sh	20	110	130	160	3900	620	12	80	2.44000
270702	4805	3814bk Sh	45	130	240	170	3600	900	12	120	2.64000
270703	4804	3819bk Sh	30	150	220	140	3600	760	12	120	2.62000
270704	4803	3824bk Sh	25	150	200	190	4050	1000	12	80	3.24000
270705	4801	3828A cy	10	40	250	350	4750	2100	100	100	5.35000
270706	4800	3833A cy	20	25	220	390	5000	1700	12	120	3.98000
270707	4800	3838Acy	15	40	210	360	4700	1250	12	120	2.64000
270708	4803	3842A cy	20	30	210	350	4500	920	12	120	1.80000
270709	4806	3846A cy	15	25	200	340	4450	640	12	80	1.04000
270710	4810	3864A cy	20	420	190	300	4300	780	12	120	1.14000
270711	4811	3869A cy	15	60	180	290	4050	620	12	100	1.14000
270712	4813	3873A cy	20	90	210	340	4300	760	12	120	1.54000
270713	4815	3878A cy	10	30	160	260	3600	1050	40	120	1.76000
270714	4814	3883A cy	10	45	160	250	3450	1050	12	120	1.66000
270715	4813	3888A cy	15	55	190	300	3850	1250	40	120	1.98000
270716	4812	3893A cy	50	3100	210	300	4000	1600	12	240	2.78000
270717	4811	3898A cy	20	460	200	300	3850	1350	12	140	2.18000
270718	5390	3725D cy	15	65	45	230	2850	2250	12	100	3.64000
270720	5391	3717D cy	15	15	50	320	2700	720	12	140	3.04000
270722	5393	3708D cy	15	15	50	360	2900	680	12	100	2.26000
270724	5400	3700D cy	15	40	45	270	2350	440	12	100	2.52000
270726	5406	3692D cy	20	15	45	250	2350	480	40	100	2.68000
270728	5406	3682A cy	40	680	180	230	3150	700	80	120	3.60000
270730	5401	3674A cy	25	95	280	300	4500	1000	180	400	2.88000
270732	5398	3665wth A	25	130	170	300	3500	880	12	1150	1.72000
270734	5401	3655A cy	40	640	150	300	3350	800	12	1400	1.42000
270736	5403	3645A cy	15	85	180	270	3600	520	12	550	1.70000
270738	5400	3636A cy	15	20	170	290	3400	420	12	200	1.30000
270740	5398	3626A cy	10	25	190	350	3900	430	12	450	.950000
270742	5400	3617A cy	10	80	190	290	3900	450	12	380	.700000
270744	5399	3607A cy	25	15	190	290	3900	500	12	340	1.36000
270746	5403	3598A cy	10	15	220	320	4200	390	12	1050	.900000
270748	5406	3589A cy	10	10	190	290	4050	640	12	1150	.780000
270750	5399	3583A cy	15	20	200	290	3950	400	12	1100	1.14000
270752	5392	3577A cy	2	10	190	260	3700	540	12	1350	1.44000
270754	5392	3567A cy	10	20	210	290	4050	560	12	1750	1.32000
270756	5393	3558A cy	10	15	240	330	4650	660	12	1750	.720000
270758	5394	3547A cy	10	10	240	300	4350	620	12	1500	1.02000
270760	5394	3538A cy	5	5	280	320	4600	470	12	700	.700000
270762	5392	3527A cy	10	5	260	300	4450	480	12	1150	1.00000
270764	5393	3518A cy	15	5	260	260	4150	620	12	400	1.74000
270766	5392	3508A cy	5	10	280	290	4500	1200	12	100	4.04000
270768	5389	3489wthbk Sh	20	110	190	160	4050	820	12	100	2.50000
355016	8925	6720wth B	35	25	240	170	3400	740	12	4050	2.74000
355017	8950	6690wth B	25	15	270	150	3150	1050	12	800	2.56000
355018	9000	6690wth B	130	540	260	280	4750	580	12	1900	2.80000
355019	9030	6730wth B	170	720	280	300	5500	580	12	3400	1.34000
355020	9020	6770wth B	130	660	270	300	5100	520	12	3100	.640000
355021	9030	6820wth B	170	560	280	300	5300	560	12	1700	1.64000
355022	9060	6865wth B	150	600	260	300	5200	230	12	300	.790000
355023	9100	6860wth B	190	1000	260	280	4950	560	12	460	1.98000
355024	9140	6820bk Sh	80	150	160	150	3550	540	30	800	3.00000
355025	9180	6805R	15	15	15	150	820	180	12	320	2.24000
355026	9230	6795bk Sh	75	110	270	150	3350	410	12	520	2.86000
355027	8550	6685wth D	15	45	250	160	4400	920	12	440	2.98000
355028	8580	6710wth A	35	85	160	140	3850	700	12	1750	1.40000
355029	8725	6710D	20	15	35	160	1650	760	12	300	2.46000
355030	8765	6710wth D	30	10	330	150	4550	900	12	1350	3.32000
355031	8805	6740wth D	15	10	40	220	2200	540	12	130	2.88000
355032	8825	6700wth D	10	10	30	170	1700	400	12	90	2.30000
355033	8845	6685cg vcc	15	30	40	190	1950	480	12	320	2.18000
355034	8865	6685cg vcc	15	15	35	220	2200	700	12	780	2.90000
355035	8895	6705wth B	250	1050	260	70	2350	180	12	2500	1.05000
355036	9550	4270wth B	210	920	200	140	2400	270	12	280	1.02000
355037	9140	4370wth B	100	410	280	170	3850	340	12	2250	1.50000
355038	8975	4460wth D	50	240	150	170	3200	130	12	500	.385000
355039	8895	4500wth D	10	25	25	220	2050	560	12	60	3.02000
355040	8790	4560wth D	20	10	250	220	4350	470	12	130	3.16000
355041	8655	4680wth D	20	15	90	170	2600	700	12	30	3.08000
355042	10095	5605wth B	160	530	410	330	5700	190	12	2500	.215000
355043	10000	5600wth B	180	810	320	310	5250	180	12	800	1.40000
355044	9910	5610wth B	40	20	340	300	4750	1000	12	120	3.13000
355045	9855	5610wth B	30	20	270	280	4150	1640	12	1550	3.11000
355046	9810	5610wth A	60	20	420	420	6100	890	12	2100	1.52000
355047	9750	5610wth A	90	280	230	290	4050	870	12	160	2.80000
355048	9700	5620py wth A	20	70	180	220	2100	620	12	80	2.51000
355049	9650	5610py wth D	20	100	60	350	2750	420	12	12	3.42000
355050	9610	5700wth A	30	20	240	230	3500	800	12	12	3.51000
355051	9615	5715wth D	20	5	60	300	3350	430	12	12	3.36000
355052	9600	5800wth D	40	70	110	290	3400	740	12	250	2.82000
355053	9610	5840wth B	110	290	240	260	3900	1080	12	1350	1.80000
355054	9610	5900R	20	30	60	220	1550	300	12	80	2.51000
355055	9610	5950R	10	5	10	220	800	180	12	12	2.37000
355056	9610	5960R	10	10	10	220	800	150	12	40	2.41000

4800N/3800E COSTEAN
(HATFIELD)5400N/3600E COSTEAN
(HATFIELD)PORTAL ROAD-
SWITCHBACK AREA

WARATAH HEC LINE

EXPLORATION PITS
9600N/5600E AREA

TABLE 1. SAMPLES COLLECTED FOR THE MACKINTOSH / HATFIELD LITHOGEOCHEMICAL PROGRAMME

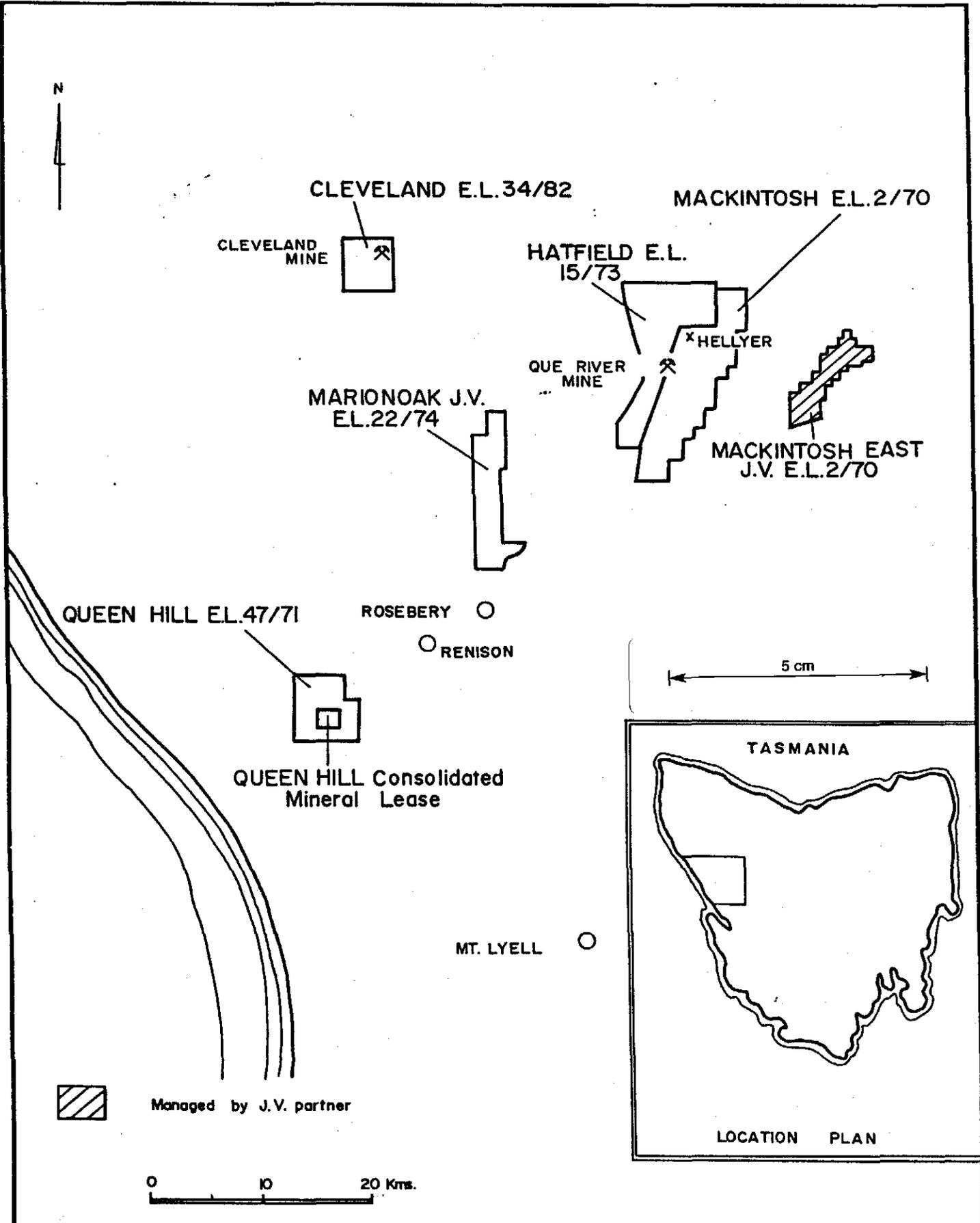
ROCK TYPE	Ni	Cr	V	Zr	Ti	Ba	As	Mn	K
wth A, A cy (33 obs.)	17	44	220	293	4145	794	21	736	1.8%
wth B (16 obs.)	132	611	248	252	4216	486	16	1481	1.4%
D, D cy, wth D (16 obs.)	19	24	97	233	2893	733	14	222	2.9%
R (4 obs.)	14	15	24	203	992	203	12	113	2.4%
bk sh, wth bk sh (8 obs.)	41	130	199	160	3681	716	14	243	2.7%

TABLE 2.

MEAN VALUES FOR MAJOR ROCK TYPES,
LITHOGEOCHEMICAL SAMPLING PROGRAMME

NUMBER ON FIG.	SAMPLE NO.	HAND SPECIMEN ID.	Cr CONTENT	COMMENT
1	270728	A Cy	680	CORRELATE WITH THIN UNIT OF HIGH Cr BASALT INTERSECTED IN DDH MC-12 BE- NEATH COSTEAN
2	270734	A Cy	640	
3	270732	wth A	130	
4	270717	A Cy	460	UNEXPLAINED - MAY BE THIN BASALT/ UNIT AS ABOVE
5	270710	A Cy	420	
NOT SHOWN	270716	A Cy	3100	UNEXPLAINED
6	355047	wth A	280	UNEXPLAINED
7	355016	wth B	25	CORRELATES WITH UNIT OF LOW Cr ANDESITE LAVA IN- TERSECTED IN DDH MAC-1
8	355017	wth B	15	
9	355044	wth B	20	UNEXPLAINED
10	355045	wth B	20	UNEXPLAINED
11	355038	wth D	240	UNEXPLAINED

TABLE 3. EXPLANATIONS FOR DISCREPANCIES IN Cr CONTENT
OF SAMPLES FROM TABLE 1.



 **Aberfoyle Exploration Pty Ltd**

Drawn: JRS
 Traced: RJE/GLC
 Checked:
 Revised by: JRS Date: 15/10/85

NORTH WEST TASMANIA
EXPLORATION LICENCES

Location code:
 Date: OCT. 1985
 Scale: As shown
 Plate No: Fig 1

052

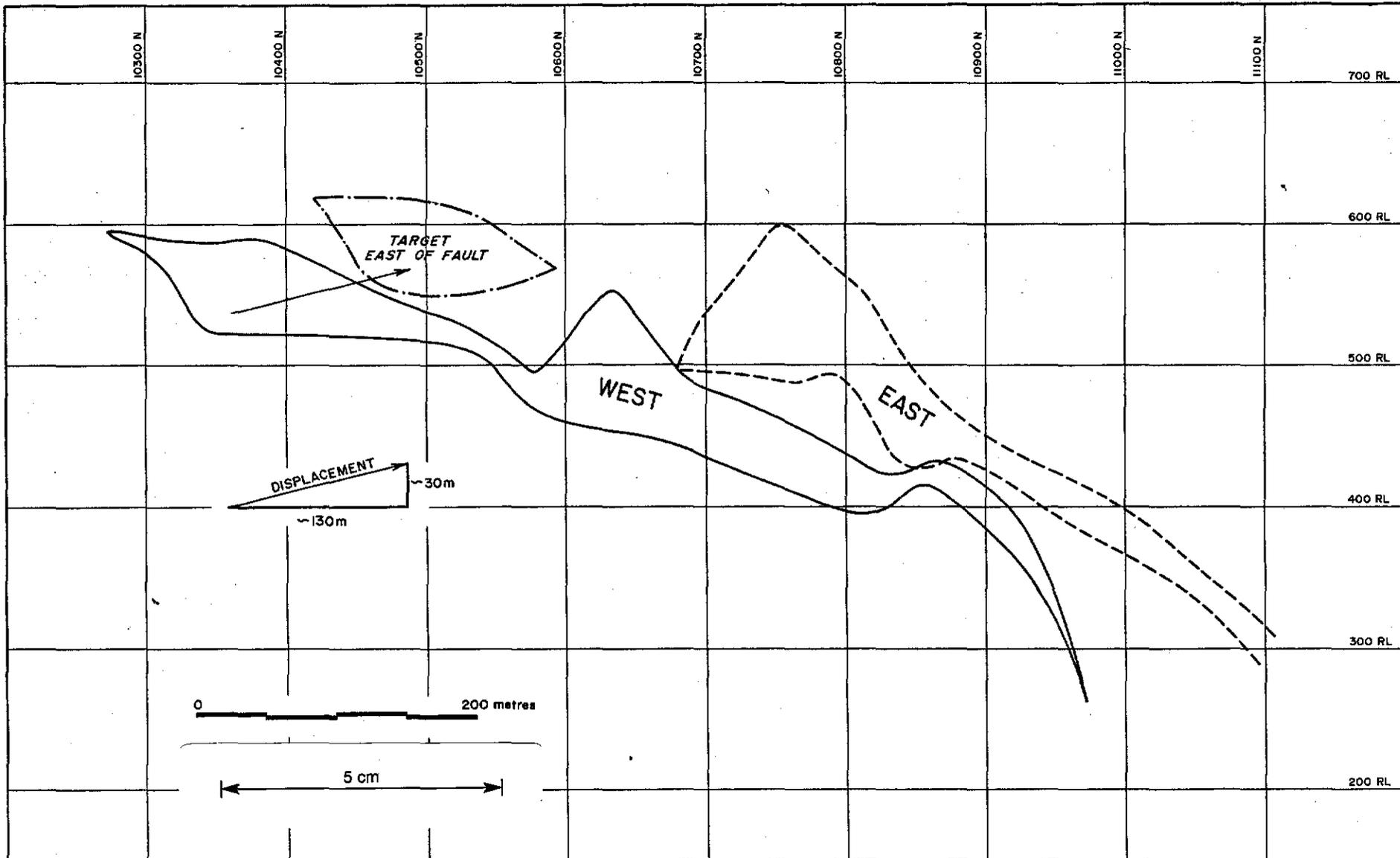


FIG. 37

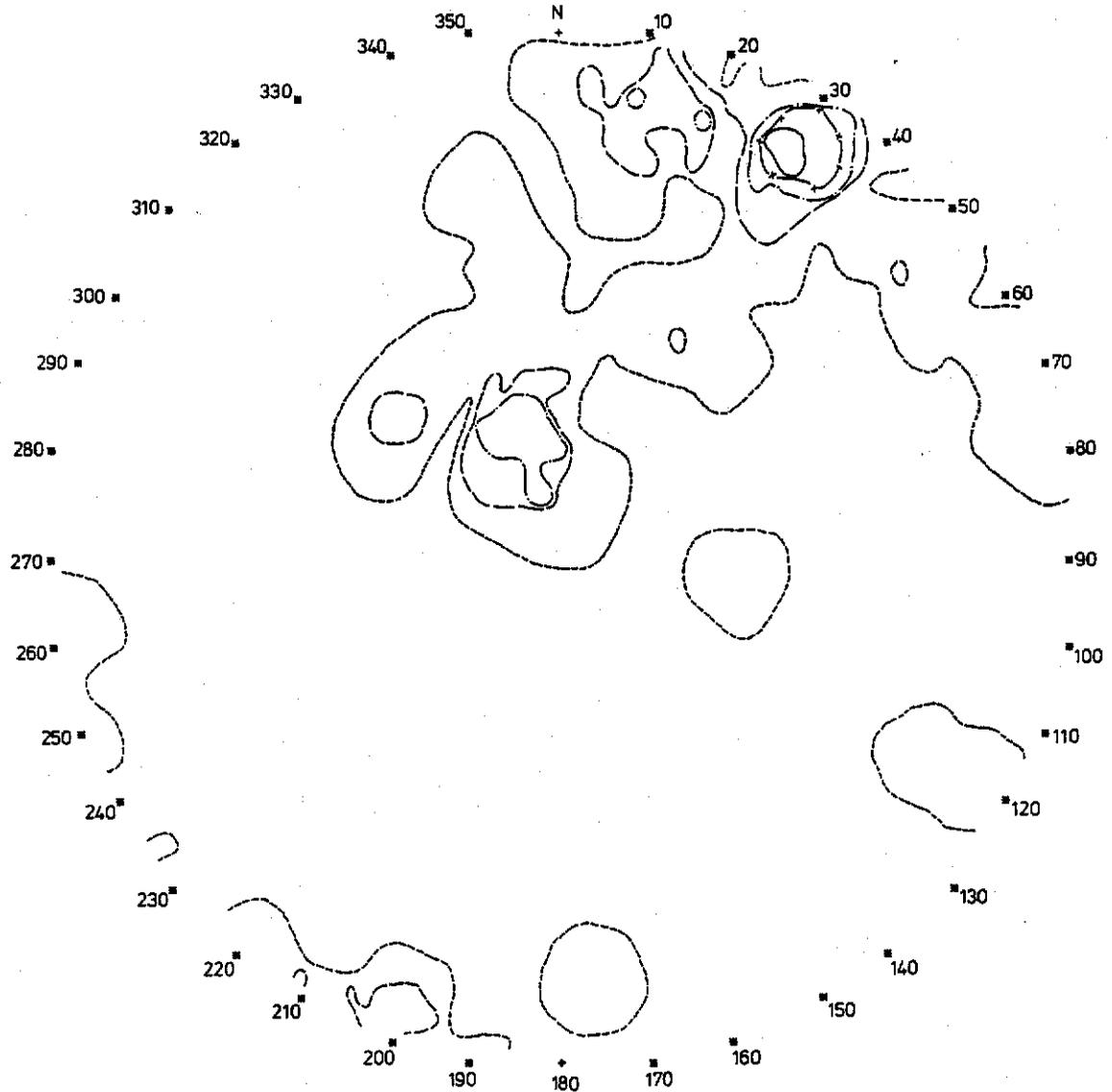
REV	DATE	REVISION	DRAWN	CKD	APP	APP

SCALE 1:4000	
DRAWN	GLC 10-5-85
CHECKED	
DESIGNED	GJMCA 10-5-85
DESIGN CKD	
DESIGN APP	
PROJECT APP	



MACKINTOSH MINING PTY. LTD.	
PROJECT HELLYER PROSPECT	
LONG SECTION ON JACK FAULT PLANE	
DRAWING No.	HEL 62
REVISION	

028054



053

CONTOURS 1 4 8 12 16
MAX 19.6 PERCENT

SCHIMDT METHOD
LOWER HEMISPHERE
EQUAL AREA PROJECTION

JOINTS
QUE RIVER SHALE
10800 N

FIG. 38

A Aberfoyle Exploration Pty Ltd							
REVISIONS				HELLYER - FRACTURE SURVEY QRS 10800N. 51 POLES.			
Init.	Date	Init.	Date				
Location Code:				Scale:		Date: 26.4.85	
						Compiled: G.J. MCA Drawn: Traced: H. B. Checked: Plate No: HEL 51	

028023

05A

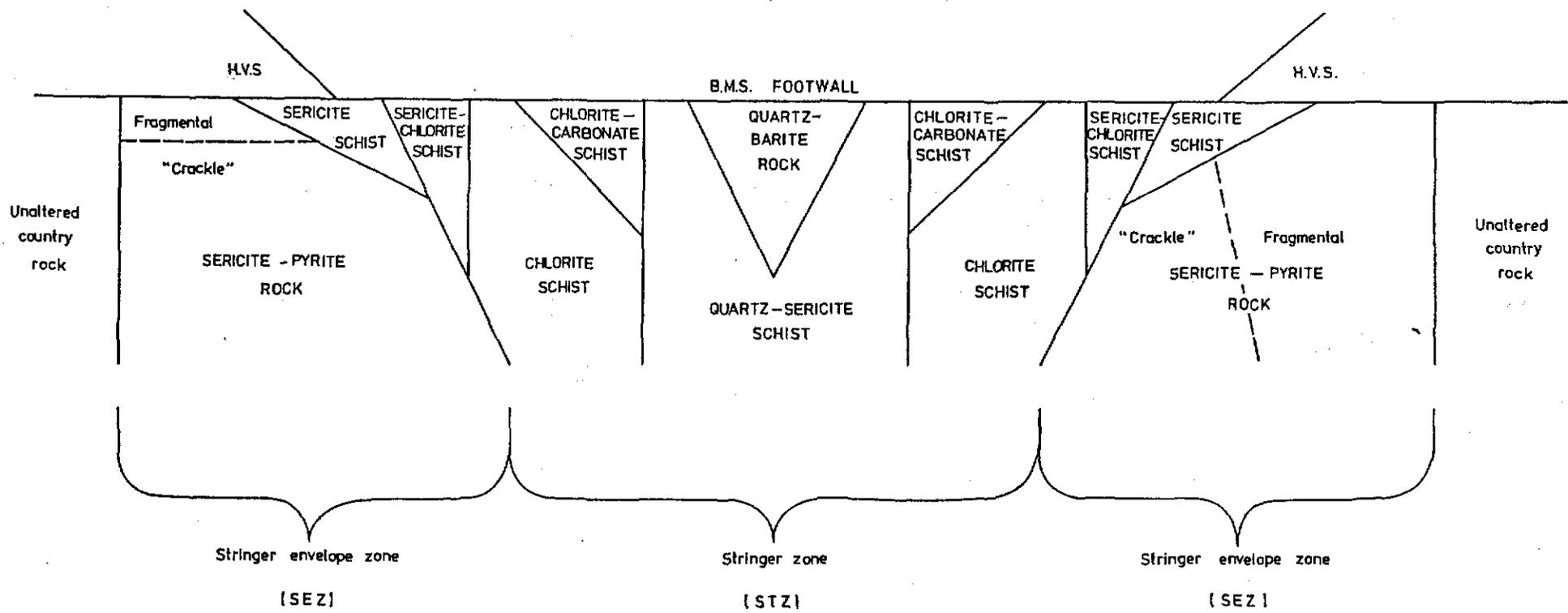


FIG 39

A Aberfoyle Exploration Pty Ltd				Compiled: G.J.McA																					
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				REVISIONS																					
				Int	Date	Int	Date																		
FOOTWALL ALTERATION ZONING (DIAGRAMMATIC ONLY)				Traced: H.B.																					
				Checked:																					
Location Code:		Scale:		Date: 29.4.85																					
				Plate No: HEL 50																					

028056

055

Glassy silica—
colloform pyrite cap

SN

0

Borite
zone

3

H/W
rich zone

13

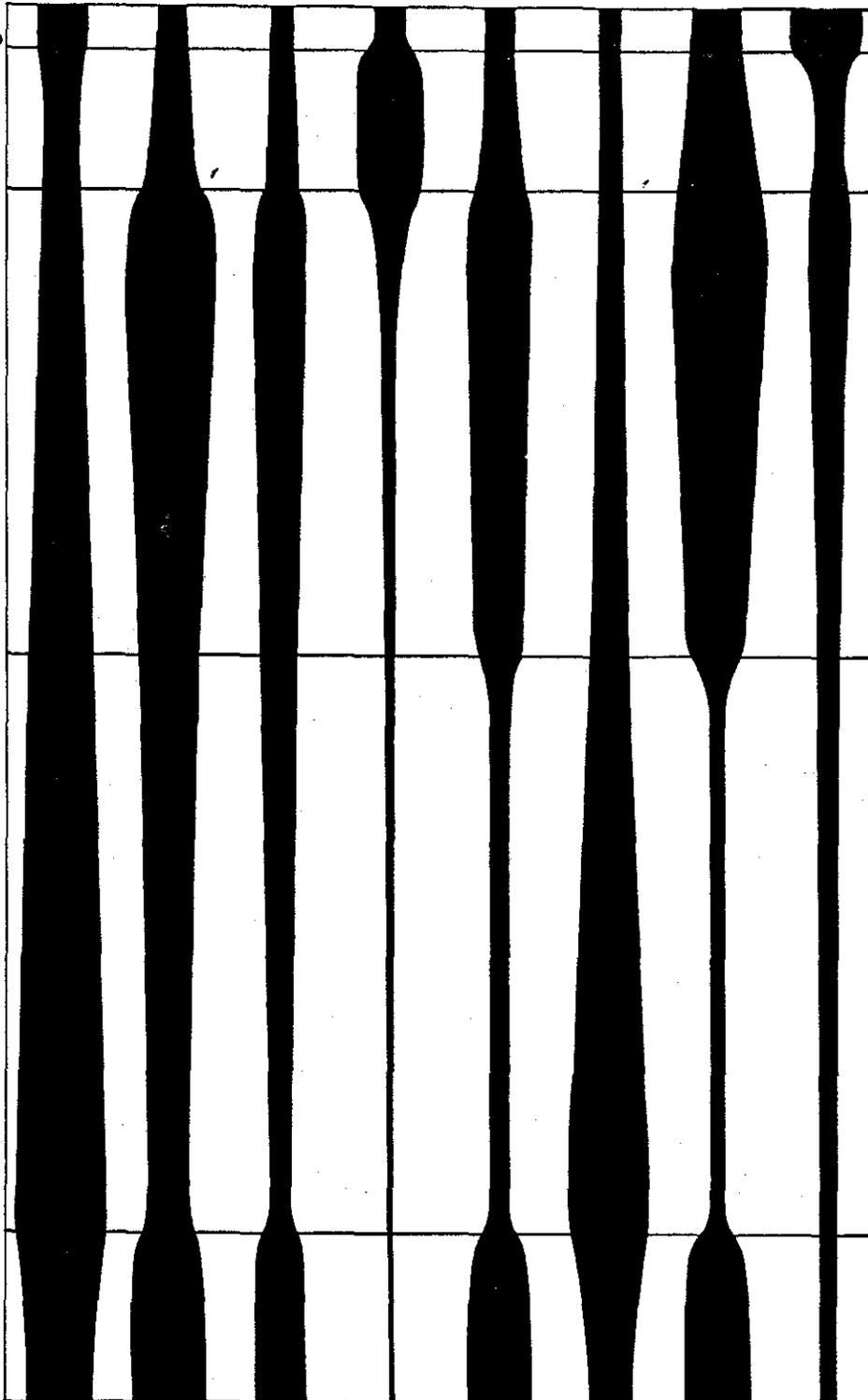
Central
poor zone

46

F/W
rich zone

87

99



PYRITE

SPHALERITE

GALENA

BARITE

ARSENOPYRITE

CHALCOPYRITE

FAHLERZ

SILICATES,
CARBONATE

* Bar width
not to scale.



Aberfoyle Exploration Pty Ltd

Drawn: G.J. McA

Location code:

Traced: H.B.

Date: 2. 5. 85

Checked:

Scale:

Revised by: Date:

Plate No HEL 59

HELLYER ORE ZONES

FIG. 40

FACT GEOLOGICAL MAPPING LEGEND MAC 79,110 PLAN SERIES

(NOTE: COMPLETE LIST OF ABBREVIATIONS IS STORED ON HP-1000 FILE ABBRV:HL:14)

LITHOLOGY COMPOSITION

R	Rhyolite
D	Dacite
A	Andesite
B	Basalt
Y	Polymict
Ss	Sandstone
Sh	Shale
Slt	Siltstone
Ba	Barite
Py	Pyrite
BMS	Base Metal Sulphide
Ch	Chert
TB	Tertiary Basalt
JDa	Jurassic Dolerite
OCg	Ordovician Conglomerate

LITHOLOGY TEXTURE / FORM

l	lava
lb	lava breccia
pl	pillow lava
av	ash volcanoclastic
flv	fine lapilli volcanoclastic
mlv	medium " "
clv	coarse " "
bv	breccia " "
xv	crystal " "
vas	vesicular
por	porphyritic
eux	eutaxitic
fbn	flowbanded
gnlr	granular
ibd	interbedded
md	matrix dominant

VOLCANICLASTIC SIZE RANGE

> 2mm	ash
2-8	fine lapilli
8-32	medium lapilli
32-64	coarse lapilli
> 64	breccia

ALTERATION COMPOSITION

Co	Carbonate
Cl	Chlorite
Kf	K-feldspar
Fu	Fuchsite
Py	Pyrite
Se	Sericite
Si	Silica

ALTERATION TEXTURE / FORM

per	pervasive
dis	disseminated
pat	patchy
spt	spotty
spr	selected fragments
stw	stockwork
stc	structure controlled
vn	vein
mtx	matrix

ALTERATION INTENSITY WEATHERING INTENSITY

1	trace
2	weak
3	moderate
4	strong
5	extreme

COLOUR

br	brown
bk	black
gy	grey
gn	green
or	orange
pk	pink
wh	white
yw	yellow
bl	blue

FAULT TERMS

cav	cavernous
lch	leached
slk	slickenside
rhd	rehealed
rbb	rubble
shd	sheared

GENERAL TERMS

tr	trace
lgt	light
dk	dark
brt	bright
ox	oxidised
fg	fine grained
mg	medium grained
cg	coarse grained

ABBREVIATED DESCRIPTION FORMAT

LITHOLOGY :

LITHOLOGY WEATHERING ALTERATION
 colour, composition, form, texture / intensity / composition, intensity, form, texture
 example gy - gn, YA, flv / Ox 3 / Fu.3, dis
 Interpretive comment can be added in brackets ()

FAULT :

WIDTH (cms) / MINERALOGY, TEXTURE
 example F 20 / Cl, cav.

VEIN :

WIDTH (cms) / MINERALOGY, TEXTURE
 example V 5 / Q, Py, cav

INTERPRETIVE GEOLOGICAL MAPPING LEGEND MAC89,111 PLAN SERIES

VOLCANICS

R.i R.lb	26	Rhyolite lava, lava breccia
R.av R.lv R.bv R.xv	25	Rhyolite volcanoclastic
YR.av YR.lv YR.bv	68	Rhyolitic Polymict volcanoclastic
D.i D.l.b	63	Dacite lava, lava breccia
D.av D.lv D.bv D.xv	54	Dacite volcanoclastic
YD.av YD.lv YD.bv	56	Dacitic Polymict volcanoclastic
A.fp.l A.fp.lb	48	Andesite feldsparphyric lava, lava breccia
A.i A.l.b	41	Andesite lava, lava breccia
A.av A.lv A.bv A.xv	44	Andesite volcanoclastic
YA.av YA.lv YA.bv	40	Andesitic Polymict volcanoclastic
B.i B.l.v	45	Basalt lava, lava breccia
B.pl	80	Basalt pillow lava
B.av B.lv B.bv B.xv	48	Basalt volcanoclastic
YB.av YB.lv YB.bv	42	Basaltic Polymict volcanoclastic
Y.av Y.lv Y.bv	88	Polymict rock
av	52	Ash volcanoclastics (composition not determined)

SEDIMENTS

Ss	71	Sandstone, micaceous Greywacke
Sh	68	Shale, black (carbonaceous, pyritic)
Slt	69	Siltstone, tuffaceous Siltstone

SULPHIDES, SULPHATES

BMS	21	Base Metal Sulphide rock
MPy	29	Massive pyrite rock
GSP	23	Glassy silica, colloform pyrite rock
Ba	22	Barite

POST CAMBRIAN ROCKS

TB	8	Tertiary Basalt
JD	32	Jurassic Dolerite
OCg	20	Ordovician Siliciclastics

ALTERATION ROCK TYPES

HA	6	Highly altered rock
Qll	18	Quartzite
Q-lv Q-bv	17	Quartzite fragmental

PARTIAL STRATIGRAPHIC COLUMN

TB	8	TERTIARY BASALT
JD	32	JURASSIC DOLERITE
OCG	20	ORDOVICIAN SILICICLASTICS
URS	65	UPPER RHYOLITIC SEQUENCE
QRS	68	QUE RIVER SHALE
MGW	71	MT. CHARTER MICACEOUS GREYWACKE
HBS	45	HELLYER BASALT SEQUENCE
HVS	56	HANGINGWALL VOLCANICLASTIC SEQUENCE
SWB	56	SWITCHBACK VOLCANICLASTIC SEQUENCE
HMS	21	HELLYER MINERALISED SEQUENCE
FPS	48	ANDESITE FELDSPAR PHYRIC SEQUENCE

ALTERATION SYMBOLS Overprint on "HA" symbol (Combinations can be used)

	Carbonate		Illite
	Chlorite		Feldspar
	Fuchsite		Pyrite
	Sericite		Silica

SYMBOLS MAC79,110 AND MAC89,111 SERIES

(SYMBOLS AS SHOWN IN ABEX "STANDARDS FOR GEOLOGICAL DRAWINGS", JAN. 1983)

LINE THICKNESS / LEROY LETTER SIZE (LENGTH AS SHOWN)

35		Outcrop boundary
35		Floor
35		Contact known
35		Contact interpreted
35		Contact inferred
35		Facies change
35		Unconformity
25		Anticline, syncline with plunge and trend
25		Minor fold with plunge and trend
25/50		Bedding, strike, dip
25/50		Foliation, strike, dip
25/50		Joint, strike, dip
5/50,100		Fault, definite, strike, dip, mineralogy
5/100		Fault, inferred
35		Shear zone
35/60		DDH collar and trace, top 20m geology shown
25		Grid line, stadia surveyed
25		Grid line, tape and compass survey
25		Grid line, nominal position
/60		Petrology sample location
35		Track, unurveyed
35		Road (unsealed) or track, surveyed
7		Major road
35		Costean
25		Creek
35		Mining Lease boundary
5		Exploration Licence boundary
/60		Peg with number, tape and compass surveyed
/60		Peg with number, stadia surveyed
25		Alteration boundary

028058

Aberfoyle Exploration Pty Ltd

REVISIONS				NORTH WEST TASMANIA		Compiled	AMH
Init	Date	Init	Date	MACKINTOSH E.L.2/70, HATFIELD E.L.15/73		Drawn	AMH
GLC	12-85					Traced	GLC
GLC	1-86					Checked	AMH
SURFACE GEOLOGICAL MAPPING LEGEND				Date		November, 1985	
Location Code K55/6/44		Scale		Date		Plate No	
						MAC 114	

MACKINTOSH - MATFIELD GEOLOGICAL ABBREVIATIONS

rev. (850726.1610)

Copies to: RJE SMR
 AMH JRS
 DJJ DBW
 GJM

Abundant abn
 Adularia Adl
 Agglomerate agg
 Albite Ab
 Alkali feldspar Afd
 Altered alt
 Amphibole Amb
 Amygdaloidal amg
 Andesite A
 Angular ang
 Aplite Ap
 Approximate apx
 Arcuate ar
 Arenaceous arn
 Argillaceous arg
 Argillite Arg
 Arkose Ak
 Arkosic ak
 Arsenopyrite Ap
 Ash volcanoclastic av
 Autobrecciated aub
 Average ave
 Banded bnd
 Barite Ba
 Basalt B
 Bedded bd
 Black bk
 Black shale Bsh
 Blue bl
 Boulder bld
 Breccia b
 Breccia volcanoclastic bu
 Bright brt
 Brown br
 Calcareous cc
 Calcite Cc
 Carbonaceous g
 Carbonate Co
 Cavernous cav
 Chalcopyrite Cp
 Chert Ch
 Chlorite Cl
 Chromite Cr
 Chromiferous cr
 Clay cy
 Coarse c
 Coarse grained cg
 Colour col

Common com
 Conglomerate Cg
 Conglomeratic cg
 Crystal volcanoclastic xv
 Decite D
 Dark dk
 Dense dns
 Devitrification dv
 Diorite Di
 Disseminated dis
 Dolerite Do
 Dolomite Dm
 Dyke dy
 Elongated el
 Emphasised emp
 Epiclastic (adj.) e
 Epiclastic (noun) E
 Epidote Ep
 Euhedral euh
 Eutaxitic eux
 Fabric fab
 Fault F
 Fault zone FZ
 Feldspar Fd
 Feldspar phyrlic fp
 Ferruginous fer
 Fibrous fb
 Fine f
 Fine grained fg
 Fissile fis
 Floumbanded fbn
 Fragments fr
 Fuchsite Fu
 Galena Gn
 Glass Gl
 Glassy gl
 Granular glr
 Graphite Gt
 Graphitic gt
 Green gn
 Grey gy
 Greywacke Gw
 Ignimbrite Ig
 Illite Ill
 Interbedded ibd
 Intercalated icl
 Jurassic Ju
 K-Feldspar Kfd
 Khaki kh
 Laminated lm
 Lepilli volcanoclastic lv
 Lava l
 Leached lch
 Light lgt
 Lithic lh
 Magnetite Mt
 Massive mas
 Matrix mtx
 Matrix dominated md
 Medium med

Medium grained mg
 Micaceous mic
 Minor mnr
 Mixed mxd
 Mottled mtl
 Nodule nd
 Orange or
 Ordovician O
 Oxidised ox
 Patchy pat
 Peperitic pep
 Perlitic pri
 Pervasive per
 Phenocrysts phn
 Picrite Pic
 Pillow lava pl
 Pink pk
 Polymict Y
 Porphyritic por
 Pumice/pumiceous pu
 Purple pp
 Pyrite Py
 Pyritic py
 Pyroxene Px
 Quartz Q
 Quartzite Qtz
 Quillite Qll
 Questionable ?
 Recrystallised rx
 Rehealed rhd
 Reworked rw
 Rhyodacite RD
 Rhyolite R
 Round rnd
 Rubble rbb
 Sandstone Ss
 Schist Sch
 Schistose sch
 Sediment sed
 Selected fragments sfr
 Sericite Sa
 Serpentine Srp
 Shale Sh
 Sheared shd
 Siderite Sid
 Silica Si
 Siltstone Slt
 Slickenside slk
 Sphalerite Sp
 Spotted spt
 Spotty spt
 Stockwork stw
 Strong str
 Structure controlled stc
 Talc Tc
 Tertiary T
 Trace tr
 Trachyte Tr
 Tuff Tf
 Varicolitic vr

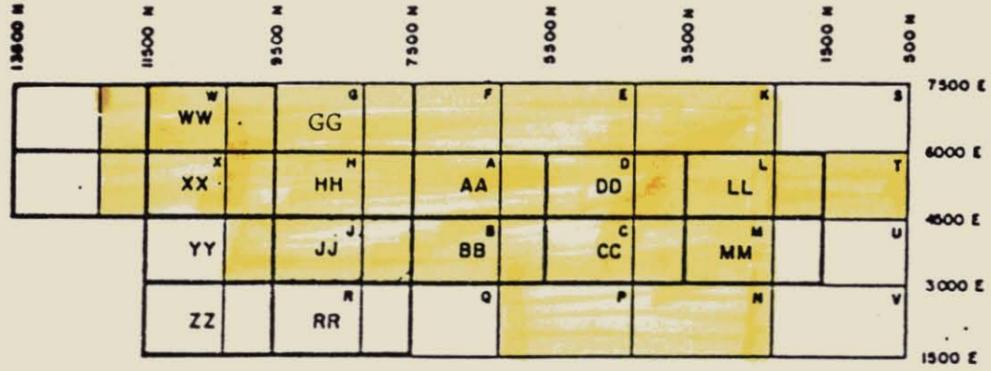
Uash un
 Uary v
 Vesicular ves
 Vitric utr
 Volcanic vic
 Volcanoclastic vlc
 Weak wk
 Weathered wth
 White wh
 Yellow yw

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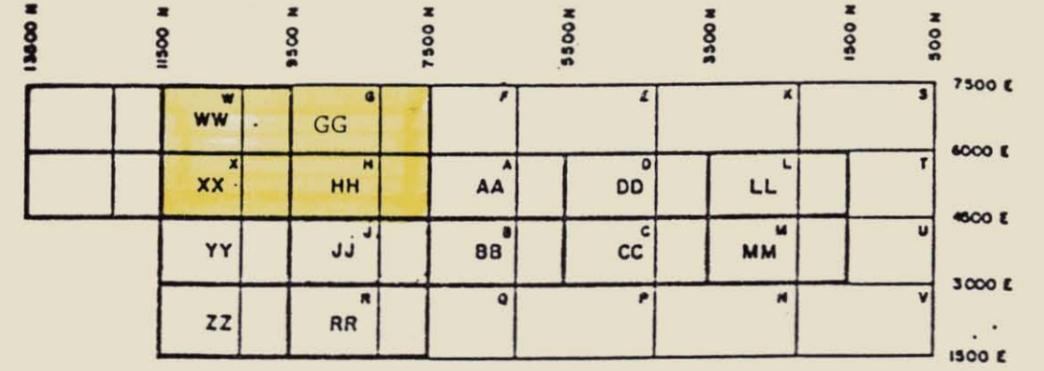
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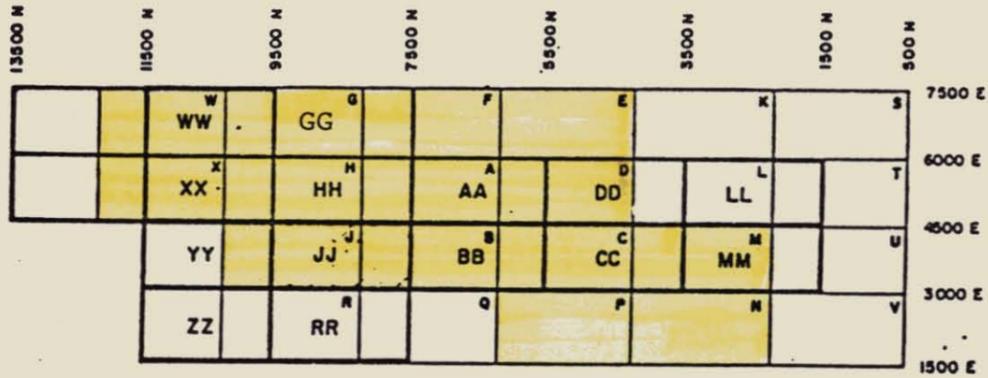
fig 47



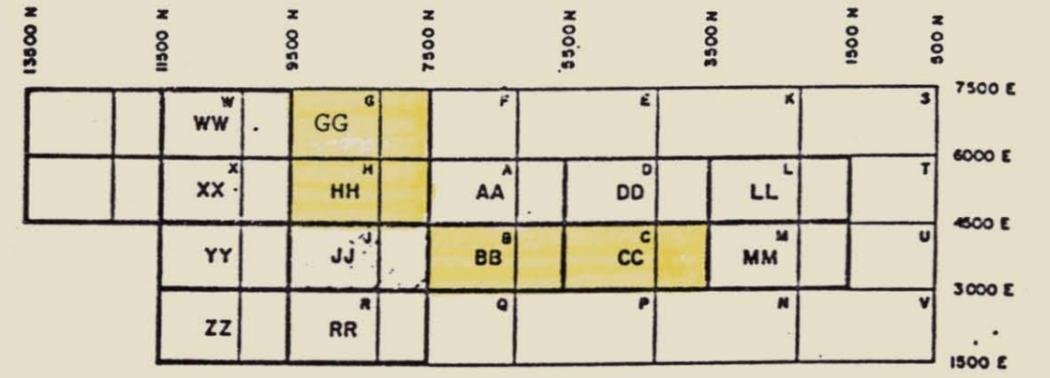
QR 81 SERIES - FACT GEOLOGY (PRE - 1983)



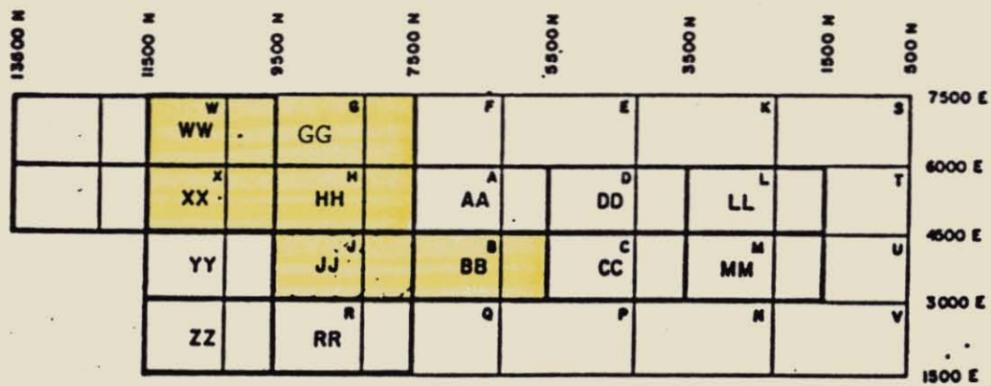
MAC 89 - INTERPRETIVE GEOLOGY



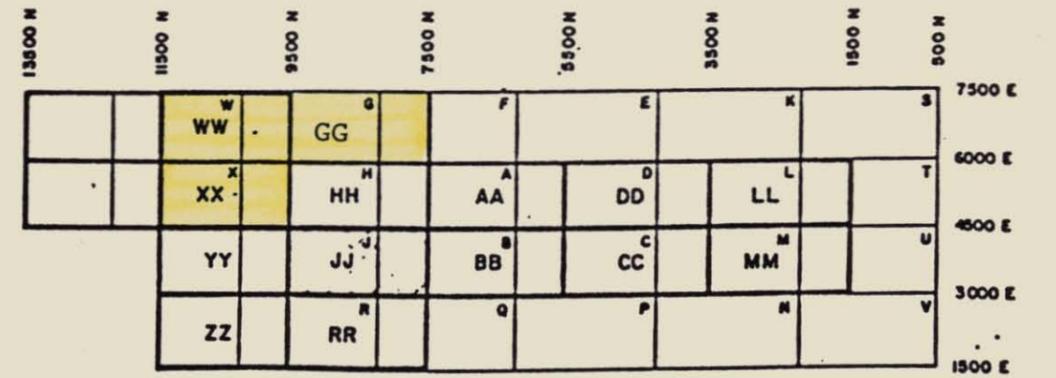
MAC 45(Cu) MAC 46(Pb) MAC 47(Zn) SOIL GEOCHEMISTRY



MAC 90 - GEOPHYSICAL SURVEY MAP (UTEM, IP/RESISTIVITY)

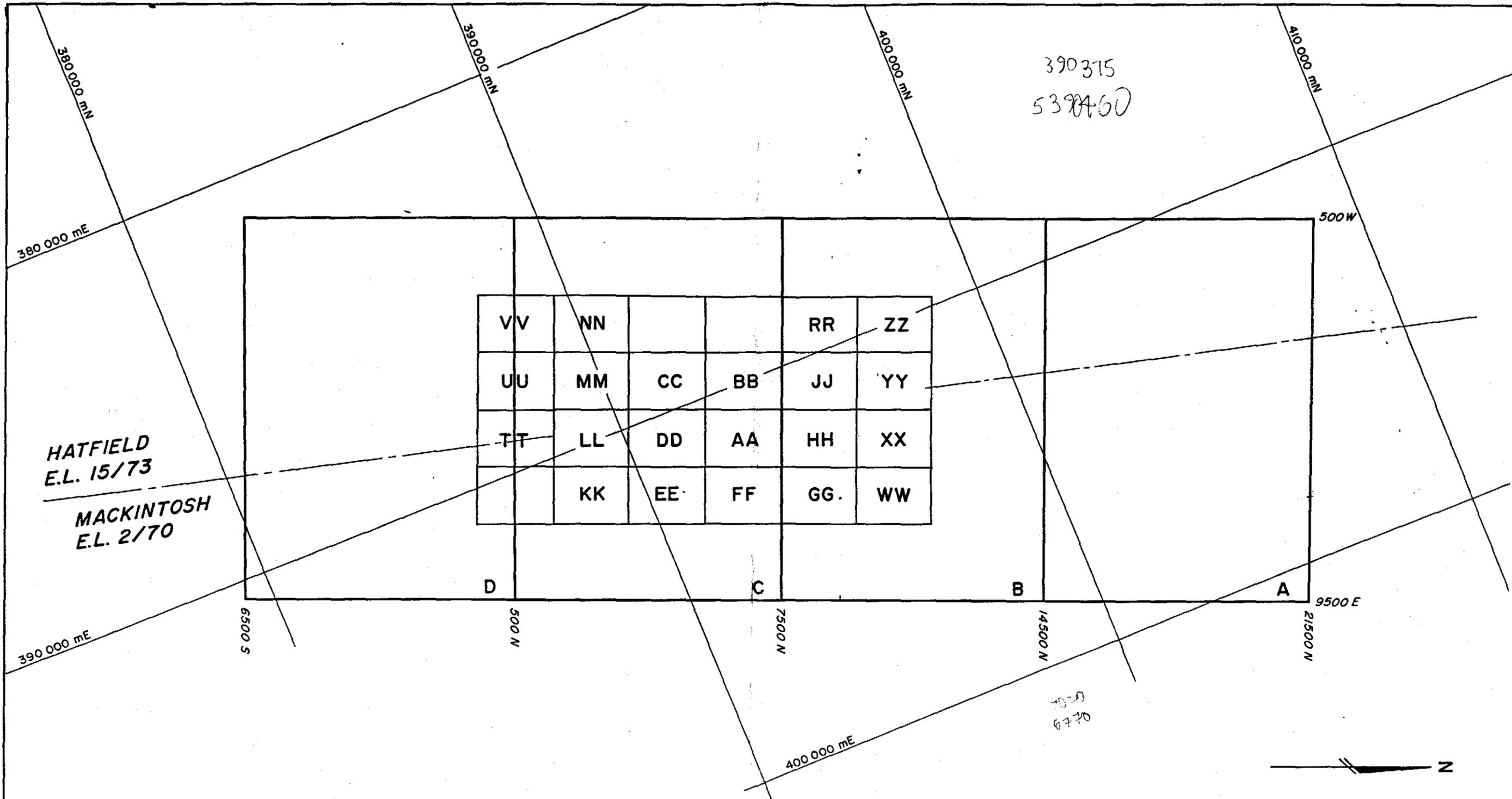


MAC 79 - FACT GEOLOGY (POST 1983)



MAC 88 - ROCK CHIP/WEATHERED ROCK GEOCHEMISTRY

650



HATFIELD
E.L. 15/73
MACKINTOSH
E.L. 2/70

HH MAC 79 SERIES

390 000 mN
AMG GRID

5 cm

028062

B MAC 109, 110, 111 SERIES

9500 E
21500 N
ABEX GRID

090

A Aberfoyle Exploration Pty Ltd																																																					
NORTH WEST TASMANIA																																																					
MACKINTOSH E.L. 2/70, HATFIELD E.L. 15/73																																																					
MAP INDEX FOR MAC 79 and MAC 109, 110, 111 SERIES																																																					
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Plate No:	MAC 118																																																				

Fig 49 RMC

061

028063

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15 WTACC;

<< Mackintosh/Hatfield - Tasmania >>

<< Latest update <851024.1028> >>

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<<===== ALL ITEM NAMES =====>>

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27	NSURV,	X6;	<<Number of surveys	n >>
28	NASIN,	X6;	<<Number of assay intervals	n >>
29	NORTH,	X8;	<<Collar Northing	n >>
30	EASTG,	X8;	<<Collar Easting	n >>
31	ALTIT,	X8;	<<Collar Reduced Level	n >>
32	DPCOL,	X8;	<<Depth of collar	n >>
33	MGSNTH,	X8;	<<MGS Northing-Graphic Selectn	n >>
34	STTUS,	X4;	<<Status of Data	KEY ITEM a >>
35			<< HOLE SIZE SET	>>
36	DHID2,	X10;	<<Drillhole Id	a/n>>
37	FROM2,	X6;	<<Depth FROM for hole/casing	n >>
38	TOTO2,	X6;	<<Depth TO for hole/casing	n >>
39	DATES,	X6;	<<Date drillhole started	n >>
40	DATEF,	X6;	<<Date drillhole finished	n >>
41	LOGBY,	X4;	<<Logged by	a/n>>
42	H SIZE,	X4;	<<Hole size	a/n>>
43	CTYPE,	X4;	<<Casing type	a/n>>
44	CSIZE,	X4;	<<Casing size(inside diameter)	n >>
45	COMMT,	X24;	<<Comments	a/n>>
46			<< SURVEY SET	>>
47	DHID3,	X10;	<<Drillhole Id	a/n>>
48	SRUDP,	X6;	<<Survey Depth	n >>
49	AZMTH,	X8;	<<Azimuth	n >>
50	DIPPP,	X6;	<<Dip (negative for DOWN hole)	n >>
51			<< ROCK GEOCHEM SET	>>
52	DHID4,	X10;	<<Drillhole Id	a/n>>
53	FROM4,	X6;	<<From	n >>
54	TOTO4,	X6;	<<To	n >>
55	SAMPNO,	X6;	<<Sample number	n >>
56	SAMPT,	X4;	<<Sample type	KEY ITEM a/n>>
57	ROCKT,	X4;	<<Rock type	KEY ITEM a/n>>

fig 50

062

028064

ALTN,	X6;	<<Alteration	KEY ITEM a/n>>
CUPPMR,	X6;	<<Copper ppm	- Cu n >>
PBPPMR,	X6;	<<Lead ppm	- Pb n >>
ZNPPMR,	X6;	<<Zinc ppm	- Zn n >>
AGPPMR,	X6;	<<Silver ppm	- Ag n >>
AUPPMR,	X6;	<<Gold ppm	- Au n >>
BAPPMR,	X6;	<<Barium ppm	- Ba n >>
ASPPMR,	X6;	<<Arsenic ppm	- As n >>
CRPPMR,	X6;	<<Chromium ppm	- Cr n >>
NIPPMR,	X6;	<<Nickel ppm	- Ni n >>
ZRPPMR,	X6;	<<Zircon ppm	- Zr n >>
TIPPMR,	X6;	<<Titanium ppm	- Ti n >>
SPARE1,	X6;	<<Spare 1 ppm	- ?1 n >>

		<< ASSAY SET	>>
DHID8,	X10;	<<Drillhole Id	a/n>>
FROM8,	X6;	<<From	n >>
TOT08,	X6;	<<To	n >>
SPGRAU,	X6;	<<Specific gravity	- Sg n >>
CU%,	X6;	<<Copper %	- Cu n >>
PB%,	X6;	<<Lead %	- Pb n >>
ZN%,	X6;	<<Zinc %	- Zn n >>
AGPPM,	X6;	<<Silver ppm	- Ag n >>
AUPPM,	X6;	<<Gold ppm	- Au n >>
BA%,	X6;	<<Barium %	- Ba n >>
AS%,	X6;	<<Arsenic%	- As n >>

<<----->>
 <<----- MASTER SETS ----->>

SETS:

1	NAME:	@MIDMH:20,A;	<< MASTER DRILL HOLE IDENTITY SET >>	<< 1 >>
2	ENTRY:	KDHID(5);		
3	CAPACITY:	53;		
4	NAME:	@MSSMH:20,A;	<< MASTER DATA STATUS SET	<< 2 >>
5	ENTRY:	KSTAT(1);		>>
6	CAPACITY:	7;		
7	NAME:	@MSTMH:20,A;	<< MASTER SAMPLE TYPE	<< 3 >>
8	ENTRY:	KSAMPT(1);		>>
9	CAPACITY:	11;		
10	NAME:	@MRKMH:20,A;	<< MASTER ROCK TYPE	<< 4 >>
11	ENTRY:	KROCKT(1);		>>
12	CAPACITY:	53;		
13	NAME:	@MALMH:20,A;	<< MASTER ALTERATION	<< 5 >>
14	ENTRY:	KALTN(1);		>>
15	CAPACITY:	19;		

fig 2

063

data-base @DBDMH:MH:20

master-set @MIDMH

page

Detail

Set :	@HIDMH	@HSZMH	@SVYMH	@RGCMH	@ASYMH
Item:	DHID1	DHID2	DHID3	DHID4	DHID8
HATD001	1	2	8	.	.
HATD002	1	2	8	.	.
HATD002A	1	2	10	.	.
HATD003	1	3	8	29	.
HATD004	1	4	21	45	.
HATD005	1	3	20	42	.
MACD001	1	3	16	40	.
MACD002	1	3	18	48	.
MACD003	1	4	10	71	.
MACD004	1	4	15	38	.
MACD005	1	4	18	45	.
MACD006	1	4	12	41	.
XDAD001	1	4	14	104	.
XDAD002	1	4	12	86	.
XDAD003	1	4	12	95	.
XDAD004	1	3	29	94	.
XDAD005	1	3	20	55	.
XHLD080	1	3	17	42	.
XMCD001	1	2	9	65	.
XMCD002	1	2	9	10	.
XMCD003	1	2	12	.	.
XMCD004	1	2	10	.	.
XMCD005	1	4	13	30	.
XMCD006	1	4	14	34	.
XMCD007	1	1	3	.	.
XMCD008	1	3	11	24	.
XMCD009	1	3	11	26	.
XMCD010	1	3	12	29	.
XMCD011	1	3	11	28	.
XMCD012	1	3	17	40	.
XMCD013	1	3	16	29	.
Totals	31	94	416	1190	0

total number of unique items = 31

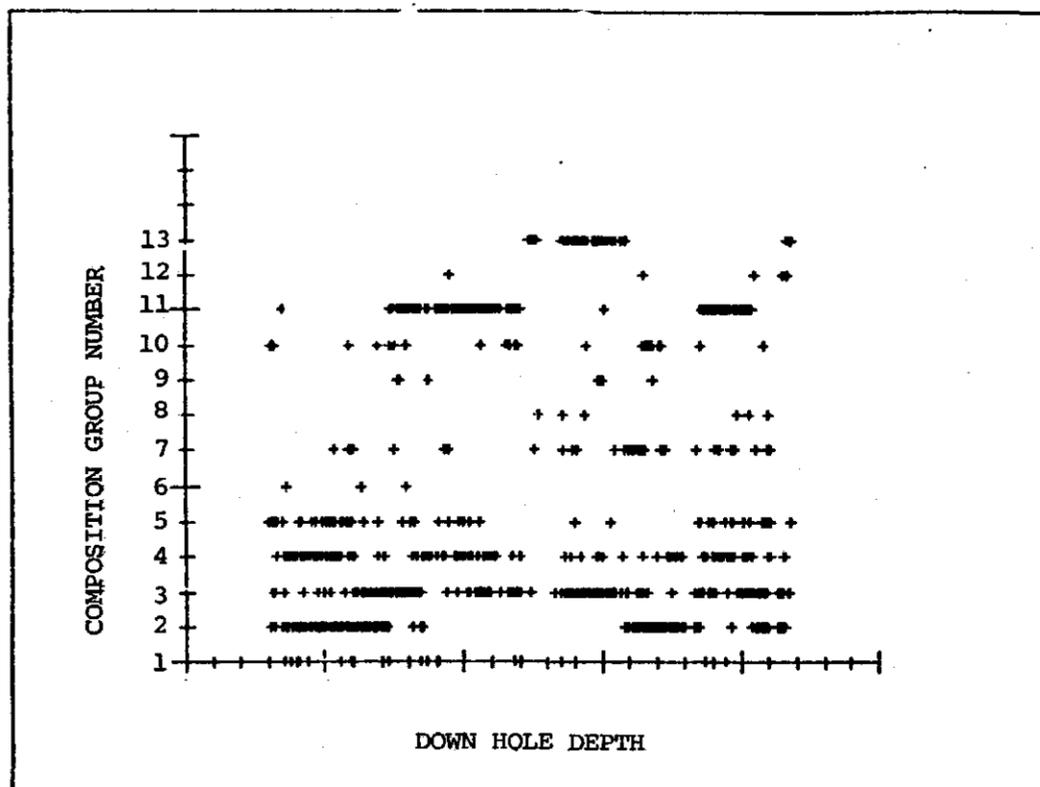
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064

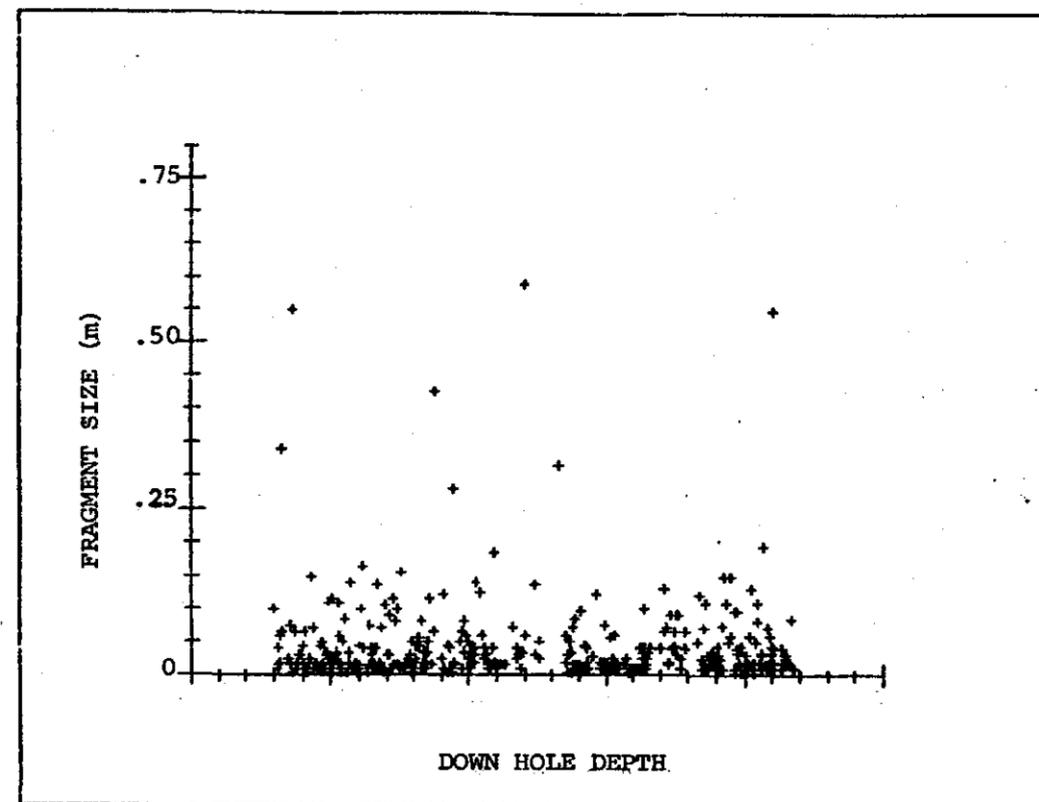
IMAGE/1000 DATA BASE SPACE UTILITY

DATA SET NAME	CAPACITY	FREE RECORDS	RECORDS USED	DIFFERENCE
@MIDMH	53	22	31	0
@MSSMH	7	6	1	0
@MSTMH	11	9	2	0
@MRKMH	53	52	1	0
@MALMH	19	18	1	0
@HIDMH	53	22	31	0
@HSZMH	159	65	94	0
@SUVMH	533	117	416	0
@RGCMH	3001	1811	1190	0
@ASYMH	1003	1003	0	0

END DBSPA
/OSP1 : STOP 00000



(a) Composition vs depth, matrix and fragments



(b) Fragment size vs depth, (matrix excluded)

No.	Name	#Obs
1	Not Ident.	16
2	Gy Fu Mat.	159
3	Pk Dacite	145
4	Gy/Pk Dac.	113
5	Gy Dacite	59
6	Fu Spots	3
7	Illite	40
8	Sulph Frag	6
9	Gy Chert	7
10	Qz/Co Uns	27
11	Cl/Fu Matx	132
12	Gn Ves Rck	5
13	Crn Matrix	63

(c) Composition name and corresponding number

Fig. 52 SUMMARY OF RESULTS OF DETAILED LOGGING OF SWITCHBACK VOLCANICLASTICS IN DDH MACD001 (206.0 - 249.0m)

090

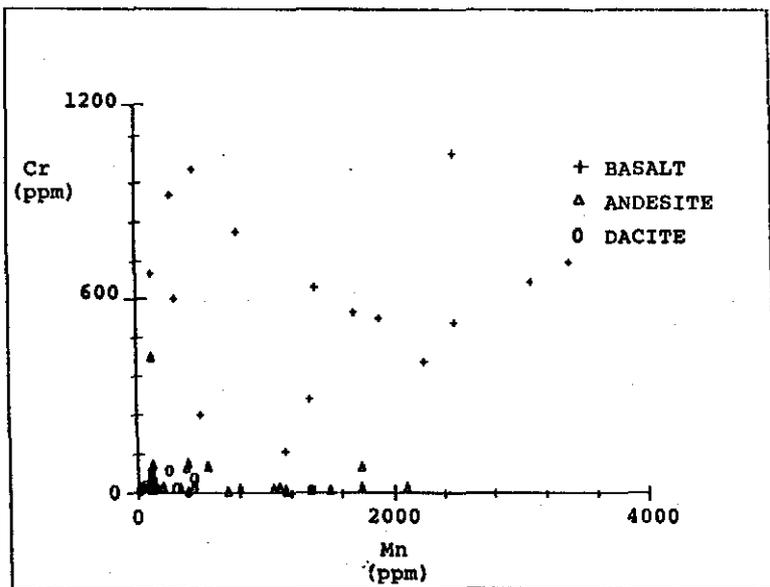


Fig. 53 (a) MACKINTOSH HATFIELD LITHOGEOCHEMICAL SAMPLES-Cr vs Mn

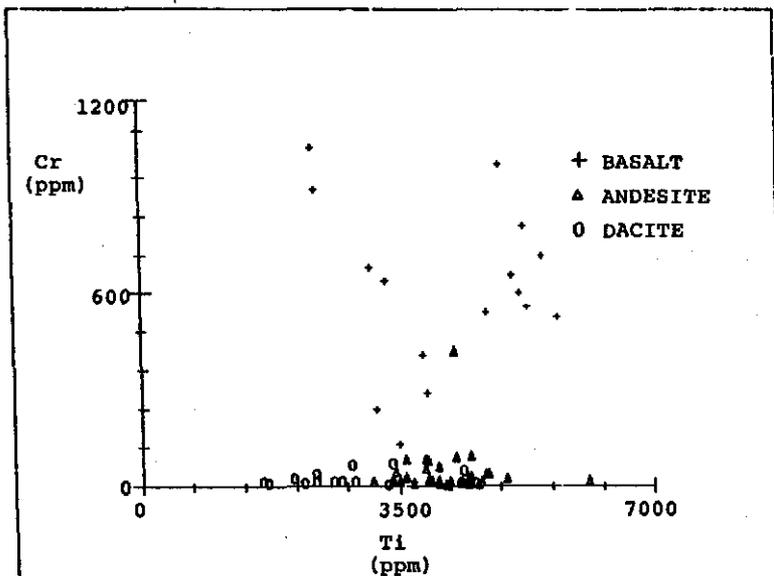


Fig. 53 (b) MACKINTOSH HATFIELD LITHOGEOCHEMICAL SAMPLES - Cr vs Ti

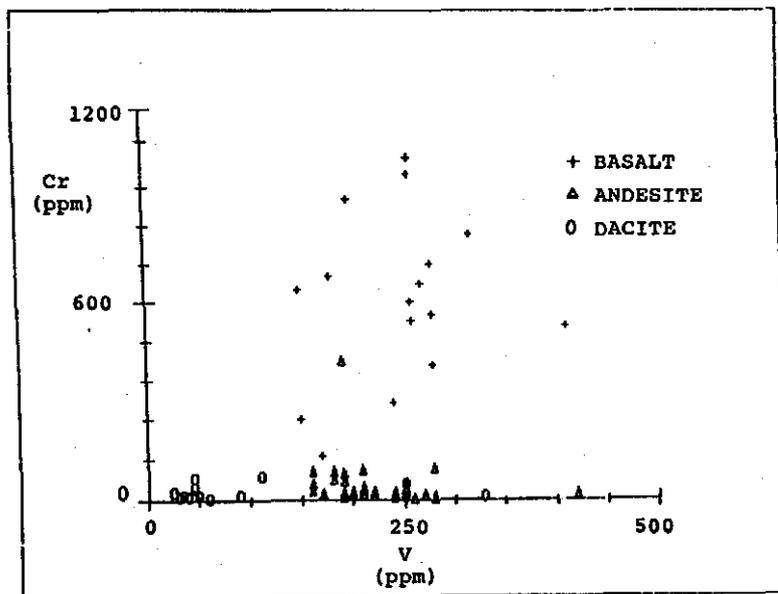


Fig. 53 (c) MACKINTOSH HATFIELD LITHOGEOCHEMICAL SAMPLES - Cr vs V

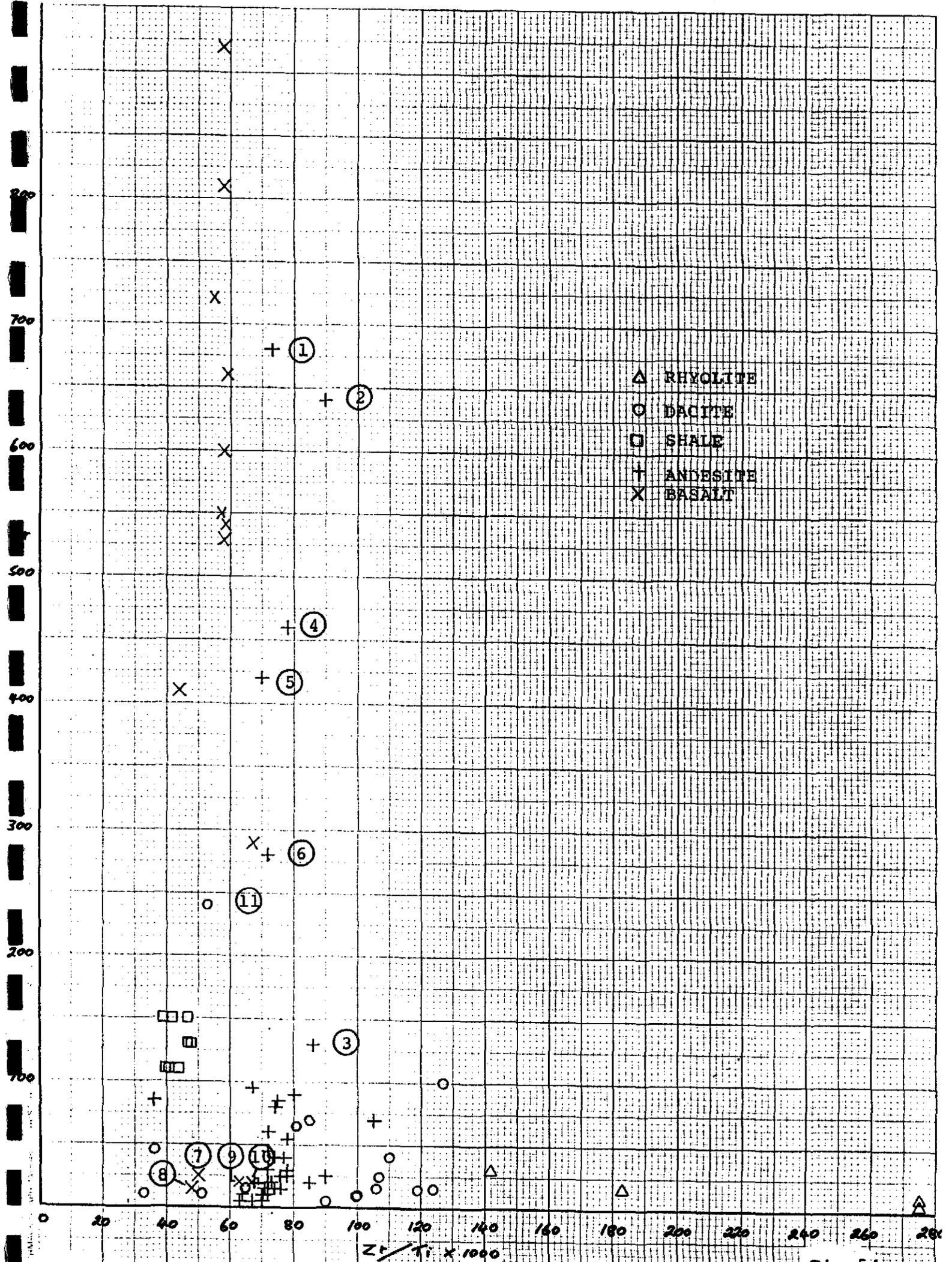


Fig 54

068

028070

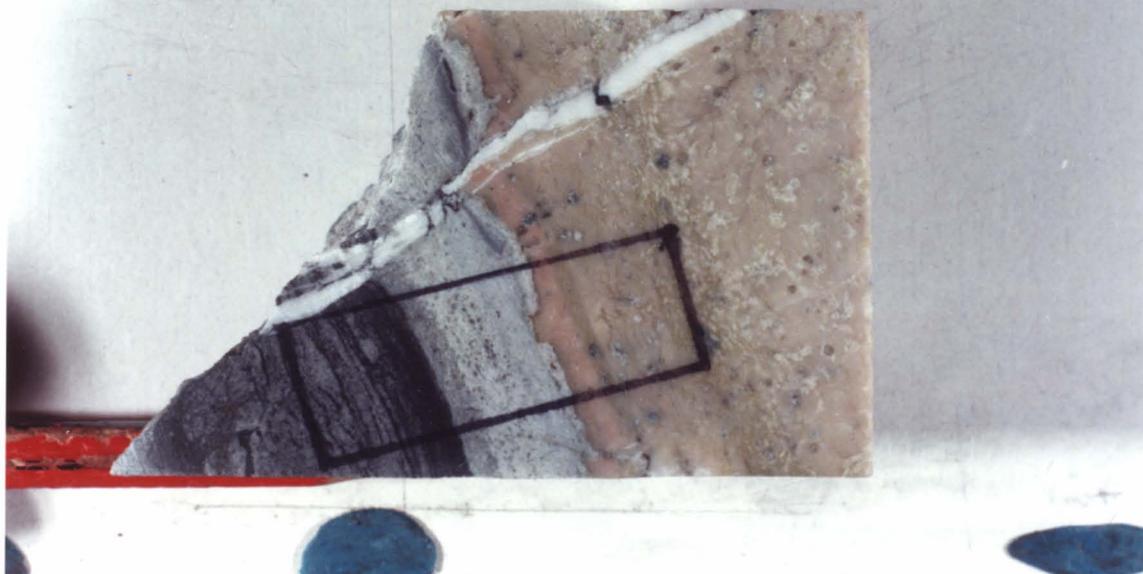
355079

DDH MAC-1/140.0



355085

DDH MAC-1/205.7



355081 DDH MAC-1/213.5



355082 DDH MAC-1/295.8



070

028072

355089

HL80

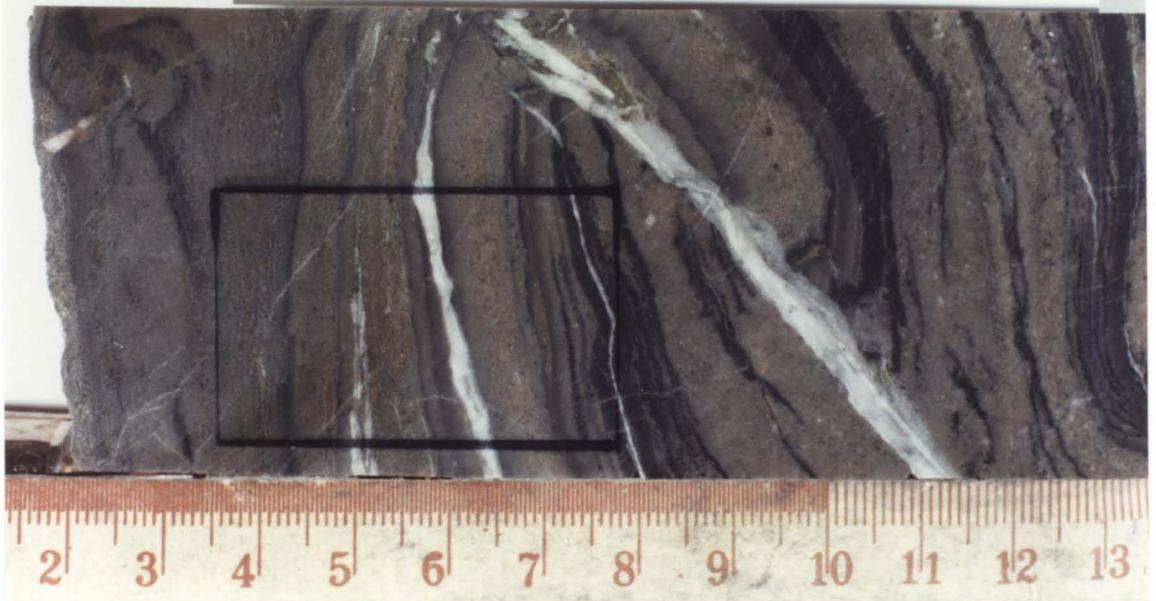
302.2m



355090

HL80

303.2m



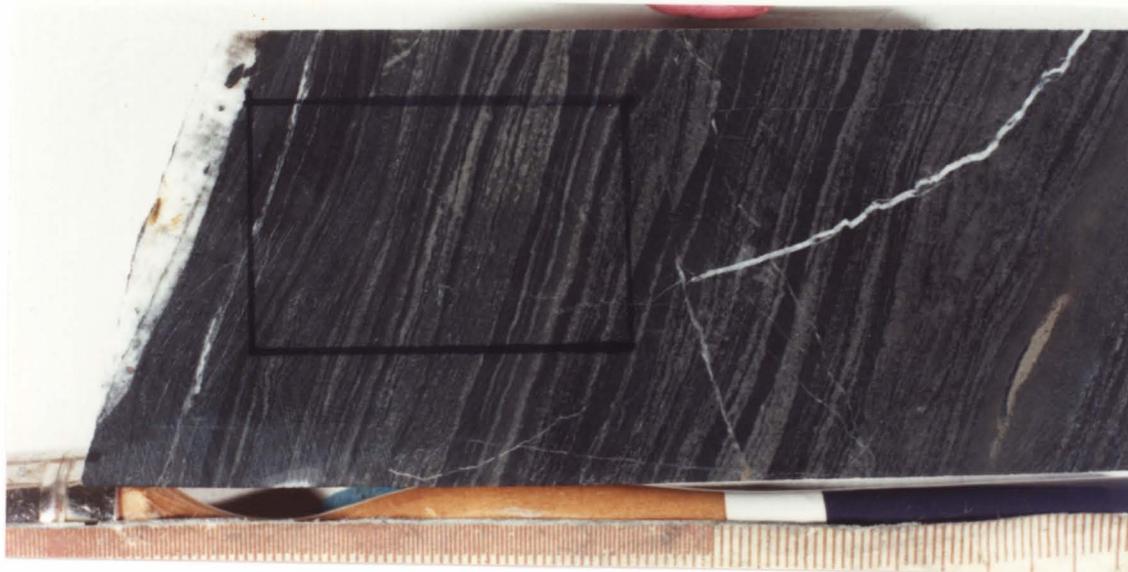
071

028073

355091

HL80

304.2m



355093

HL80

307.8m



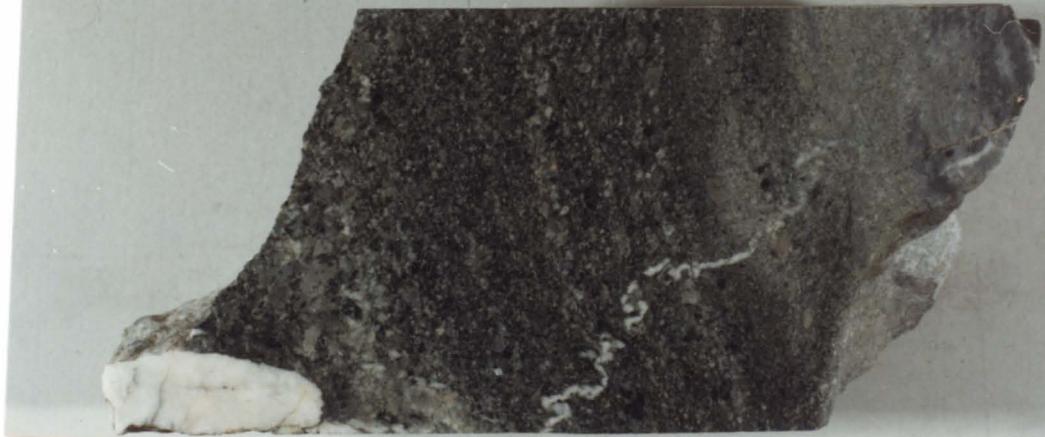
072

028074

355462

MAC-4

85.4



355463

MAC-4

165.0



073-20

028075

355464

MAC-4

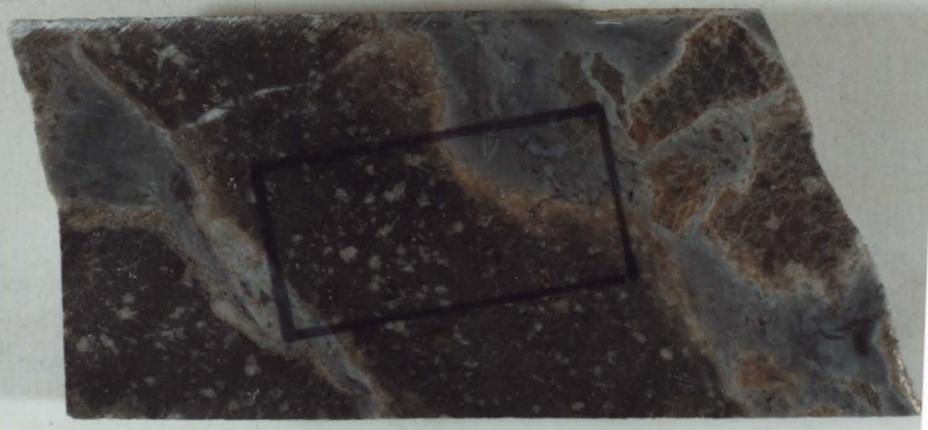
169.2



355465

MAC-4

173.2



028076

OPEN FILE

D.M.M.	A.G.	C.	E.C.	D.M.M.E.
				Registrar
D. DIR.	- 2 JUN 1986			E & IL
	DEPT. OF MINES			
REF. No.	5353			810

MACKINTOSH EXPLORATION LICENCE 2/70

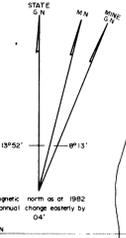
TASMANIA

PROGRESS REPORT

FOR THE PERIOD

MAY 1984 TO DECEMBER 1985

VOLUME 2 PLATES



E.L. 2/70

E.L. 15/73

ZONE H7

ZONE K

K1

K2

K3

AREA COVERED BY FEB 1984 UTEM SURVEY

LAKE MACKINTOSH

028077

5 cm

ABERFOYLE RESOURCES LTD.		
NORTH WEST TASMANIA		Location code: K55/6/44
Drawn: R J E	Date: February, 1986	
Traced: ACD	Scale: 1:10,000	
Checked:	Plate No:	
Revised by: Dore	Map: 122	

9400N 9300N 9200N 9100N 9000N 8900N 8800N 8700N 8600N

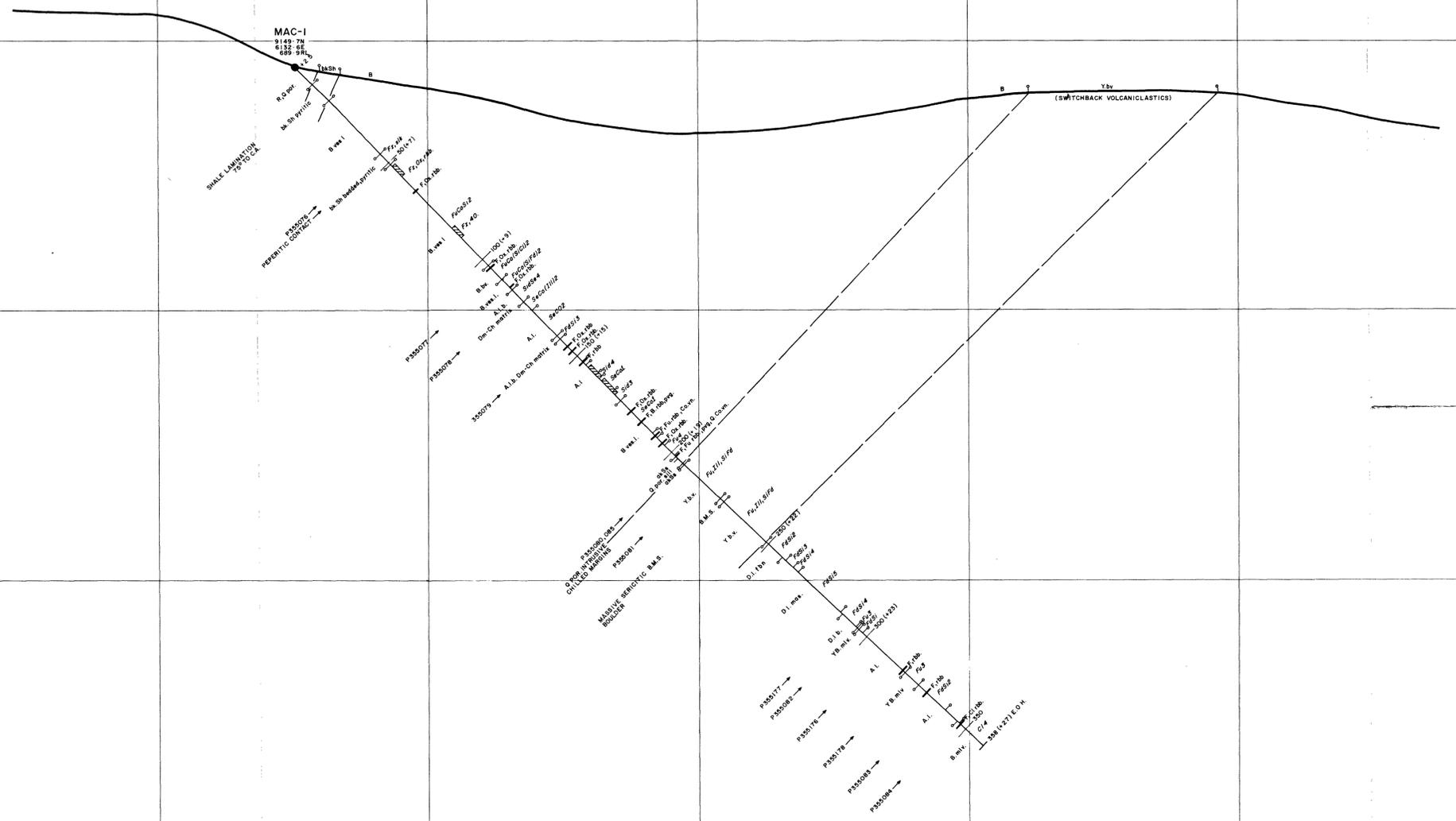
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700

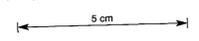
600

500

400



028078



Aberfoyle Exploration Pty Ltd

REVISIONS Init Date Init Date AMH 5 9 85		NORTH WEST TASMANIA MACKINTOSH EL 2/70 DDH MAC-1 ON LINE 6130E	Compiled: AMH Drawn: AMH Traced: KJO Checked:
Location Code: K553/44		Scale: 1:1000	Date: August, 1985 Plate No: MAC 108 A

9300N

9200N

9100N

9000N

8900N

8800N

8700N



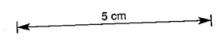
RL 700

600

500

400

028079

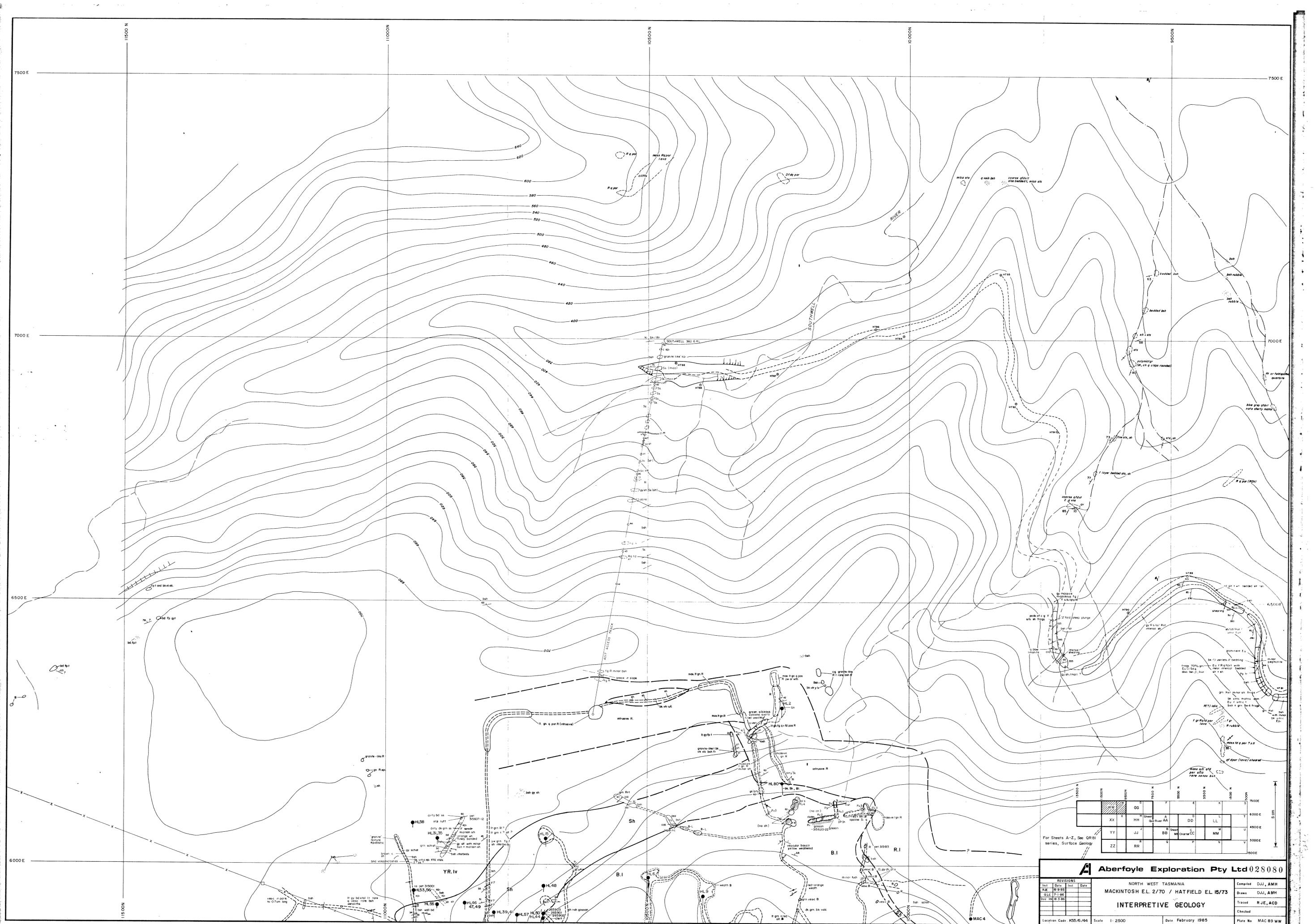


LEGEND

Sample No., Sample Type, Rock Type, Alteration, Cu, Pb, Zn, Ag, Au, Ba, As, Cr, Ni, Zr, Ti
 (All elements measured in ppm)

Aberfoyle Expl. 3. III.	
DDH MAC 1	
CORE GRIND GEOCHEMISTRY	
scale 1 :	1000.
drawn by: GREG CAYZER	
drwg rev: THU., 8 FEB., 1988	
GEODS/1000 by data science	

Plate No. MAC 108B



11500N	11600N	11700N	11800N	11900N	12000N	12100N	12200N	12300N	12400N	12500N
7500E	7600E	7700E	7800E	7900E	8000E	8100E	8200E	8300E	8400E	8500E
7000E	7100E	7200E	7300E	7400E	7500E	7600E	7700E	7800E	7900E	8000E
6500E	6600E	6700E	6800E	6900E	7000E	7100E	7200E	7300E	7400E	7500E
6000E	6100E	6200E	6300E	6400E	6500E	6600E	6700E	6800E	6900E	7000E

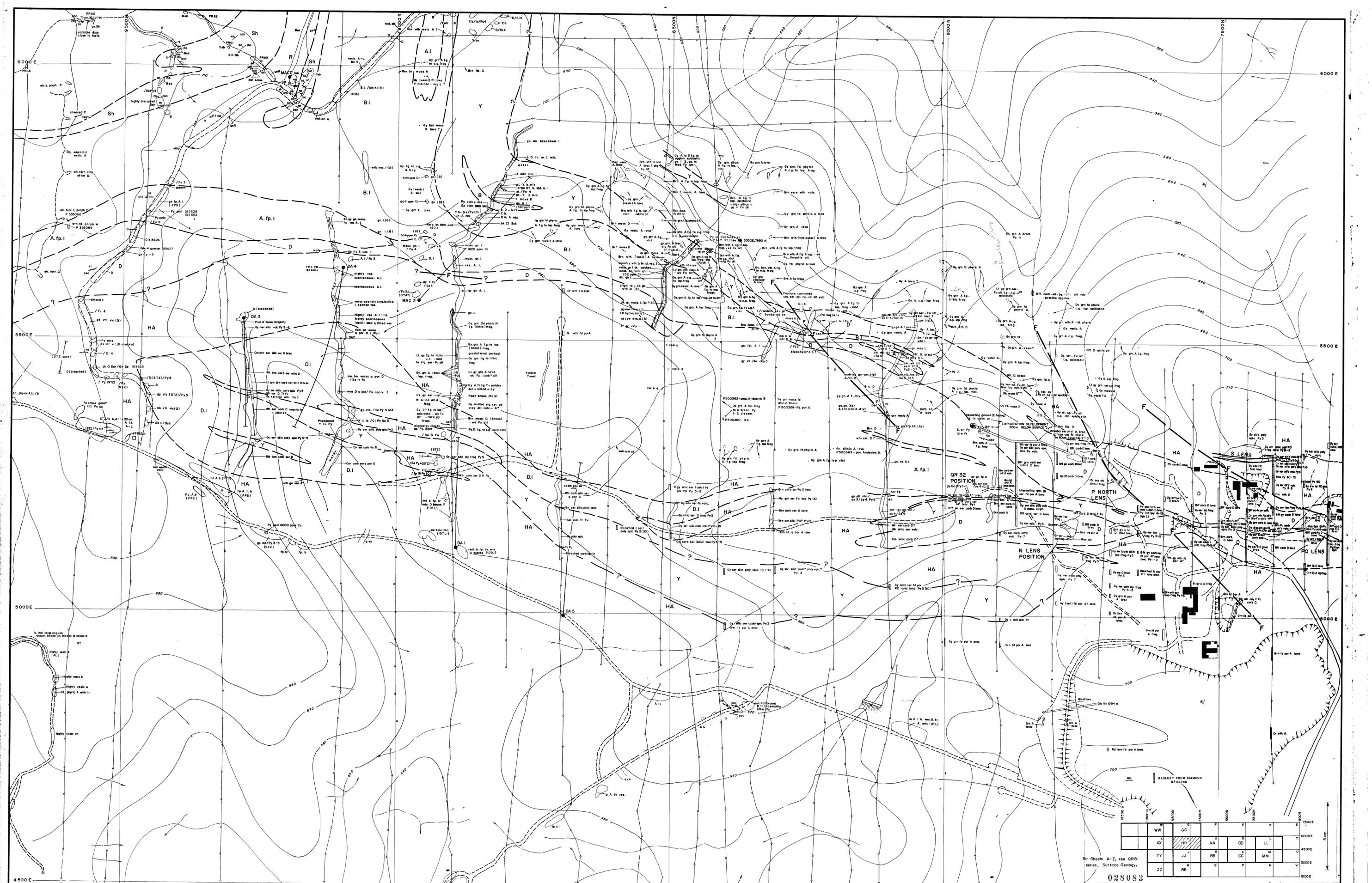
Aberfoyle Exploration Pty Ltd 028080

NORTH WEST TASMANIA
 MACKINTOSH EL. 2/70 / HATFIELD EL. 15/73
 INTERPRETIVE GEOLOGY

Location Code K55,6/44 Scale 1:2500 Date February 1985 Plate No MAC 89 WW

REVISIONS		REVISED BY		CHECKED BY	
1	15/85	DJJ	AMH		
2	15/85	DJJ	AMH		
3	15/85	DJJ	AMH		

Compiled DJJ, AMH
 Drawn DJJ, AMH
 Traced RJE, ACD
 Checked



028083

Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
 MACKINTOSH E.L. 2/70 / HATFIELD E.L. 15/73

INTERPRETIVE GEOLOGY

Location Code: Y55/6/44 Scale: 1:2500 Date: January, 1986 Plate No: M08/9/H

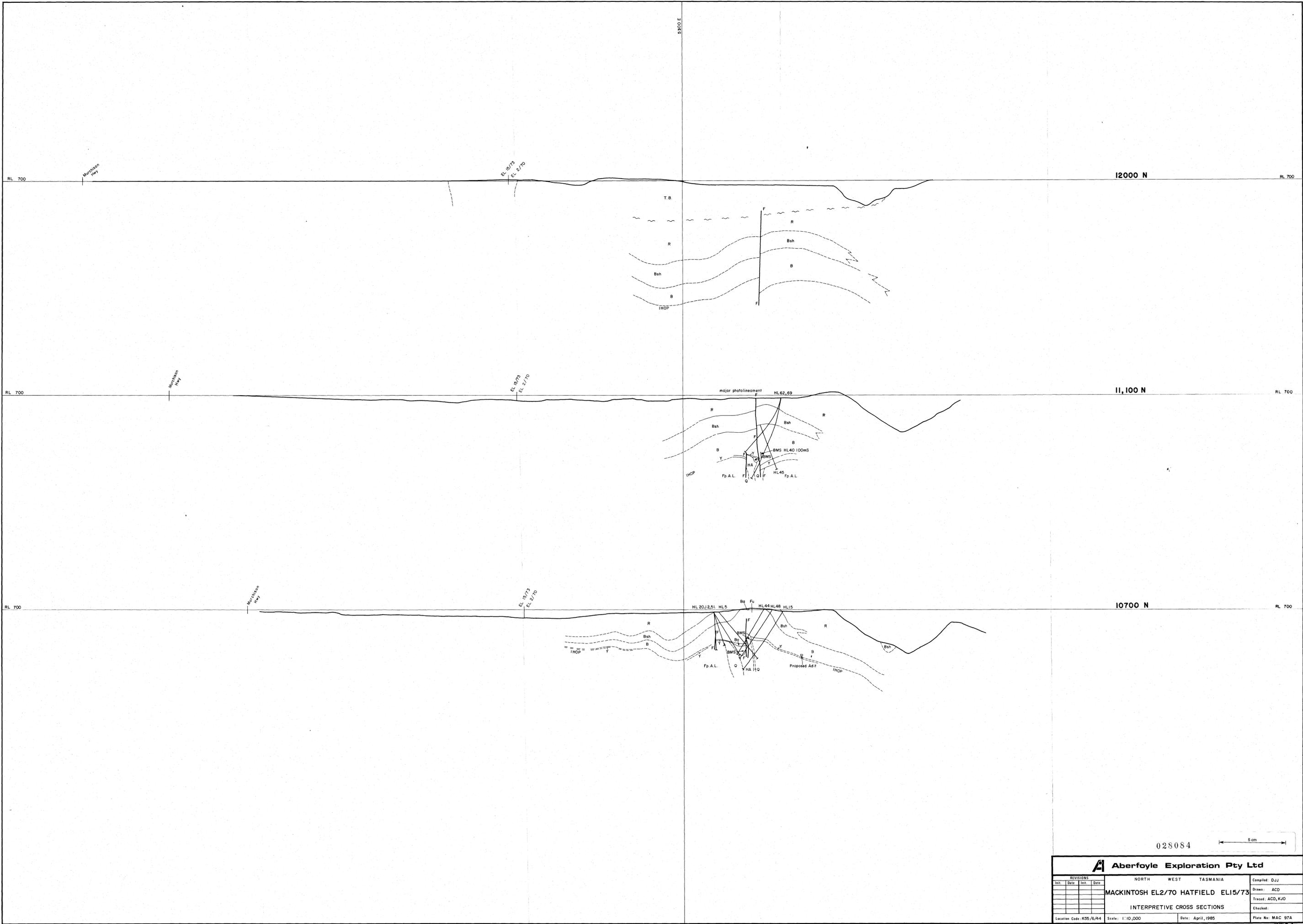
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YY	JJ	BB	CC	MM	UU	
ZZ	RR	Q	P	N	V	

For Sheets A-Z, see ORBI series, Surface Geology.

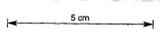
REVISIONS

No.	Date	By	Desc.

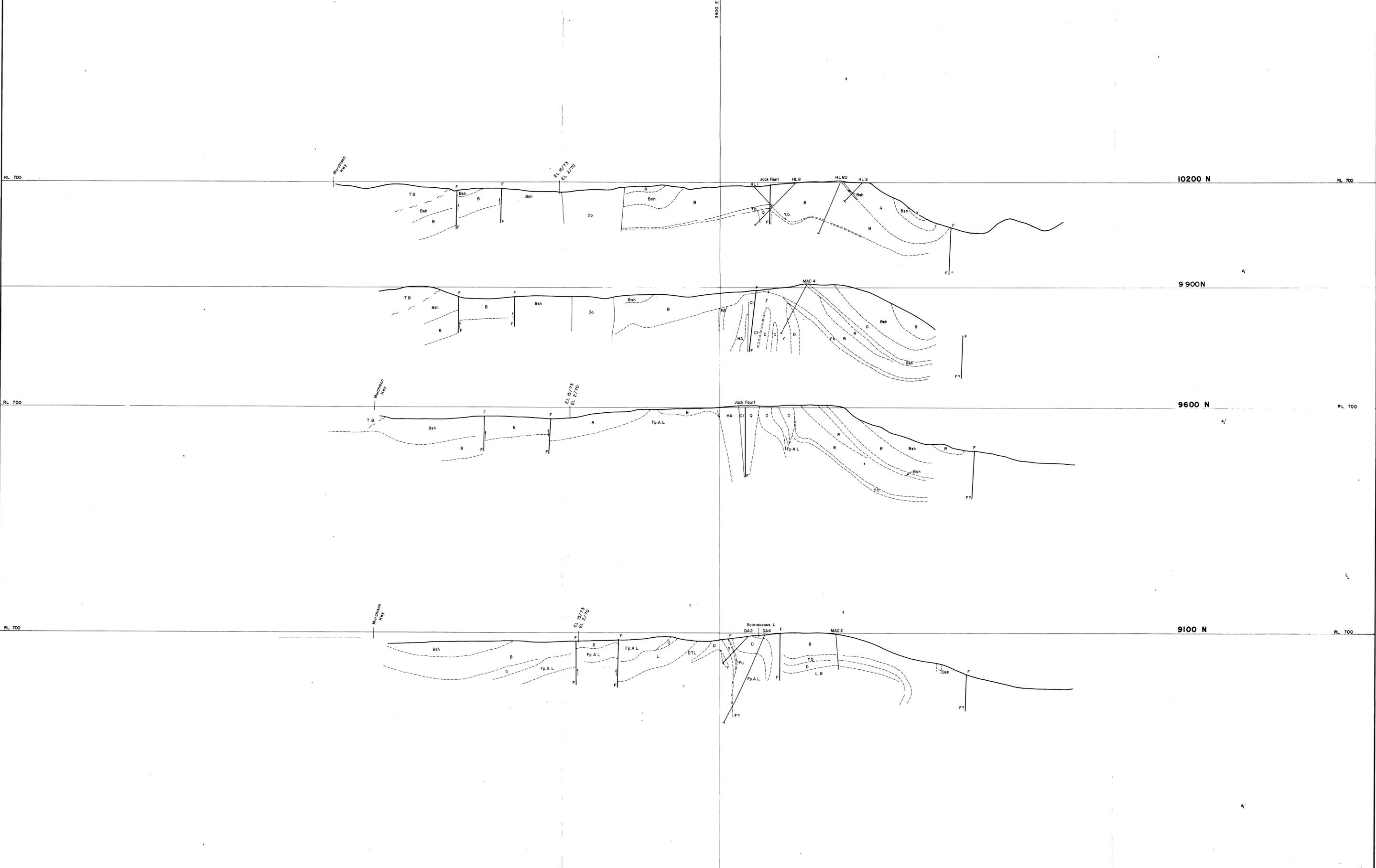
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 Drawn: DBW/AMH
 Traced: ACD/GLC
 Checked:



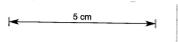
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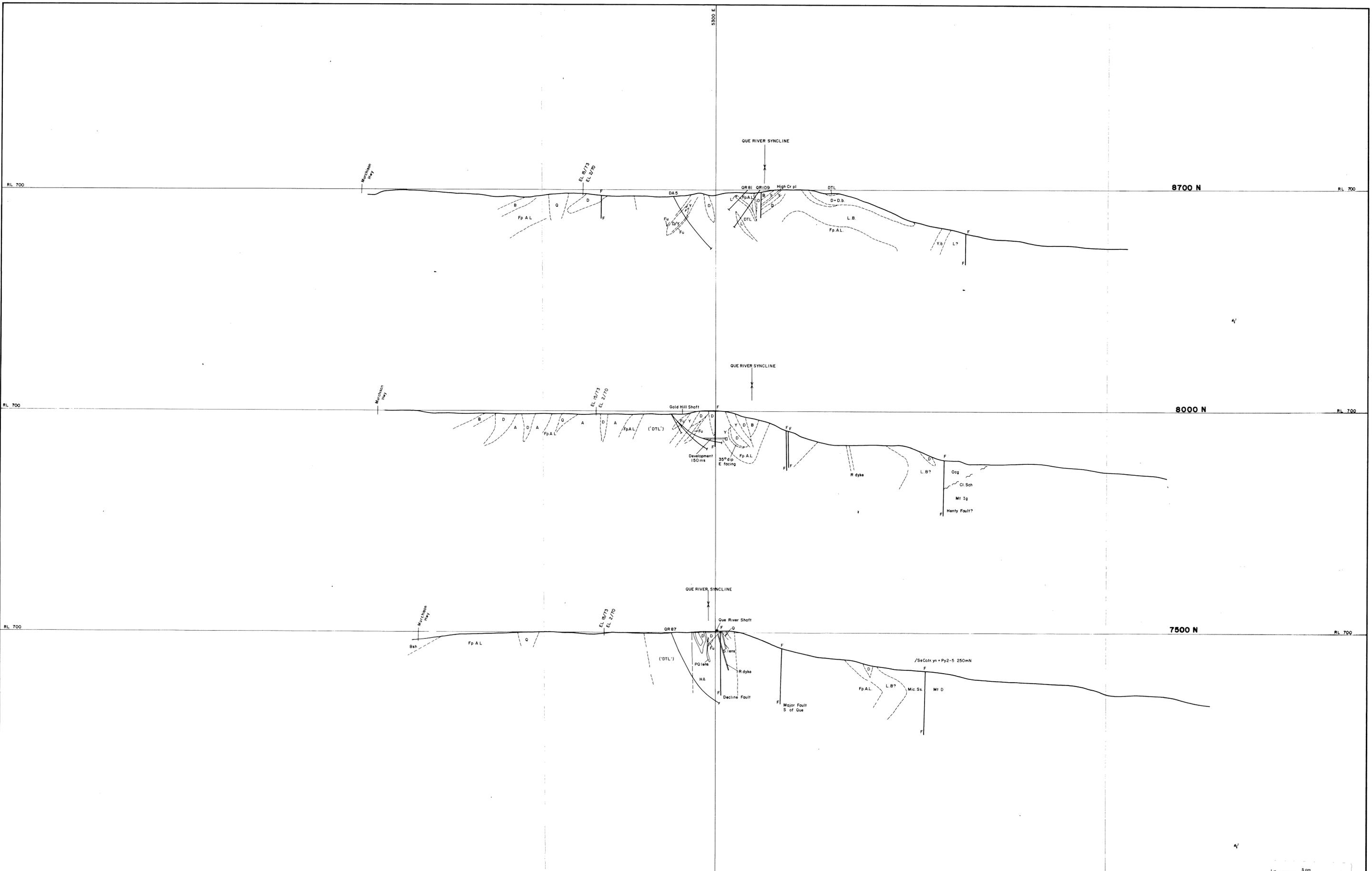
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				MACKINTOSH EL2/70 HATFIELD EL15/73 Drawn: ACD Traced: ACD, KJO Checked: _____		
INTERPRETIVE CROSS SECTIONS Location Code: K05/6A4 Scale: 1:10,000 Date: April, 1985 Plate No: MAC 97A				36-2551 214 5794		



028055



Aberfoyle Exploration Pty Ltd			
NORTH WEST TASMANIA		Compiled: DJJ	
MACKINTOSH EL2/70 HATFIELD EL15/73		Drawn: ACD	
INTERPRETIVE CROSS SECTIONS		Traced: ACD, KJO	
Location Code: K55/6/44		Checked:	
Scale: 1"=10,000	Date: April, 1985	Plate No: MAC 97B	



028086

Aberfoyle Exploration Pty Ltd

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Rev	Date	Int	Date	Drawn: ACD
				Traced: ACD, KJO
				Checked: ACD
Location Code: K55/6/44		Scale: 1:10,000	Date: April, 1985	Plate No: MAC 97 C

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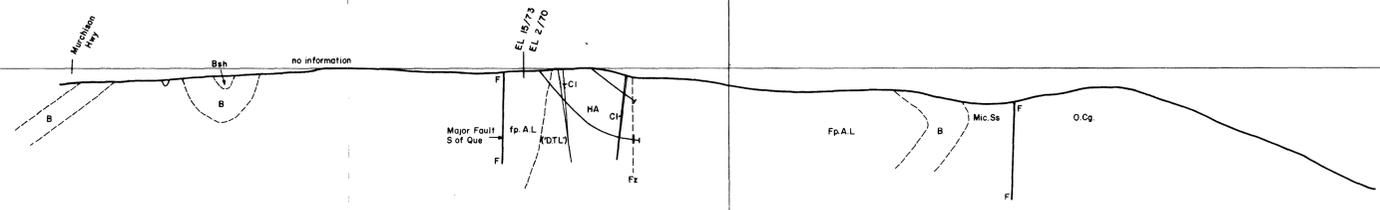
MACKINTOSH EL2/70 HATFIELD EL15/73

36-2551 24 5796 RMO 566

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6700 N

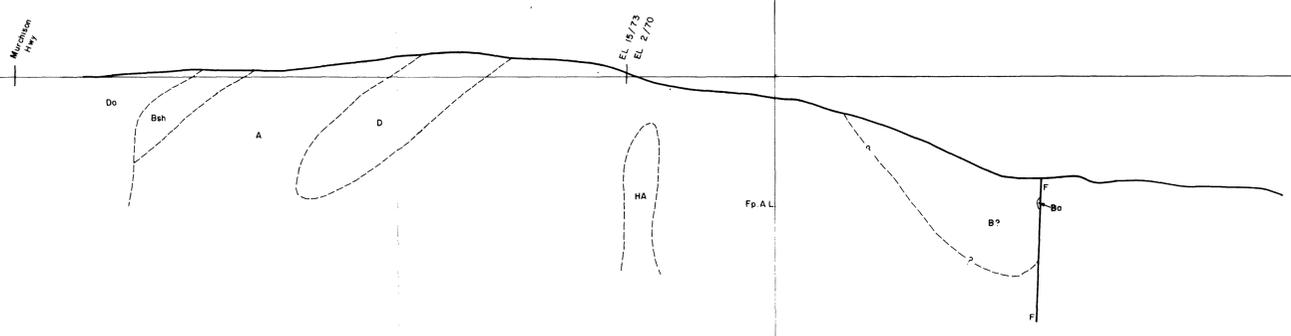
RL 700



RL 700

5200 N

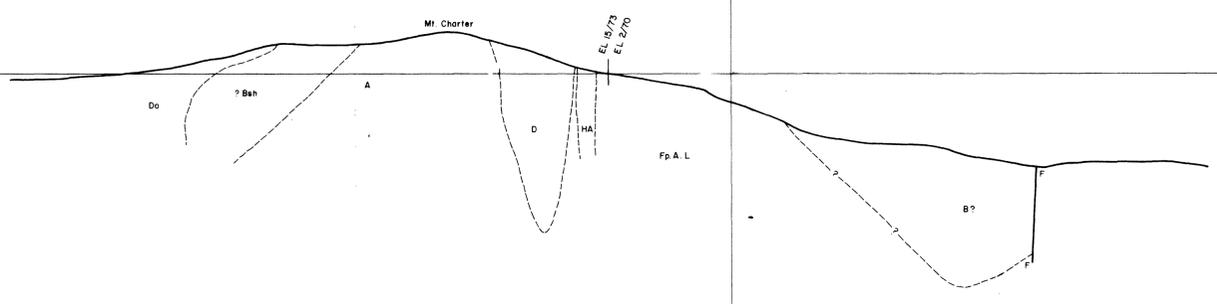
RL 700



RL 700

4500 N

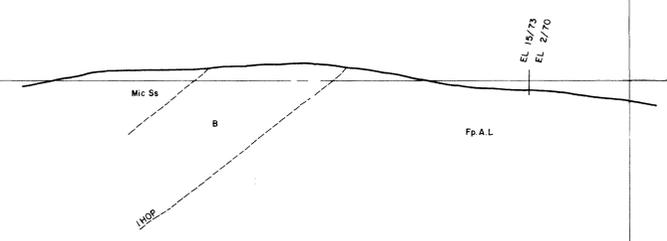
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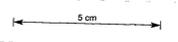
RL 700

3900 N

RL 700



028087



Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA

MACKINTOSH EL2/70 HATFIELD EL15/73

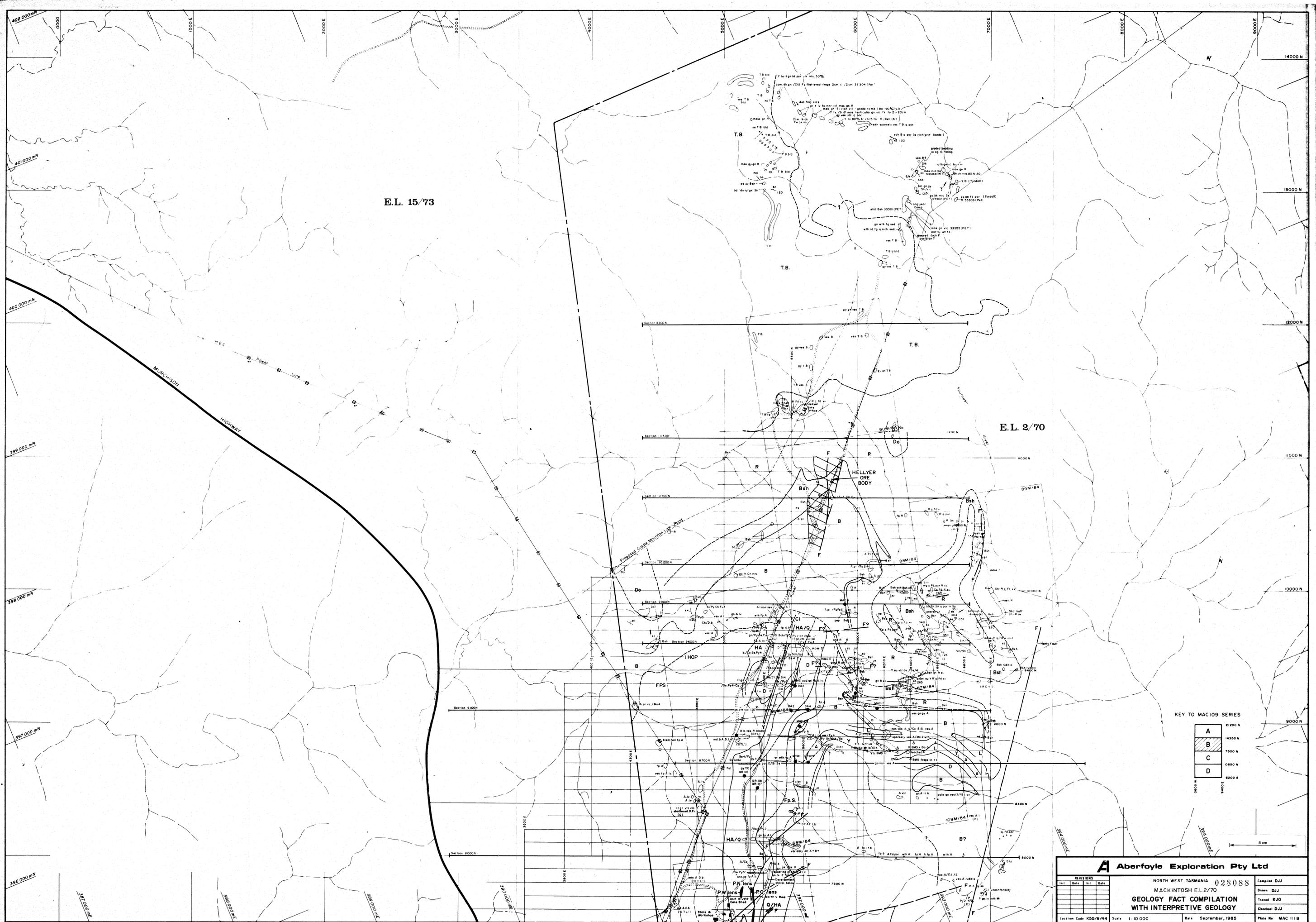
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REVISIONS			
Int	Date	Int	Date

Computed: DJJ
 Drawn: ACD
 Traced: ACD, KJO
 Checked:
 Plate No: MAC 97 D

5797 RMO 556



E.L. 15/73

E.L. 2/70

MURCHISON
HIGHWAY

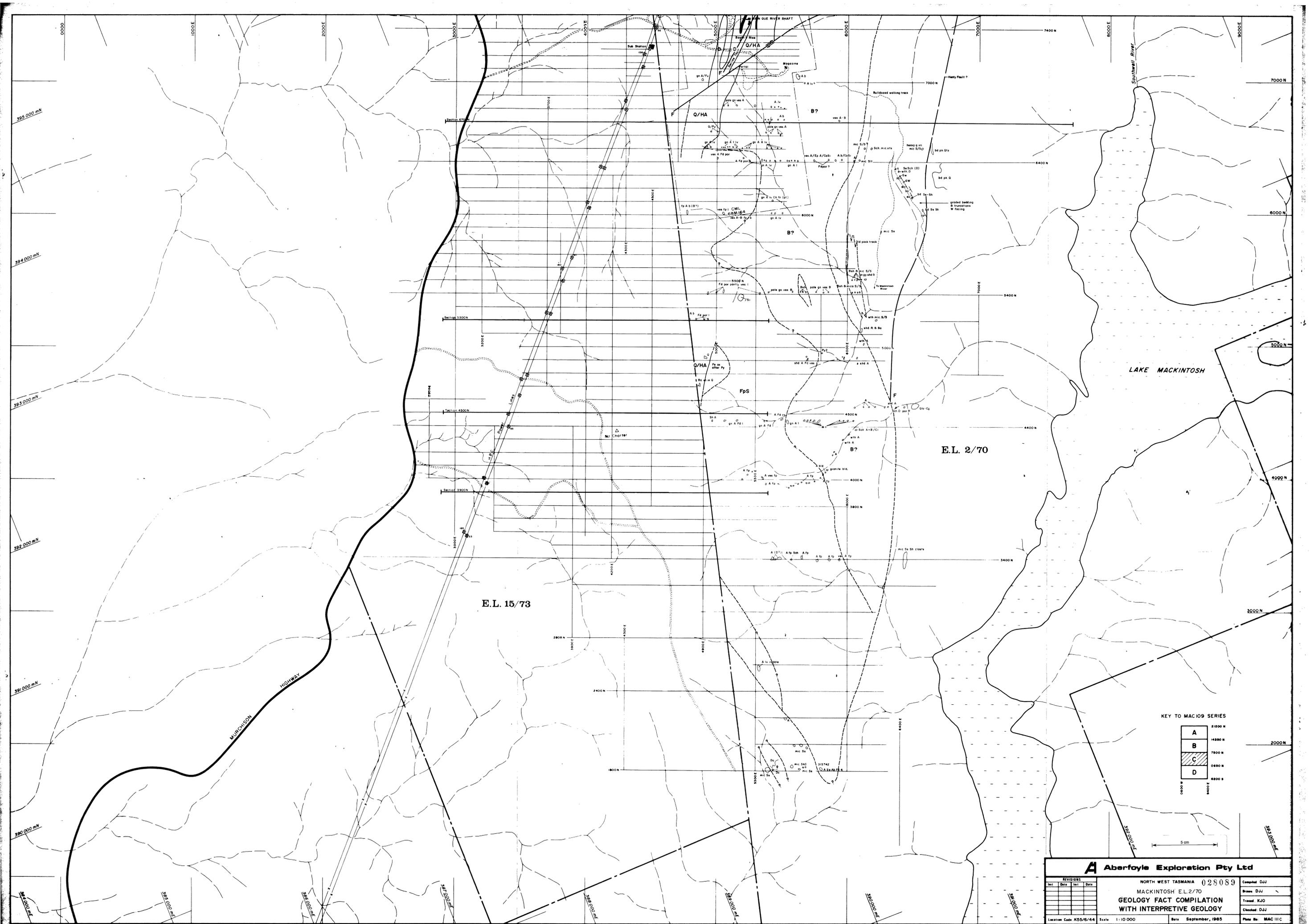
HELLYER
ORE
BODY

KEY TO MAC109 SERIES

A	14200 N
B	14300 N
C	14400 N
D	14500 N

A Aberfoyle Exploration Pty Ltd

REVISIONS		NORTH WEST TASMANIA 028088		Compiled DJJ
1	1985	MACKINTOSH E.L.2/70		Drawn DJJ
GEOLOGY FACT COMPILATION				Traced KJO
WITH INTERPRETIVE GEOLOGY				Checked DJJ
Location Code K25/6/44	Scale 1:10 000	Date September, 1985	Plate No. MAC 111 B	



LAKE MACKINTOSH

E.L. 2/70

E.L. 15/73

KEY TO MACIOS SERIES

A	21800 N
B	14880 N
C	7800 N
D	0880 N

5 cm

A Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA 028089

MACKINTOSH E.L. 2/70

GEOLOGY FACT COMPILATION WITH INTERPRETIVE GEOLOGY

Location Code: K55/6/44 Scale: 1:10,000 Date: September, 1985 Plate No: MAC III C

REVISIONS	
Int.	Date

Compiled: DJJ
 Drawn: DJJ
 Traced: KJO
 Checked: DJJ

5900E

6000E

6100E

6200E

6300E

6400E

RL 700

600

500

400

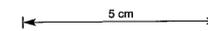
333177\CGR\1130\105\405\210.02\621\56\219\11
 333178\CGR\1125\135\350\210.01\522\48\599\11
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 333180\CGR\1140\25\155\71-0.008\387\10\546\11
 333181\CGR\1118\140\190\71\0.01\370\1-2\534\11
 333182\CGR\1100\40\110\71\0.02\389\6\598\11
 333183\CGR\1175\25\190\0.5\0.02\374\17\492\11
 333184\CGR\1165\50\195\0.5\0.01\278\7\663\11
 333185\CGR\1145\20\195\71-0.008\237\11\647\11
 333186\CGR\1130\50\125\0.5\0.008\221\4\456\11
 333187\CGR\1145\70\124\5\1.5\0.008\221\4\456\11
 333188\CGR\1190\50\105\71-0.008\288\5\347\11
 333189\CGR\1175\110\225\1.5\0.008\303\2\410\11
 333190\CGR\1140\55\780\1.5\0.008\323\12\448\11
 333191\CGR\1140\75\240\71-0.008\194\10\448\11
 333192\CGR\1150\95\475\71-0.008\267\10\307\11
 333193\CGR\1165\185\480\7.5\0.02\638\18\392\11
 333194\CGR\1165\125\485\71-0.008\635\7\396\11
 333195\CGR\1170\235\520\1-0.5\0.008\932\21\408\11
 333196\CGR\1165\245\460\71-0.008\389\1-2\400\11
 333197\CGR\1160\165\530\71-0.008\508\7\459\11
 333198\CGR\1160\105\285\0.5\0.07\152\8\567\11
 333199\CGR\1180\45\150\71-0.008\700\5\322\11
 333200\CGR\1185\350\890\0.5\0.01\398\1-2\436\11
 333201\CGR\1185\135\450\0.5\0.008\507\1-2\428\11
 333202\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333203\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333204\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333205\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333206\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333207\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333208\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333209\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333210\CGR\1185\135\450\0.5\0.008\507\1-2\436\11
 333211\CGR\1180\225\600\1-0.5\0.008\354\9\1-9\11
 333212\CGR\1100\210\340\0.5\0.008\199\11\332\11
 333213\CGR\1140\265\870\1-0.5\0.008\507\1\39\11
 333214\CGR\1190\615\1950\1-0.5\0.008\418\4\450\11
 333215\CGR\11260\295\810\0.5\0.008\847\1-2\478\11
 333216\CGR\1195\125\370\0.5\0.008\810\5\362\11
 333217\CGR\1180\70\275\71-0.008\955\1-2\420\11
 333218\CGR\1175\130\565\71-0.008\739\1-2\443\11

X-ILDOB

LEGEND

Sample No., Sample Type, Rock Type, Alteration, Cu, Pb, Zn, Ag, Au, Ba, As, Cr, Ni, Zr, Ti
(All elements measured in ppm)

028091



Aberfoyle Expl. #. III.

DDH HL80
CORE GRIND GEOCHEMISTRY

scale 1 : 1000.

drawn by: GREG CAYZER
drwg rev: THU.. 6 FEB.. 1988
GEODS/1000 by data science

Plate No. MAC 106B

5600 E

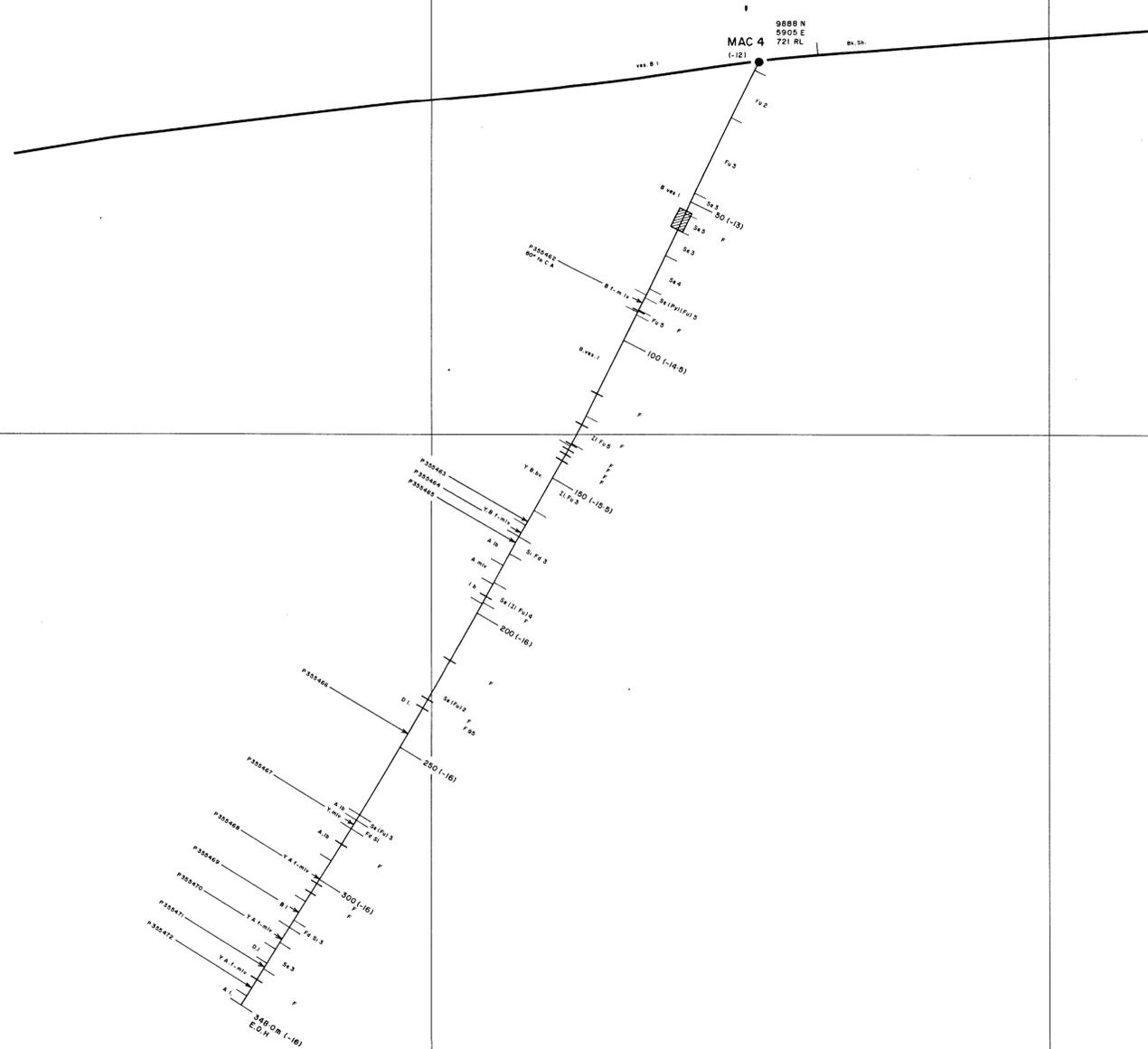
5800 E

6000 E

800 RL

600

400



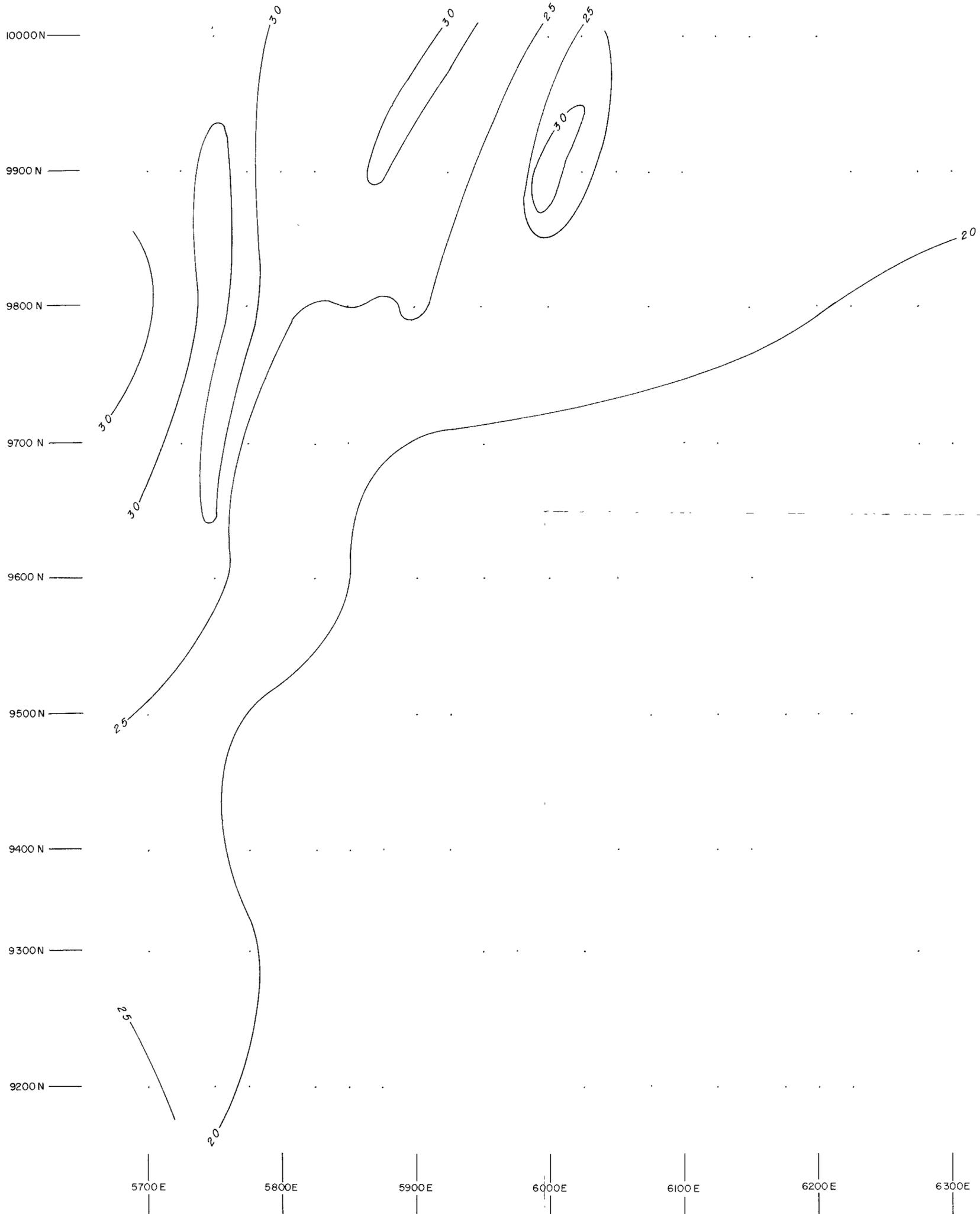
028092

5 cm

A Aberfoyle Exploration Pty Ltd

REVISIONS				NORTH WEST TASMANIA MACKINTOSH E.L. 2/70 SECTION 9900N DDH - MAC - D - 004	Compiled: AMH Drawn: AMH Traced: GLC Checked: AMH
Int	Date	Int	Date		

Location Code: K55/6/44 Scale: 1:1000 Date: January, 1986 Plate No: MAC 120 A



028093

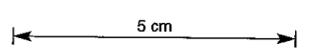
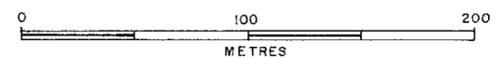


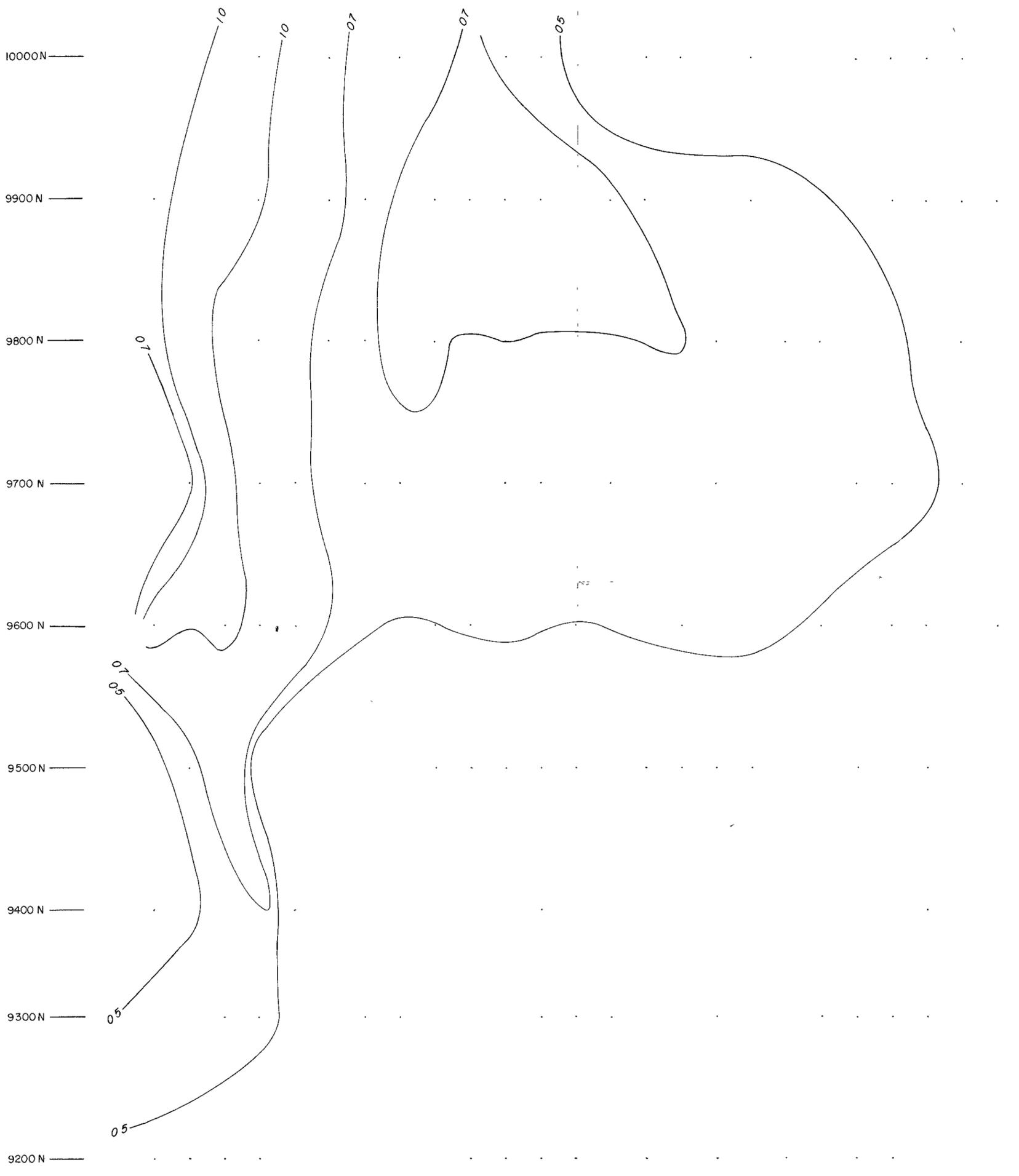
Figure 16



Aberfoyle Exploration Pty Ltd																							
NORTH WEST TASMANIA MACKINTOSH E.L.2/70 UTEM LOOP 25 - CHANNEL 5 DATA						Compiled	ETE																
<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>Int</th> <th>Date</th> <th>Int</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>						REVISIONS				Int	Date	Int	Date									Drawn	ETE
						REVISIONS																	
						Int	Date	Int	Date														
Traced	LML																						
Checked	ETE																						
Location Code K55/6/44		Scale 1:2500		Date July, 1985		Plate No	Mac 104																

86-2551 24

5803



5700E 5800E 5900E 6000E 6100E 6200E 6300E

028094

5 cm

0 100 200
METRES

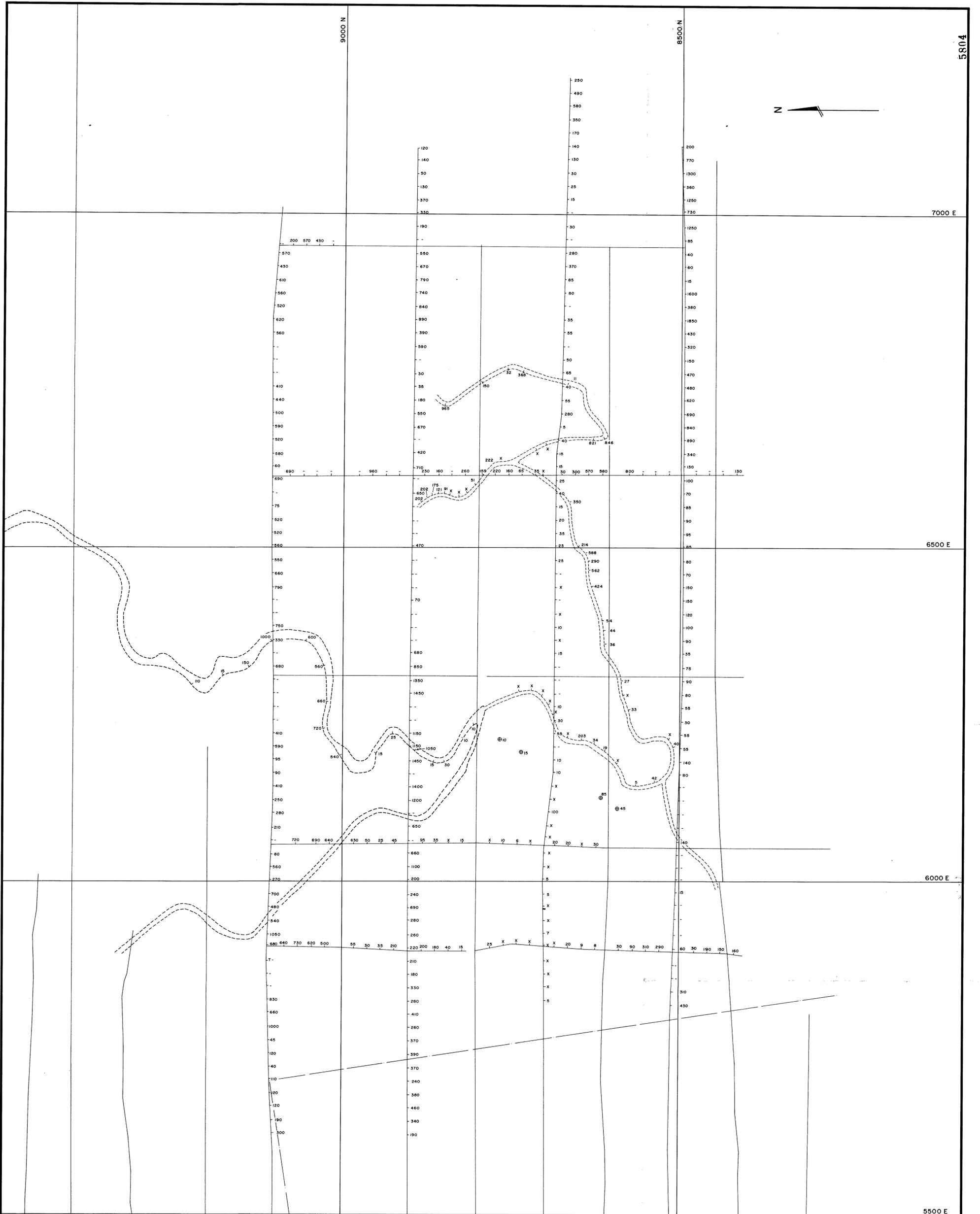
Figure 15

 Aberfoyle Exploration Pty Ltd			
NORTH WEST TASMANIA MACKINTOSH E.L.2/70 UTEM LOOP 25 - CHANNEL 4 DATA			
Location Code. K55/6/44		Scale 1:2500	Date July, 1985
Compiled. ETE		Drawn ETE	
Traced LML		Checked ETE	
Plate No Mac 103			

86-2551 2/4

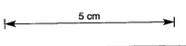
5806

RMO 554



ANALYSES BY Analabs
 METHOD Pressed powder / XRF
 SAMPLES C-Horizon soil samples taken in 1978; except samples along Portal Road and Southwell Track which are rock chips taken 1985

028095



Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L.2/70 SWITCHBACK AREA
 SOIL AND ROCK CHIP ANALYSES - CHROMIUM

REVISIONS		Compiled:
Int.	Date	AMH
		Drawn: AMH
		Traced: GLC
		Checked:

Location Code K55/6/44 Scale 1:2500 Date: January, 1986 Plate No: MAC 119

5500 E

5600 E

5700 E

5800 E

5900 E

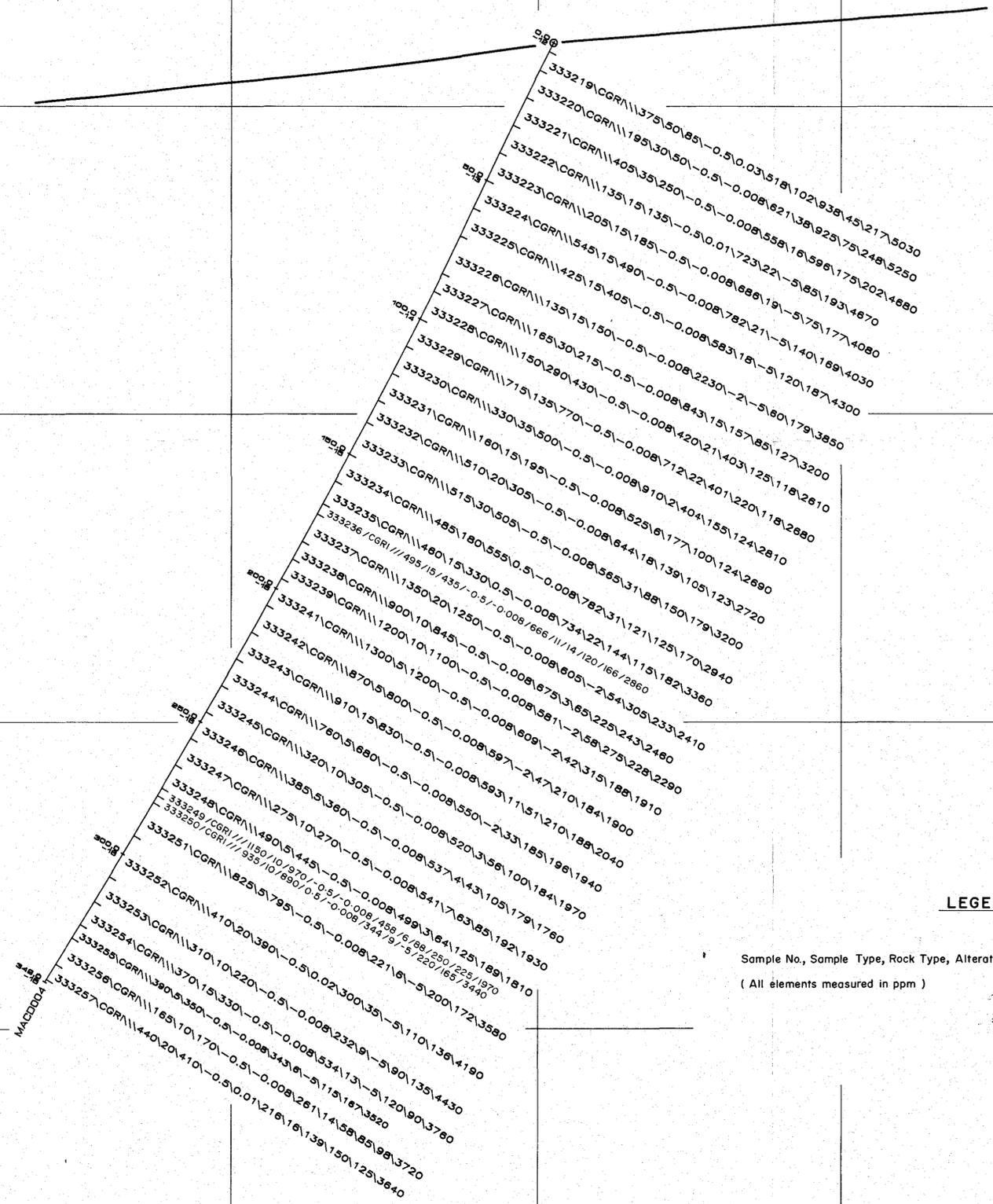
6000 E

6100 E

RL 700

600

500



LEGEND

Sample No., Sample Type, Rock Type, Alteration, Cu, Pb, Zn, Ag, Au, Ba, As, Cr, Ni, Zr, Ti
(All elements measured in ppm)

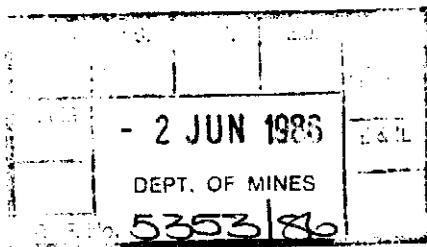
028096



Aberfoyle Expl. #. III.	
DDH MAC4	
CORE GRIND GEOCHEMISTRY	
scale 1 :	1000.
drawn by: GREG CAYZER	
drwg rev: THU., 8 FEB., 1986	
GEODS/1000 by data science	

Plate No. MAC I20B

028097



MACKINTOSH EXPLORATION LICENCE 2/70

TASMANIA

PROGRESS REPORT

FOR THE PERIOD

MAY 1984 TO DECEMBER 1985

OPEN FILE

86 - 2551

3/4

VOLUME 3 APPENDICES A-G

073

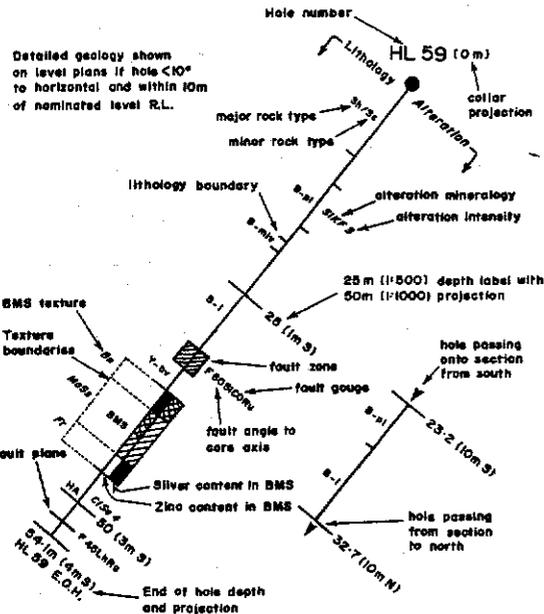
028098

APPENDIX A

MICROFILMED

DRILL HOLE PLOTTING

ANNOTATION



LITHOLOGY

COMPOSITION PREFIX

Ba	Berite
B	Bosilt
BMS	Base metal sulphides
Ch	Chert
D	Dacite
FP	Feldspar phytic andesite
GSP	Glossy silica - colloform pyrite ore
HA	Highly altered rock
MCPy	Massive chalcopyrite
MPy	Massive pyrite
Y	Polymict
Q	Quartzite
R	Rhyolite
Ss	Sandstone, siltstone
Sh	Shale
TB	Tertiary basalt

TEXTURE SUFFIX

av	ash volcanoclastic
<math>< 2\text{mm}</math>	
bv	braccio volcanoclastic
> 64 mm	
xv	crystal volcanoclastic
lv	lapilli volcanoclastic
flv	fine 2-8 mm
mlv	medium 8-32 mm
coiv	coarse 32-64 mm
lv	lava
lb	lava breccia
pl	pillow lava
vp	variolitic pillow lava

TB-l	8	B-lv	49	YFP-lv	40
R-l	26	YB-lv	42	Q	18
R-lb	28	D-l	63	Q-lv	17
R-lv	25	D-lb	54	HA	6
R-bv	25	D-lv	54	GSP	25
YB-lv	65	D-bv	54	Ba	22
YB-bv	65	YB-lv	56	Bc	22
Sh	68	Y-lv	58	BMS	21
Ss	69	Y-av	58	MPy	29
B-l	45	av	52	MCPy	9
B-pl	50	FP-l	48		
B-vp	51	FP-lb	48		
		FP-lv	44		
		FP-bv	44		

STRATIGRAPHIC COLUMN

TERTIARY BASALT	TB	8
UPPER RHYOLITIC SEQUENCE	URS	65
QUE RIVER SHALE	QRS	69
PILLOW LAVA SEQUENCE	PLS	50
HANGING WALL VOLCANICLASTIC SEQUENCE	HVS	58
HELLYER MINERALISED SEQUENCE	HMS	21
FELDSPAR PHYRIC SEQUENCE	FPS	48
LOWER VOLCANICLASTIC SEQUENCE	LVS	58
LOWER ANDESITIC TUFF SEQUENCE	LAS	44
STRINGER ENVELOPE ZONE	SEZ	17
STRINGER ZONE	STZ	6

ALTERATION

Si	2	SeCl	30	CARBONATE	CO
SiKF	13	SePy	39	CHLORITE	Cl
SiKFCI	14	Se	38	FUCHSITE	Fu
CI	47	Fu	46	ILLITE	Il
GCO	41	Il	19	K-FELDSPAR	KF
				PYRITE	Py
				SERICITE	Se
				SILICA	Si

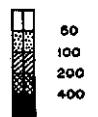
MINERALISATION

Bn	Banded	Ma	Massive
Br	Brecciated	No	Nodular
Cm	Colloform	Pm	Pillow margin
Da	Disseminated	Rx	Recrystallised
Eu	Euhedral	Rk	Reworked
Fr	Fragmental	Sh	Shoaled
Fb	Framboidal	Ss	Shrinkage Shadows
IP	Interpillow	Vn	Veins
JP	Joint plane coating	Vs	Vein selvage

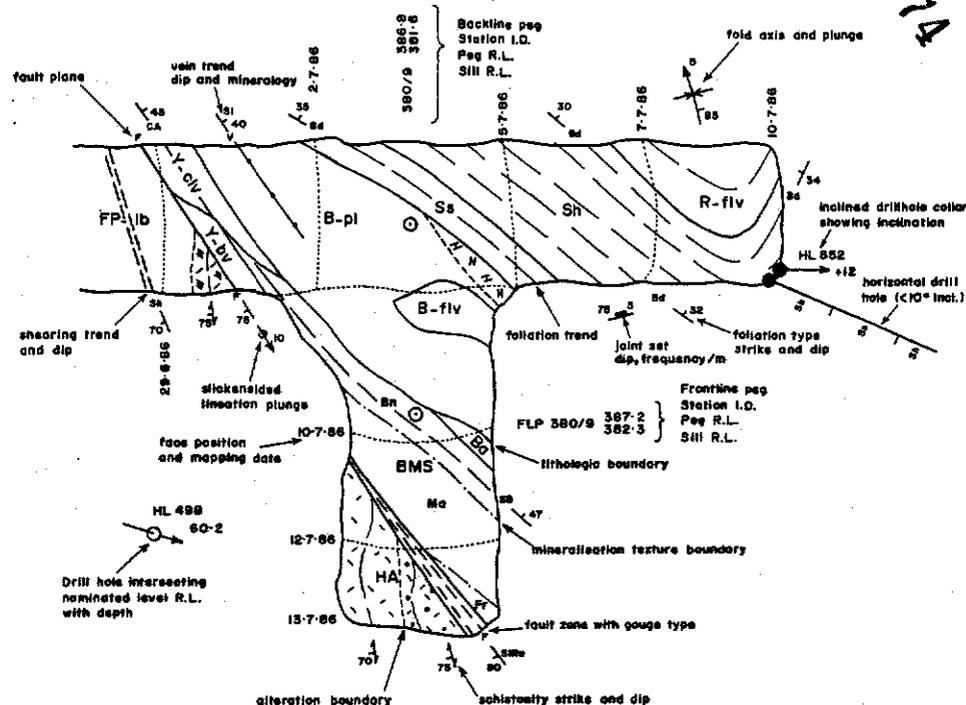
FAULT GOUGE

Br	Brecciated
Cv	Cavernous
Lh	Leached
Rh	Rehealed
Ru	Rubbed
Si	Slickensided

% Zn g/t Ag



UNDERGROUND MAPPING



LINE TYPE

—	LITHOLOGIC BOUNDARY
—	FAULT PLANE
—	VEIN
—	FOLIATION
—	MINERALISATION TEXTURE BOUNDARY
—	SHEAR
—	ALTERATION BOUNDARY
—	FACE POSITION

ALTERATION SYMBOLS

CARBONATE	[Symbol]
CHLORITE	[Symbol]
FUCHSITE	[Symbol]
ILLITE	[Symbol]
K-FELDSPAR	[Symbol]
PYRITE	[Symbol]
SERICITE	[Symbol]
SILICA	[Symbol]

SCALE		
DRAWN	GLC	9-86
CHECKED		
DESIGNED	GJMCA	7-85
DESIGN CKD		
DESIGN APP		
PROJECT APP		

MACKINTOSH MINING PTY. LTD.

PROJECT HELLYER PROSPECT

FIG. 2

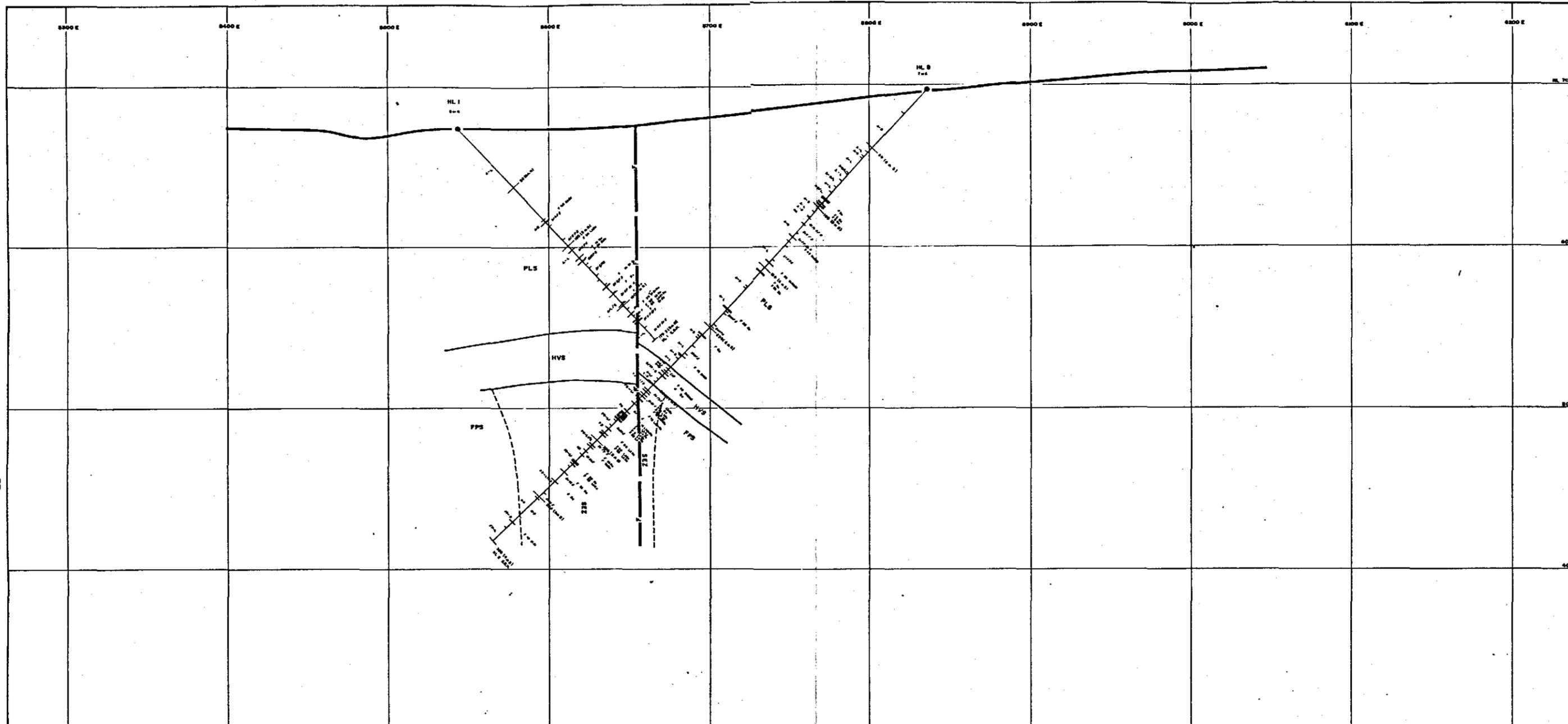
GEOLOGICAL LEGEND

DRAWING No. HEL 67

REVISION

074

028099



STRATIGRAPHY
(See MEL 28 notes)

SEQUENCE	ROCK TYPE	DESCRIPTION
UPPER INVOLITE	UBS	Basalt
UPPER EPICLASTIC	UES	Basalt
BLUE RIVER	UBS	Basalt
SHALL	UBS	Basalt
MIDDLE	PLS	Andesite
UPPER ANDESITE	UAS	Andesite
HANDSHALL	HVS	Andesite
VOLCANOCLASTICS	HVS	Andesite
HAR ORE	MOP	Andesite
FOOTHILL	FVS	Andesite
VOLCANOCLASTICS	FVS	Andesite
FELDSPAR	FFS	Andesite
PHYRIC	FFS	Andesite
SEQUENCE	FFS	Andesite
LOWER EPICLASTIC	LES	Andesite
SEQUENCE	LES	Andesite
LOWER ANDESITE	LAS	Andesite
TUFF	LAS	Andesite
SEQUENCE	LAS	Andesite
DACITE	DVU	Dacite
VENT	DVU	Dacite
UNIT	DVU	Dacite
TRIMMER	BTZ	Basalt
ZONE	BTZ	Basalt

LEGEND

ALTERATION
(Shaded East of bore path)

- Al: Alteration
- Pl: Plagioclase
- Py: Pyrite
- Ch: Chlorite
- Ep: Epidote
- Qtz: Quartz
- Ms: Muscovite
- Ca: Calcite
- Op: Opal
- St: Staurolite
- Py: Pyrite
- Ch: Chlorite
- Ep: Epidote
- Qtz: Quartz
- Ms: Muscovite
- Ca: Calcite
- Op: Opal
- St: Staurolite

MINERALIZATION TEXTURE
(Shaded West of bore path)

FAULTS
(Shaded East of bore path)

- F1: Fault
- F2: Fault
- F3: Fault
- F4: Fault
- F5: Fault
- F6: Fault
- F7: Fault
- F8: Fault
- F9: Fault
- F10: Fault
- F11: Fault
- F12: Fault
- F13: Fault
- F14: Fault
- F15: Fault
- F16: Fault
- F17: Fault
- F18: Fault
- F19: Fault
- F20: Fault

SCALE 1:1000

0 50 100 meters

HL 17 (1043)
 - Outer location with hole number and projection N or S of section
 - Down hole indicator with projection N or S of section
 - Down East of bore path
 - Core size depth gauge
 - Down hole indicator with projection N or S of section
 - E.D.N. with projection N or S of section
 - Distance in metres

Pn + 26 GRADES

0-2% (Pn + 26)
5-10
10-20
20-40
> 40

A4 GRADES

0-50 g/t A4
50-100
100-200
200-400
> 400

FIG. 3

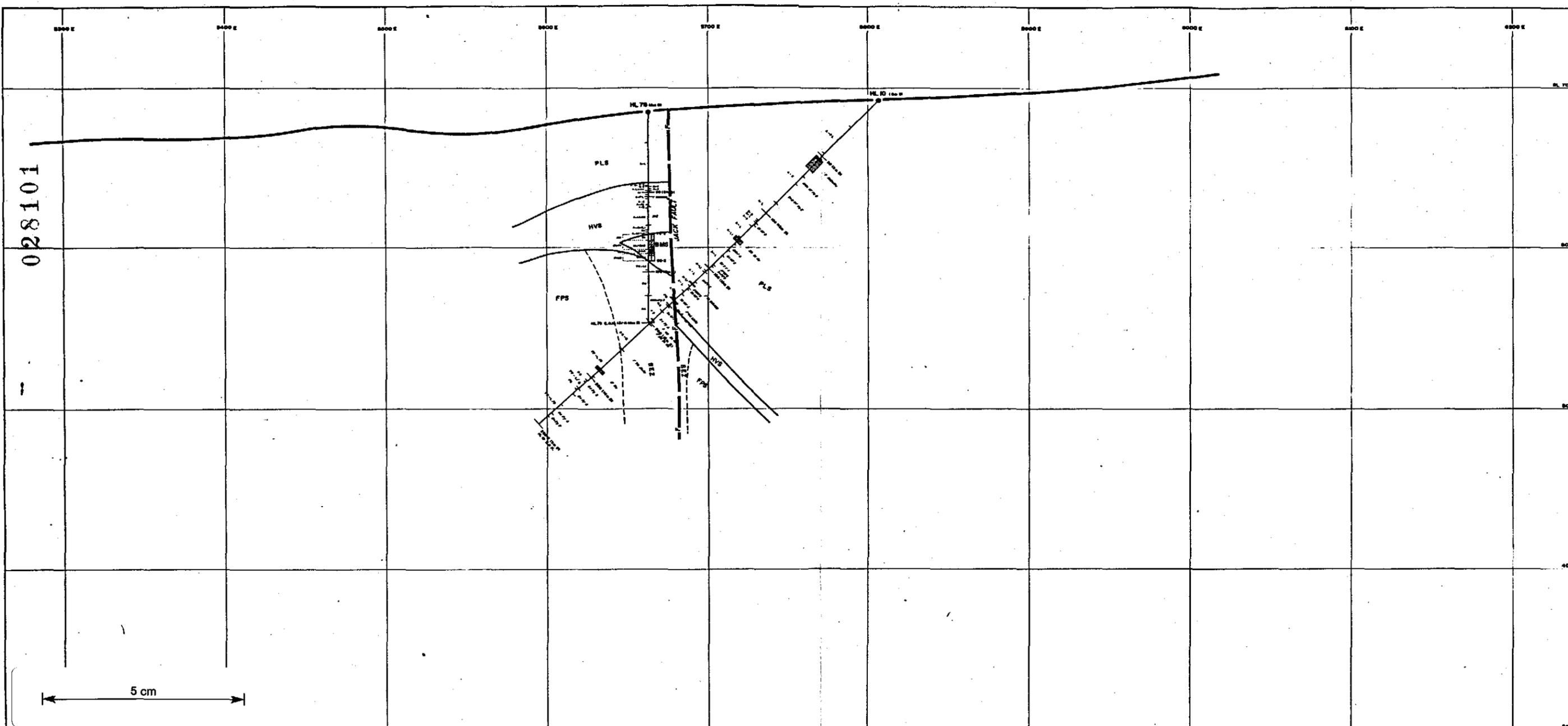
Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
 MACKINTOSH E.L. 2/70
 HELLYER PROSPECT
 CROSS SECTION 10200 N

Consulted G.J.M.C.A.
 Drawn ASTEC
 Traced ASD
 Checked G.M.C.A.
 Prepared by MEL/4/10200 N
 Scale 1:2500
 Date February 1988

075

5 cm



SYMBOLS
(See NEL 2/70)

ROCK TYPES
(Show East of hole path)

UPPER BIVOLITE SEQUENCE	UBS	1	1
UPPER EPICLASTIC SEQUENCE	UES	2	2
UPPER ANDREITIC SEQUENCE	UAS	3	3
MIDDLE ANDREITIC SEQUENCE	MAS	4	4
LOWER ANDREITIC SEQUENCE	LAS	5	5
BAKITE VEIN UNIT	BVU	6	6
STRONG SAND	STZ	7	7

ALTERATION
(Show East of hole path)

AL1	Albite
AL2	Albite
AL3	Albite
AL4	Albite
AL5	Albite
AL6	Albite
AL7	Albite
AL8	Albite
AL9	Albite
AL10	Albite
AL11	Albite
AL12	Albite
AL13	Albite
AL14	Albite
AL15	Albite
AL16	Albite
AL17	Albite
AL18	Albite
AL19	Albite
AL20	Albite
AL21	Albite
AL22	Albite
AL23	Albite
AL24	Albite
AL25	Albite
AL26	Albite
AL27	Albite
AL28	Albite
AL29	Albite
AL30	Albite
AL31	Albite
AL32	Albite
AL33	Albite
AL34	Albite
AL35	Albite
AL36	Albite
AL37	Albite
AL38	Albite
AL39	Albite
AL40	Albite
AL41	Albite
AL42	Albite
AL43	Albite
AL44	Albite
AL45	Albite
AL46	Albite
AL47	Albite
AL48	Albite
AL49	Albite
AL50	Albite

FAULTS
(Show East of hole path)

F1	Normal
F2	Normal
F3	Normal
F4	Normal
F5	Normal
F6	Normal
F7	Normal
F8	Normal
F9	Normal
F10	Normal
F11	Normal
F12	Normal
F13	Normal
F14	Normal
F15	Normal
F16	Normal
F17	Normal
F18	Normal
F19	Normal
F20	Normal
F21	Normal
F22	Normal
F23	Normal
F24	Normal
F25	Normal
F26	Normal
F27	Normal
F28	Normal
F29	Normal
F30	Normal
F31	Normal
F32	Normal
F33	Normal
F34	Normal
F35	Normal
F36	Normal
F37	Normal
F38	Normal
F39	Normal
F40	Normal
F41	Normal
F42	Normal
F43	Normal
F44	Normal
F45	Normal
F46	Normal
F47	Normal
F48	Normal
F49	Normal
F50	Normal

MINERALIZATION TEXTURE
(Show West of hole path)

Grade	Texture
0-5% Pb-Zn	0-50 g/t Ag
5-10	50-100
10-20	100-200
20-40	200-400
>40	>400

LEGEND

ML 17 (1-17) Core log with hole number and projection N or S of section

Core hole indicator with projection N or S, to nearest metre

Short East of hole path

Core hole depth/grade (Show West of hole path)

Distance in metres (Show West of hole path)

SCALE 1:1000

0 50 100 metres

FIG. 4

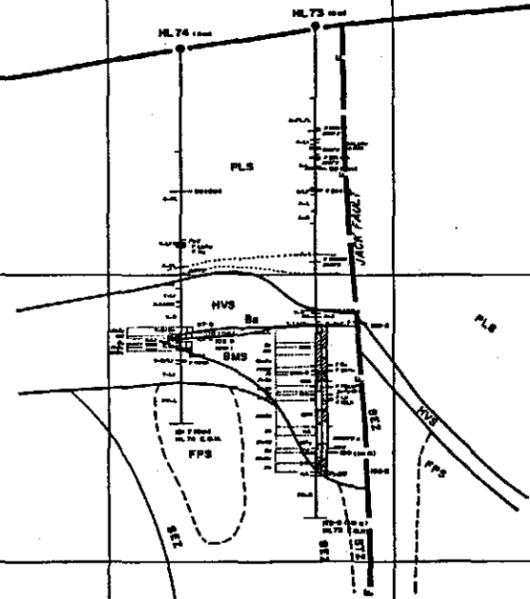
Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10300N

Drawn	ASTEC
Checked	GLC
Scale	1:2500
Date	January 1988

Tasmanian Code 135/6/84 Sheet 11 2500 Date January 1988

033102



STRATIGRAPHY
(Show ML 2/70)

UPPER BRYOLITE SEQUENCE	UBS	White sandstone
UPPER EPIDIOSTIC SEQUENCE	UES	Dark "blocky" sandstone sandstone
ONE METER SHALE	OSD	Dark shale
YELLOW LIMESTONE SEQUENCE	PLS	Blocky sandstone / limestone
LOWER ANDRETTIC SEQUENCE	LAS	Blocky sandstone sandstone
NORTHWEST VOLCANICLASTICS	NVS	Blocky sandstone sandstone
ONE METER SANDSTONE	OSP	Blocky sandstone sandstone
SOUTHWEST VOLCANICLASTICS	SVS	Blocky sandstone sandstone
YELLOW MOUNTAIN SEQUENCE	YMS	Blocky sandstone sandstone
LOWER ANDRETTIC SEQUENCE	LES	Blocky sandstone sandstone
LOWER ANDRETTIC SEQUENCE	LAS	Blocky sandstone sandstone
ONE METER SANDSTONE	OSP	Blocky sandstone sandstone
STRONG SANDSTONE	STX	Blocky sandstone sandstone

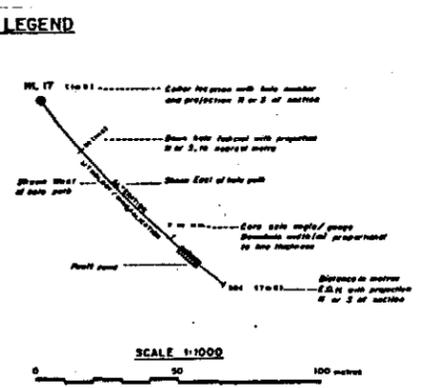
LEGEND

ALTERATION
(Show East of hole path)

1	None
2	Very slight
3	Slight
4	Medium
5	Heavy
6	Very heavy
7	Extremely heavy

FAULTS
(Show East of hole path)

1	None
2	Very slight
3	Slight
4	Medium
5	Heavy
6	Very heavy
7	Extremely heavy



MINERALIZATION TEXTURE
(Show East of hole path)

Grade	Texture
0-5%	0-50 g/t Ag
5-10	50-100
10-20	100-200
20-40	200-400
> 40	> 400

A Aberfoyle Exploration Pty Ltd

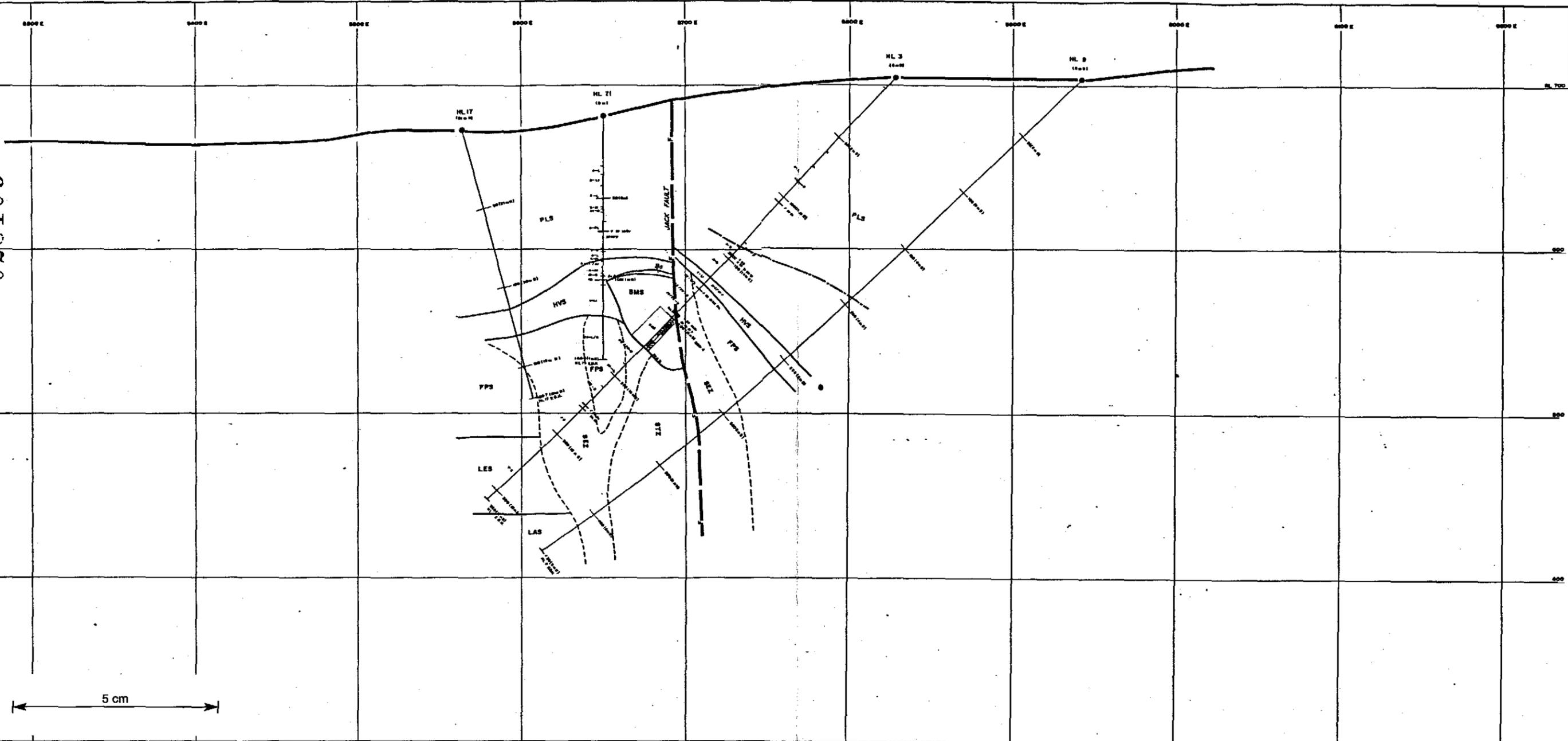
NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10350N

Author	GAMA
Drawn	ABTEC
Checked	SLC
Revised	GAMA

Scale: 1:2500 Date: January 1985

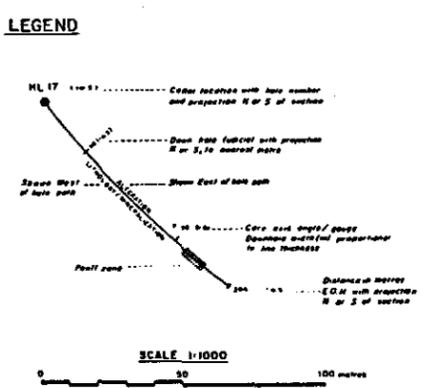
FIG. 5

028103



STRATIGRAPHY (See M.C.22 survey)	ROCK TYPES (See M.C.22 survey)
UPPER BIVOLITE SEQUENCE	UBS
UPPER EPICLASTIC SEQUENCE	UES
RIVER SHALE	RS
PILLOW LAVA SEQUENCE	PLS
UPPER ANDESITIC SEQUENCE	UAS
HANDSHALL VOLCANICLASTICS	HVS
MAIN ONE POSITION	MOP
FOOTWALL VOLCANICLASTICS	FVS
FELDSPAR RHYOLITE SEQUENCE	FRS
LOWER EPICLASTIC SEQUENCE	LES
LOWER ANDESITIC TUFF SEQUENCE	LAS
DIACYTE VEIN UNIT	DVS
STRONGE ZONE	STZ

ALTERATION (Shown East of hole path)
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
A20
A21
A22
A23
A24
A25
A26
A27
A28
A29
A30
A31
A32
A33
A34
A35
A36
A37
A38
A39
A40
A41
A42
A43
A44
A45
A46
A47
A48
A49
A50



MINERALIZATION TEXTURE (Shown East of hole path)	Py + Zn GRADES	As GRADES
M1	0-5% (Pb + Zn)	0-50 g/t As
M2	5-10	50-100
M3	10-20	100-200
M4	20-40	200-400
M5	40	400

FIG. 6

Aberfoyle Exploration Pty Ltd

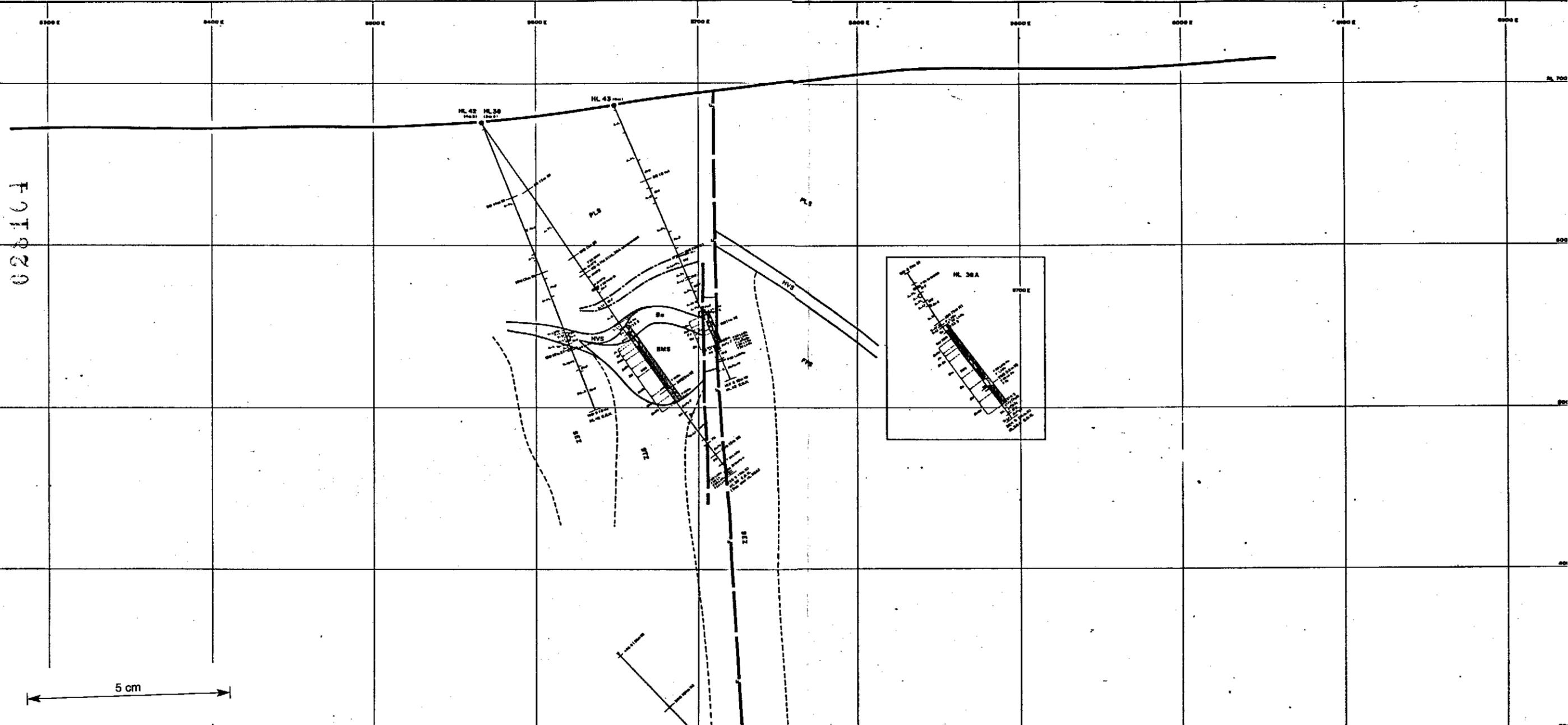
NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10400 N

Scale 1:2500 Date January, 1985

Author	W.D.M.	Checked	G.L.M.A.
Drawn	A.B.T.E.C.	Checked	G.J.M.B.
Printed	A.C.P.	Checked	G.J.M.B.
Plotted	G.J.M.B.	Checked	G.J.M.B.

Plan No. 10400/10400

F91920



STRATIGRAPHY
(See HEL.22 series) (Shown West of hole path)

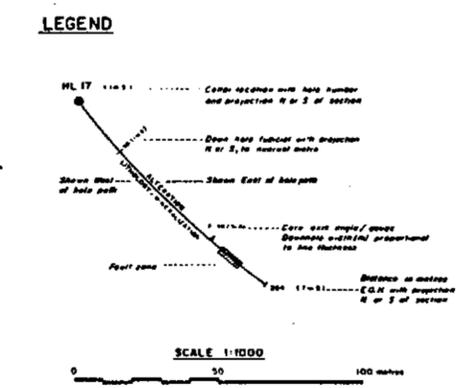
UNIT	ROCK TYPES	DESCRIPTION
UPPER ANDIESTIC SEQUENCE	VPE	Andesite
UPPER EPICLASTIC SEQUENCE	UES	Andesite, basalt, tuff, sandstone, siltstone, shale
RIVER SHALE	QRS	Shale, sandstone
PILLOW LAVA SEQUENCE	PLS	Basalt, andesite, tuff, sandstone, siltstone, shale
UPPER ANDIESTIC SEQUENCE	UAS	Andesite, basalt, tuff, sandstone, siltstone, shale
MAIN ORE POSITION	MDP	Andesite, basalt, tuff, sandstone, siltstone, shale
FOOTWALL VOLCANOCLASTICS	FVS	Andesite, basalt, tuff, sandstone, siltstone, shale
PELORPHERA PHYENIC SEQUENCE	FPE	Andesite, basalt, tuff, sandstone, siltstone, shale
LOWER EPICLASTIC SEQUENCE	LES	Andesite, basalt, tuff, sandstone, siltstone, shale
LOWER ANDIESTIC TUFF SEQUENCE	LAS	Andesite, basalt, tuff, sandstone, siltstone, shale
DACTYLIC UNIT	DVM	Andesite, basalt, tuff, sandstone, siltstone, shale
STRONG ZONE	STZ	Andesite, basalt, tuff, sandstone, siltstone, shale

ALTERATION
(Shown East of hole path)

A1	None
A2	Very fine grained
A3	Very fine grained / coarse
A4	Coarse
A5	Very coarse
A6	Coarse / medium
A7	Medium / coarse
A8	Coarse / medium / fine
A9	Medium / coarse / fine
A10	Coarse / medium / fine / very fine

FAULTS
(Shown East of hole path)

F1	Normal
F2	Reverse
F3	Thrust
F4	Normal / Reverse
F5	Normal / Thrust
F6	Normal / Reverse / Thrust
F7	Normal / Reverse / Thrust / Strike-slip
F8	Normal / Reverse / Thrust / Strike-slip / Fault zone



MINERALIZATION TEXTURE
(Shown East of hole path)

TEXTURE	Pb + Zn GRADES	Ag GRADES
0-5% (Pb + Zn)	0-50 g/t Ag	
5-10	50-100	
10-20	100-200	
20-40	200-400	
> 40	> 400	

FIG. 7

Aberfoyle Exploration Pty Ltd

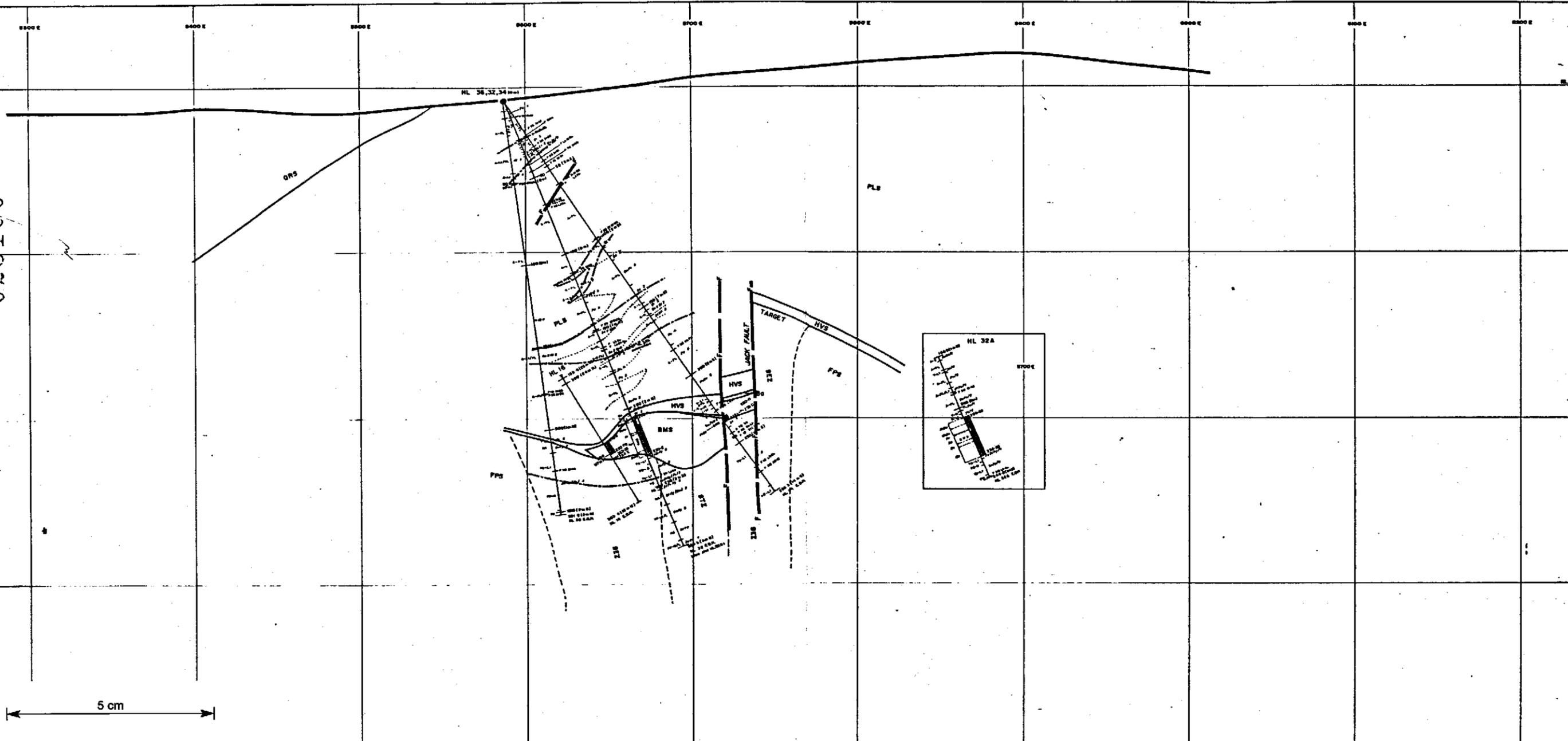
NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10450N

Scale 1:2500 Date November 1984

Author	S.L.M.C.
Drawn	ASTEC
Traced	S.L.C.A.C.
Checked	S.L.M.C.
Printed by	HELA/DMG

070

028106



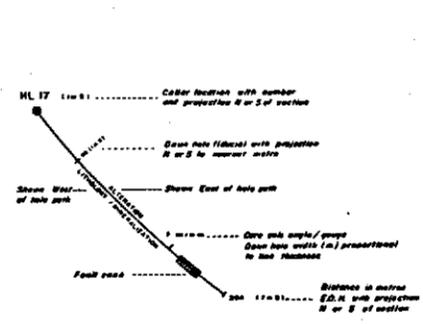
STRATIGRAPHY
(See HEL 22 series)

ROCK TYPES
(Shown West of hole path)

UPPER INVOLUTE SEQUENCE	URS	Shale
UPPER EPICLASTIC SEQUENCE	UES	Shale
OUT RIVER	ORS	Shale
SHALE		
PILLOW LAVA SEQUENCE	PLS	Shale
UPPER ANDESITE SEQUENCE	UAS	Andesite
HANDSHALL VOLCANICLASTICS	HVS	Andesite
MAIN ONE POSITION	MOP	Andesite
FOOTWALL VOLCANICLASTICS	FVS	Andesite
FELDSPAR PHYRIC SEQUENCE	FPS	Andesite
LOWER EPICLASTIC SEQUENCE	LES	Andesite
LOWER ANDESITE TUFF SEQUENCE	LAS	Andesite
AGATE BERT UNIT	ABU	Andesite
STRONG ZONE	STZ	Andesite

ALTERATION
(Shown East of hole path)

U1	Ultramylonite
U2	Ultramylonite
U3	Ultramylonite
U4	Ultramylonite
U5	Ultramylonite
U6	Ultramylonite
U7	Ultramylonite
U8	Ultramylonite
U9	Ultramylonite
U10	Ultramylonite
U11	Ultramylonite
U12	Ultramylonite
U13	Ultramylonite
U14	Ultramylonite
U15	Ultramylonite
U16	Ultramylonite
U17	Ultramylonite
U18	Ultramylonite
U19	Ultramylonite
U20	Ultramylonite



SCALE 1:1000

MINERALIZATION TEXTURE
(Shown West of hole path)

M1	Microcrystalline
M2	Microcrystalline
M3	Microcrystalline
M4	Microcrystalline
M5	Microcrystalline
M6	Microcrystalline
M7	Microcrystalline
M8	Microcrystalline
M9	Microcrystalline
M10	Microcrystalline
M11	Microcrystalline
M12	Microcrystalline
M13	Microcrystalline
M14	Microcrystalline
M15	Microcrystalline
M16	Microcrystalline
M17	Microcrystalline
M18	Microcrystalline
M19	Microcrystalline
M20	Microcrystalline

Pb & Zn GRADES

0-5%	(Pb & Zn)
5-10%	
10-20%	
20-40%	
40%	

Ag GRADES

0-50 g/t	Ag
50-100 g/t	
100-200 g/t	
200-400 g/t	
400 g/t	

180

FIG.9

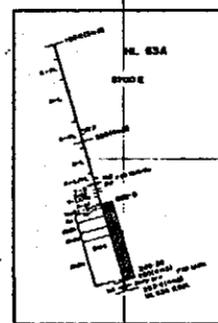
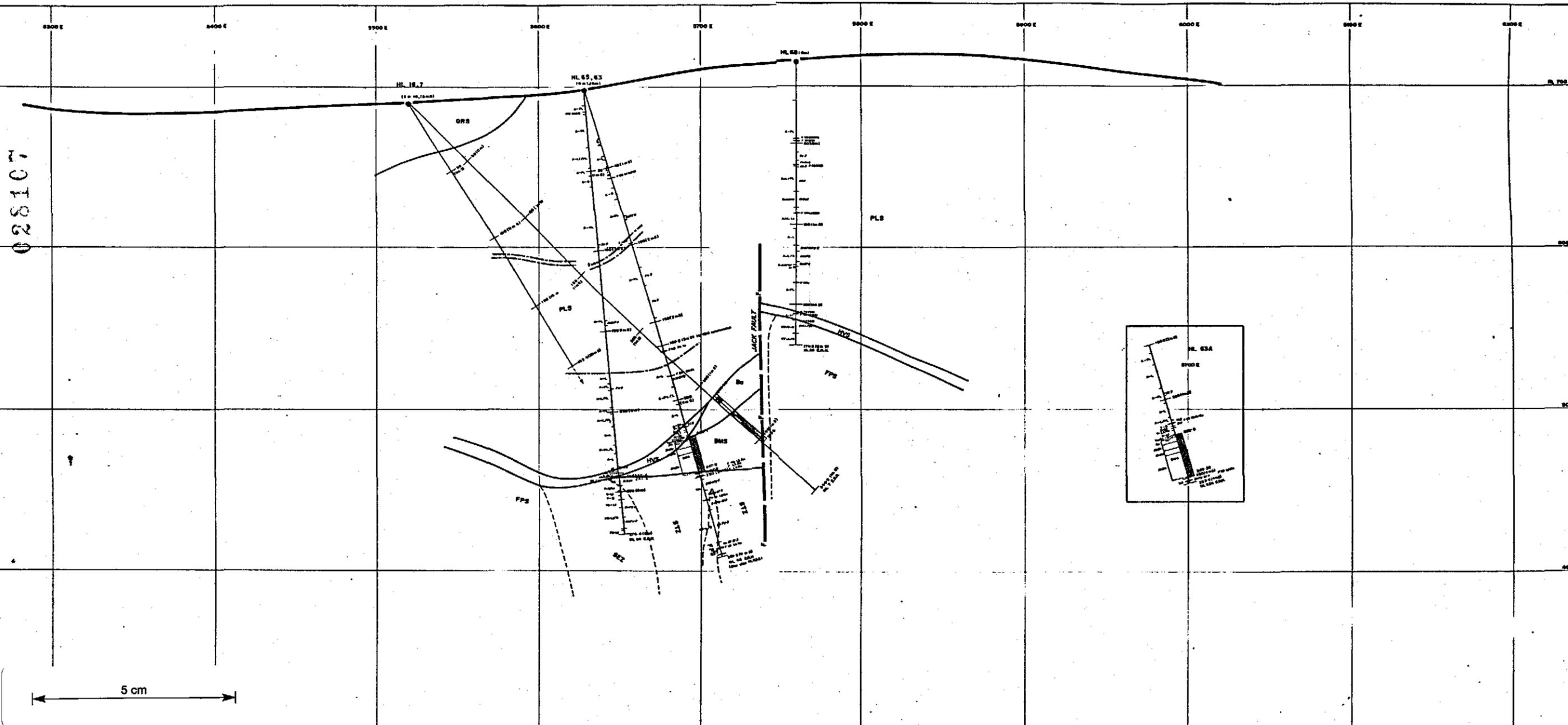
Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/7D
HELLYER PROSPECT
CROSS SECTION 10550 N

Scale 1:2500 Date October 1984

Author G.L.M.C.A.
Drawn A.S.T.E.C.
Title A.C.C.
Checked G.J.H.A.
Plot No. HEL4/10550

028107



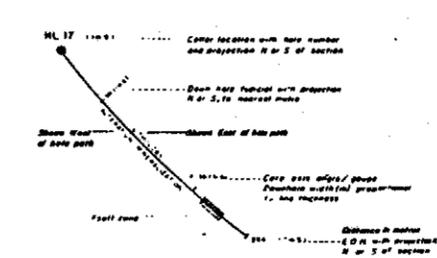
STRATIGRAPHY
(From MEL 22 series)

UPPER ANHYDRITE SEQUENCE	URS
UPPER EPIPLASTIC SEQUENCE	MES
QUE RIVER SHALE	QRS
FELLOW LAIN SEQUENCE	PLS
UPPER ANDESITIC SEQUENCE	UAS
HANDSHALL VOLCANICLASTICS	HVS
MAIN ORE POSITION	MOP
FOOTWALL VOLCANICLASTICS	FVS
FELDSPAR PHYRIC SEQUENCE	FPE
LOWER EPIPLASTIC SEQUENCE	LES
LOWER ANDESITIC SEQUENCE	LAS
DACTYL VENT UNIT	DVU
FRIGER ZONE	FTX

ROCK TYPES
(Shown West of hole path)

URS	Upper Anhydrite
MES	Upper Epiplastic
QRS	Que River Shale
PLS	Fellow Lain
UAS	Upper Andesitic
HVS	Handshall Volcaniclastics
MOP	Main Ore Position
FVS	Footwall Volcaniclastics
FPE	Feldspar Phyric
LES	Lower Epiplastic
LAS	Lower Andesitic
DVU	Dactyl Vent Unit
FTX	Friger Zone

LEGEND



ALTERATION
(Shown East of hole path)

URS	Upper Anhydrite
MES	Upper Epiplastic
QRS	Que River Shale
PLS	Fellow Lain
UAS	Upper Andesitic
HVS	Handshall Volcaniclastics
MOP	Main Ore Position
FVS	Footwall Volcaniclastics
FPE	Feldspar Phyric
LES	Lower Epiplastic
LAS	Lower Andesitic
DVU	Dactyl Vent Unit
FTX	Friger Zone

FAULTS
(Shown East of hole path)

URS	Upper Anhydrite
MES	Upper Epiplastic
QRS	Que River Shale
PLS	Fellow Lain
UAS	Upper Andesitic
HVS	Handshall Volcaniclastics
MOP	Main Ore Position
FVS	Footwall Volcaniclastics
FPE	Feldspar Phyric
LES	Lower Epiplastic
LAS	Lower Andesitic
DVU	Dactyl Vent Unit
FTX	Friger Zone

MINERALIZATION
(Shown East of hole path)

URS	Upper Anhydrite
MES	Upper Epiplastic
QRS	Que River Shale
PLS	Fellow Lain
UAS	Upper Andesitic
HVS	Handshall Volcaniclastics
MOP	Main Ore Position
FVS	Footwall Volcaniclastics
FPE	Feldspar Phyric
LES	Lower Epiplastic
LAS	Lower Andesitic
DVU	Dactyl Vent Unit
FTX	Friger Zone

GRADES

URS	Upper Anhydrite
MES	Upper Epiplastic
QRS	Que River Shale
PLS	Fellow Lain
UAS	Upper Andesitic
HVS	Handshall Volcaniclastics
MOP	Main Ore Position
FVS	Footwall Volcaniclastics
FPE	Feldspar Phyric
LES	Lower Epiplastic
LAS	Lower Andesitic
DVU	Dactyl Vent Unit
FTX	Friger Zone

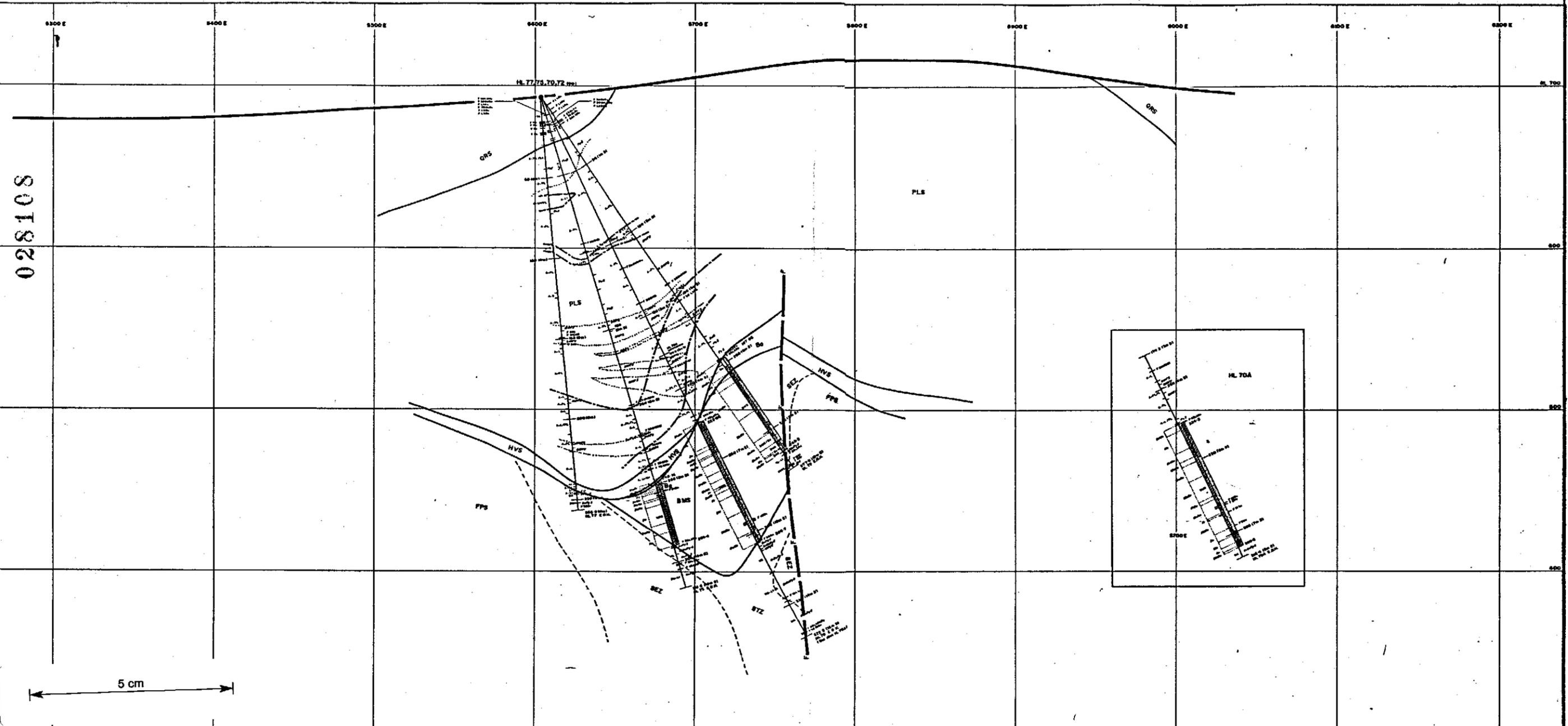
FIG. 10

Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10600 N

Scale 1:2500 Date November 1984

028108

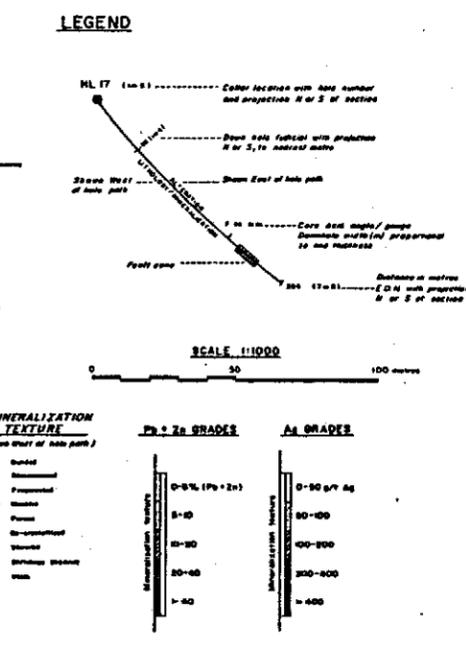


STRATIGRAPHY
(See HL 72 sheet)

UNIT	ROCK TYPES	DESCRIPTION
UPPER ANATOLITE SEQUENCE	URS	Basalt "spines" and siltstone
UPPER EPICLASTIC SEQUENCE	MES	Basalt "spines" and siltstone
QUS	Quartzite	
PLS	Plagioclase	
MAS	Mafic andesite	
HVS	Hyaloclastic	
MSP	Mafic andesite	
FVB	Felsic volcanic	
FFS	Felsic volcanic	
LES	Lithic andesite	
LAS	Lithic andesite	
BTZ	Basaltic tuff zone	

ALTERATION
(Shown East of hole path)

U	Unaltered
Q	Quartz
OP	Opal
CH	Chalcopyrite
SP	Sphalerite
PT	Pyrite
ST	Stibnite
SI	Siderite
SO	Sulphur
SA	Sulfate
SC	Sulfide
SE	Sulfide
SS	Sulfide
STZ	Sulfide
STZ	Sulfide



3200

FIG. 11

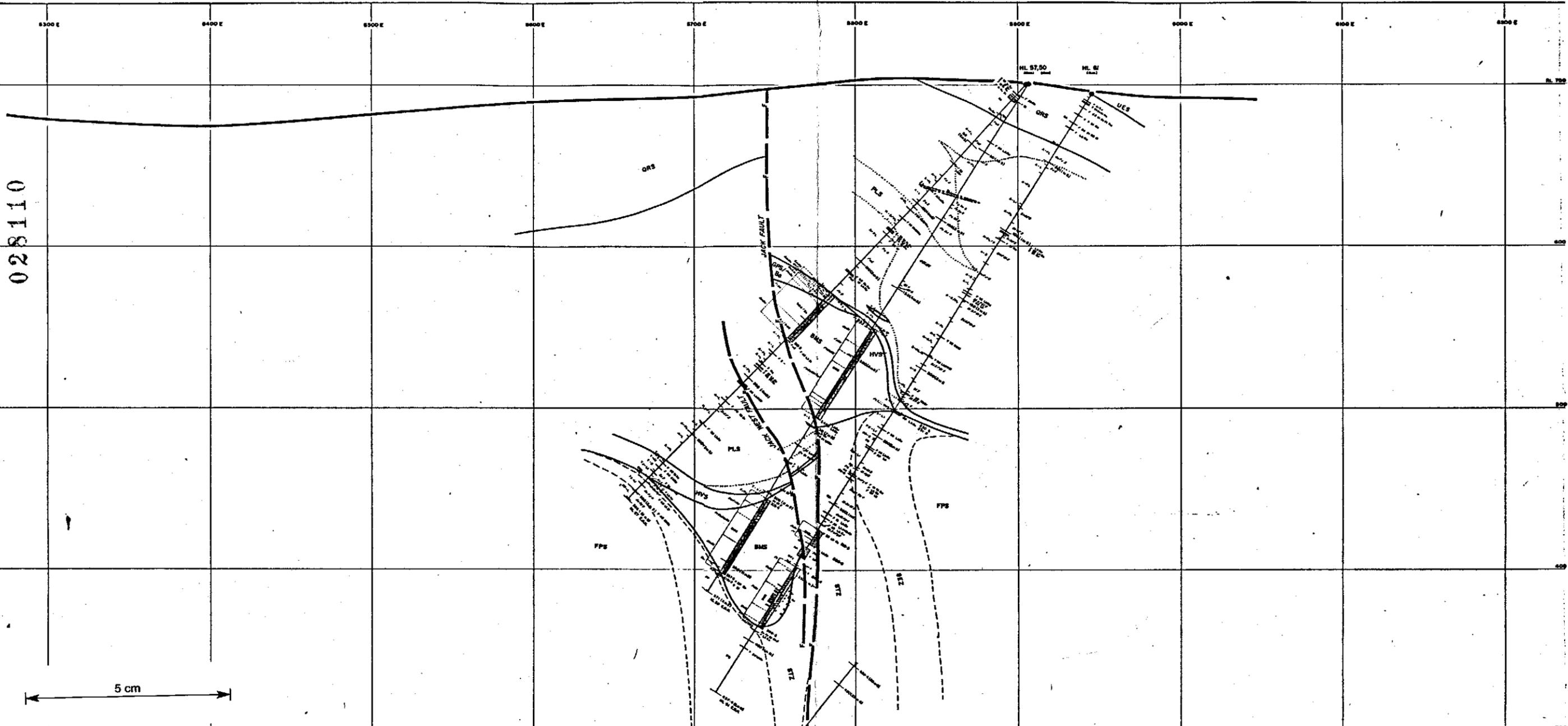
A Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10650N

Scale: 1:2500 Date: January 1988

Author: G.J.M.A.
Drawn: A.B.T.C.
Checked: S.L.C.
Plotted: G.J.M.A.

028110



STRATIGRAPHY
(See NE. 27 corner)

UPPER ANDOLITE SEQUENCE	URS	Shale
UPPER EPICLASTIC SEQUENCE	UES	Shale
QUE RIVER SHALE	QRS	Shale
YELLOW LAVA SEQUENCE	PLS	Shale
UPPER ANDOLITE SEQUENCE	UAS	Shale
HARRISVILLE VOLCANICLASTICS	MVS	Shale
MAIN ONE POSITION	MOP	Shale
FOOTWALL VOLCANICLASTICS	FVS	Shale
FELDSPAR PHYRIC SEQUENCE	FFS	Shale
LOWER EPICLASTIC SEQUENCE	LES	Shale
LOWER ANDOLITE SEQUENCE	LAS	Shale
DACITE VEIN UNIT	BVU	Shale
TRINCKER ZONE	STT	Shale

ROCK TYPES
(Shaded area of hole path)

URS	Shale
UES	Shale
QRS	Shale
PLS	Shale
UAS	Shale
MVS	Shale
MOP	Shale
FVS	Shale
FFS	Shale
LES	Shale
LAS	Shale
BVU	Shale
STT	Shale

LEGEND

HL 17 (1-82) Color log with hole number and projection N or S of surface

..... Core hole indicated with projection N or S, N nearest mine

..... Shows East on hole path

..... Shows East on hole path

..... Core only sample points

..... Distance in metres

..... E.D.N. with projection N or S of surface

SCALE 1:1000

0 50 100 metres

ALTERATION
(Shaded area of hole path)

U1	Unaltered
U2	Unaltered
U3	Unaltered
U4	Unaltered
U5	Unaltered
U6	Unaltered
U7	Unaltered
U8	Unaltered
U9	Unaltered
U10	Unaltered
U11	Unaltered
U12	Unaltered
U13	Unaltered
U14	Unaltered
U15	Unaltered
U16	Unaltered
U17	Unaltered
U18	Unaltered
U19	Unaltered
U20	Unaltered
U21	Unaltered
U22	Unaltered
U23	Unaltered
U24	Unaltered
U25	Unaltered
U26	Unaltered
U27	Unaltered
U28	Unaltered
U29	Unaltered
U30	Unaltered

MINERALIZATION TEXTURE
(Shaded area of hole path)

U1	Unaltered
U2	Unaltered
U3	Unaltered
U4	Unaltered
U5	Unaltered
U6	Unaltered
U7	Unaltered
U8	Unaltered
U9	Unaltered
U10	Unaltered
U11	Unaltered
U12	Unaltered
U13	Unaltered
U14	Unaltered
U15	Unaltered
U16	Unaltered
U17	Unaltered
U18	Unaltered
U19	Unaltered
U20	Unaltered
U21	Unaltered
U22	Unaltered
U23	Unaltered
U24	Unaltered
U25	Unaltered
U26	Unaltered
U27	Unaltered
U28	Unaltered
U29	Unaltered
U30	Unaltered

Pb-Zn GRADES

0-5% (Pb+Zn)
5-10
10-20
20-50
50

Ag GRADES

0-50 g/t Ag
50-100
100-200
200-400
400

FIG. 13

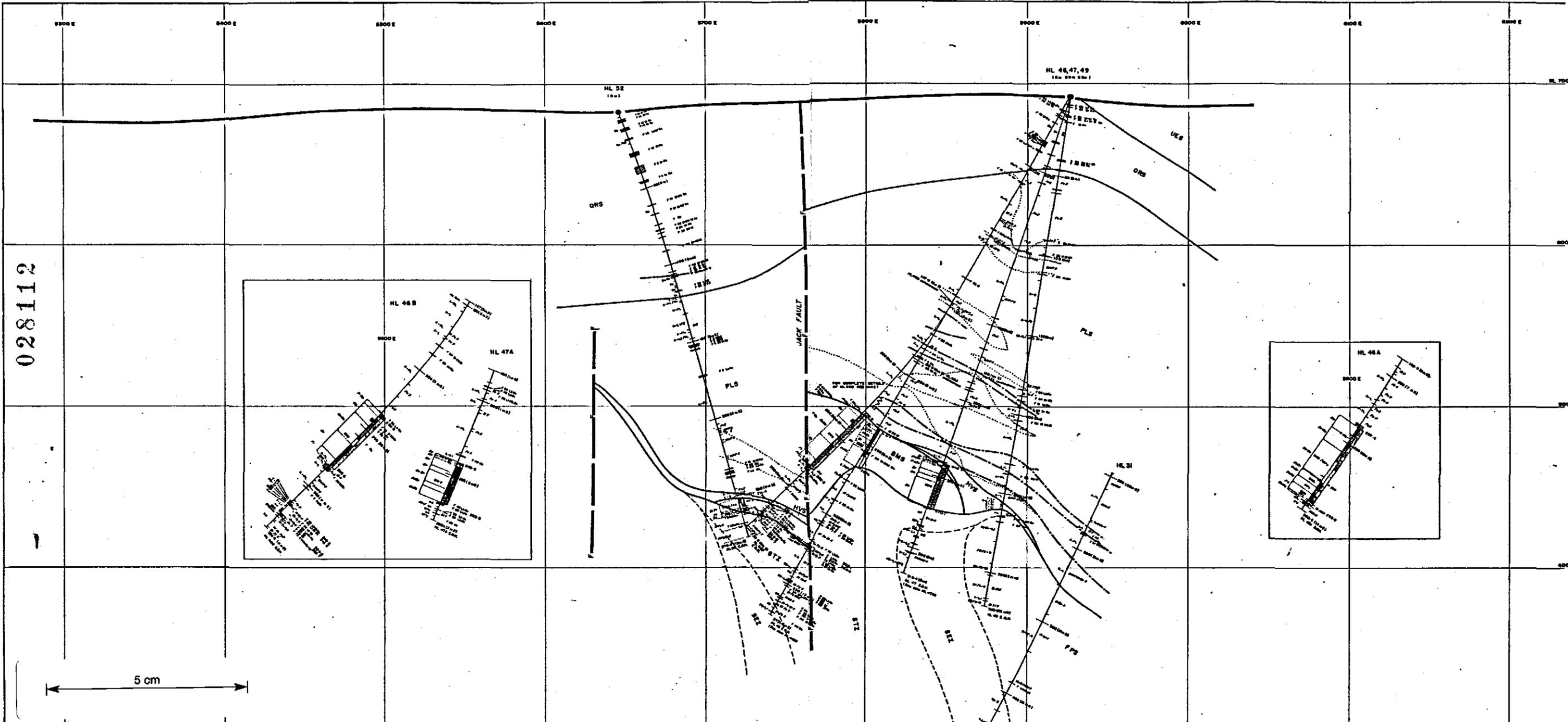
A Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10750 N

Scale 1:2500 Date December 1984

Author G.J.M.A.
Drawn J.B.T.C.
Checked A.D.
Checked G.J.M.A.
Printed by MEL 44/0750

028112



STRATIGRAPHY (See H.L. 52 notes)

UPPER BIVOLITE SEQUENCE	UBS
UPPER EPICLASTIC SEQUENCE	UES
BLUE BAY SHALES	DBS
MIDDLE LIME SEQUENCE	PLS
UPPER AMPHIBOLITE SEQUENCE	MAS
HANDSHALL VOLCANICLASTICS	HVS
SEAN DIRT POSITION	SDP
FOOTWALL VOLCANICLASTICS	FVS
FELDSPAR PHYRIC SEQUENCE	FPS
LOWER EPICLASTIC SEQUENCE	LES
LOWER AMPHIBOLITE SEQUENCE	LAS
BASES VERY UNIT	DVU
STRONGE ZONE	STZ

ROCK TYPES (Character of hole part)

UBS	Upper Bivolite
UES	Upper Epiclastic
DBS	Blue Bay Shales
PLS	Plagioclase
MAS	Mylonitic Amphibolite
HVS	Handshall Volcaniclastics
SDP	Sean Dirt Position
FVS	Footwall Volcaniclastics
FPS	Feldspar Phyric
LES	Lower Epiclastic
LAS	Lower Amphibolite
DVU	Bases Very Unit
STZ	Stronge Zone

LEGEND

HL 17 (100) ----- Color location with hole number and projection N or S of section

----- Down hole section with projection N or S of nearest wire

----- Show start of hole part

----- Show end of hole part

----- Core with depth/grade (downhole section) projected to the thickness

----- Fault zone

----- EGR with projection N or S of section

SCALE 1:1000

0 50 100 metres

ALTERATION (Shown East of hole part)

1	None
2	Very slight alteration
3	Slight alteration
4	Medium alteration
5	Heavy alteration
6	Very heavy alteration

FAULTS (Shown East of hole part)

1	None
2	Very slight
3	Slight
4	Medium
5	Heavy
6	Very heavy

MINERALIZATION TEXTURE (Shown West of hole part)

1	None
2	Very slight
3	Slight
4	Medium
5	Heavy
6	Very heavy

Pb + Zn GRADES

0-5%	(Pb + Zn)
5-10	
10-20	
20-40	
>40	

Ag GRADES

0-50 g/t	Ag
50-100	
100-200	
200-400	
>400	

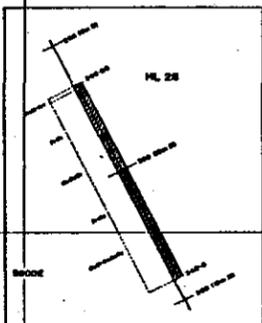
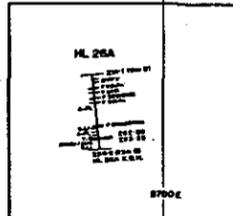
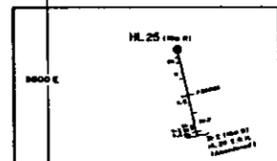
FIG. 15

Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10850 N

Geologist G.J.M.A.
Drawn ABTC
Traced AGS
Checked G.J.M.A.
Printed by H.E.L.A. & CO. PTY. LTD.
Scale 1:2500
Date January, 1985

028113



5 cm

STRATIGRAPHY
(See MEL 28 notes)

UPPER ANDIHITE SEQUENCE	URS
UPPER EPIDIOCLASTIC SEQUENCE	UES
BLUE RIVER SEQUENCE	URS
PLIOGENE SEQUENCE	PLS
UPPER ANDIHITE SEQUENCE	URS
HANMERWALL VOLCANOCLASTICS	HVS
MAIN ONE POSITION	MOP
FOOTWALL VOLCANOCLASTICS	FVS
FELDSPAR PHYRIC SEQUENCE	FPS
LOWER EPIDIOCLASTIC SEQUENCE	LES
LOWER ANDIHITE TUFF SEQUENCE	LAS
BASE OF TUFF UNIT	BOTU
STANDARD ZONE	STZ

(Numbers show the correct panel colours)

ROCK TYPES
(Show West of hole path)

URS	AndiHITE
UES	AndiHITE
URS	AndiHITE
PLS	AndiHITE
URS	AndiHITE
HVS	AndiHITE
MOP	AndiHITE
FVS	AndiHITE
FPS	AndiHITE
LES	AndiHITE
LAS	AndiHITE
BOTU	AndiHITE
STZ	AndiHITE

LEGEND

ALTERATION (Show East of hole path)

URS	AndiHITE
UES	AndiHITE
URS	AndiHITE
PLS	AndiHITE
URS	AndiHITE
HVS	AndiHITE
MOP	AndiHITE
FVS	AndiHITE
FPS	AndiHITE
LES	AndiHITE
LAS	AndiHITE
BOTU	AndiHITE
STZ	AndiHITE

FAULTS (Show East of hole path)

URS	AndiHITE
UES	AndiHITE
URS	AndiHITE
PLS	AndiHITE
URS	AndiHITE
HVS	AndiHITE
MOP	AndiHITE
FVS	AndiHITE
FPS	AndiHITE
LES	AndiHITE
LAS	AndiHITE
BOTU	AndiHITE
STZ	AndiHITE

MINERALIZATION TEXTURE
(Show West of hole path)

URS	AndiHITE
UES	AndiHITE
URS	AndiHITE
PLS	AndiHITE
URS	AndiHITE
HVS	AndiHITE
MOP	AndiHITE
FVS	AndiHITE
FPS	AndiHITE
LES	AndiHITE
LAS	AndiHITE
BOTU	AndiHITE
STZ	AndiHITE

Pb + Zn GRADES

0-5%	(Pb + Zn)
5-10	
10-20	
20-40	
> 40	

Ag GRADES

0-50 g/t Ag	
50-100	
100-200	
200-400	
> 400	

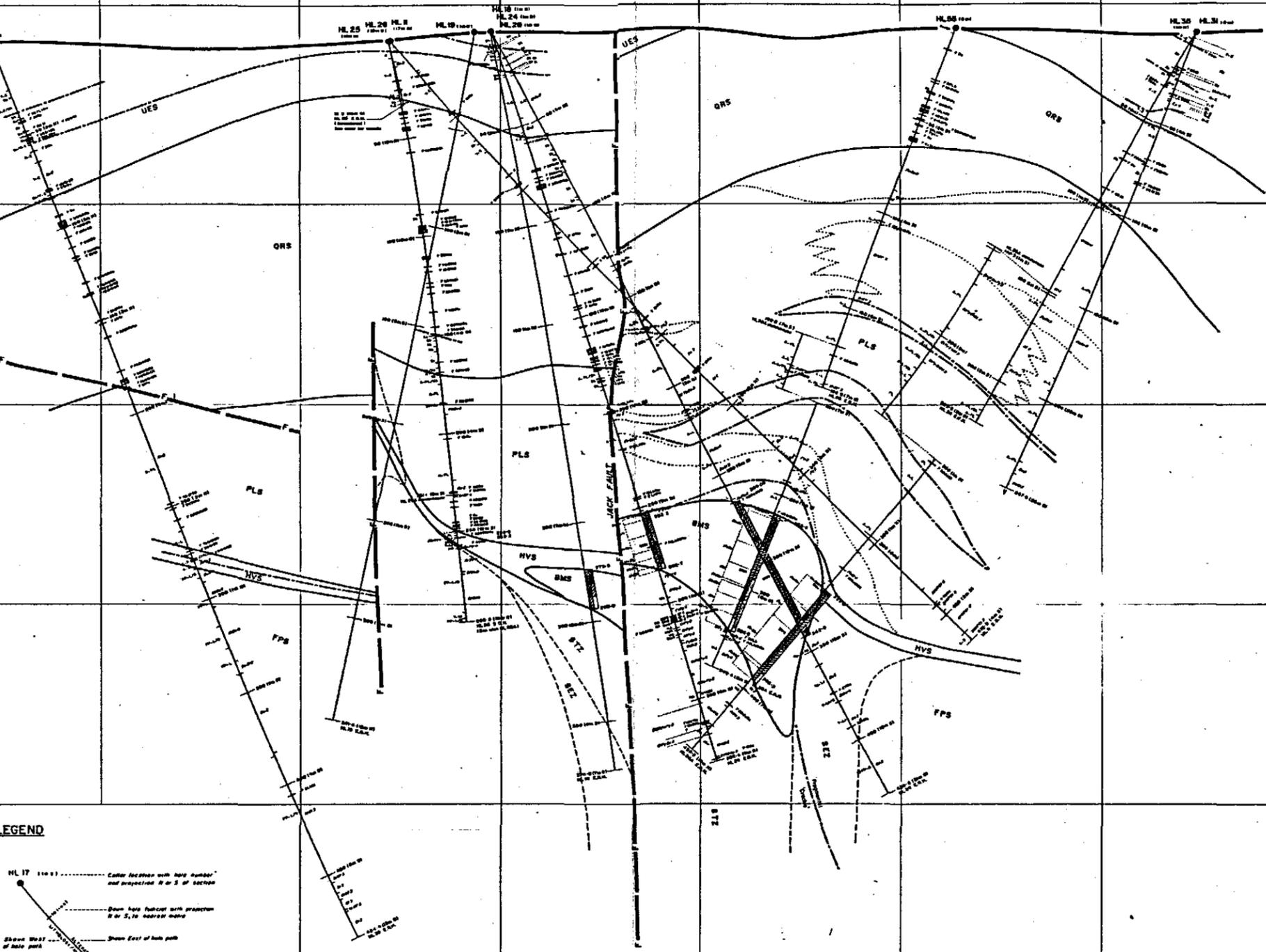


FIG.16

Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10900N

Scale: 1:2500 Date: December, 1984

028114

5 cm

STRATIGRAPHY
(See NEL 22 series)

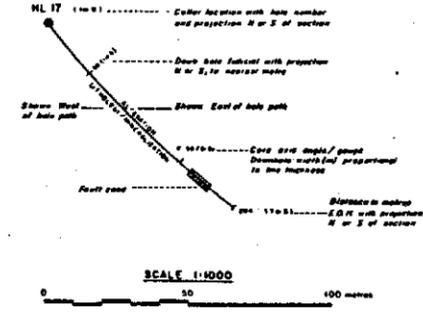
ROCK TYPES
(Shown West of hole path)

UPPER INTRUSIVE SEQUENCE	URS
UPPER EPICLASTIC SEQUENCE	UES
ONE RIVER SHALES	ORS
PILLON LENS SEQUENCE	PLS
UPPER ANDESITIC SEQUENCE	UAS
HANDSWELL VOLCANICLASTICS	HVS
MAIN ORE POSITION	MOP
FOOTBALL VOLCANICLASTICS	FVS
FELDSPAR PORPHYRY SEQUENCE	FPS
LOWER EPICLASTIC SEQUENCE	LES
LOWER ANDESITIC SEQUENCE	LAS
BAGLEY VEGET UNIT	BVU
STRIMMER	STZ

ALTERATION
(Shown East of hole path)

U	Ultramylonite
U1	Ultramylonite - fine grained
U2	Ultramylonite - coarse grained
U3	Ultramylonite - very coarse grained
U4	Ultramylonite - massive
U5	Ultramylonite - highly fractured
U6	Ultramylonite - highly fractured and mineralized
U7	Ultramylonite - highly fractured and mineralized with pyrite
U8	Ultramylonite - highly fractured and mineralized with pyrite and arsenic
U9	Ultramylonite - highly fractured and mineralized with pyrite, arsenic and antimony
U10	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony and tellurium
U11	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium and bismuth
U12	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth and silver
U13	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver and gold
U14	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold and copper
U15	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper and lead
U16	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead and zinc
U17	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc and iron
U18	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron and manganese
U19	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese and nickel
U20	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel and cobalt
U21	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt and selenium
U22	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium and molybdenum
U23	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum and vanadium
U24	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium and niobium
U25	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium and tantalum
U26	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum and tin
U27	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin and tungsten
U28	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten and rhenium
U29	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium and ruthenium
U30	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium and rhodium
U31	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium and palladium
U32	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium and platinum
U33	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, platinum and iridium
U34	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium and osmium
U35	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium and platinum
U36	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum and gold
U37	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold and silver
U38	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver and copper
U39	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper and lead
U40	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead and zinc
U41	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc and iron
U42	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron and manganese
U43	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese and nickel
U44	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel and cobalt
U45	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt and selenium
U46	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium and molybdenum
U47	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum and vanadium
U48	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium and niobium
U49	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium and tantalum
U50	Ultramylonite - highly fractured and mineralized with pyrite, arsenic, antimony, tellurium, bismuth, silver, gold, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum, tin, tungsten, rhenium, ruthenium, rhodium, palladium, iridium, osmium, platinum, gold, silver, copper, lead, zinc, iron, manganese, nickel, cobalt, selenium, molybdenum, vanadium, niobium, tantalum and tin

LEGEND



MINERALIZATION TEXTURE
(Shown West of hole path)

0-5% (Pb + Zn)	0-50 g/t Ag
5-10	50-100
10-20	100-200
20-40	200-400
40	400

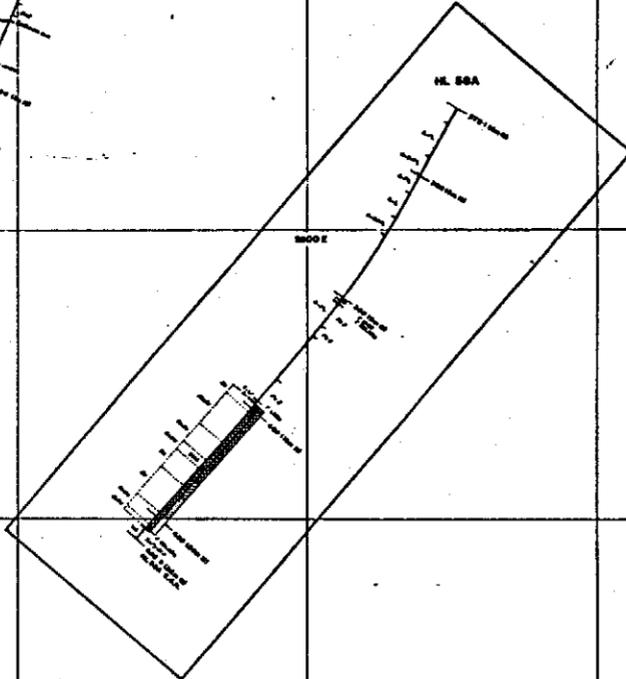
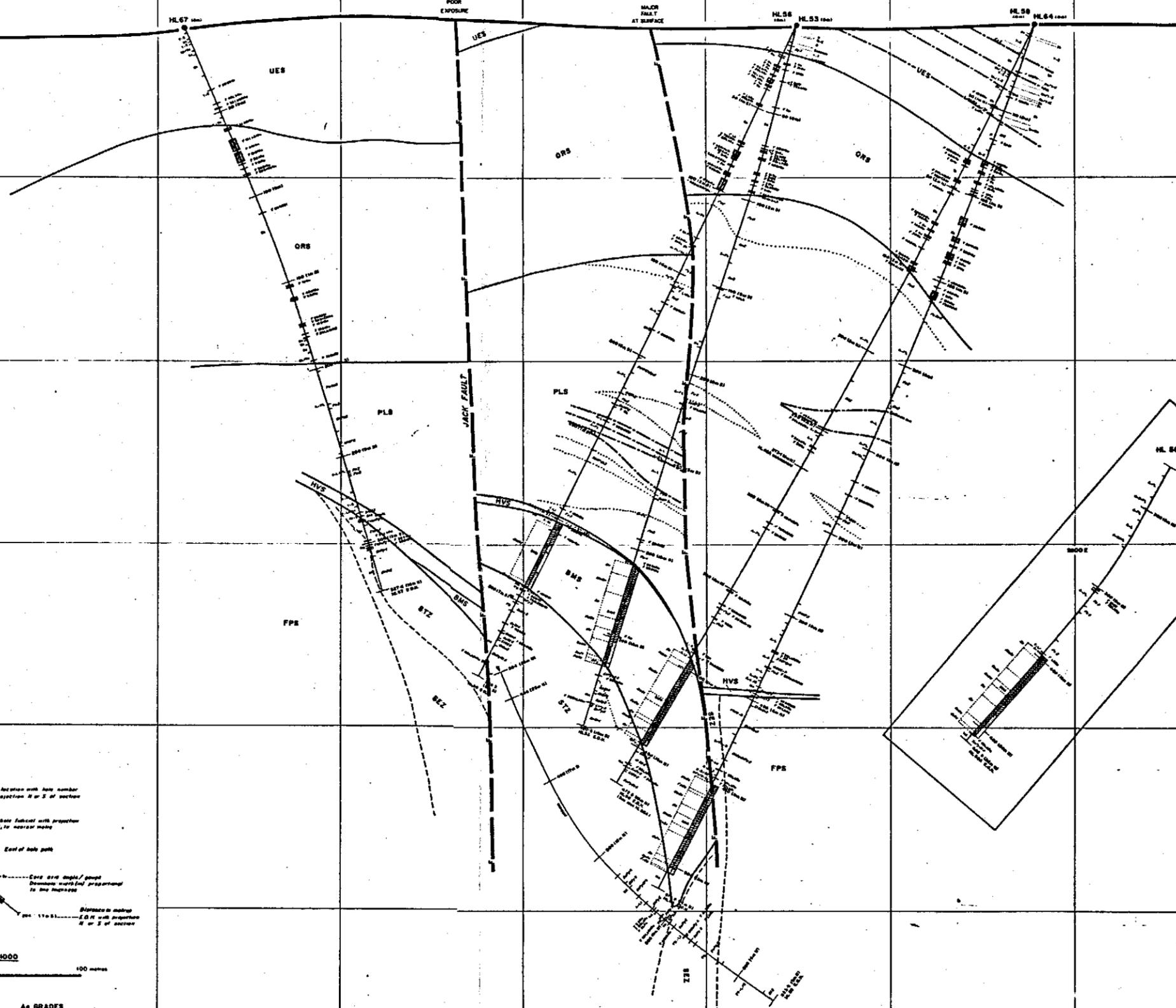


FIG. 17

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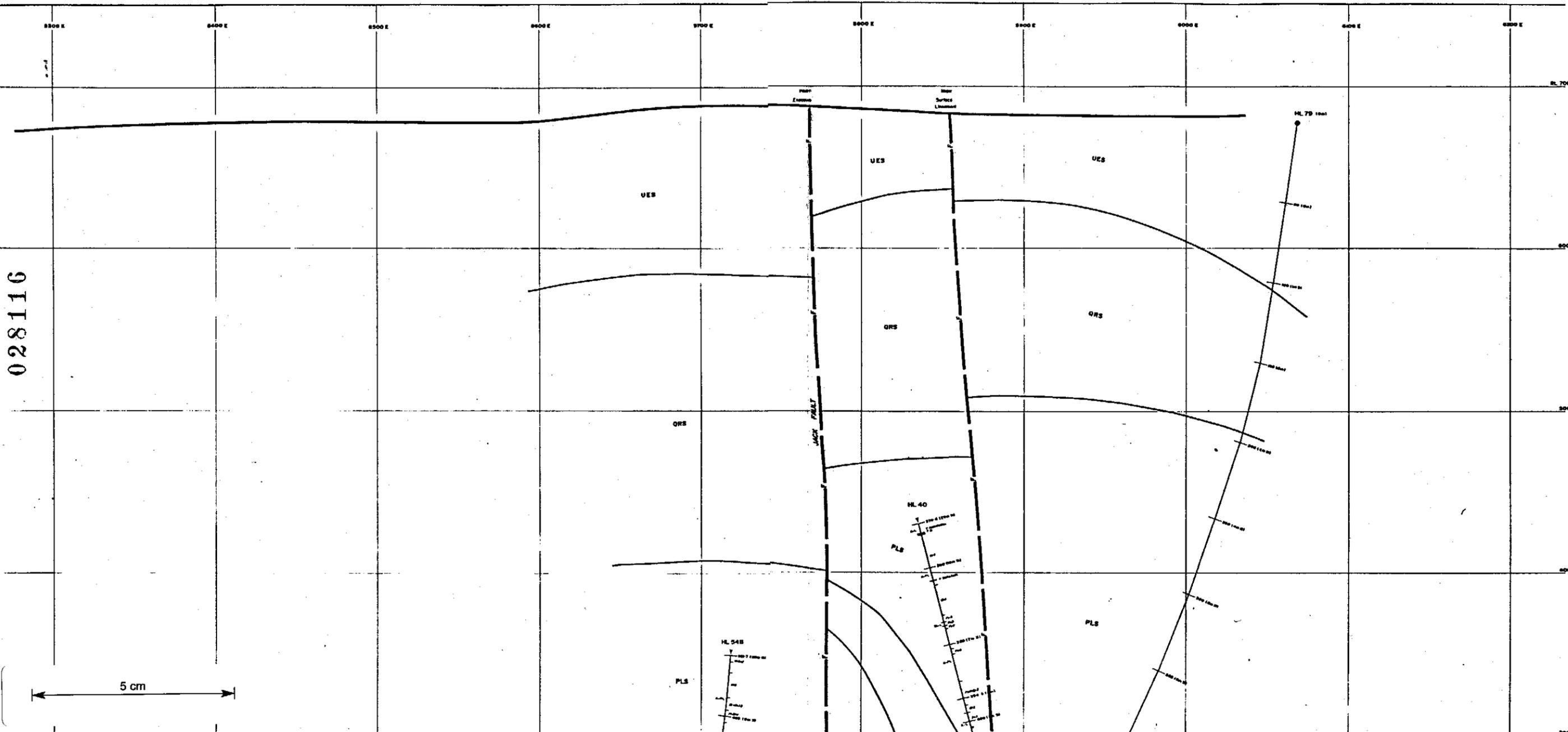
NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 10950N

Scale 1:2500
Date January 1988

Author	G.M.A.
Drawn	ARTEC
Traced	G.A.C.
Checked	G.M.A.

Issue No. NEL 4708004

028116



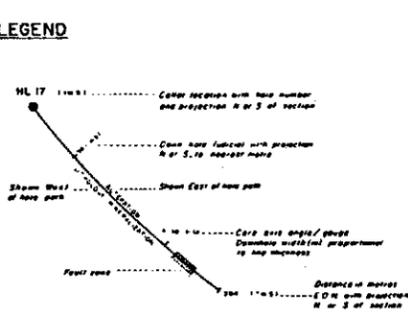
STRATIGRAPHY
(See HEL 22 series)

SEQUENCE	ROCK TYPES	DESCRIPTION
UPPER DIOCLASE SEQUENCE	URS	Diabase
UPPER EPICLASTIC SEQUENCE	UES	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
QUE RIVER SHALE	QRS	Shale, sandstone
PILLOW LAVA SEQUENCE	PLS	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
UPPER ANDESITE SEQUENCE	UAS	Andesite, tuff, sandstone, siltstone, shale, conglomerate
HARDWALL VOLCANICLASTICS	HVS	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
MAIN ONE POSITION	MOP	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
FOOTWALL VOLCANICLASTICS	FVS	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
FELDSPAR PHYRIC SEQUENCE	FPS	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
LOWER EPICLASTIC SEQUENCE	LES	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
LOWER ANDESITE SEQUENCE	LAS	Andesite, tuff, sandstone, siltstone, shale, conglomerate
SACIE VENT UNIT	SUV	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate
STRIPPER ZONE	STZ	Basalt, andesite, tuff, sandstone, siltstone, shale, conglomerate

LEGEND

ALTERATION
(Shown East of new path)

Symbol	Description
...	Zone
...	Zone with fracture with projection N or S, to represent mine
...	Zone East of new path
...	Core zone (angle of dip) Dashed with (1) proportion to dip (thickness)
...	Fault zone
...	Deposits in mine
...	20 m with direction N or S of section



MINERALIZATION TEXTURE
(Shown West of new path)

Symbol	Pb + Zn GRADES	Ag GRADES
...	0-5% (Pb + Zn)	0-50 g/t Ag
...	5-10	50-100
...	10-20	100-200
...	20-40	200-400
...	> 40	> 400

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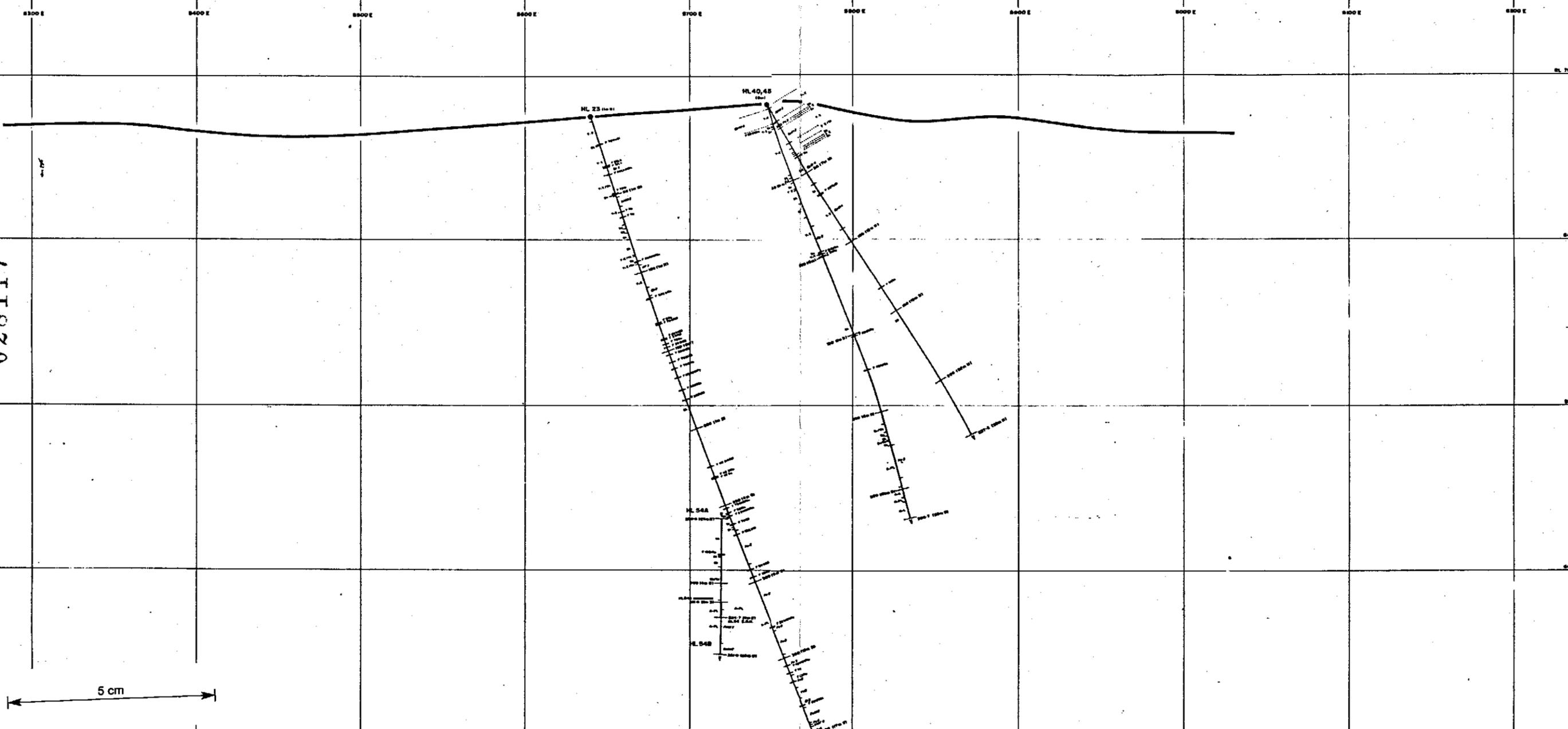
NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 11050N

Scale 1:2500 Date January 1985

Checked GJMAA
Drawn ASTEC
Compiled S.J.M.A.

FIG.19

028117



STRATIGRAPHY
(See HEL 22 series)

Sequence	Code	Rock Type
UPPER BRYOLITE	UBR	...
UPPER EPICLASTIC	UER	...
UPPER RIVER SHALE	URS	...
PILLON LENS	PLS	...
UPPER ANDRETTIC	UAS	...
WANDSWELL VOLCANICLASTIC	WVLC	...
MAIN ORC PORTION	MOR	...
FOOTWALL VOLCANICLASTIC	FVLC	...
FELDSPAR PHYRIC	FPP	...
LOWER EPICLASTIC	LER	...
LOWER ANDRETTIC	LAS	...
DACITE VEGET UNIT	DVU	...
STRIMBER	STZ	...

ROCK TYPES
(Shown West of hole path)

LEGEND

ALTERATION
(Shown East of hole path)

AL	Albite
AN	Anhydrite
EP	Epithermal
OP	Opal
PH	Phosphatic
SA	Sulfate
SH	Shale
SP	Sphalerite
ST	Stannite
TR	Trillite
VE	Vegetation
VI	Volcaniclastic
WV	Wandswell

FAULTS
(Shown East of hole path)

MINERALIZATION TEXTURE
(Shown West of hole path)

Grade	Texture
Pn + Zn GRADES	As GRADES
0-5% (Pn + Zn)	0-50 g/t As
5-10	50-100
10-20	100-200
20-40	200-400
> 40	> 400

SCALE 1:1000

0 50 100 metres

FIG. 20

Aberfoyle Exploration Pty Ltd

NORTH WEST TASMANIA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 11100N

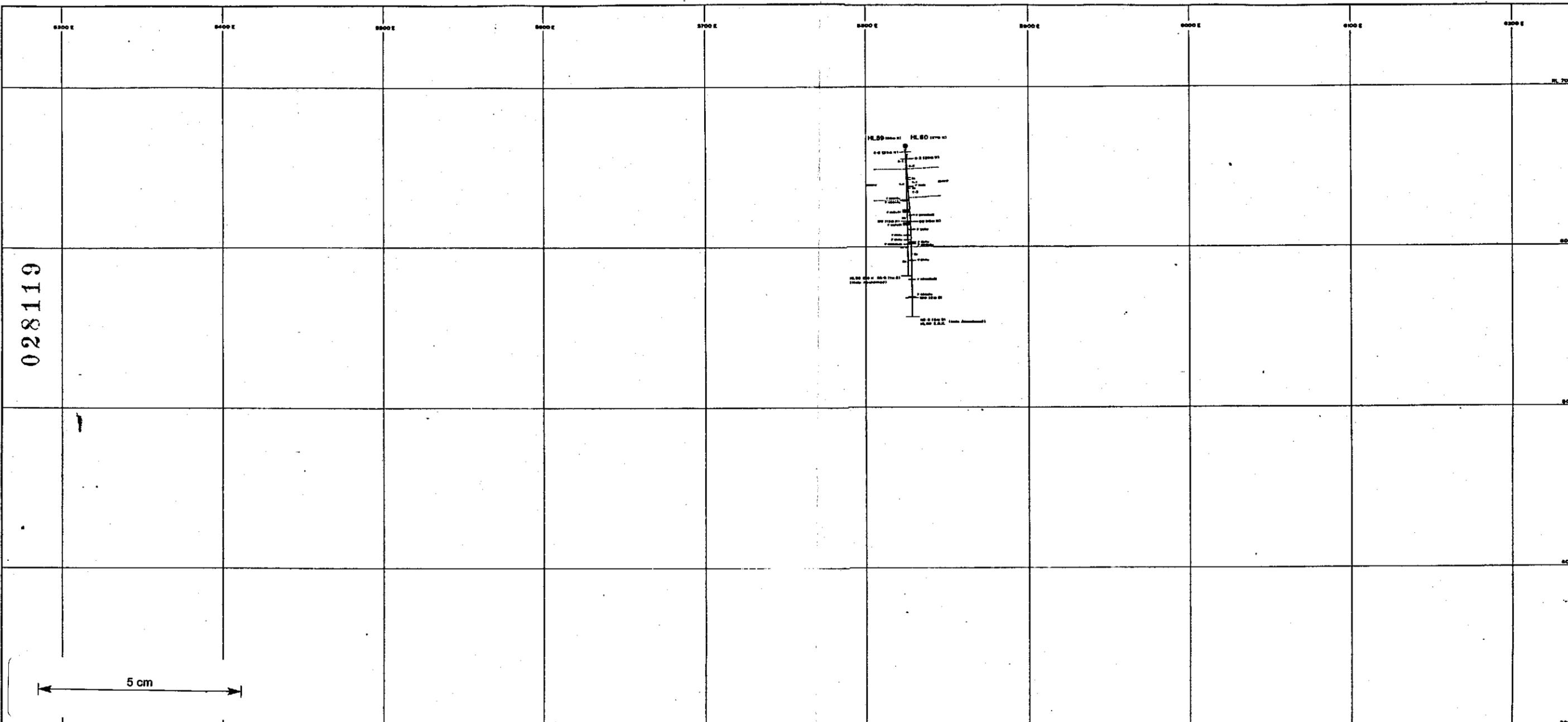
Scale 1:2500 Date January 1988

Prepared S.J.M.A.
Drawn ABTEC
Traced S.L.C.
Checked S.J.M.A.
From HEL 44/1988

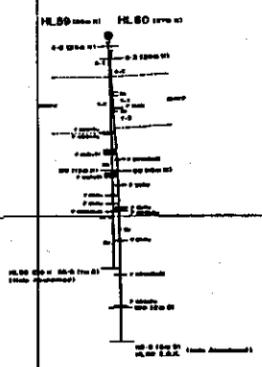
095

028120

APPENDIX B



028119



5 cm

STRATIGRAPHY
15 m HEL 17 (shown)

SEQUENCE	ROCK TYPES
UPPER ONDOLITE SEQUENCE	UBS
UPPER EPICLASTIC SEQUENCE	UES
ONE RIVER SHALE	ORS
FILLIN LOW SEQUENCE	PLS
UPPER ANDESITE SEQUENCE	UAS
HAMBRELL VOLCANCLASTICS	HVS
MARI DRIF POSITION	MSP
FOOTWALL VOLCANCLASTICS	FVS
FELDSPAR PHYRIC SEQUENCE	FPS
LOWER EPICLASTIC SEQUENCE	LES
LOWER ANDESITIC TUFF SEQUENCE	LAS
SAGITT VERT UNIT	SUV
FRONIER ZONE	FTZ

LEGEND

ALTERATION
(Shown East of hole path)

FAULTS
(Shown East of hole path)

MINERALIZATION TEXTURE
(Shown West of hole path)

Py + Zn GRADES

Ag GRADES

SCALE 1:1000

FIG. 22

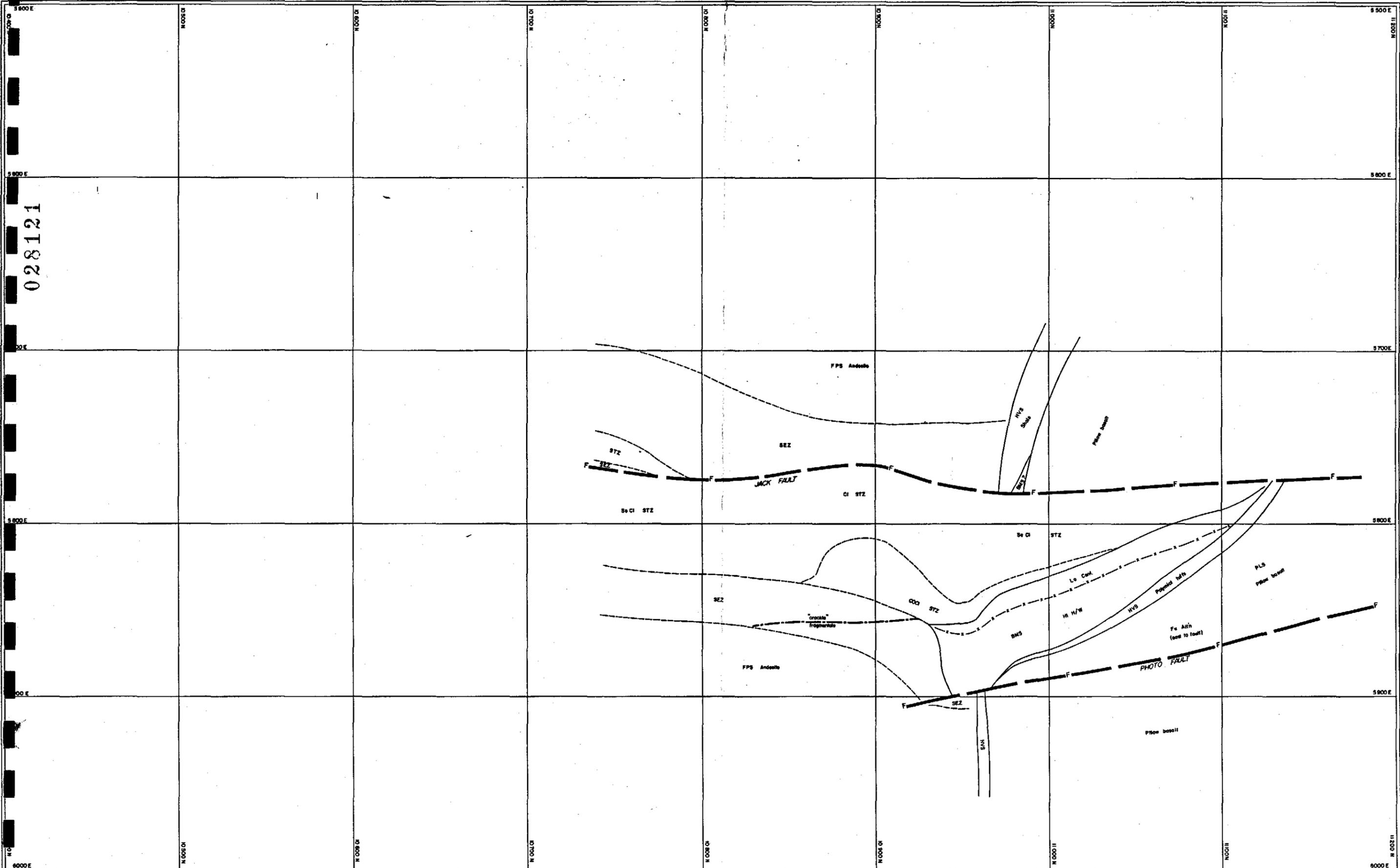
A Aberfoyle Exploration Pty Ltd

NORTH WEST TARNANA
MACKINTOSH E.L. 2/70
HELLYER PROSPECT
CROSS SECTION 11350N

Scale 1:2500 Date January 1986

Author S.J.M.H.
Name ASTEC
Title SLC
Checked S.J.M.H.
Drawn S.J.M.H.

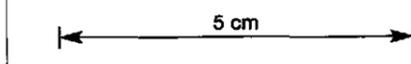
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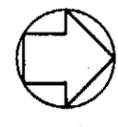
028121

LEGEND

	Stratigraphic unit boundary		Fault
	Lithologic unit boundary		Ore zone boundary
	Partial alteration boundary		
	Non-partial alteration boundary		



REV	DATE	REVISION	DRAWN	CHK	APP	APP



SCALE 1:2000

DRAWN	G.J.McA.	April, 1980
CHECKED		
DESIGNED		
DESIGN CKD		
DESIGN APP		
PROJECT APP		

MACKINTOSH MINING PTY LTD

PROJECT: HELLYER FIG. 23

GEOLOGICAL INTERPRETATION

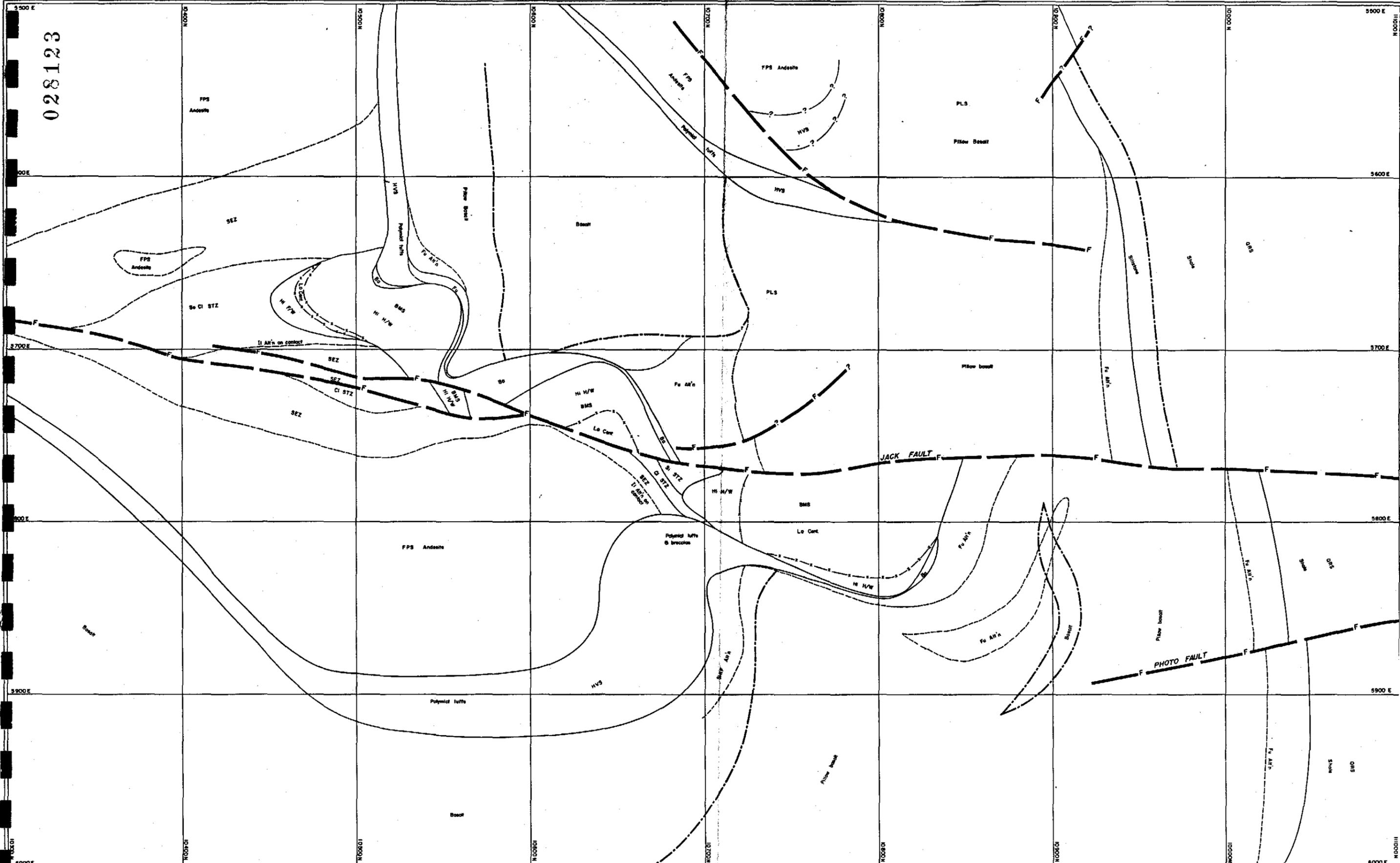
300RL PLAN

NEL 10 400 N - 11 200 N NON-STANDARD FORMAT

DRAWING NO. NEL 46/300 RL
REVISION

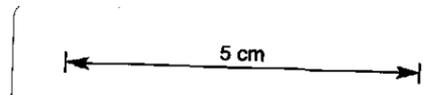
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028123

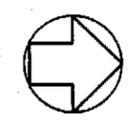


LEGEND

—	Stratigraphic unit boundary	—	50m Fault
- - -	Lithologic unit boundary	- - -	On zone boundary
- · - · -	Fachwall alteration boundary		
- · - · -	Hangingwall alteration boundary		



REV	DATE	REVISION	DRAWN	CHK	APP	APP



SCALE 1:2000	
DRAWN	GJMCA
CHECKED	APR 1985
DESIGNED	
DESIGN CKD	
DESIGN APP	
PROJECT APP	

MACKINTOSH MINING PTY LTD

PROJECT: HELLER

FIG. 25

GEOLOGICAL INTERPRETATION

500RL PLAN

DRAWING NO. HEL 46/500 RL

REVISION:

002300

100

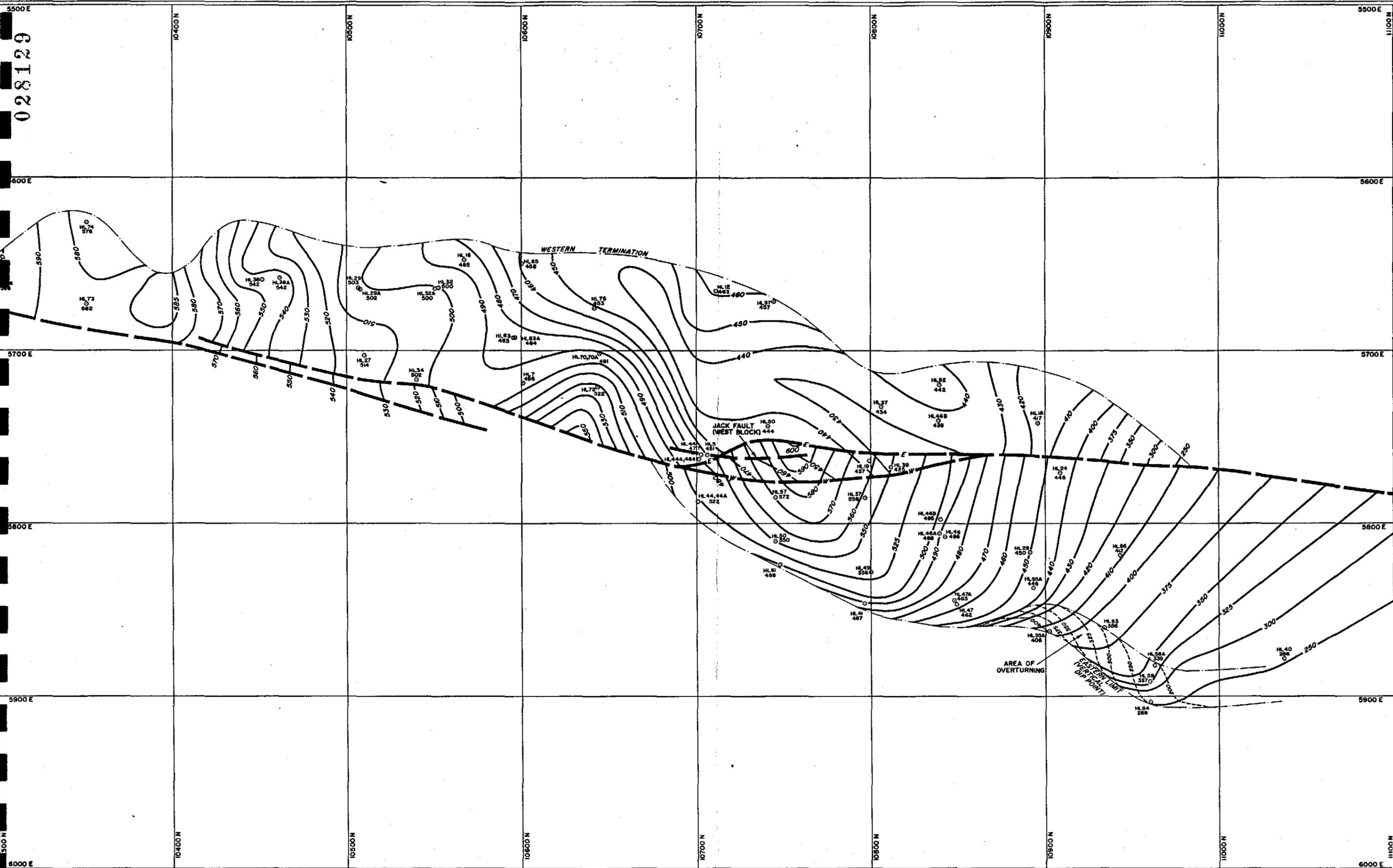
028125

APPENDIX C

103

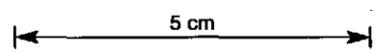
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APPENDIX D



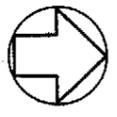
028129

104



HL 67
○
629 Shows R.L. (in metres) where drillhole passes through structure.

REV	DATE	REVISION	DRAWN	CHKD	APP	APP



SCALE 1:2000		Sheet No. 1110-600
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CHECKED		
DESIGNED	GJMca	21-1-85
DESIGN CKD		
DESIGN APP		
PROJECT APP		

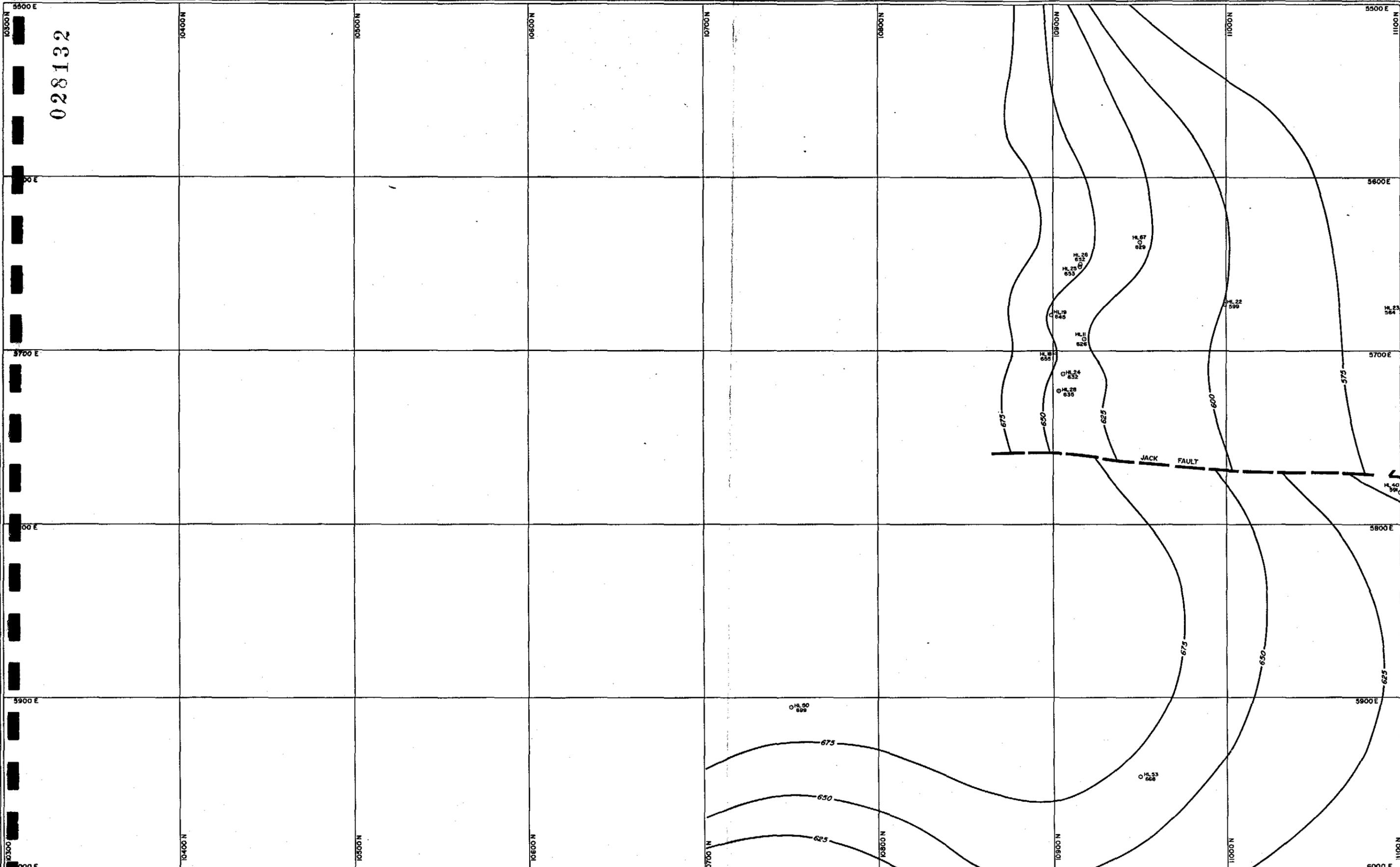
MACKINTOSH MINING PTY LTD	
PROJECT: HELLYER PROSPECT	FIG. 29
STRATIGRAPHIC HORIZON TOP-BMS (H/W)	DRAWING NO. HEL 38 F
	REVISION

028131

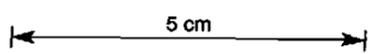
106

APPENDIX E

028132



107



HL 67
629 Shows R.L. (in metres) where drillhole passes through structure.

REV	DATE	REVISION	DRAWN	CHKD	APP	APP



SCALE 1:2000		Sheet No. 110-600
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CHECKED	GJMca	21-1-85
DESIGNED		
DESIGN CKD		
DESIGN APP		
PROJECT APP		

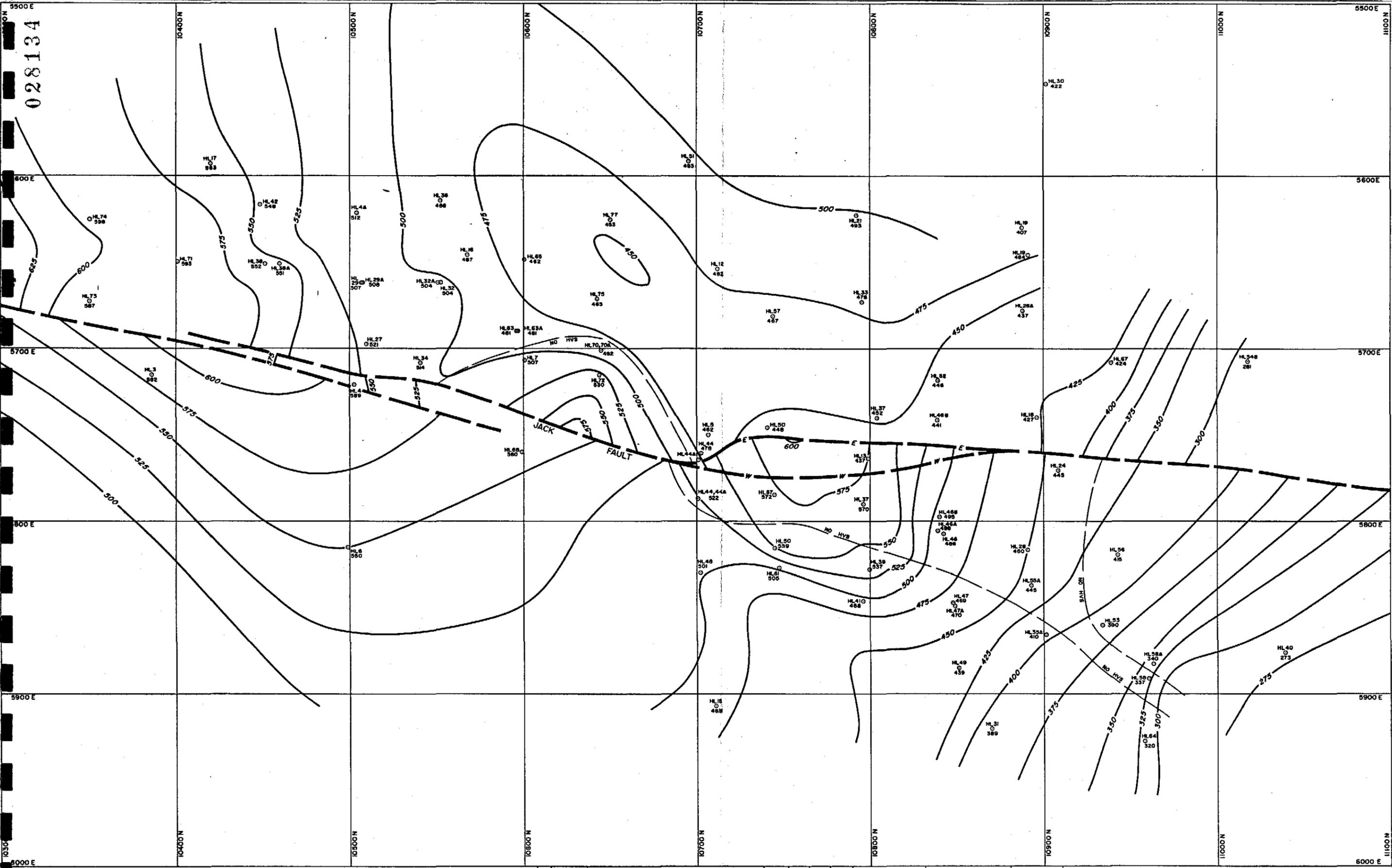
MACKINTOSH MINING PTY LTD

PROJECT: HELLYER PROSPECT FIG. 32

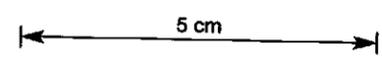
**STRATIGRAPHIC HORIZON
BASE-UPPER EPICLASTIC SEQUENCE**

DRAWING NO. HEL 38 A
REVISION

028134



109



HL 67
429 Shows R.L. (in metres) where drillhole passes through structure.

REV	DATE	REVISION	DRAWN	CHK	APP	APP



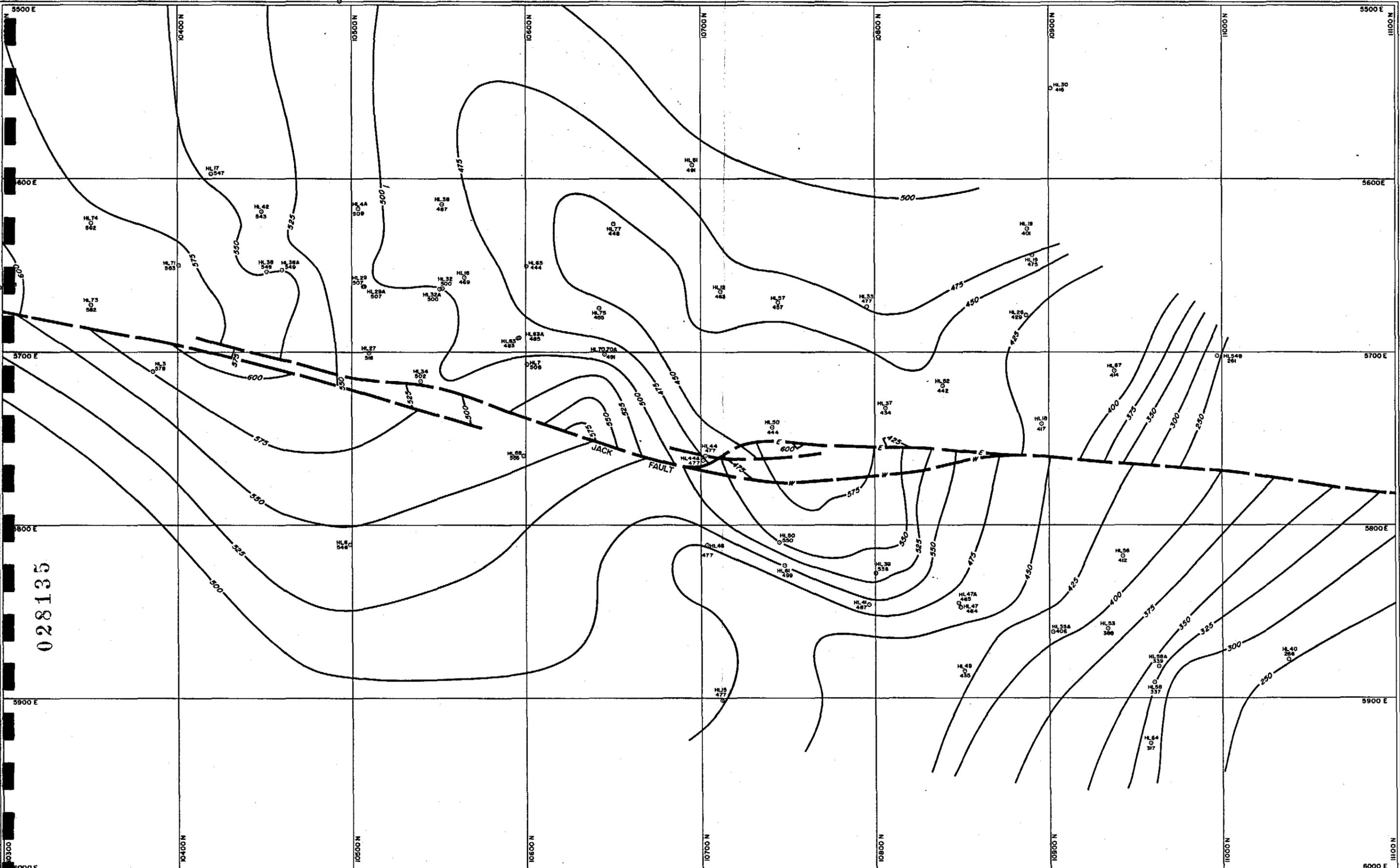
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CHECKED			
DESIGNED	GJMca	21-1-85	
DESIGN CKD			
DESIGN APP			
PROJECT APP			

MACKINTOSH MINING PTY LTD

PROJECT: HELLYER PROSPECT FIG. 34

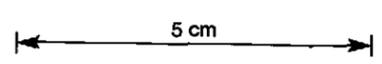
**STRATIGRAPHIC HORIZON
BASE - PILLOW LAVA SEQUENCE**

DRAWING NO. HEL 38 C	REVISION
----------------------	----------



028135

110



HL 67 529 Shows R.L. (in metres) where drillhole passes through structure.

REV	DATE	REVISION	DRAWN	CHK	APP	APP



SCALE 1:2000	Sheet No. 1110-600
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CHECKED	
DESIGNED GJMca	21-1-85
DESIGN CKD	
DESIGN APP	
PROJECT APP	

MACKINTOSH MINING PTY LTD

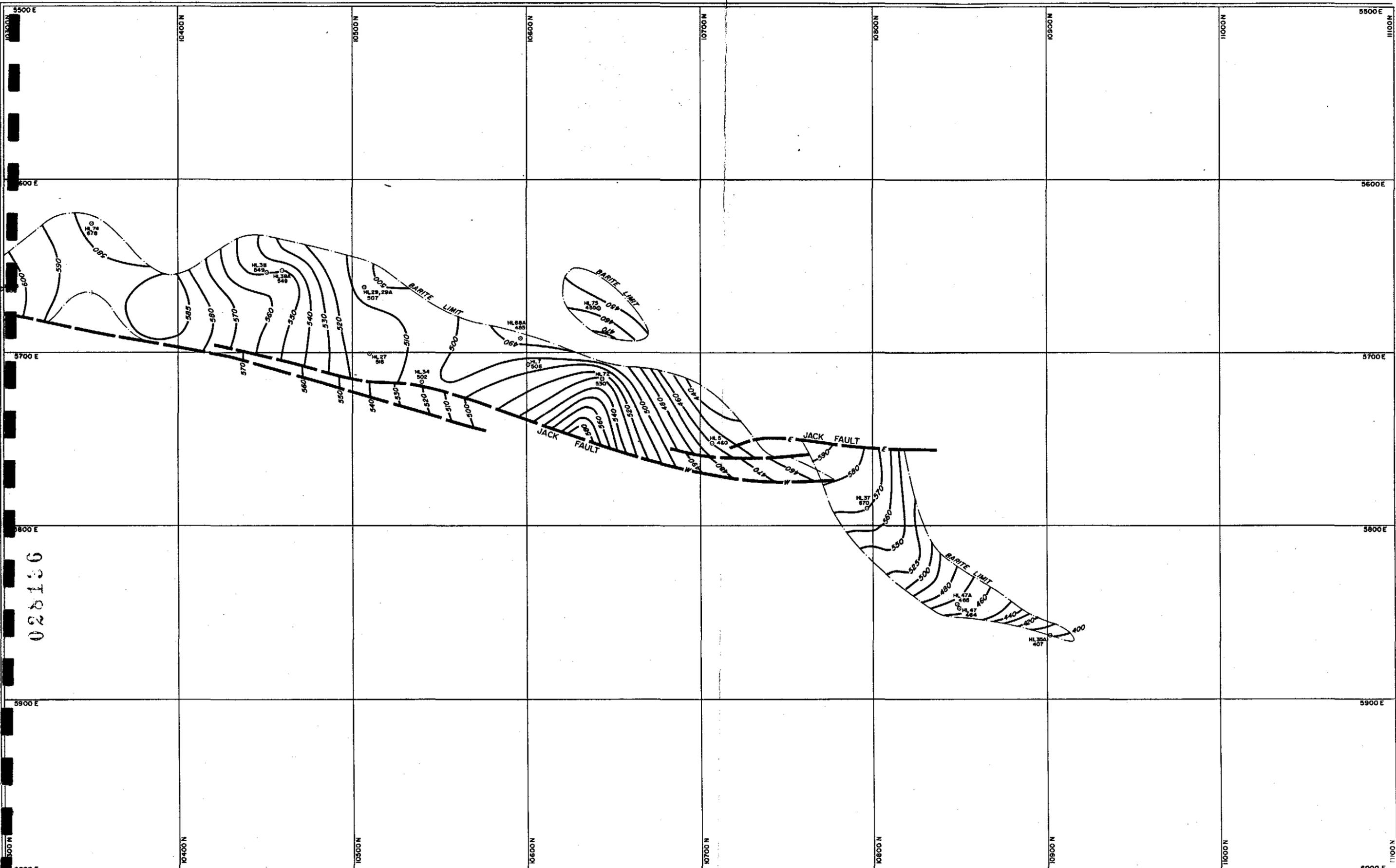
PROJECT: HELLYER PROSPECT

STRATIGRAPHIC HORIZON
BASE-HANGINGWALL VOLCANICLASTICS

FIG. 35

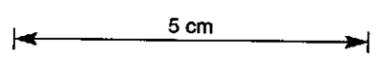
DRAWING NO. HEL 38 D

REVISION



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H. 27
○ 526 Shows R.L. (in metres) where drillhole passes through structure.

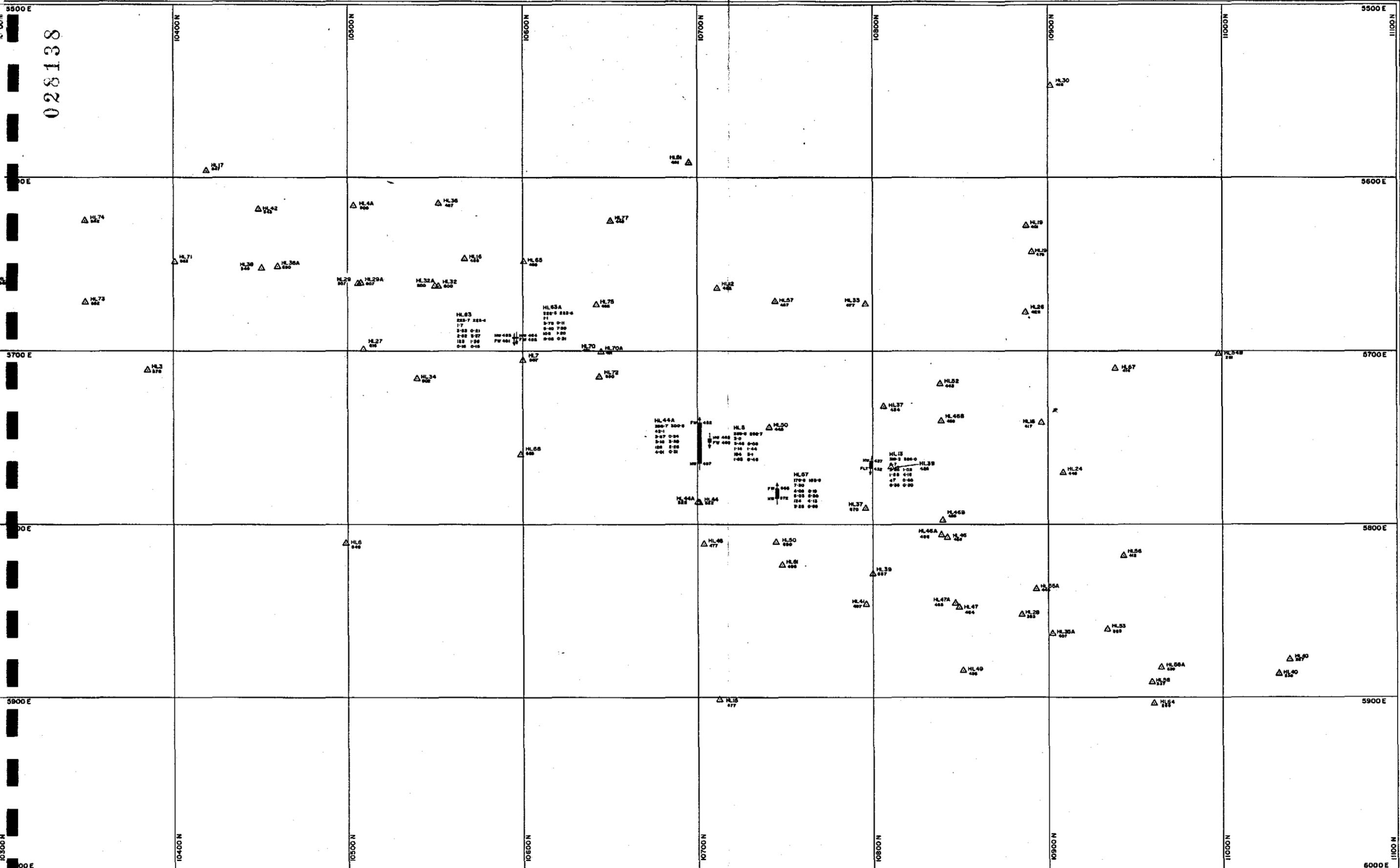
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CHECKED		
DESIGNED	GJMcA	21-1-85
DESIGN CKD		
DESIGN APP		
PROJECT APP		

MACKINTOSH MINING PTY LTD	
PROJECT: HELLYER PROSPECT	FIG. 36
STRATIGRAPHIC HORIZON TOP - BARITE	
DRAWING NO. HEL 38 E	
REVISION	

APPENDIX F



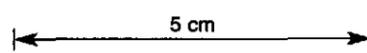
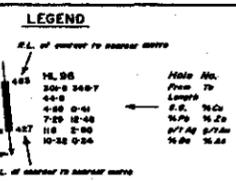
5500 E
5600 E
5700 E
5800 E
5900 E

10300 N
10400 N
10500 N
10600 N
10700 N
10800 N
10900 N
11000 N

028138

00 113

INDEX
 HEL 41 A GSP (glassy silica/cobbeform pyrite)
 B Ba
 C Ba/BMS
 D BMS



REV	DATE	REVISION	DRAWN	CHKD	APP	APP
1-5-85		Inclusion of barren drillhole intersections	GLC			



SCALE	1:2000
Sheet No.	1110-600
DRAWN	GLC
CHECKED	
DESIGNED	GJMCA
DESIGN CKD	22-2-85
DESIGN APP	
PROJECT APP	

MACKINTOSH MINING PTY LTD

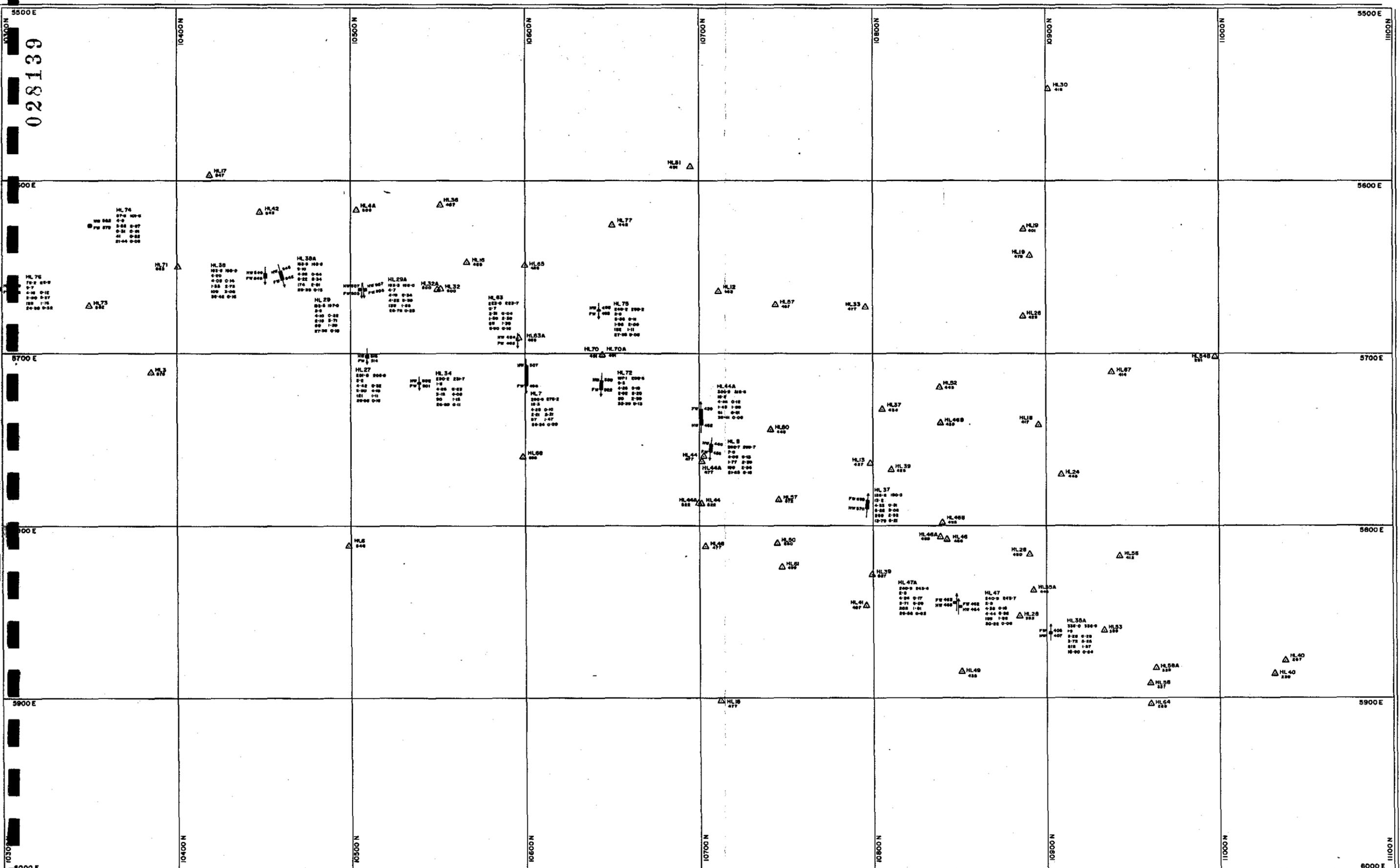
PROJECT: **HELLYER PROSPECT** FIG. 41

PLAN PROJECTION - ORE INTERSECTIONS

GSP
(GLASSY SILICA/COLLOFORM PYRITE)

DRAWING NO. HEL 41 A

REVISION



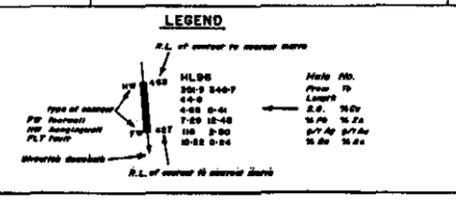
028139

114

INDEX

HEL 41 A GSP (glassy siliceo/carbonate pyrite)

B Bz
C Bz/BMS
D BMS



REV	DATE	REVISION	DRAWN	CHKD	APP	APP
1-5-85		Inclusion of barren drillhole intersections	GLC			

SCALE 1:2000

Sheet No. 110-600

DRAWN	GLC	3-4-85
CHECKED		
DESIGNED	GJMCA	21-2-85
DESIGN CKD		
DESIGN APP		
PROJECT APP		

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PROJECT: HELLYER PROSPECT

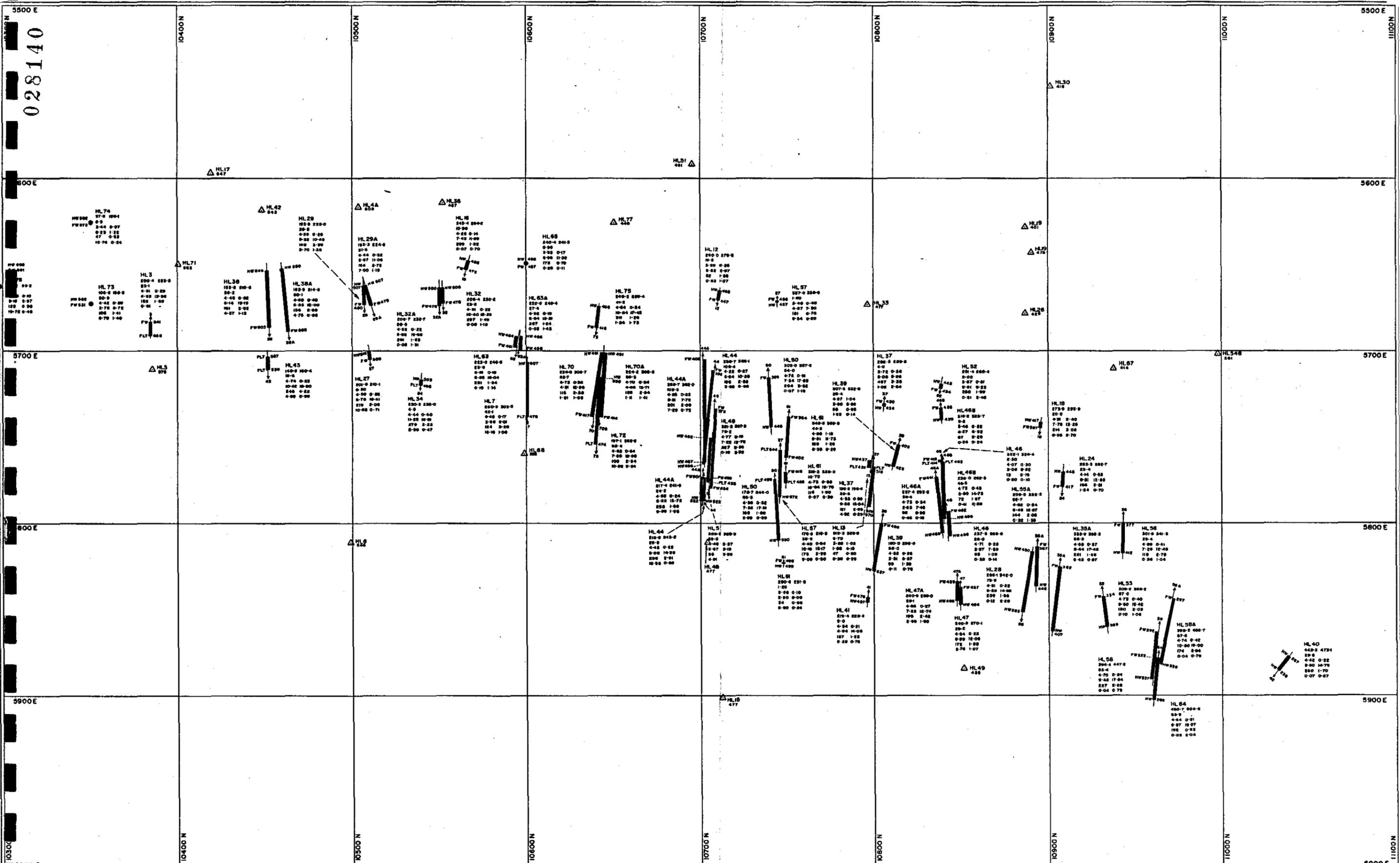
FIG. 42

PLAN PROJECTION - ORE INTERSECTIONS

Bz (BARITE)

DRAWING NO. HEL 41 B

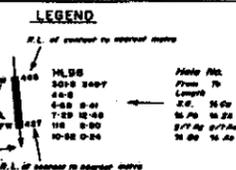
REVISION



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INDEX
 HEL 41 A GSP (glassy silica/calcium pyrite)
 B Ba
 C Ba/BMS
 D BMS



REV	DATE	REVISION	DRAWN	CHK	APP	APP
1-5-85		Inclusion of barren drillhole intersections	GLC			



SCALE 1:2000	Sheet No. 1110-600
DRAWN GLC	15-4-85
CHECKED GJMCA	21-2-85
DESIGNED	
DESIGN CKD	
DESIGN APP	
PROJECT APP	

MACKINTOSH MINING PTY LTD

PROJECT: HELLYER PROSPECT

FIG. 43

PLAN PROJECTION - ORE INTERSECTIONS

Ba/BMS

DRAWING NO. HEL 41 C

REVISION

5 cm

APPENDIX G

28 NOV 1984

118

INTERPRETATION OF DOWNHOLE ELECTROMAGNETIC
DATA FROM THE HELLYER DEPOSIT - REPORT 1

DISTRIBUTION

Aberfoyle, Hawthorn
G J McArthur, Burnie
J R Sise, Burnie
D Wallace, Que River
E T Eadie, Hawthorn

E T EADIE
Geophysicist
Aberfoyle Exploration

NOVEMBER, 1984

TABLE OF CONTENTS

	<u>PAGE NO.</u>
I INTRODUCTION	1
II GEOMETRICAL INTERPRETATION	
1. HL 1	2
2. HL 3	2
3. HL 4	3
4. HL 19	3
5. HL 21	5
6. HL 31	6
7. HL 45A	7
III DECAY CURVES AND CONDUCTANCE CONSIDERATIONS	
1. HL 3	8
2. HL 19, 21 and 31	8
3. HL 45A	9
IV NEWMONT EMP RESULTS	10
V CONCLUSIONS	11
VI REFERENCES	11

LIST OF ILLUSTRATIONS

FIGURE 1 Hellyer Downhole EM Transmitter Loop Layout

FIGURE 2a Data from HL 1 - Loop 1 (Plate XHEL 2a)

2b Data from HL 1 - Loop 2 (Plate XHEL 2b)

FIGURE 3a Cross Section 10400N (Plate HEL22/10400N)

3b Data from HL 3 - Loop 1 (Plate XHEL 3a)

3c Data from HL 3 - Loop 2 (Plate XHEL 3b)

FIGURE 4a Cross Section 10500N (Plate HEL 22/10500N)

4b Data from HL 4 - Loop 1 (Plate XHEL 4a)

FIGURE 5 HL 19 - EM Primary Field Configurations

FIGURE 6a Cross Section 10900N (Plate HEL 22/10900N)

6b Data from HL 19 - Loop 1 (Plate XHEL 5a)

6c Data from HL 19 - Loop 2 (Plate XHEL 5b)

6d Data from HL 19 - Loop 3 (Plate XHEL 5c)

6e Data from HL 19 - Loop 4 (Plate XHEL 5d)

FIGURE 7a Cross Section 10800N (Plate HEL 22/10800N)

7b Data from HL 21 - Loop 1 (Plate XHEL 6a)

7c Data from HL 21 - Loop 2 (Plate XHEL 6b)

7d Data from HL 21 - Loop 3 (Plate XHEL 6c)

7e Data from HL 21 - Loop 4 (Plate XHEL 6d)

FIGURE 8 HL 31 - EM Primary Field Configurations

FIGURE 9a Data from HL 31 - Loop 1 (Plate XHEL 7a)

9b Data from HL 31 - Loop 2 (plate XHEL 7a)

FIGURE 10a Cross Section 11100N (Plate HEL 22/11100N)

10b Data from HL 45A - Loop 1 (Plate XHEL 8a)

LIST OF ILLUSTRATIONS

- FIGURE 11 Downhole EM Decay Curves
- FIGURE 12 Newmont EMP Data - HL 3
- FIGURE 13 Newmont EMP Data - HL 4
- FIGURE 14 Newmont EMP Data - HL 19
- FIGURE 15 Newmont EMP Data - HL 21
- FIGURE 16 HL 4 - EM Primary Field Configuration

I. INTRODUCTION

From May to September of 1984, seven different drill holes were logged with downhole Sirotem from several different transmitter loop positions for a total of 16 different surveys. Only in two cases have the results so far been of any real value to the drill geologists:-

- 1) the lack of response in HL 1 that proved that the ore body does not continue to 10200N and
- 2) the large response in HL 31 which indicated that this hole passed significantly closer to the ore body than had previously been thought.

A third case where the results might prove of value to future drilling was in HL 45A. This data not only helps to outline the geometry of the eastern edge of the deposit on 11100N, but also suggests that the body has a greater conductance in this region, and is therefore probably larger than further south. Further downhole work in this area, which has been planned, will be necessary to confirm this hypothesis.

In other cases, the EM results have only confirmed what was already known by the drill geologists. There are two reasons for this apparent lack of effectiveness. One is that it is very difficult to be much help when the deposit is being drilled off on a 50 metre grid. The second is that timing was often a problem. It was often not feasible, or at least not cost effective to mobilize a crew and log a hole in time to help the drill programme, which was progressing very rapidly.

Now that there is a pause in drilling, and the results up to now have been carefully interpreted and understood, a small amount of downhole EM work, which is already planned, may be able to make a large contribution to the understanding of the geometry of the northern part of the Hellyer ore deposit.

II GEOMETRICAL INTERPRETATION

Figure 1 shows in plan the location of all of the transmitter loops and drillholes mentioned in this report, plus a projection of the Hellyer ore deposit to surface. All of the EM data and the relevant geological cross sections are included in this report.

1. HL 1

The data for HL 1 is shown in figures 2a (loop 1) and 2b (loop 2). The data for loop 1 is too noisy to be interpreted because of weak signal and the presence of the HEC transmission line. However, it is apparent from figure 2b that there is no conductive feature in the vicinity, within at least 75 metres of the drill hole. The side-looping capability of the Sirotem in this situation is limited to about 75 metres because of the short length of the drill hole (170 metres).

2. HL 3

The Sirotem data exhibits the classic positive response expected when a conductor is intersected for both loops 1 (figure 3b) and 2 (figure 3c).

The geological cross section for Line 10400N is shown in figure 3a. The slight assymetry of this positive response which has a gradual buildup as the conductor is approached from above and a sharp decline past the conductor, agrees well with the geologically interpreted vertical fault contact on the eastern side of the body, and a bottom contact roughly perpendicular to the drill hole. The fact that the anomaly remains positive until after 5 milliseconds, indicates that the drill hole intersects the body very close to its cross sectional centre. The negative response at very late times for loop 1, and the positive to negative crossover for loop 2, shows quite clearly that there is more to the conductor than was intersected in the drill hole. There is more discussion on this late time anomaly in a later section.

124

3. HL 4

The geological cross section for 10500N is shown in figure 4a and the HL 4 Sirotem data in figure 4b. The data shows a very high amplitude off hole response which is hundreds of times the noise level of the survey. This contrasts with the original surface work which had an anomaly amplitude only 1 or 2 times the noise level of the survey, proving how effective downhole EM can be when drilling for the sources of anomalies that are weak at surface.

Because the EM survey was conducted only in HL 4 to 255 metres and not in the extended HL 4A, there is not enough information to do a detailed interpretation because only half of the anomaly has been covered. The best interpretation based on this coverage would have to assume that the middle of the anomaly is at about 250 metres. This is suggested by the fact that the maximum negative appears to have been achieved at this depth.

Accepting this, the conductor is about 40 metres off the hole from a depth 250 metres down the hole. This agrees with the known configuration.

The drill geologists have developed a theory that there should be a substantial thickness of ore immediately to the east of the fault from about 10500N to 10600N based on the known post-ore fault movements and the considerable thickness of ore immediately adjacent to the fault to the west on Lines 10350N to 10450N. The geophysics does not support this theory, although it should be noted that the geometrical complication of the hypothesized situation could lead to interpretation errors. Certainly it would be best to test the hypothesis on 10600N or 10550N where there is no downhole information before drilling on Line 10500N.

4. HL 19

The results for HL 19 vary so much depending on the position of the transmitter loop that it is obvious the conductor is a very complicated shape. A knowledge of the direction of the primary

125

field is essential for each loop, particularly in the vicinity on the target ore body, if one is to understand and learn from this test. For this reason, I have included a diagram of the primary field expected from a transmitter loop at surface (Macnae, 1980) for loops 1 and 2 (figure 5).

For loop 1, the primary field near the body is vertical, which induces a current to flow horizontally in the ore body. This creates a positive-negative-positive trough anomaly that is seen in the loop 1 data (figure 6b). The width of the trough at late time suggests that the thick part of the ore body is about 75 metres off to the east from about 220 metres down the hole. The trough is more narrow at early times, indicating that a thinner extension of the body comes closer than 40 metres from the hole. This concurs with the geological knowledge (figure 6a). An interpretation of the dip relative to the drill hole is not possible because the full amplitude of the second positive shoulder can not be determined due to the limited length of the drill hole.

From the loop 2 transmitter position, the primary field is almost horizontal near the deposit, inducing a vertical current flow in the plane perpendicular to the page. This current flow will be tilted slightly clockwise from vertical.

The resultant anomaly shape from such a secondary current is a positive to negative crossover as is seen in the data in figure 6c. Once again, the relative smooth late time curves are reacting to a large body at a large distance (70 metres?) while the early times are responding to a closer smaller body. The crossovers occur further up the hole than the middle of the loop 1 trough anomaly because of the tilt of the secondary currents in the ore body.

The large differences between the loop 1 and loop 2 results show clearly that the body is not simply a planar body which would allow current flow in one plane only. In the Hellyer ore deposit,

126

currents can flow in many different planes (perhaps an infinite number) depending on the orientation of the primary field.

The data from loop 3 (figure 6d) mimics the loop 2 data except that the amplitudes are smaller because the transmitter loop is in a very similar position to loop 2 but is further from both the drill hole and the ore deposit (figure 1). Another difference is that the crossover is further down the hole. This is due to the fact that because the loop is further offset from the deposit, the primary field lines are closer to horizontal at the deposit, resulting in secondary currents that are very close to vertical. Therefore the crossovers are probably a better reflection of the actual position of the ore than was the case for loop 2.

The data from loop 4 (figure 6e) mimics the loop 1 data almost perfectly except for a drop in amplitude for the reasons mentioned above.

5. HL 21

The results for HL 21 for the same four loops are almost identical to those for HL 19 except that the interpretation is more greatly limited because the hole was not long enough to obtain all of the required data. However, a negative trough anomaly can be seen in the loop 1 data, (figure 7b) and possibly in the loop 4 data (figure 7c). A crossover anomaly is evident from loops 2 (figure 7c) and 3 (figure 7d), again with the crossover at a slightly greater depth from loop 3. A tentative interpretation based mostly on the loop 3 crossover and the incomplete loop 1 results, would suggest the the thick section of the body lies about 60 - 70 metres from a position about 260 metres down the hole. The distance estimated by the EM of 60 - 70 metres can be seen from the drilling (figure 7a) to be a little too short.

6. HL 31

The results from HL 31 are also very complicated and a close analysis of the primary field is again necessary (figure 8). For the appropriate geological cross-section, refer to figure 6a. The results from loop 1 (figure 9a) are what would be expected from a sphere-like body. The positive shoulders, and the shape of the negative trough are not symmetrical because:-

- 1) the primary field lines that intersect the approximate centre of mass of the deposit are not quite vertical and
- 2) the drill hole is inclined to the west, enhancing the assymetry.

Not much can be determined about the exact shape of the eastern side of the deposit except that its closest distance must be less than 40 metres. This has encouraged the drill geologist to extend one limb of the ore deposit toward the drill hole and is one of the minor successes of the downhole programme. The exact location of the edge of the deposit is very difficult to determine because HL 31 deviated to the south more than 30 metres and the shape of the ore body is changing dramatically along strike.

The results from loop 2 (figure 9b) are similar to loop 1 except that the positive shoulders are more symmetrical and the centre of the anomaly is further down the hole. These changes are due entirely to the direction of the primary field. As can be seen in figure 8, the field lines in the centre of the body are now almost parallel to the drill hole. Therefore current flow is induced perpendicular to the hole, giving a symmetrical response with a projection further down the hole. Distance to the body is estimated at less than 50 metres which agrees quite well with loop 1.

7. HL 45A

The data from the only transmitter loop for HL 45A is shown in figure 10b and the interpretive geological section is figure 10a.

Because the body is so deep on this section and so close to the centre of the loop, the primary field lines will be very close to vertical, resulting in horizontal current flow regardless of the shape of the body (unless it is plate-like). Since the hole is to the east of the ore body and is inclined to the east, the asymmetry of the downhole profile, which shows the first positive shoulder to be larger, and the first crossover steeper, is expected. This information reveals nothing about the shape of the body except that it is probably not plate-like.

From the shape of the curve, it is estimated that the ore deposit is approximately 50 - 60 metres from the hole at a depth of 400 metres down the hole. This agrees quite well with the geological interpretation. However, the EM shows clearly that the body comes no closer than this lower down the hole and in this respect disagrees totally with the picture shown in 10a. Either the body dips more steeply than the drill hole from RL 300 or else it is terminated near this point.

Three dimensional effects might complicate this picture to some degree and one or two more loop positions might be necessary to support this geophysical argument.

III DECAY CURVES AND CONDUCTANCE CONSIDERATIONS

The analysis of an anomaly's decay with time reflects the bulk conductance of the part of the ore body energized by the transmitter loop. Decay curves from drill holes HL 3, HL 19, HL 21, HL 31 and HL 45A have been studied. These reveal an increase in the conductance to the north, with the highest values measured near HL 45A. All of the decay curves studied, with the calculated time constants, are plotted in figure 11.

1. HL 3

The decay of the positive anomaly in DDH HL 3 is seen to be very rapid in figure 11, reflecting the small dimensions of the body intersected in this hole. Based on a cylindrical model with a radius of 25 metres, the time constant of 0.8 milliseconds represents a low resistivity of about 0.2 ohm-metres.

The late time negative anomaly observed in HL 3 has a much larger time constant of about 3 milliseconds. This off-hole response is therefore seeing a body with a large conductivity times size product, which is probably the main portion of the ore deposit to the north. The slower decay is probably simply a result of the increase in size of the ore body to the north, because a doubling of the radius of the body would cause the observed fourfold jump in time constant, even without a conductivity increase.

2. HL 19, 21 and 31

HL 19 and 21 have almost identical responses in both amplitude and time constant which is expected because they are quite close together and the same transmitter loop was used. As mentioned before, the DHEM results are predominantly a reflection of the bulk electrical properties of the part of the ore body energized by the transmitter loop. The time constant of just under 3 milliseconds again denotes a resistivity of about 0.2 ohm-metres if a cylindrical model with a radius of 50 metres is used.

The results from loop 2 for HL 31 (figure 11) and loop 1 (not shown) both have a time constant of about 3.4 milliseconds. This slightly higher value probably reflects the fact that the ore body is thicker on its eastern edge than it is to the west.

All of these results, which indicate a resistivity of approximately 0.2 ohm-metre, show clearly that Hellyer is a relatively good conductor. If the thickness of the body is taken into account and assigned an average value of about 30 metres, a conductance of about 150 Siemens is calculated. This high value was not recognized in the preliminary stages of the investigation of the surface EM work because the depth to width ratio for Hellyer is very large (Eadie and Silic, 1984).

3. HL 45A

Possibly the most interesting results of the whole survey were obtained in DDH HL 45A, which is at the northern end of the known deposit on $11100N$. The time constant of 4.0 milliseconds is significantly higher than anything else measured near the deposit, even on the thick $10900N$ section. This could suggest an increase in conductivity of the ore material, but more likely it indicates that the body is larger in this vicinity. This is significant because there has not been much success with drilling the northern extensions of the body.

Work that is planned on other drill holes to the north and a second loop position for hole HL 45A will be needed to confirm this potentially very important interpretation.

IV NEWMONT EMP RESULTS

The Newmont EMP results for HL 3, 4, 19 and 21 are shown in figure 12 - 15. The transmitter loop position is shown in figure 1. The results for HL 3, 19 and 21 are very similar to the Sirotem results from similar loop positions except that they are noisier. The noise is due to the fact (I am assured) that the data logger was not working properly and only half of the data measured at each station was plotted.

However, the results from HL 4 show a positive anomaly instead of the negative anomaly that was measured with the Sirotem. With the known position of the ore body on 10500N and the direction of the primary field in its vicinity (figure 16) a positive anomaly is not possible. Therefore, it is almost certain that the polarity of the transmitter loop was wrong when this hole was being surveyed.

Another, remote possibility is that the geometry of the ore body on 10500N is very different than now interpreted, but this would suggest that the polarity for the Sirotem was wrong. The combination of these errors is very unlikely. This problem shows clearly how easy it is to make a polarity error, and how important it is when doing DHEM. Operators will be pressured to be extremely careful in the future not to make this mistake.

V CONCLUSIONS

The DHEM results have not been very usefule in obtaining very detailed information in areas that have been drilled on a 50 metre grid. The potential lies in areas that have sparse drill information. In these areas, downhole EM can save money and perhaps define targets that may otherwise have been missed by surface drilling.

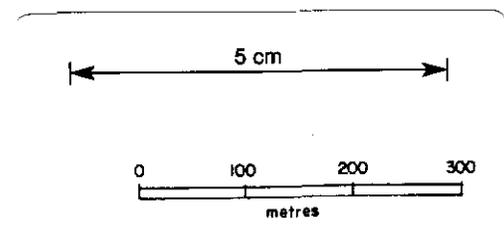
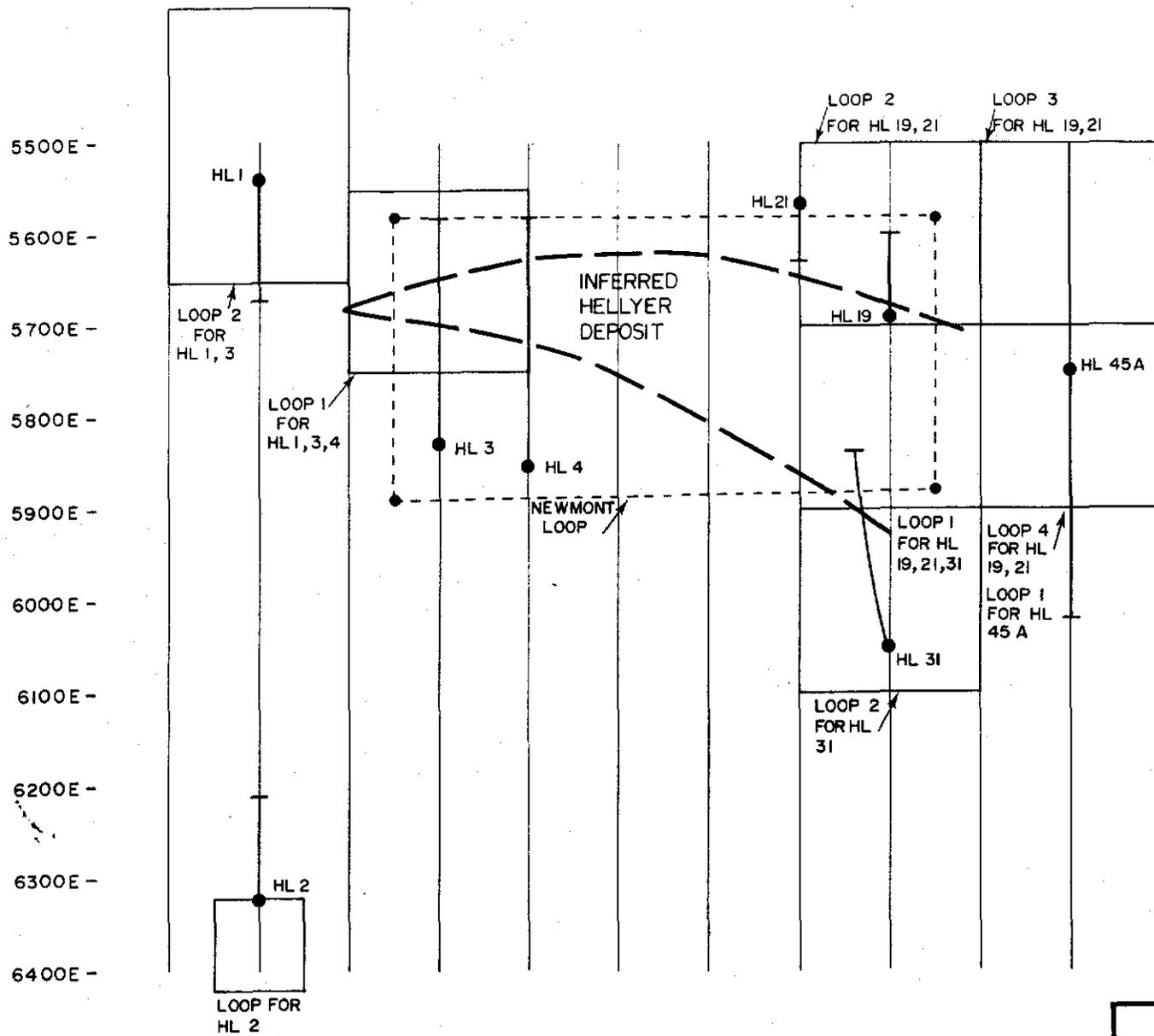
One indication of this potential is illustrated by the results of HL 45A which not only help to define the position and dip of the ore body to the north, but also suggest that the body is very large in this vicinity.

VI REFERENCES

- EADIE, E.T and SILIC, J. 1984: "The Application of Geophysics in the Discovery of the Hellyer Ore Deposit" in Collection of Papers presented at the AMIRA AGM, 1984.
- MACNAE, J.C., 1980: An Atlas of Primary Fields Due to Fixed Transmitter Loop EM Sources, Research in Applied Geophysics, No 13, University of Toronto Press, Toronto

LIST OF ILLUSTRATIONS

10100N 10200N 10300N 10400N 10500N 10600N 10700N 10800N 10900N 11000N 11100N 11200N



134
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REVISIONS				Aberfoyle Exploration TASMANIA HELLYER DOWNHOLE E.M. TRANSMITTER LOC LAYOUT
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Location Code K55/6/44				Scale 1: 5000
Date: November '84				

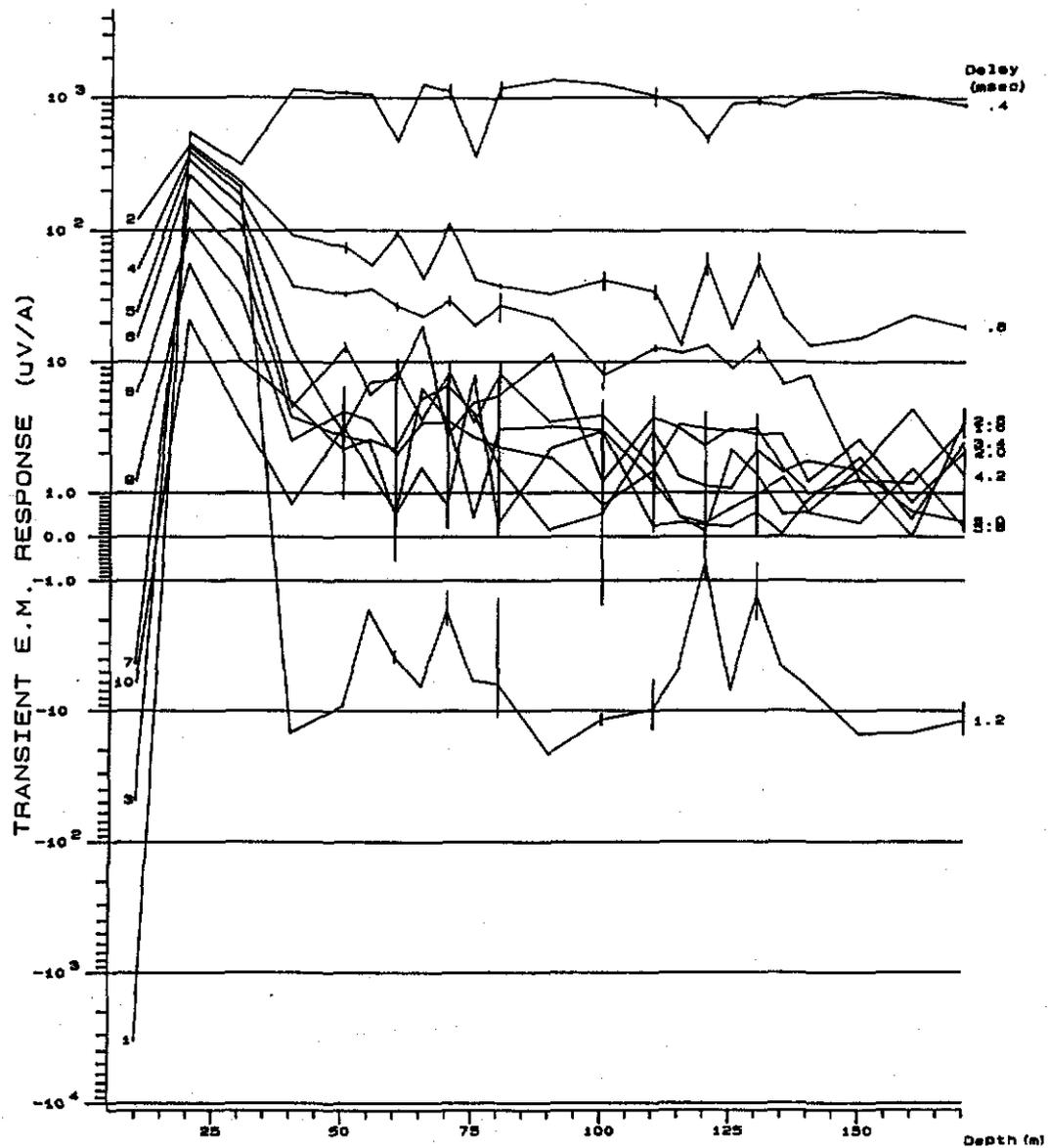


FIGURE 2A

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL1 1st. loop
 SIROTEM Survey by SOLO Geophysics & Co. 6/ 5/84
 SOLO hole ref.215 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:11 PM 8/ 8/84
 Plate No: X HEL 2A

LOOP DIAGRAM



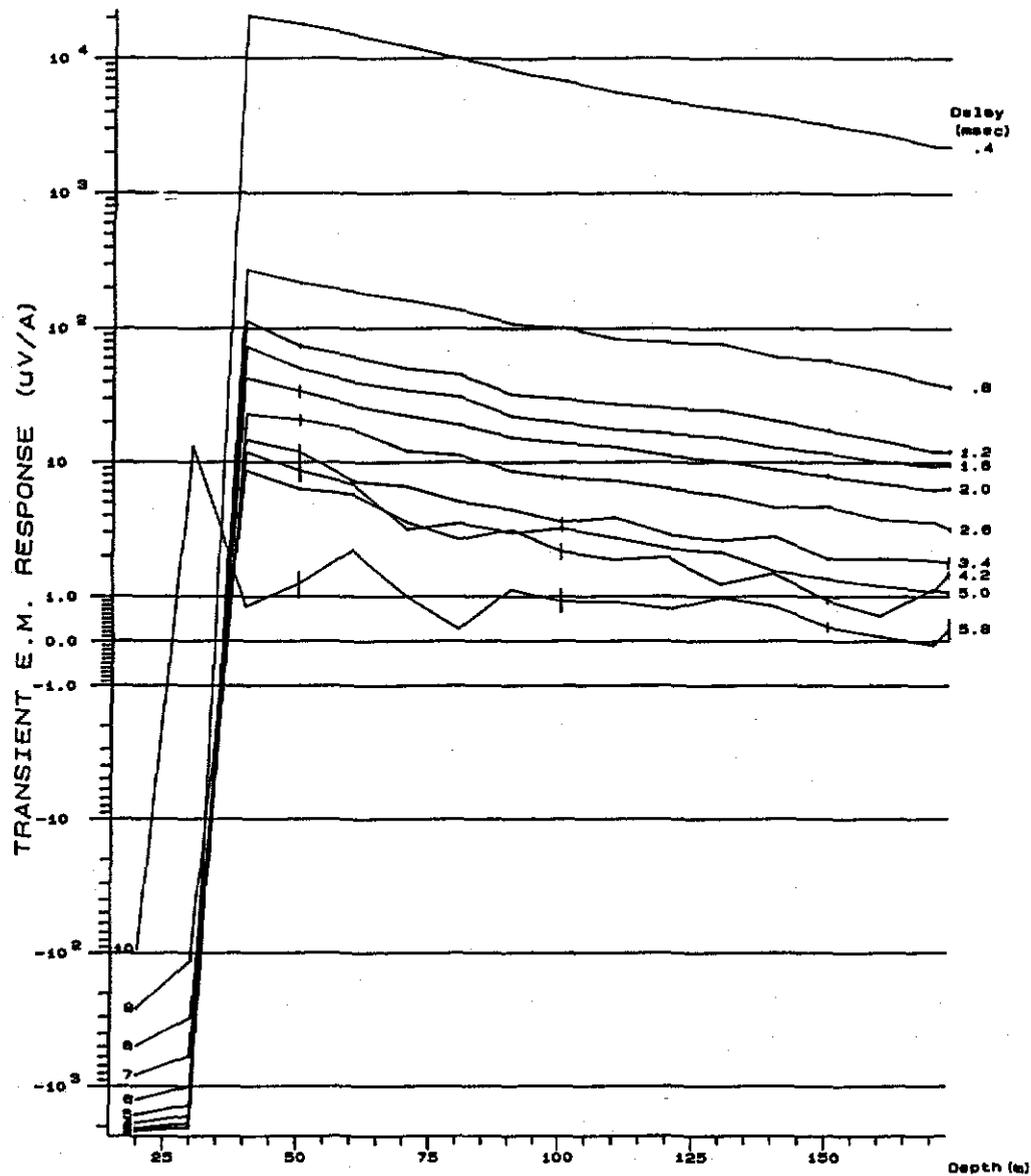
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 B = (10200N, 8750E)
 C = (10200N, 8550E)
 D = (10200N, 8550E)

SOLO

5 cm

135

028160

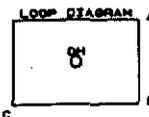


136

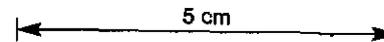
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FIGURE 2B

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL1 2nd loop
 SIROTEM Survey by SOLO Geophysics & Co. 8/ 5/84
 SOLO hole ref.224 Reading interval 3.0 m
 SCALE 1 : 1000 Loop size : 300 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4: 39 PM 8/ 6/84
 Plate No: X HEL 2B



A - (10200N, 5550E)
 B - (10100N, 5550E)
 C - (10100N, 5500E)
 OH - (10200N, 5550E)



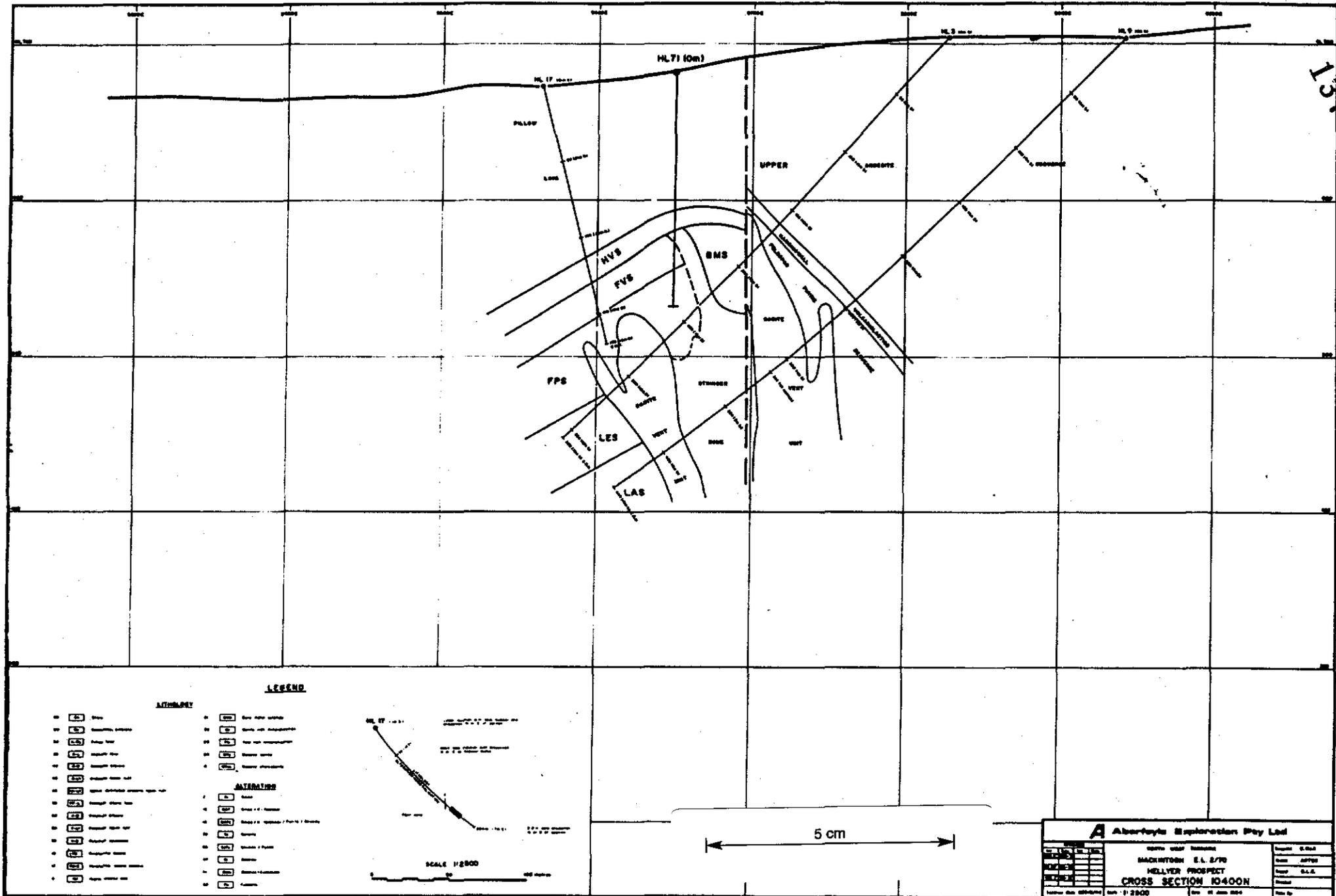


FIGURE 3A

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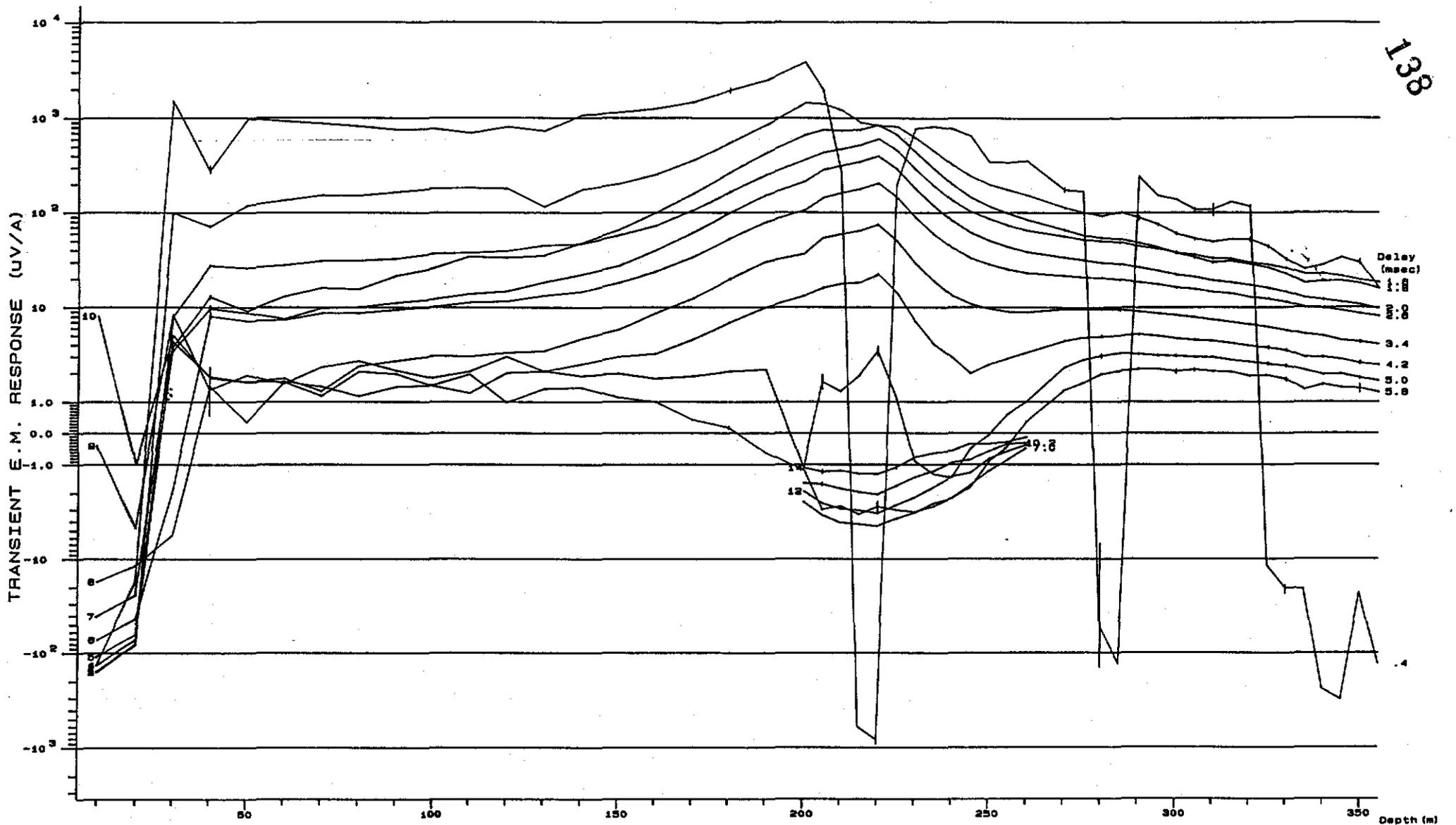
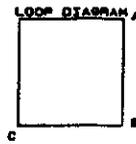
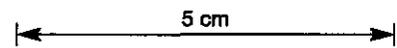


FIGURE 3B

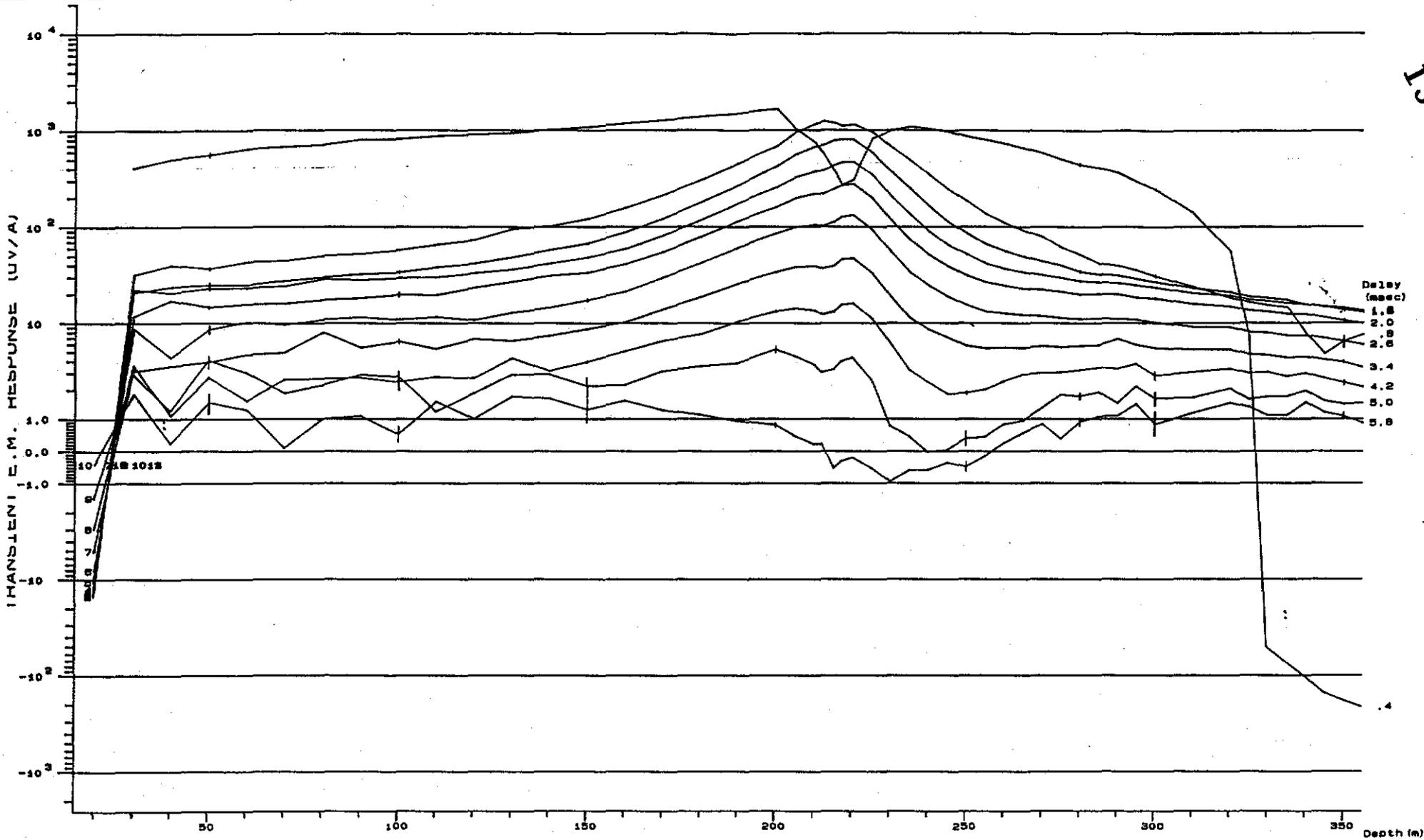
ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 51B)
 DRILL HOLE HL3 1st. loop
 SIROTEM Survey by SOLO Geophysics & Co. 5/ 5/84
 SOLO hole ref.212 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 3:33 PM 8/ 8/84
 Plate No: X-HELL 3A



- A = (10500N, 5750E)
- B = (10300N, 5750E)
- C = (10300N, 5550E)
- D = (10400N, 5830E)



028163



139

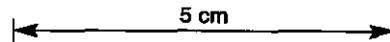
FIGURE 3C

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL3 2nd loop
 SIROTEM Survey by SOLO Geophysics & Co. 10/ 5/84
 SOLO hole ref.225 Reading interval 2.0 m
 SCALE 1 : 1000 Loop size : 300 x 200 m
 LOOP configuration : Drill hole
 Plotted : 3:37 PM 8/ 6/84
 Plate No: X HELL 3B

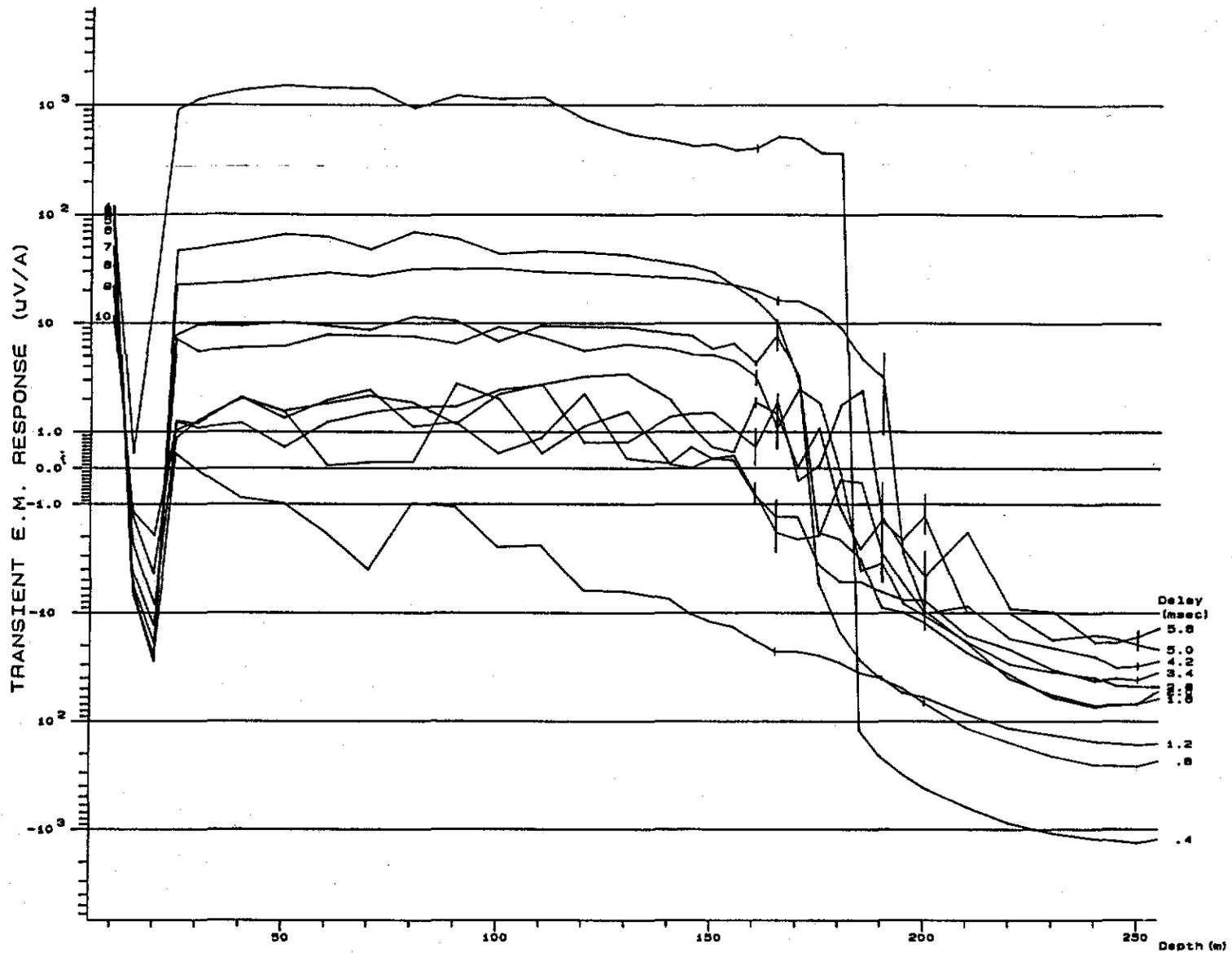


A - (10300N, 5850E)
 B - (10100N, 5850E)
 C - (10100N, 5930E)
 DH - (10400N, 5830E)

SOLO



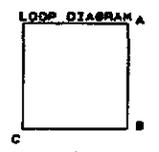
028164



141

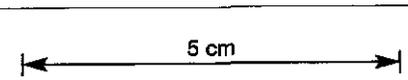
FIGURE 4B

ABERFOYLE EXPLORATION PTY. LTD.
 GUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL4 1st. loop
 SIROTEM Survey by SOLO Geophysics & Co. 4/ 5/84
 SOLO hole ref.208 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 3: 48 PM 8/ 6/84
 Plate No: X HELL 4A



- A - (10200N, 5750E)
- B - (10200N, 5750E)
- C - (10200N, 5850E)
- DN - (10510N, 5800E)

SOLO



028166

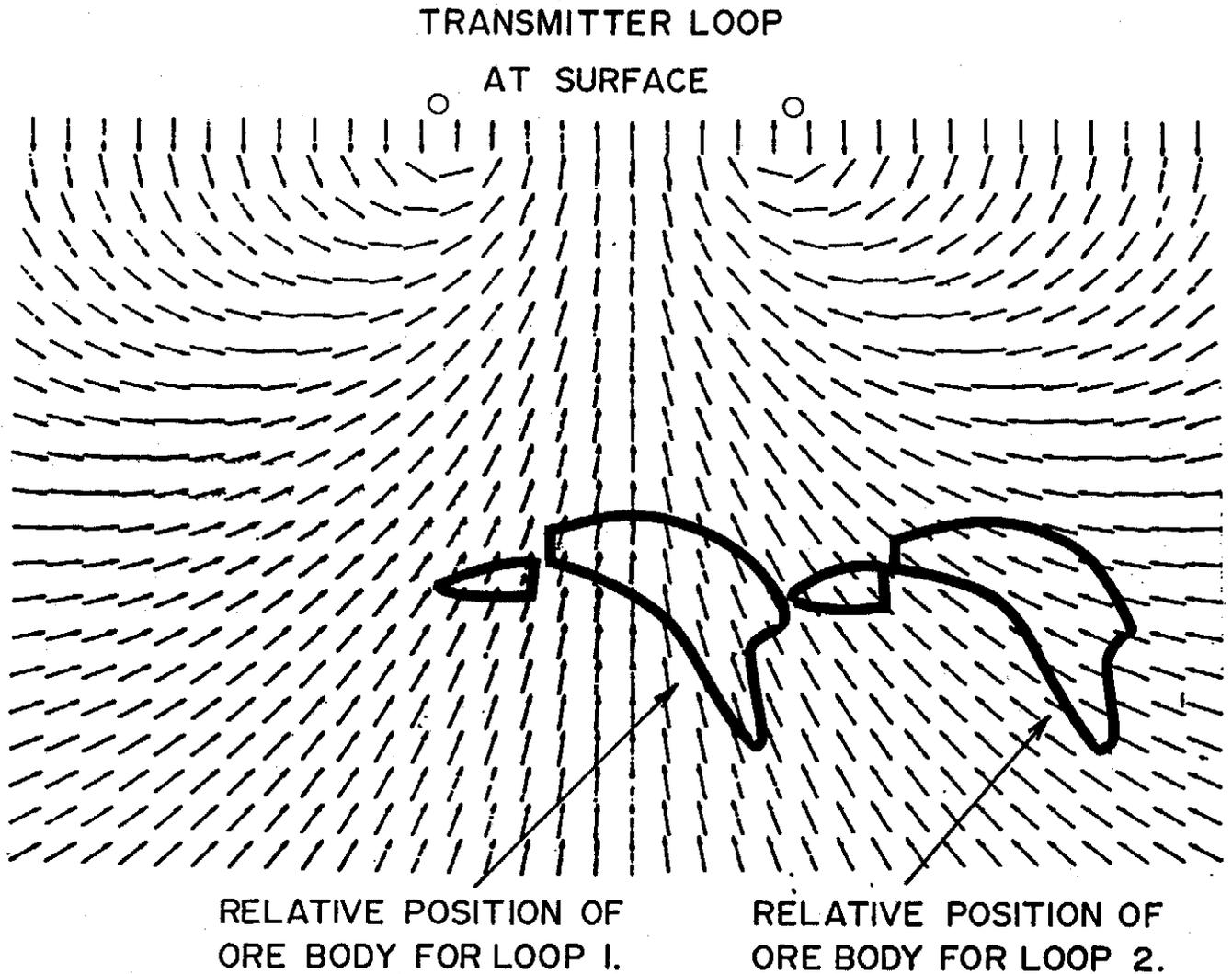
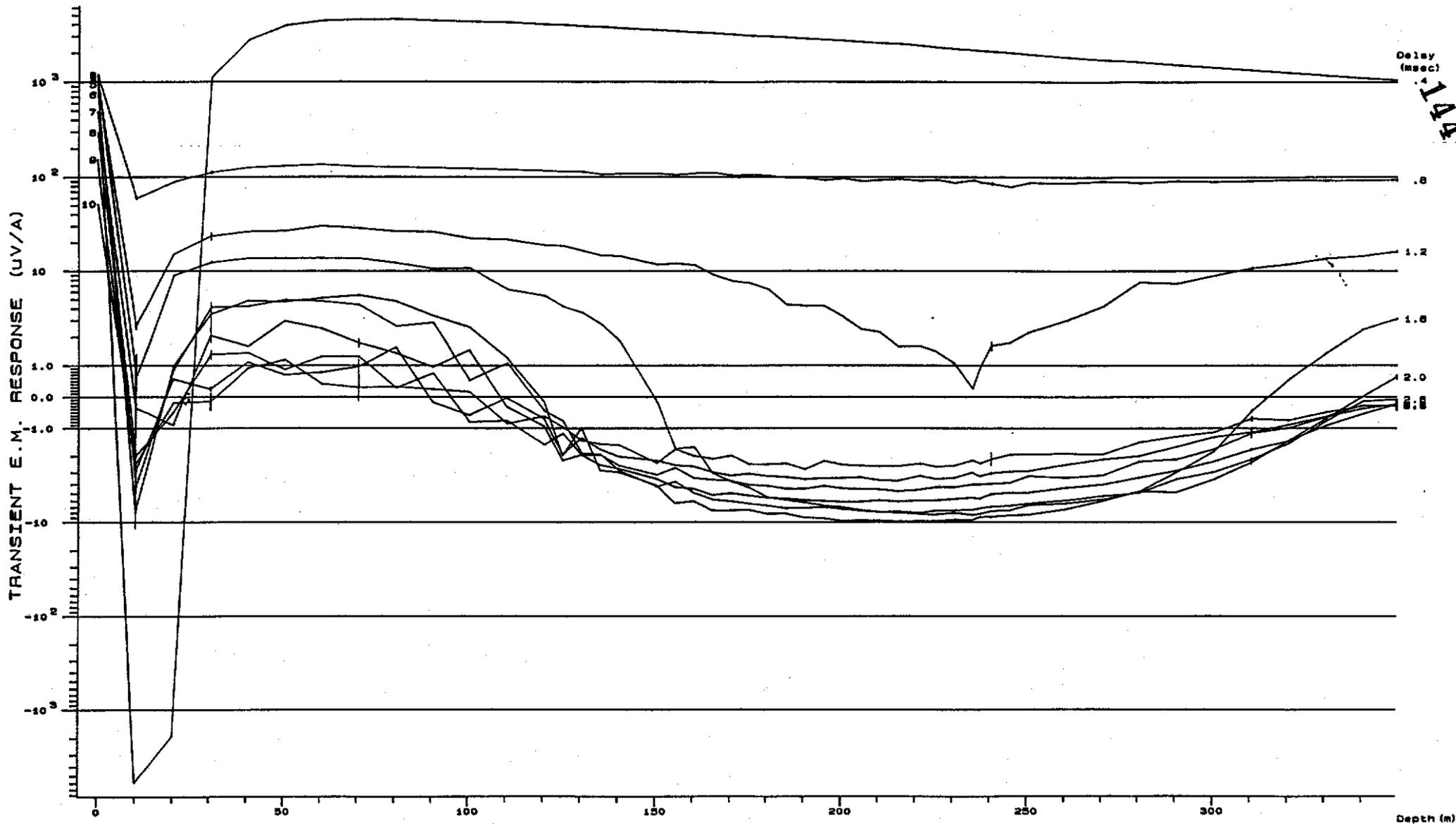


figure 5: HL 19

EM PRIMARY FIELD CONFIGURATIONS



Delay (msec)

0.4
0.6
1.2
1.6
2.0
2.8

TRANSIENT E.M. RESPONSE (UV/A)

Depth (m)

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL18 1st loop
 SIROTEM Survey by SOLO Geophysics & Co. 7/ 5/84
 SOLO hole ref.218 Reading interval 2.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:17 PM 8/ 8/84
 Plate No: X HELL 5A

LOOP DIAGRAM



- A = (11000M, 8900E)
- B = (10900M, 8900E)
- C = (10900M, 8700E)
- D = (10800M, 8800E)

SOLO

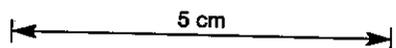
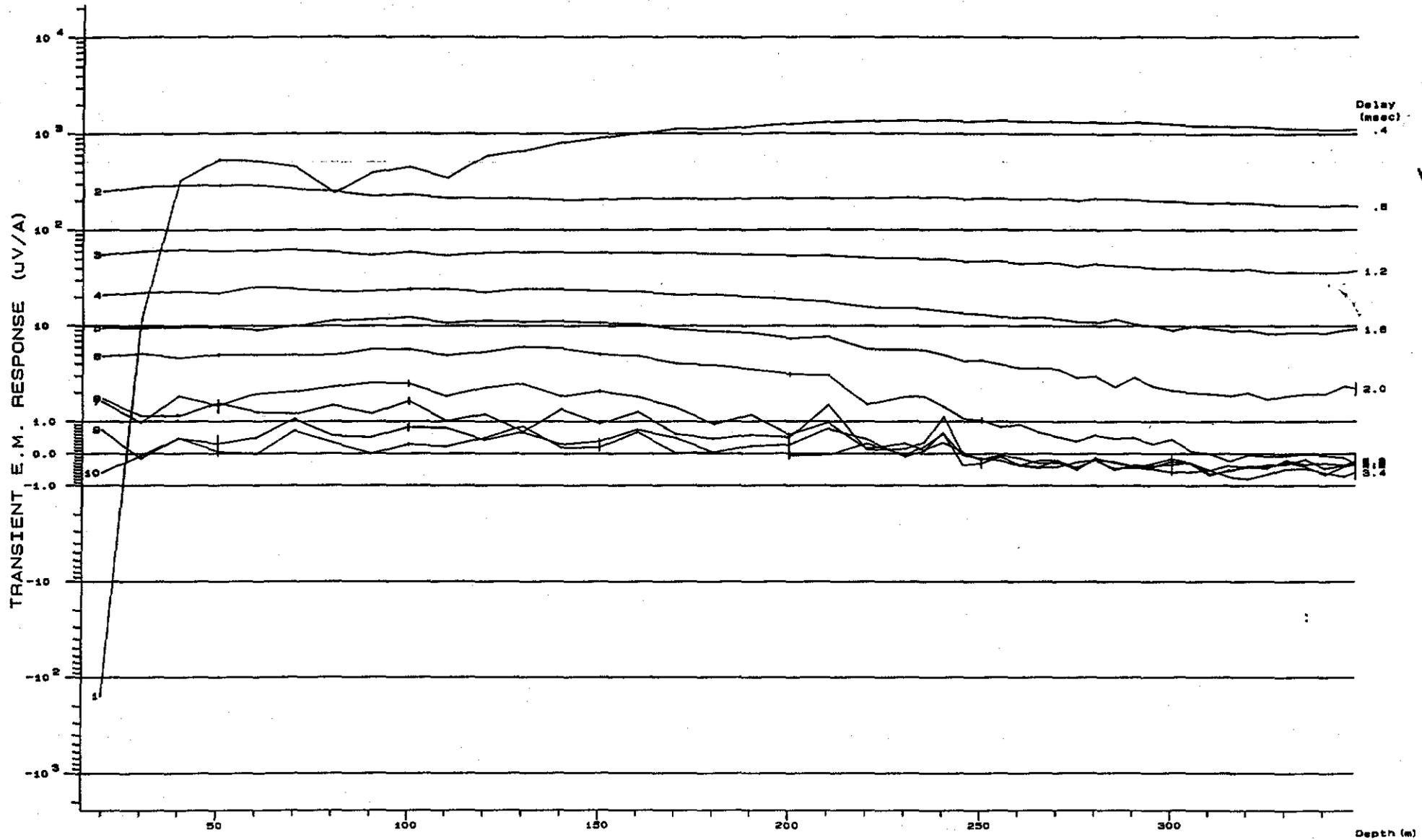


FIGURE 6B

028169



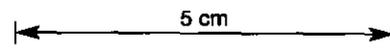
146

FIGURE 6D

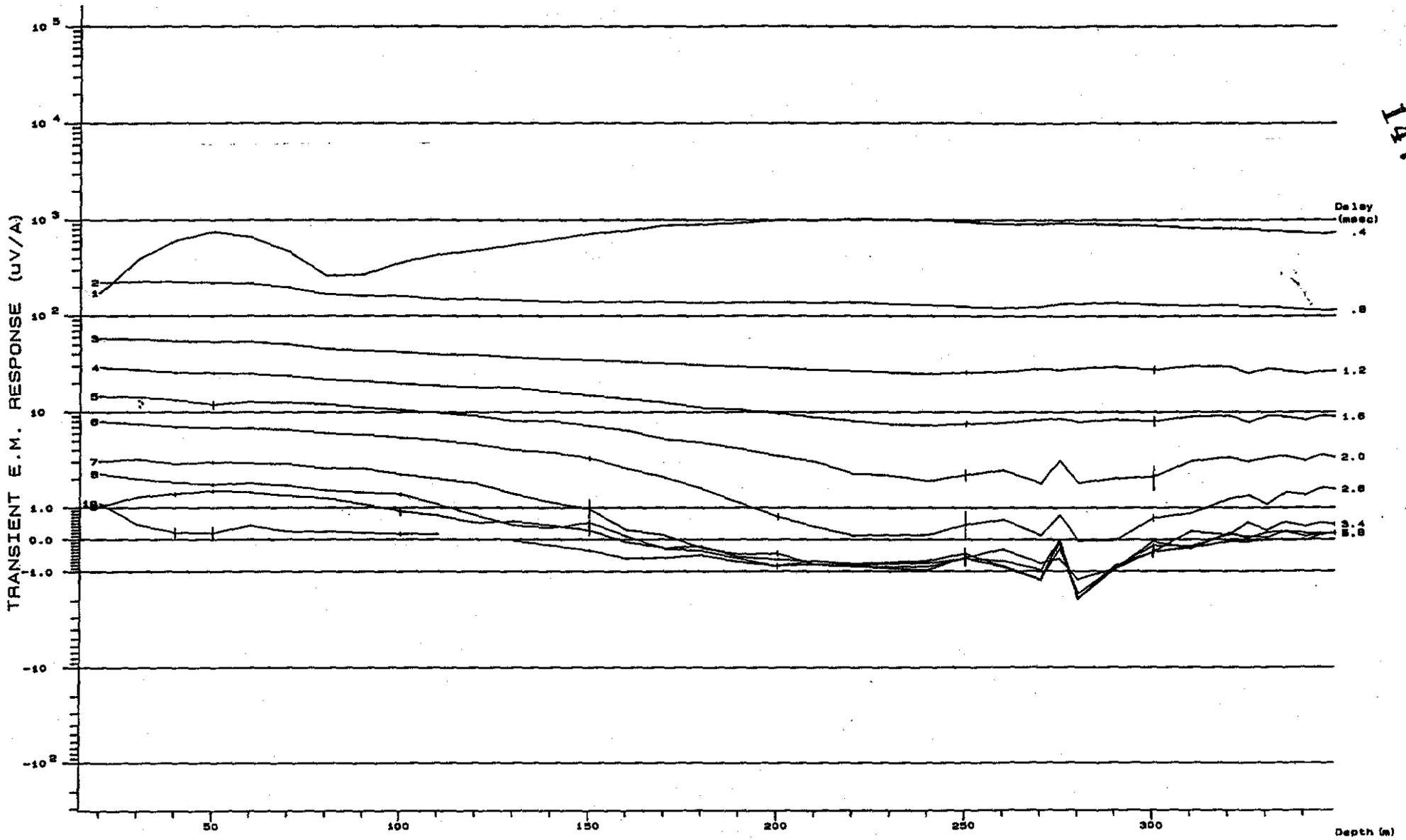
ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 51B)
 DRILL HOLE HL19 3rd loop
 SIRTEM Survey by SOLO Geophysics & Co. 8/ 5/84
 SOLO hole ref.222 Reading interval 3.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:32 PM 8/ 8/84
 Plate No: X HELL 5C



- A - (11200N, 8700E)
- B - (11000N, 8700E)
- C - (11000N, 8500E)
- DN - (10200N, 8600E)



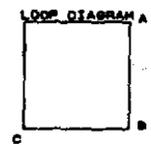
028171



147

FIGURE 6E

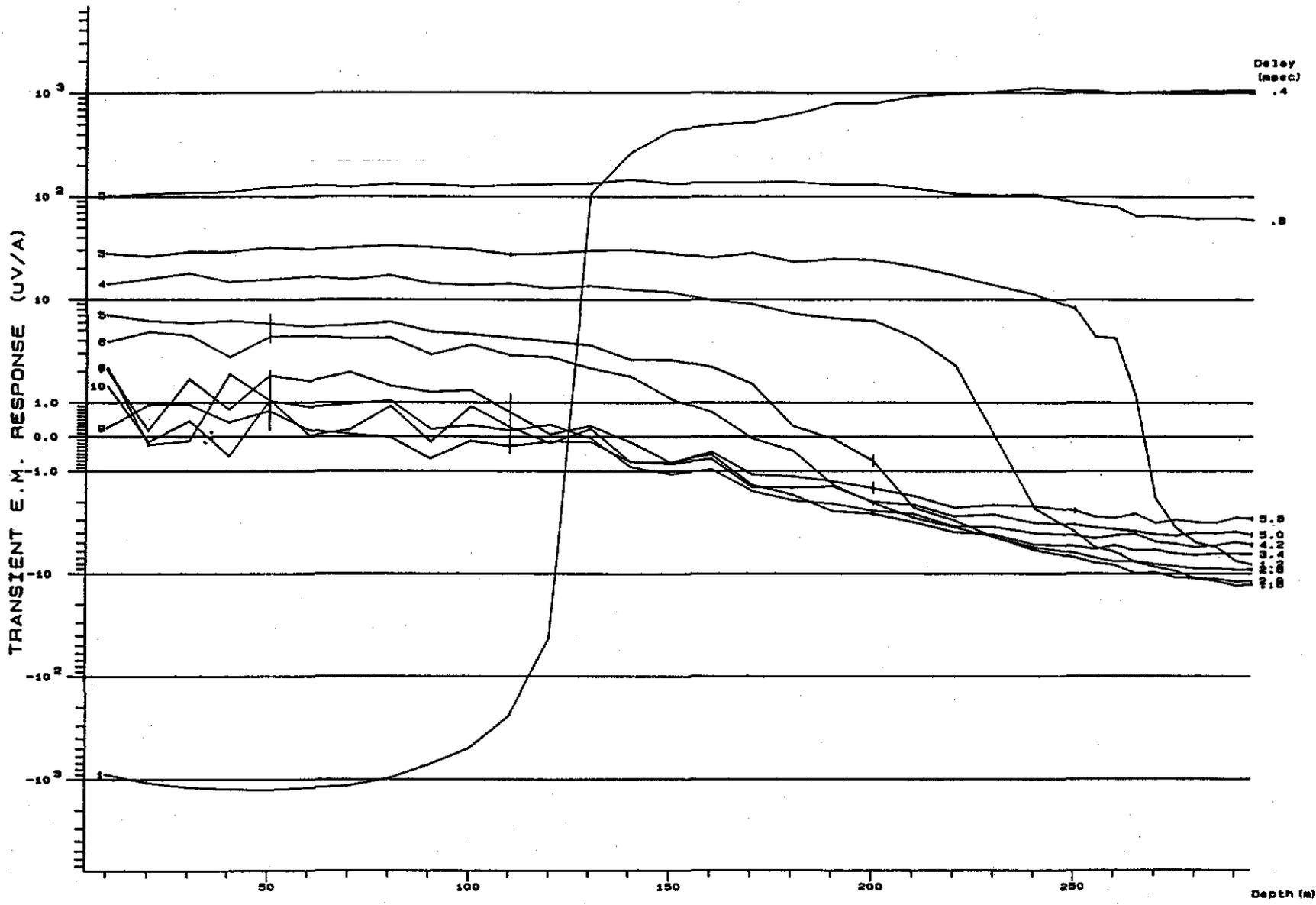
ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL19 4th loop
 SIROTEM Survey by SOLO Geophysics & Co. 10/ 5/84
 SOLO hole ref.228 Reading interval 3.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:43 PM 8/ 8/84
 Plate No' X HELL 5D



- A = (11200N, 5800E)
- B = (11000N, 5800E)
- C = (11000N, 5700E)
- DN = (10900N, 5800E)



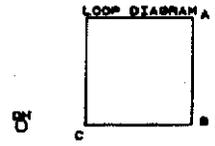
028172



1419

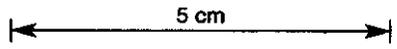
FIGURE 7B

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL21 1st loop
 SIROTEM Survey by SOLO Geophysics & Co. 7/ 5/84
 SOLO hole ref.219 Reading interval 4.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:20 PM 8/ 6/84
 Plate No: X HELL 6A



- A = (11800N, 5800E)
- B = (10800N, 5800E)
- C = (10800N, 6700E)
- D = (10800N, 6800E)

SOLO



028174

150

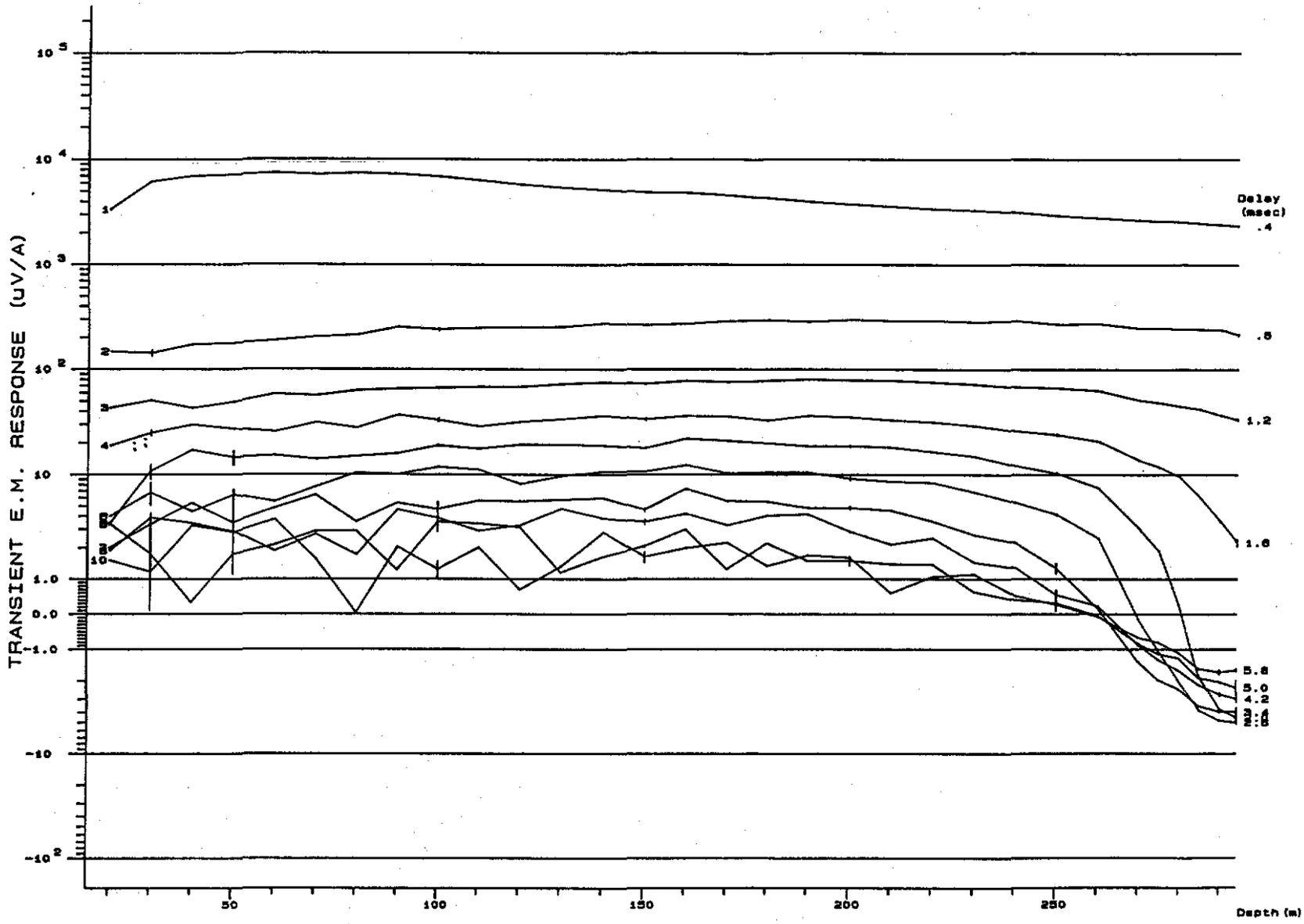
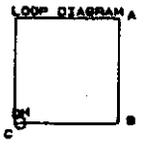


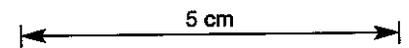
FIGURE 7C

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL21 2nd loop
 SIROTEM Survey by SOLO Geophysics & Co. 8/ 5/84
 SOLO hole ref.221 Reading interval 4.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:28 PM 8/ 6/84
 Plate No: X HELL 6B

SOLO



- A = (1000N, 5700E)
- B = (1000N, 5700E)
- C = (1000N, 5500E)
- DN = (1000N, 5500E)



028175

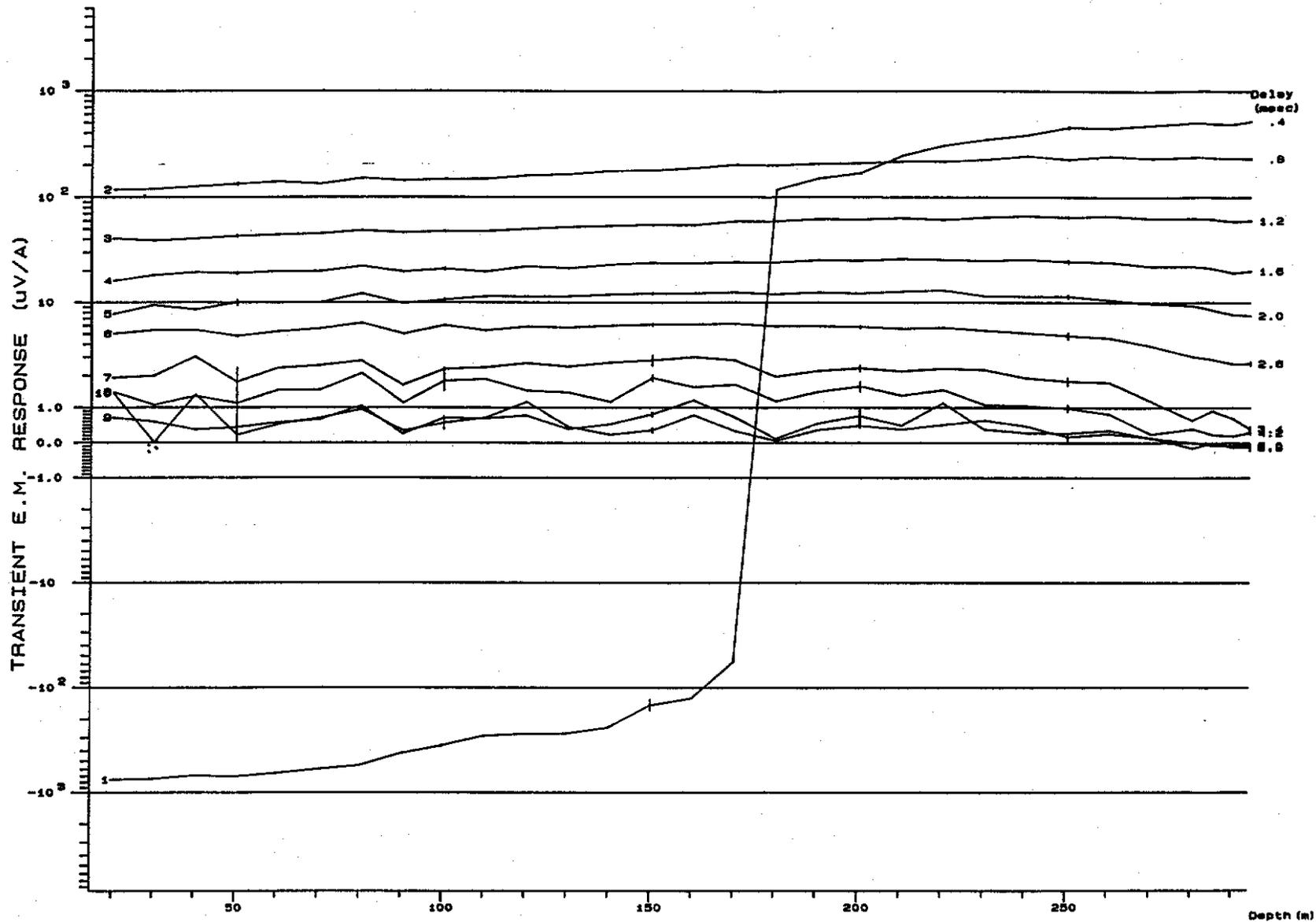
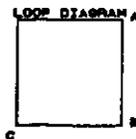
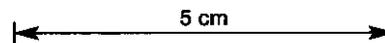


FIGURE 7D

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLER (Job No. 518)
 DRILL HOLE HL21 3rd loop
 SIRTEM Survey by SOLO Geophysics & Co. 8/ 5/84
 SOLO hole ref.223 Reading interval 4.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:35 PM 8/ 6/84
 Plate No: X HELL 6C

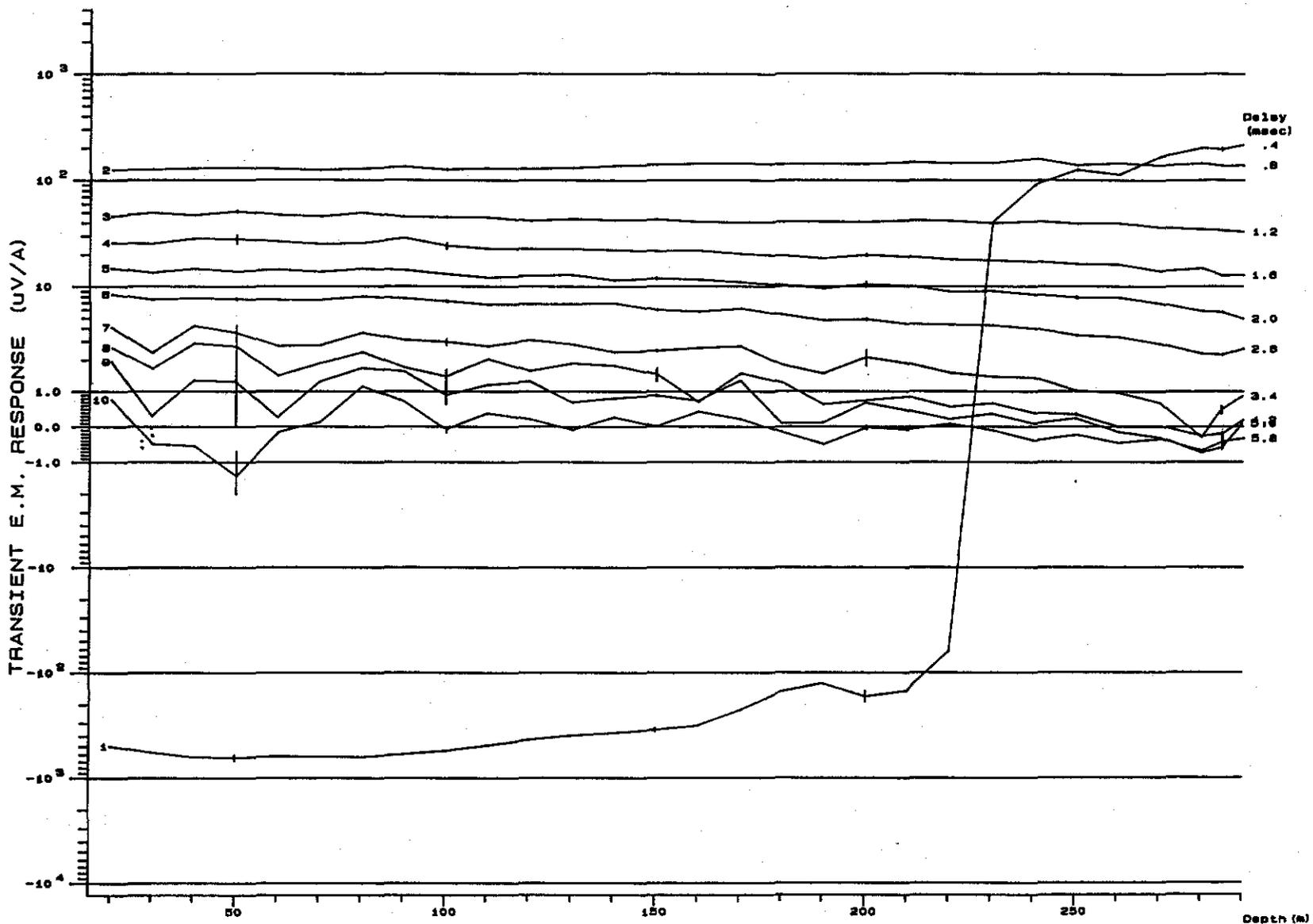


A - (11200N, 5700E)
 B - (11000N, 5700E)
 C - (11000N, 5800E)
 D - (10800N, 5800E)



151

028176



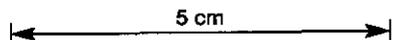
152

FIGURE 7E

ABERFOYLE EXPLORATION PTY. LTD.
 QUE RIVER TASMANIA
 HELLYER (Job No. 518)
 DRILL HOLE HL21 4th loop
 SIRTEM Survey by SOLO Geophysics & Co. 10/ 5/84
 SOLO hole ref.227 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 x 200 m
 LOOP configuration : Drill hole
 Plotted : 4:48 PM 8/ 8/84
 Plate No: X HELL 6D



- A - (11200N, 8900E)
- B - (11000N, 8900E)
- C - (11000N, 8700E)
- DM - (10800N, 8900E)



028177

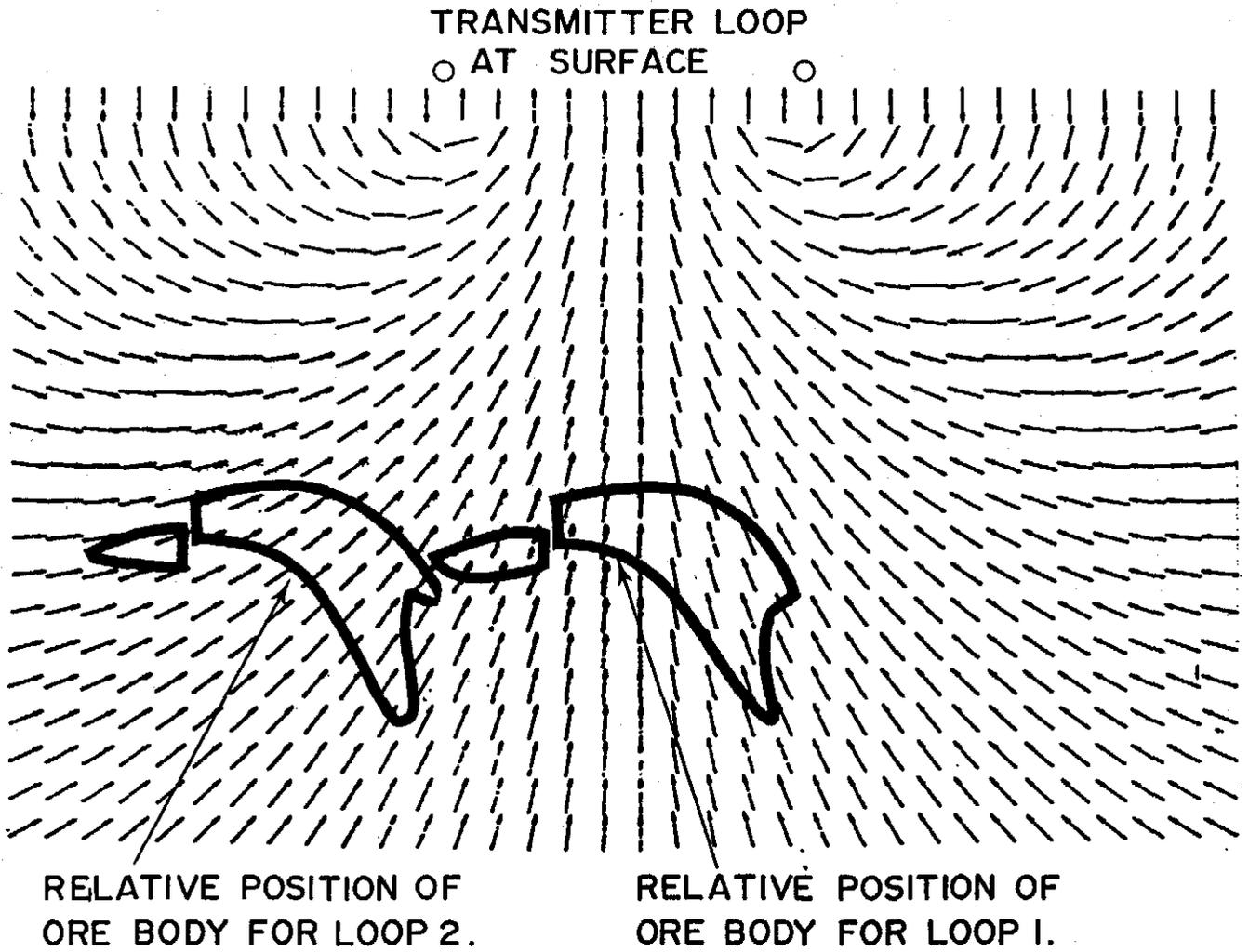
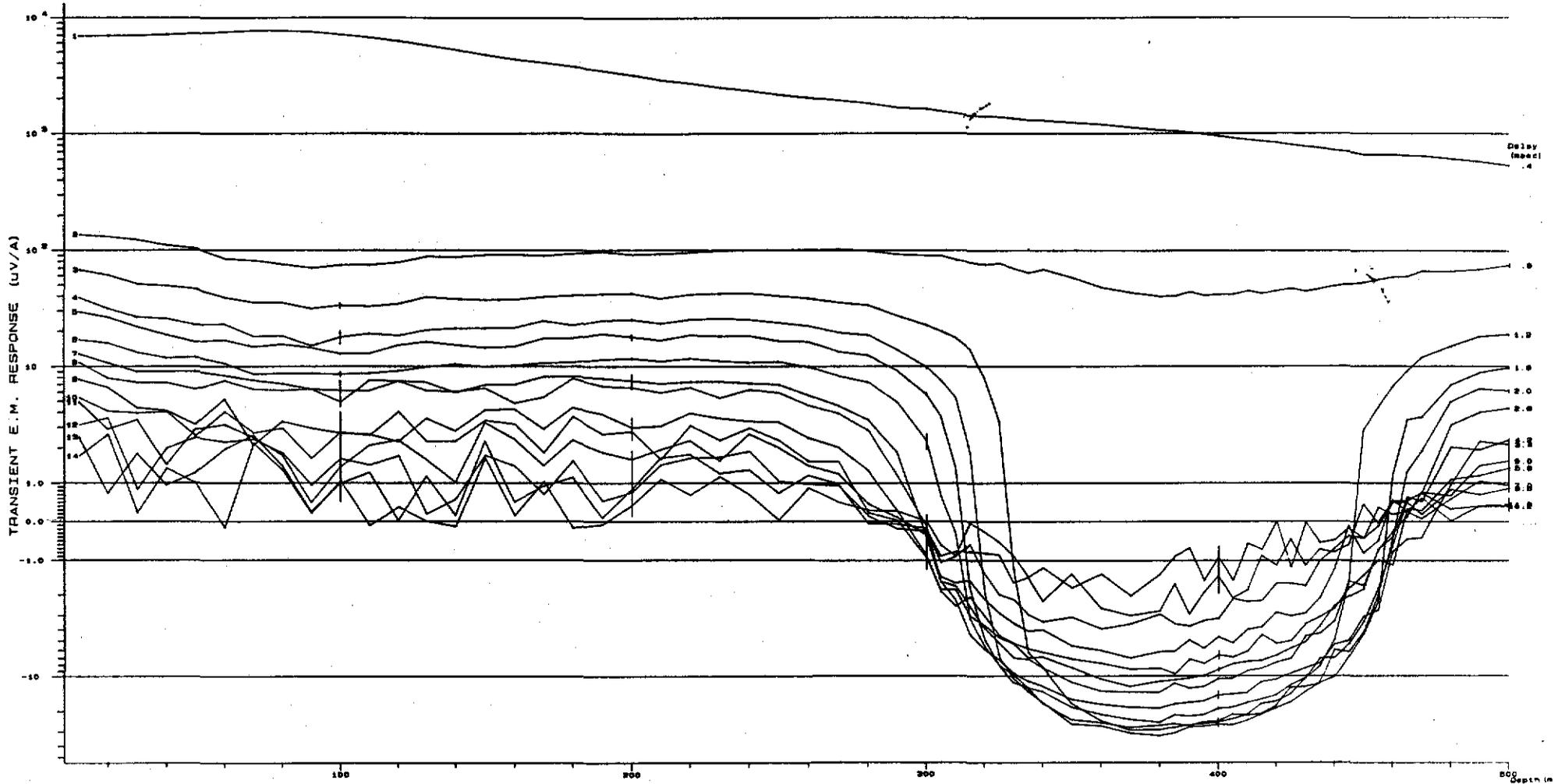


figure 8: HL 31

EM PRIMARY FIELD CONFIGURATIONS

028180



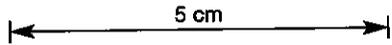
ABERFOYLE EXPLORATION PTY LTD.
 QUE RIVER TASMANIA
 HELLER PROSPECT (JOB NO 0548)
 DRILL HOLE HL3; LOOP 2
 SIROTEM Survey by SOLO Geophysics & Co. 12/ 8/84
 SOLO hole ref.308 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 m
 LOOP configuration : Drill hole
 Plotted : 9:39 AM 21/ 8/84
 Plate No: X HELL 7C



A = (1100004, 81000)
 B = (1000004, 81000)
 C = (1000004, 80000)
 D = (1000004, 80000)

SOLO

FIGURE 9b



157

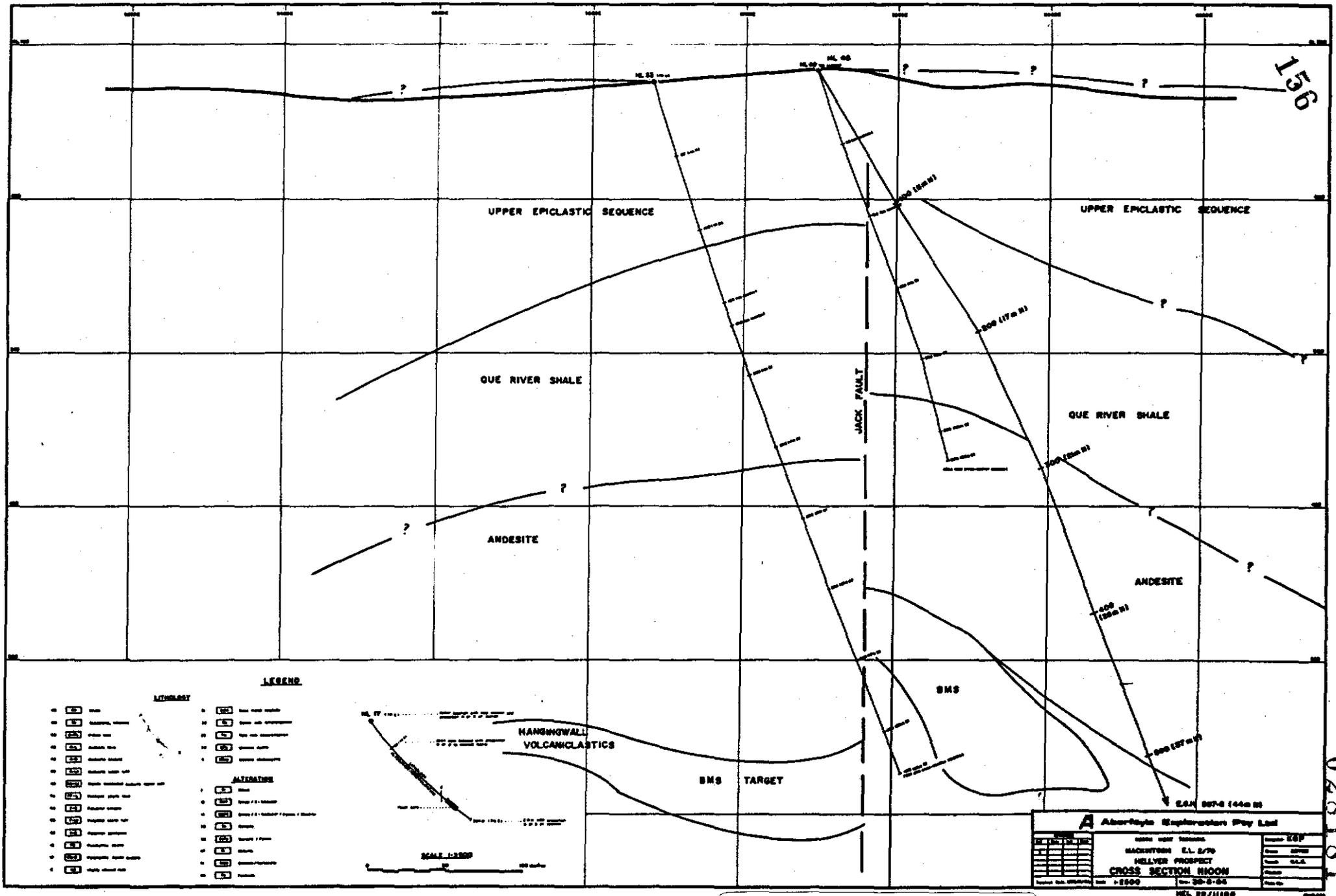
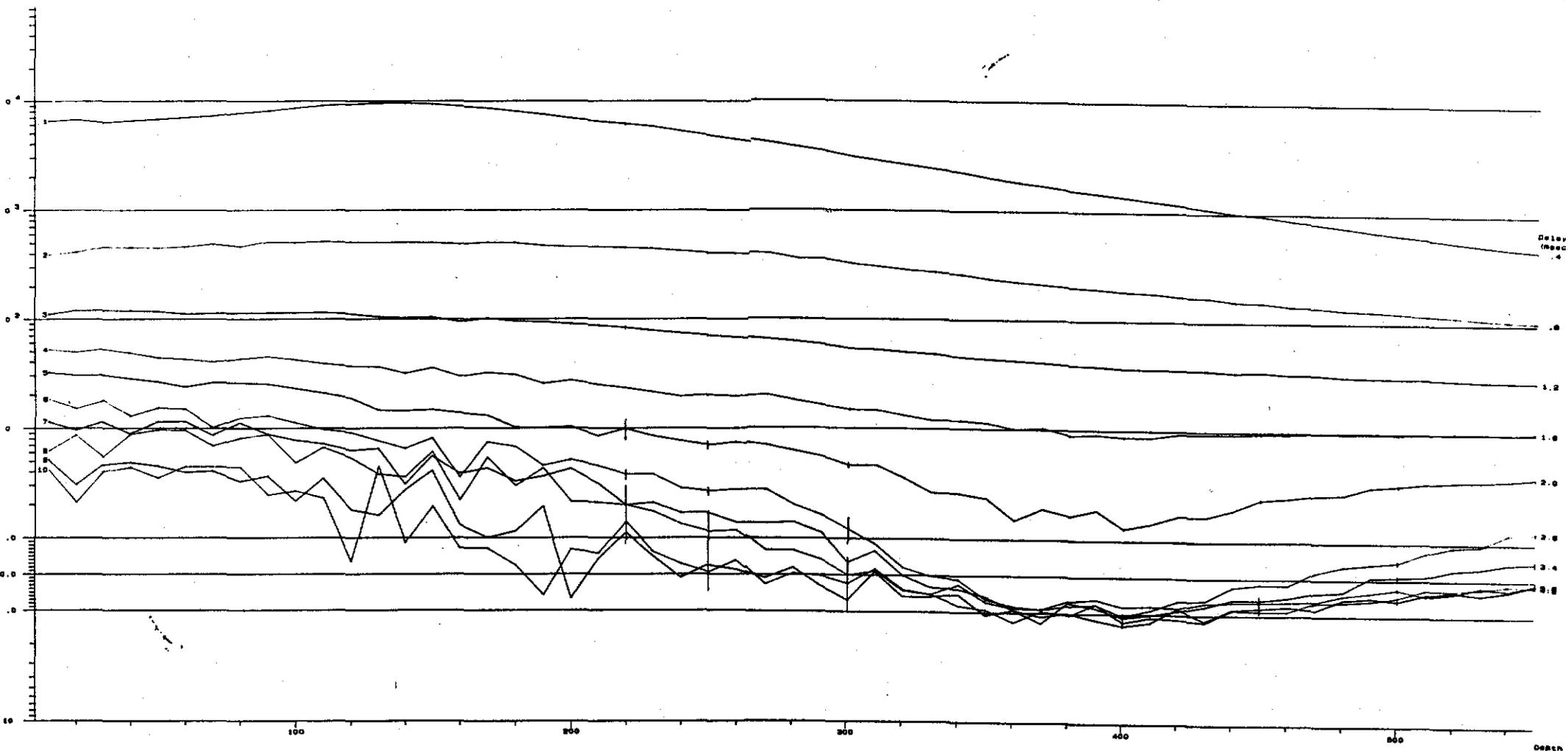


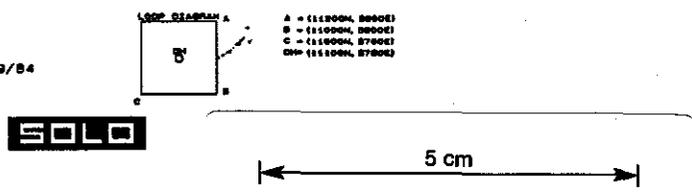
FIGURE 10A

5 cm

028187



ABERFOYLE EXPLORATION PTY LTD.
 QUE RIVER TASMANIA
 HELLVER PROSPECT (JOB NO 0548)
 DRILL HOLE HL45A LOOP 1
 SIROTEM Survey by SOLO Geophysics & Co. 13/ 9/84
 SOLO hole ref.310 Reading interval 10.0 m
 SCALE 1 : 1000 Loop size : 200 m
 LOOP configuration : Drill hole
 Plotted : 9: 53 AM 21/ 9/84
 Plate No: X HELL 8A



- A - (112004, 88002)
- B - (112004, 88002)
- C - (112004, 87002)
- D - (112004, 87002)

FIGURE 10b

158

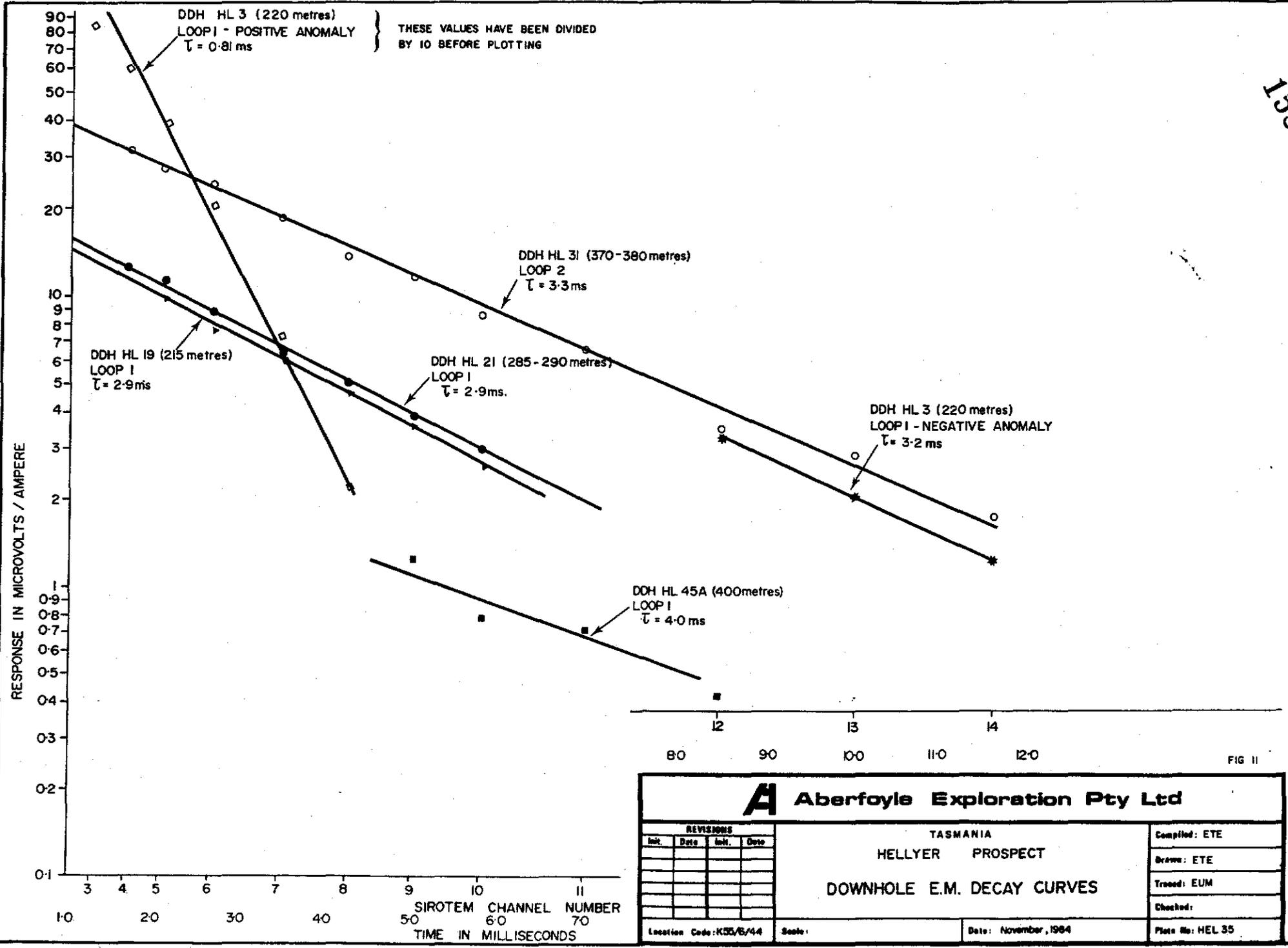


FIG II

A Aberfoyle Exploration Pty Ltd																															
TASMANIA HELLYER PROSPECT																															
DOWNHOLE E.M. DECAY CURVES																															
<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>Init.</th> <th>Date</th> <th>Init.</th> <th>Date</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		REVISIONS				Init.	Date	Init.	Date																					Compiled: ETE Drawn: ETE Traced: EUM Checked:	
REVISIONS																															
Init.	Date	Init.	Date																												
Location Code: K55/6/44		Date: November, 1984																													
Scale:		Plate No: HEL 35																													

028183

NEWMONT HOLDINGS PTY LTD
 EMP SURVEY

AREA : TASMANIA
 PROJECT : QUE RIVER
 OPERATOR : GEOCRAFT P/L
 DATE : MAY 1984
 SURVEY TYPE : DRILLHOLE EMP

TX LOOP NO. : 2
 RX COIL NO. : 550
 HOLE NO. : 3

80
 60
 40
 20
 0

MICROVOLTS

159

Z-COMPONENT
 DOWN

TIME: 1.22MS
 TIME: 1.53MS
 TIME: 2.08MS
 TIME: 2.70MS
 TIME: 3.80MS
 TIME: 5.05MS
 TIME: 7.24MS
 TIME: 9.74MS

SCALE X 500
 SCALE X 500
 SCALE X 200
 SCALE X 100
 SCALE X 20
 SCALE X 2
 SCALE X 2
 SCALE X 1

STATION NO. 50 160 205 230 255 280 305 330 355

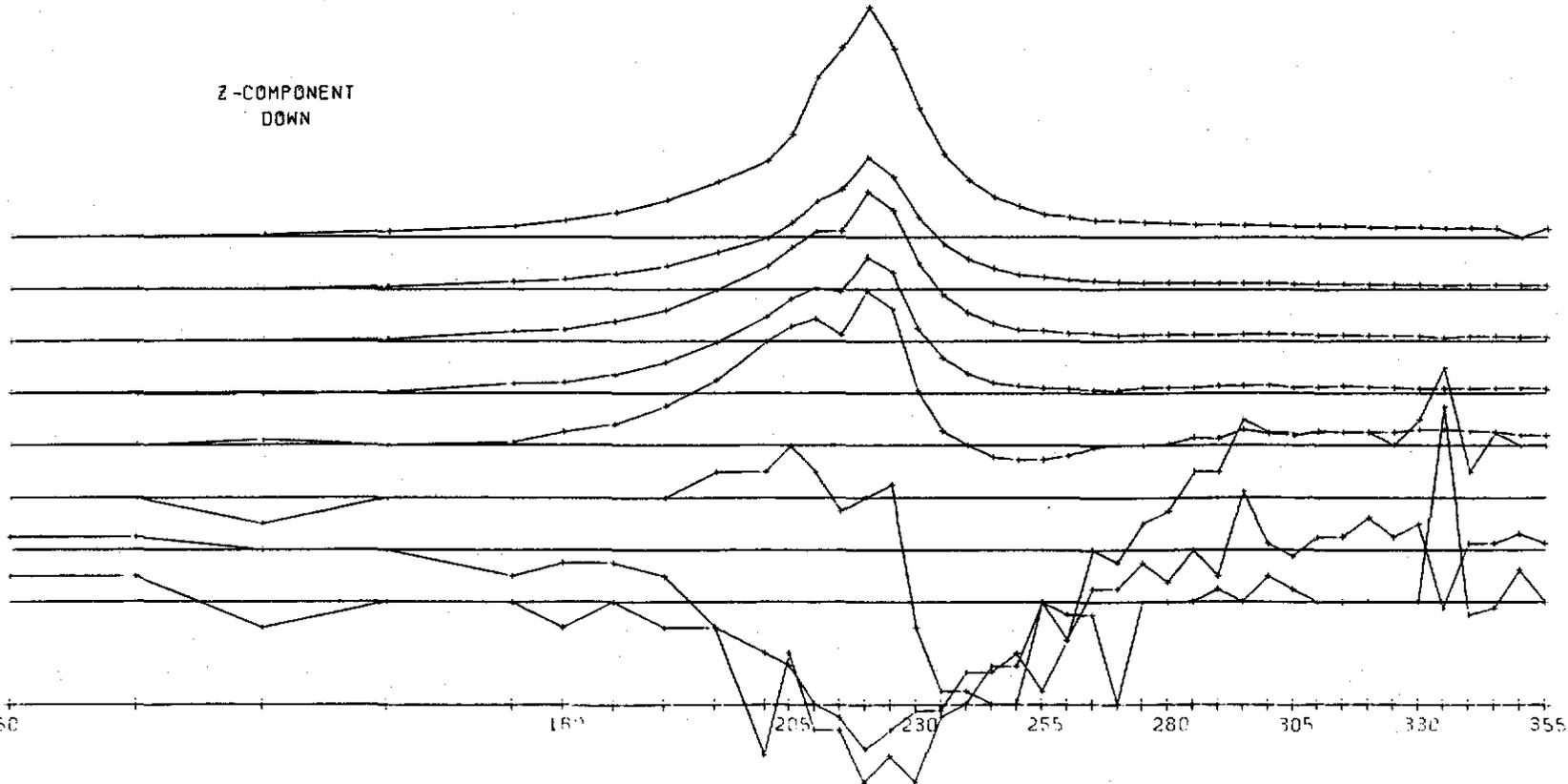


FIGURE 12

028184

NEWMONT HOLDINGS PTY LTD
 EMP SURVEY
 AREA : TASMANIA
 PROJECT : QUE RIVER
 OPERATOR : GEOCRAFT P/L
 DATE : MAY 1984
 SURVEY TYPE : DRILLHOLE EMP
 TX LOOP NO. : 2
 RX COIL NO. : 550
 HOLE NO. : 4

MICROVOLTS

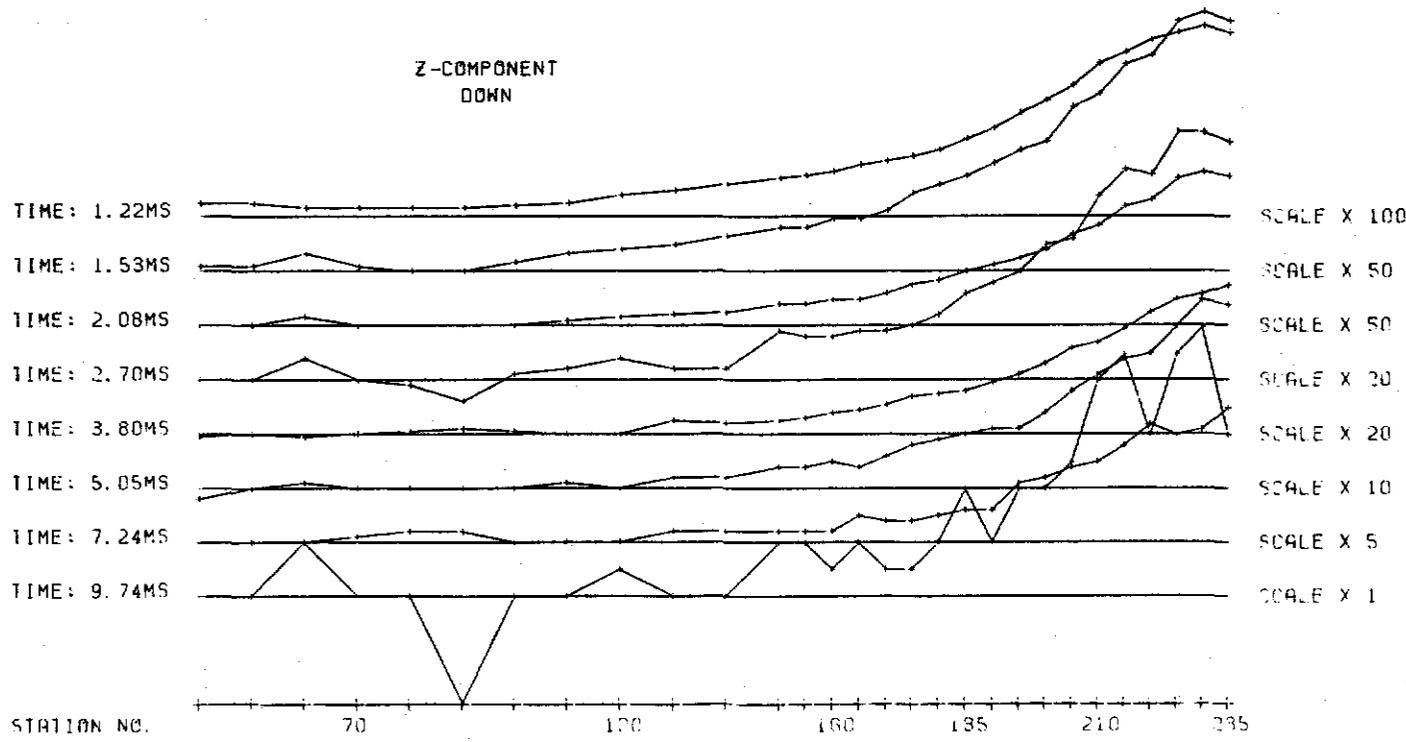


FIGURE 13

160

028185

NEWMONT HOLDINGS PTY LTD
 EMP SURVEY

AREA : TASMANIA
 PROJECT : QUE RIVER
 OPERATOR : GEOCRAFT P/L
 DATE : MAY 1984
 SURVEY TYPE : DRILLHOLE EMP

TX LOOP NO. : 2
 RX COIL NO. : 550
 HOLE NO. : 19

MICROVOLTS

80
60
40
20
0

161

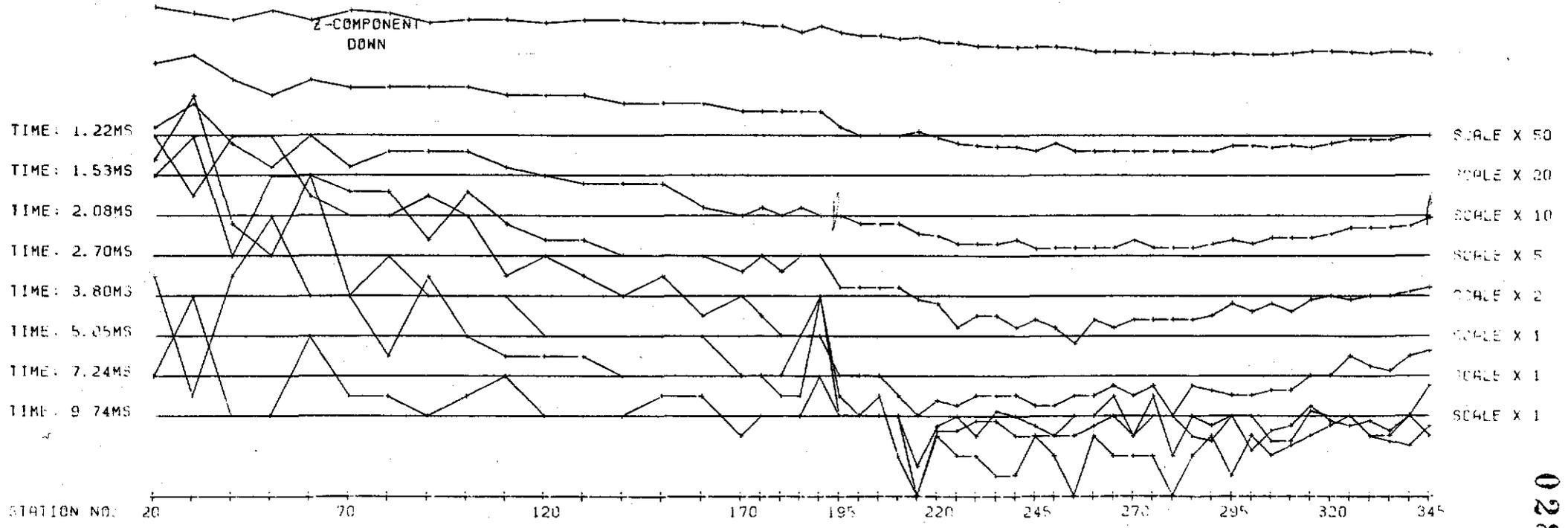


FIGURE 14

028186

NENMONT HOLDINGS PTY LTD
 EMP SURVEY
 AREA : TASMANIA
 PROJECT : QUE RIVER
 OPERATOR : GEOCRAFT P/L
 DATE : MAY 1984
 SURVEY TYPE : DRILLHOLE EMP
 TX LOOP NO. : 2
 RX COIL NO. : 550
 HOLE NO. : 21

MICROVOLTS

80
60
40
20
0

162

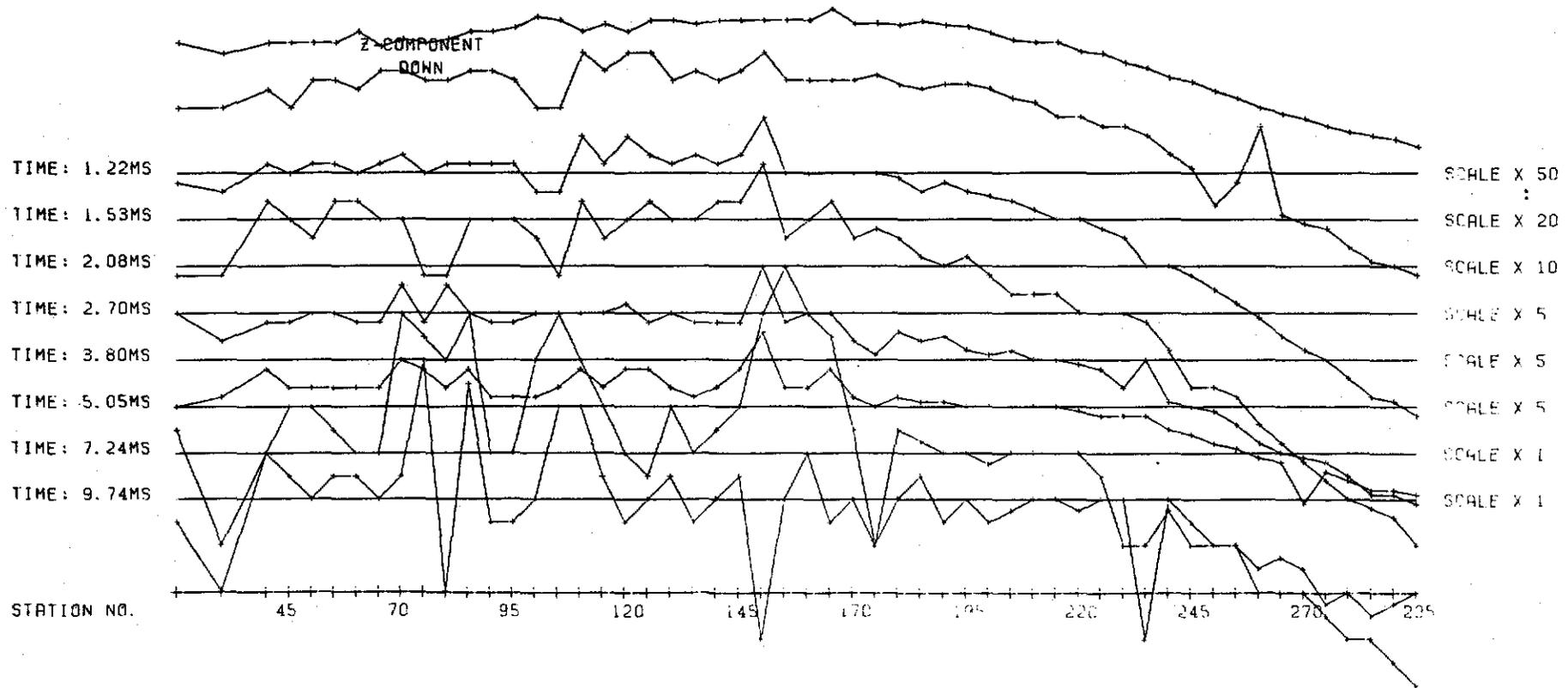


FIGURE 15

028187

163

028188

NEWMONT TX LOOP

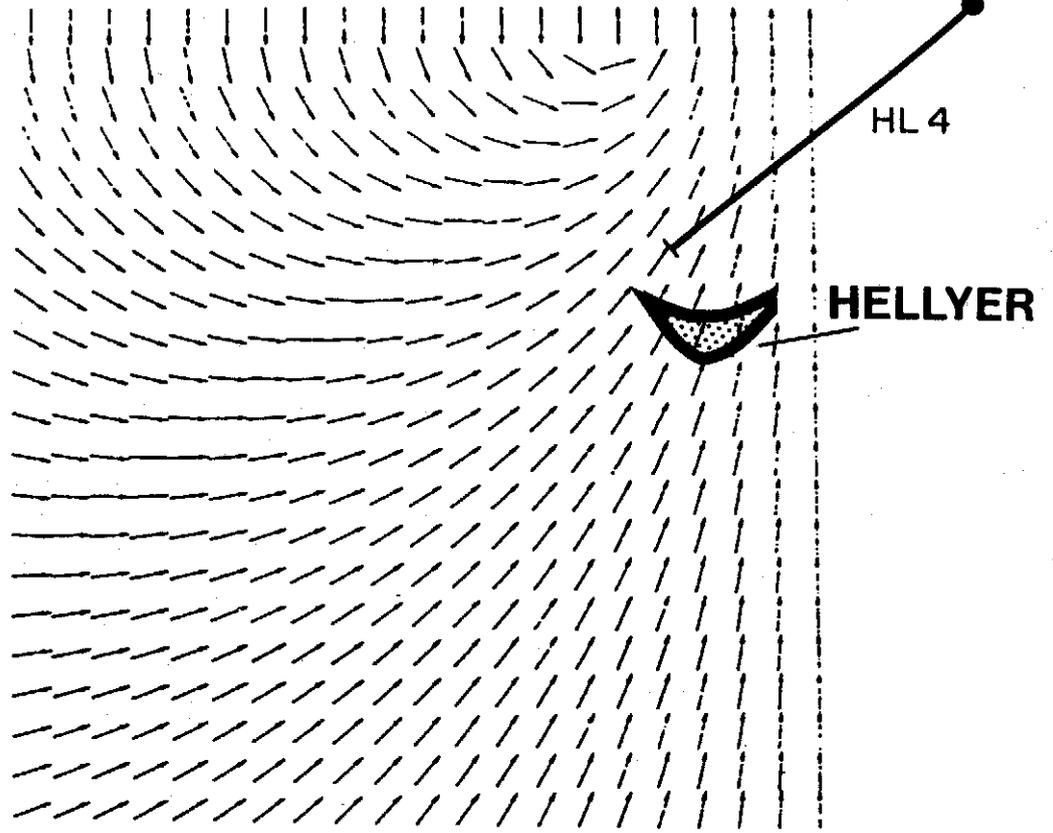


figure 16: HL 4

EM PRIMARY FIELD CONFIGURATION

MICROFILMED

NO.	M.	A.D.	CC.	S.D.
- 2 JUN 1986				
DEPT. OF MINES				
5353/86				

MACKINTOSH EXPLORATION LICENCE 2/70

TASMANIA

PROGRESS REPORT

FOR THE PERIOD

MAY 1984 TO DECEMBER 1985

OPEN FILE

86-2551

4/4

VOLUME 4 APPENDICES H-R

APPENDIX H

REPORT ON THE 1985 UTEM SURVEY
ON THE
MACKINTOSH-HATFIELD LICENCES

DISTRIBUTION
Aberfoyle, Burnie (2)
Aberfoyle, Hawthorn
Tom Eadie

Tom Eadie
Geophysicist
July 19, 1985

TABLE OF CONTENTS

	PAGE NO.
I. INTRODUCTION	1
II. INTERPRETATION	3
Loop 17	3
Loop 18 and 28 (Detail)	4
Loop 19	6
Loop 20	7
Loop 21	7
Loop 22	7
Loop 23	8
Loop 24 and 27 (Detail)	8
Loop 25	9
III. CONCLUSIONS	13

APPENDICES

APPENDIX I	COMPUTER MODELLING TO DETERMINE DETECTION LIMITS OF THE UTEM SYSTEM FOR HELLYER AND QUE RIVER SIZED TARGETS
APPENDIX II	UTEM DATA SECTIONS

LIST OF FIGURES

Figure 1	Loop 17 - Channel 8 Data
Figure 2	CSAMT Data - L 4000N
Figure 3	Loop 18 - Channel 5 Data
Figure 4	Loop 18 - Channel 4 Data
Figure 5	CSAMT Data - L 5800N
Figure 6	Loop 19 - Channel 7 Data
Figure 7	Loop 20 - Channel 7 Data
Figure 8	Loop 21 - Channel 7 Data
Figure 9	Loop 22 - Channel 7 Data
Figure 10	Loop 22 - Channel 5 Data
Figure 11	Loop 23 - Channel 5 Data
Figure 12	Loop 23 - Channel 6 Data
Figure 13	Loop 23 - Channel 4 Data
Figure 14	Loop 24 - Channel 8 Data
Figure 15	Loop 25 - Channel 4 Data
Figure 16	Loop 25 - Channel 5 Data

Plate Mac 80 UTEM and EM37 Coverage

REPORT ON THE 1985 UTEM SURVEY ON THE MACKINTOSH-HATFIELD LICENCESI INTRODUCTION

In January, 1985, approximately 50 line kilometres of UTEM data were collected by Lamontagne Geophysics on the Mackintosh-Hatfield Licences. Most of the surveying was done inside the transmitter loop, to maximize energization of the expected flat-lying targets. The frequency used was 25 hertz, with only the vertical component of the magnetic field measured.

The area covered (shown in red on Plate MAC 80) was in general very close to the surface trace of the shale-volcanic contact. The system proved to be very sensitive to this contact and was able to map it at almost all locations. Only in one area was there an obvious strong conductor, and this was interpreted to be within the shales or closely underlying them. However, since the anomaly is in such an interesting geological position (in the Murchison Highway Zone syncline and near a large structure), drilling is proposed.

A second area of interest lies within loop 25, where there is a very subtle late time anomaly that could possibly represent a conductor at a depth approaching the detection limit of the UTEM system. In spite of the lack of total confidence in this geophysical anomaly, a drill hole is proposed because there are also geological reasons for drilling in the general area. The geophysics is able to supply a precise target.

A third location, within loop 22, merits follow up by more geophysics.

169

In order to aid in the understanding and the interpretation of the UTEM data, a quantitative study of the depth detection limits of the system for Hellyer and Que River size ore bodies is included in Appendix I. It is concluded that a Hellyer-sized body would be detected to a depth of about 300 metres, and Que River to a depth of 150 metres.

II INTERPRETATION

Selected channels of the data inside the loop have been presented in a contoured plan format. The values plotted are the measured total field reduced to the channel 1 response (to remove the primary field and geometrical errors) and normalized to the value of the primary field in the centre of the loop. It is felt by the author that this is the optimum method of presentation in that it gives the most accurate presentation of the secondary field. The only problem with it is that there always tends to be an increase in values in the immediate vicinity of the loop edge. This can be seen in all plots, particularly where the amplitudes are low (later times) and is not related to anything geological.

In addition to these contoured plans, all of the data is presented in profile in Appendix II.

Loop 17

Loop 17 was surveyed in order to detail a relatively strong conductor detected in the original 1979 survey and attempt to close it off to the south. The 1985 work has shown conclusively that the anomaly is caused by the Que River Shales. The conductive unit does not extend any further south than already interpreted from the 1979 UTEM.

The conductive shales are best outlined by the channel 8 data (figure 1), which shows a feature from about 4100N to the north, with the strongest responses on the eastern half of the grid. This corresponds with the known area of shale outcrop and the trace of the 1979 UTEM anomaly. The fact that the anomaly does not continue to later times, shows that the shale is not overlying any conductive sulphide mineralisation.

It remains a bit of a mystery that the 1979 data apparently showed this shale unit to be a better conductor than the 1985 work. This is undoubtedly due to the fact that one edge of the 1979 transmitter loop ran right through the most conductive part of the shale, inducing a large amount of current in it, and making the close-in receiver positions, where the anomaly was, ambiguous to interpret.

To check this disappointing conclusion, Line 4000N was surveyed with the very deep penetrating Controlled Source Audio Magneto Tellurics method (CSAMT). The resistivities from the survey are shown in figure 2. It confirmed the UTEM interpretation of no hidden conductive bodies in the vicinity.

Loops 18 and 28 (Detail)

Loop 18 was intended to cover the synclinal feature of the Murchison Highway Zone and to extend coverage of the Northwest Mt. Charter Zone to the north. Loop 28 was surveyed to detail a large, shallow, moderately conductive feature detected within Loop 18.

The feature of interest is best outlined by the channel 5 data from loop 18 (figure 3). The very high amplitude response in the southwest corner of the grid is clearly due to a large (strike length > 400 metres), shallow body that dips to the west. The source is undoubtedly within the Que River Shales. However it must be noted that nowhere else are the shales as conductive as this.

It is interesting to speculate on why the shales are so conductive here. It could be that the shales here were deposited in the reducing environment of a trough that increased the graphite content. Alternatively a heat source beneath such as a hydrothermal vent or a small intrusion could have caused a conductivity increasing

alteration. A third possibility is a major fault causing the increase in conductivity; there appears to be a major structure running through this conductor. Any of these hypotheses, or a combination of any of them make this conductivity anomaly very interesting.

However, on the negative side, the anomaly is from a shallow source, with no evidence of a deeper, highly conductive body. The weak response in the channel 4 data (figure 4) is clearly also from a shallow body, and there is no response at all at later times. Therefore, there is no chance of there being a Hellyer-like orebody down to 300 metres, although of course there is a chance of either a smaller or less conductive one within this depth, particularly if it is right at the shale-volcanic contact, where its response would be very difficult to separate from that of the shale.

The data from the detail loop 28 supports this interpretation.

CSAMT was also tested here on Line 5800N (figure 5). The results have not yet been interpreted by the Zonge experts in Tucson, but a preliminary interpretation is that the shales are about 150 - 200 metres thick, with nothing but resistive rock beneath them. The CSAMT data was adversely affected by power lines even though these were greater than 500 metres away. It is hoped that processing can remove this problem.

There are two other possible anomalous zones within loop 18. The first is a northerly continuation of the Northwest Mt. Charter UTEM anomaly that was drilled by MC 11. This is best seen in the channel 4 data (figure 4) from 5600N - 5900N at about 3500E. Drilling (MC 11) showed this to be a weakly pyritic zone. The EM data in this

area is undoubtedly distorted somewhat by the proximity to the major HEC line and the loop edge effect.

The other anomaly runs along the extreme northwestern edge of the loop and is best seen in the channel 5 data (figure 3). It looks to be too strong and consistent to be a loop edge effect (as described in the introduction). It is probably just another anomalously conductive shale unit, but it should be thoroughly detailed if Aberfoyle obtains the ground to the west of the Murchison Highway.

Loop 19

Loop 19 is the first of a series of three loops which straddle the shale volcanic contact on the northwestern margin of the volcanics on the Hatfield property.

The early time data (channel 8 - figure 6), which generally can be relied on to map the shale-volcanic contact (see Loops 20, 21), fails in this case for two reasons. The first is that as can be seen from the raw data on Lines 7800N and 7900N, there has been a shift in the timing of the clocks, causing a severe break in the data. This disturbs the pattern in figure 6. The second reason is that the dacite unit in the northeast corner of the grid, appears to be a weak conductor, probably because of disseminated pyrite.

The late time data (from channel 5 onwards) shows no anomaly at all, indicating that there are no conductive targets in the vicinity of the loop.

Loop 20

Loop 20 maps out the shale contact very well as shown by the channel 7 data, figure 7. There are no later time anomalies and therefore no geophysical targets.

Loop 21

The channel 7 data (figure 8) maps out the shale contact reasonably well. The fact that the anomaly and the contact do not correlate well on Lines 9100N and 9200N suggests that the shale is either very thin on these lines, or not very conductive. There is no indication of a geophysical target as shown by the lack of any late time responses.

In this case, the lack of conductivity in the shale where it is expected, may be very valuable information because it may represent considerable thinning of the shale unit overlying the prospective volcanics. These areas may be the best places to drill initially in any pattern drilling programme.

Loop 22

The channel 7 data (figure 9) outlines a slightly conductive area on the western margin of the loop. The fact that channel 5 (figure 10) is also slightly anomalous suggests that this area is worth following up with further UTEM work. However the lack of anomaly in the channel 4 data indicates that it is unlikely that a large ore deposit is being directly detected. Most likely this conductive area simply indicates a thickening of the shale unit.

Just as with loop 21, the lack of conductivity in the shale in certain areas may represent thinning of the shale unit and therefore may point to good areas to pattern drill the prospective volcanics

that lie beneath. Anywhere within the eastern three hundred metres of Loop 22 falls into this category.

Data taken outside the transmitter to the east was limited to only Lines 9300N and 9500N because of the HEC transmission line. There are no target conductors on the lines covered.

Loop 23

Once again, it appears that no target conductor has been identified, and the UTEM served only to map out the location of, and possibly structure within the shale. The channel 8 data (figure 11) shows a very high amplitude response in the northeast quadrant of the loop, corresponding almost exactly with the outcropping shales. However there appears to be an interesting structure disturbing the unit at about 10400N. The same feature is seen in the channel 6 data (figure 12). This may be a major fault that also cuts the prospective volcanic unit and is therefore definitely worth understanding by geological mapping.

Across this structure, the conductor can be traced right down to the southwest corner of the loop, where it appears to become Zone B, a known UTEM conductor always assumed to be the shale unit.

The later time, channel 4 data (figure 13), show no anomalies that could possibly be interpreted to have a deep conductive source.

Loops 24 and 27 (Detail)

Loop 24 was designed to explore for mineralisation immediately to the east of the Hellyer ore deposit and cover the HL 2 prospect area. No conductors were detected except for the shale unit. The

176

interpretation of the Loop 27 data, which energized the prospect area from a different direction, supports this conclusion.

The channel 8 data from loop 24 (figure 14) shows a high amplitude anomaly along the western edge of the loop. The peak of the anomaly is slightly offset to the east of the outcropping shales because of the dip in this direction.

Later time data mimics this effect until channel 5 where there is almost no response at all. There is, therefore, no highly conductive, large, (Hellyer-size), ore deposit within 300 metres of surface within this loop. The data from Loop 27, which was taken in the same area with the transmitter positioned to the west, supports this interpretation.

Loop 25

This is the most difficult loop to trace the shale unit across possibly because the unit is very thin or even non-existent, or because it is not very conductive. There is also a geometrical problem in that to the south, the shale contact actually runs parallel to a survey line.

After overcoming initial processing mistakes by the contractors, a subtle late time anomaly became apparent in the northwest quadrant of the loop. The channel 4 results, figure 15, outline the anomalous area. The anomaly has an amplitude of about 0.5% above background on channel 4, about 1.5% (figure 16) on channel 5 and 2.5% on channel 6 (not shown). No anomaly can be seen on earlier channels because it is dominated by the background response from shallower rock units.

177

The important question is what is the cause of this anomaly. It is possible that the high amplitude, western edge (5700E-5800E) of the anomaly is caused by the loop edge effect mentioned in the introduction and the eastern portion (5900E) caused by conductive shales. However neither of these is a particularly good explanation. For one, the high amplitude western edge anomaly extends to a distance of 200 metres from the loop edge, which is much too great for this type of effect. It is possible that the shales are contributing to the western portion of the anomaly, but earlier work, both IP and UTEM, suggest that the shale is not particularly conductive in this area. Therefore, this combination of explanations does not appear to be plausible.

Another possibility is that the anomaly represents a broad, near surface zone of low resistivity. It can be seen on the resistivity overlay to plate MAC 71 (not included) that this area has an anomalously low surface resistivity. However, one would expect such a zone of slightly low resistivity to show up as a very early time response and not as the observed late time response. Therefore, this is probably not the reason for the UTEM anomaly.

A third possibility is that the anomaly is a distant effect of the nearby HEC line. However loops 23 and 24 which are respectively closer and almost as close to the same HEC line as loop 25, do not show nearly as severe an effect.

Since there appears to be little possibility of geological, geometrical or electronic noise in the data causing the anomaly, the best explanation appears to be that the source is a deep conductive feature. The amplitude of the response suggests that the body is buried at a depth equal to about twice its intermediate dimension.

The change in amplitude between channels 5 and 4 (decay rate) suggests that the body is probably intermediate in conductance (and therefore size) between Que River and Hellyer so its intermediate dimension is probably 100 - 150 metres. This makes the depth 200 - 300 metres. Furthermore, the body appears to dip to the east as evidenced by contrasting the relatively sharp western edge of the zone and the broad eastern edge. The axis of the body appears to be at about 5725E. Both of these last two parameters could have been interpreted incorrectly because of the loop edge effect which starts at about 5675E and distorts the data between 5675E and 5600E.

The strike length of the anomaly is 300 metres (9700N - 10000N), open to the north.

There are definite problems with this interpretation, mainly due to the small amplitude of the response. Certainly these are the values one would expect from a body at the depth detection limit of the system, but the numbers are so small that one must worry that the anomaly does not exist at all.

A related problem is that the anomalous area had already been covered by the 1983 UTEM survey (Loop 10) and no anomaly was detected. This could be due to the fact that the target was not as well coupled to the original transmitter loop, and the noise level was higher, making the target undetectable. However I would have expected current channelling to enhance the anomaly, at early times at least, and make it readily visible. This data makes me believe that if there is a target, it is at the deeper end of the original depth estimate (300 metres).

179

To summarise this section, a drill hole is proposed on the basis of very prospective geology, with the target being a UTEM conductor. The target coordinates are 9900N, 5725E at a depth of 300 metres.

There was also some work done outside loop 25 to the south, where the western continuation of the C3 Zone was detected, supporting the earlier interpretation. There is no indication of a large, highly conductive feature down to 300 metres, or a Que River size target down to 150 metres.

180

III CONCLUSIONS

Only two drill targets have been located in the survey. The first is a west dipping, shallow conductor within loop 18 that stretches from about 5600N to 5900N. A hole located at about 3200E and drilled at 45 degrees to the east would definitely intersect the source of this anomaly.

The second is an east (?) dipping, deep conductor in the northwest corner of loop 25. A hole located to test 9900N, 5725E at a depth of 300 metres would probably hit the target and would definitely get close enough to it to check the validity of the response with DHEM.

In addition, an anomaly on the western edge of Loop 22 is worth following up with more geophysics. Because it is quite close to our property boundary, this may not be possible. If however, pattern drilling is planned for the area, a position close to 9700N, 3000E, might be more interesting than most. Other possible locations for early pattern drill holes might be where the shale is interpreted to be abnormally thin, such as near 9700N, 3400E or 9200N, 3800E.

In general, the UTEM data quality was excellent and I have no hesitation in saying that no conductive ore bodies were missed within the depth limits mentioned in the introduction.

181

3400 E

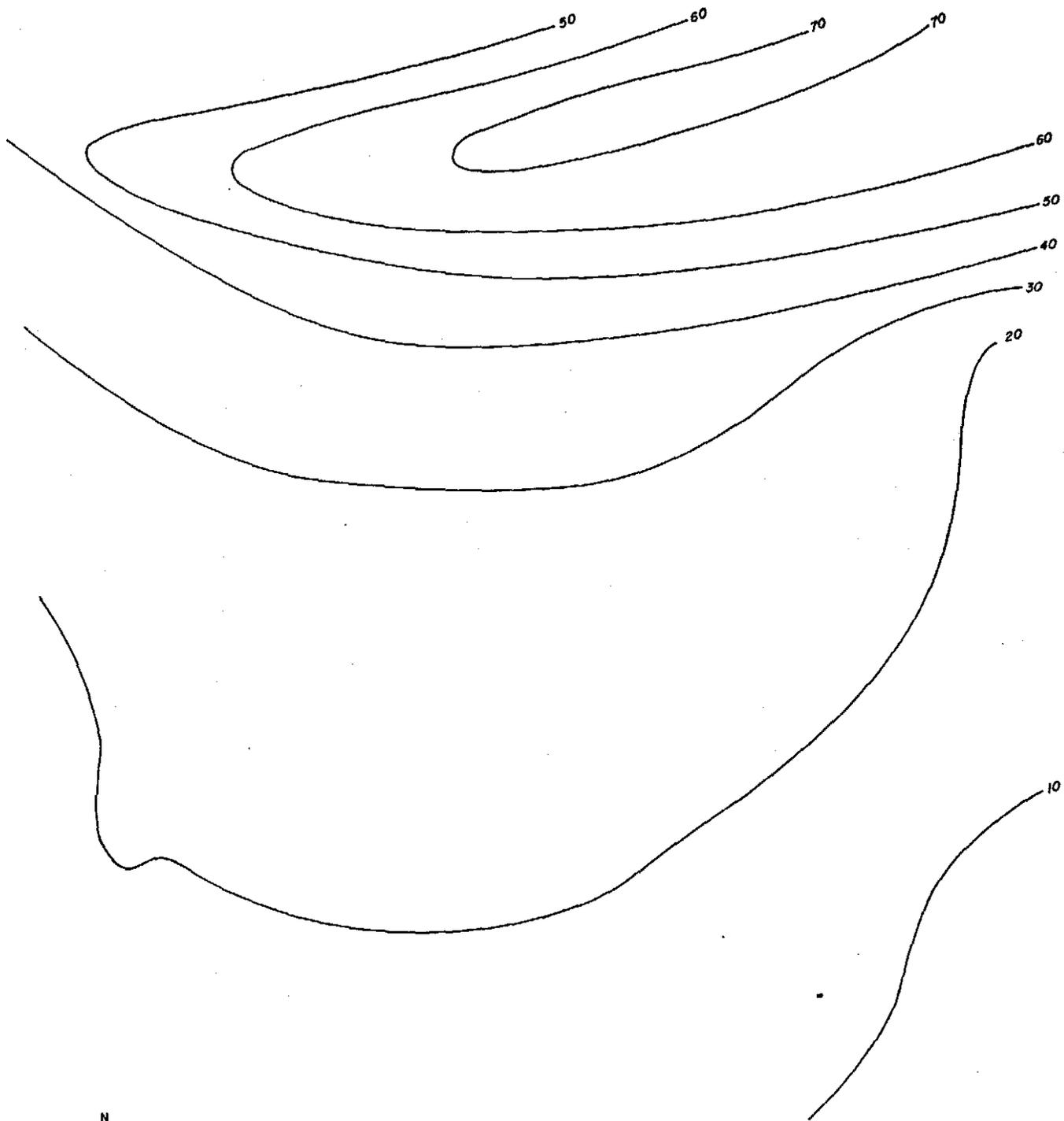
3600 E

3800 E

200 N

3000 N

3800 N



5 cm



FIGURE 1



Aberfoyle Exploration Pty Ltd

REVISIONS			
Int	Date	Int	Date

TASMANIA
HATFIELD UTEM
 LOOP 17 - CHANNEL 8 DATA

Compiled: ETE
 Drawn: ETE
 Traced: LML
 Checked:

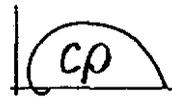
Location Code: K55/6/44

Scale: 1:2500

Date: April, 1985

Plate No: HT 75

CLIENT	<u>Aberfoyle</u>	LOCATION	<u>Hatfield</u>	Tx LENGTH	<u>1000 m</u>
JOB NUMBER	<u>484</u>	LINE	<u>40 (4000 m N)</u>	DISTANCE	<u>10 km</u>
DATE	<u>25-2-85</u>	BEARING	<u>E-W</u>	BEARING	<u>E-W</u>
OPERATOR	<u>BC</u>	α-SPACING	<u>100 m</u>	DIRECTION	<u>N</u>
PLOT OF	<u>P</u>	UNITS	<u>Ω m</u>		



ZONGE ENGINEERING
& RESEARCH ORGANIZATION
Tucson, Arizona USA

182

fHz	1	2	3	4	5	6	7	fHz
2048		(1172)	1275	(905)	1044	1655	978	2048
1024		(5342)	(4611)	(760)	1063	(2107)	744	1024
512		(1093)	(1623)	15731	1119	2416	616	512
256		(1066)	(1690)	1650	1323	1552	724	256
128		(2950)	(39707)	(14493)	1074	(10597)	(3131)	128
64		(505)	(554)	660	804	1609	349	64
32		393	663	173	3410	4161	1462	32
16		568	1575	4335	7490	9632	3303	16
8								8
4								4
2								2

028208

3200E

3400E

3600E

028209

183

6400N

6200N

6000N

5800N



FIGURE 3



Aberfoyle Exploration Pty Ltd

TASMANIA

HATFIELD UTEM

LOOP 18 - CHANNEL 5 DATA

Computed: ETE

Drawn: ETE

Traced: EUM

Checked:

Plate No HT 63

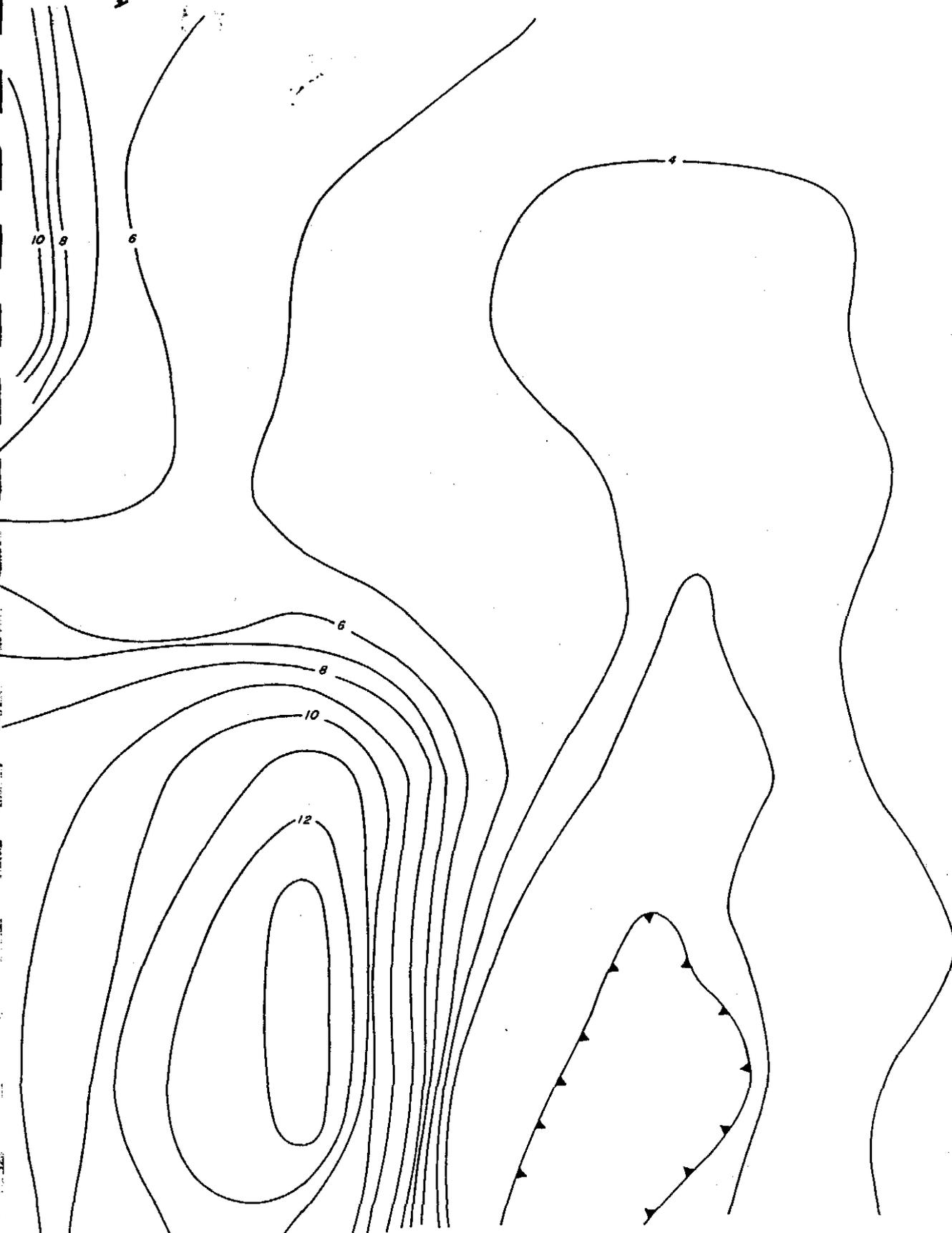
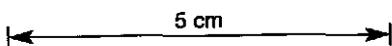
REVISIONS

Init.	Date	Init.	Date

Location Code K55/6/44

Scale: 1 : 2500

Date: February, 1985



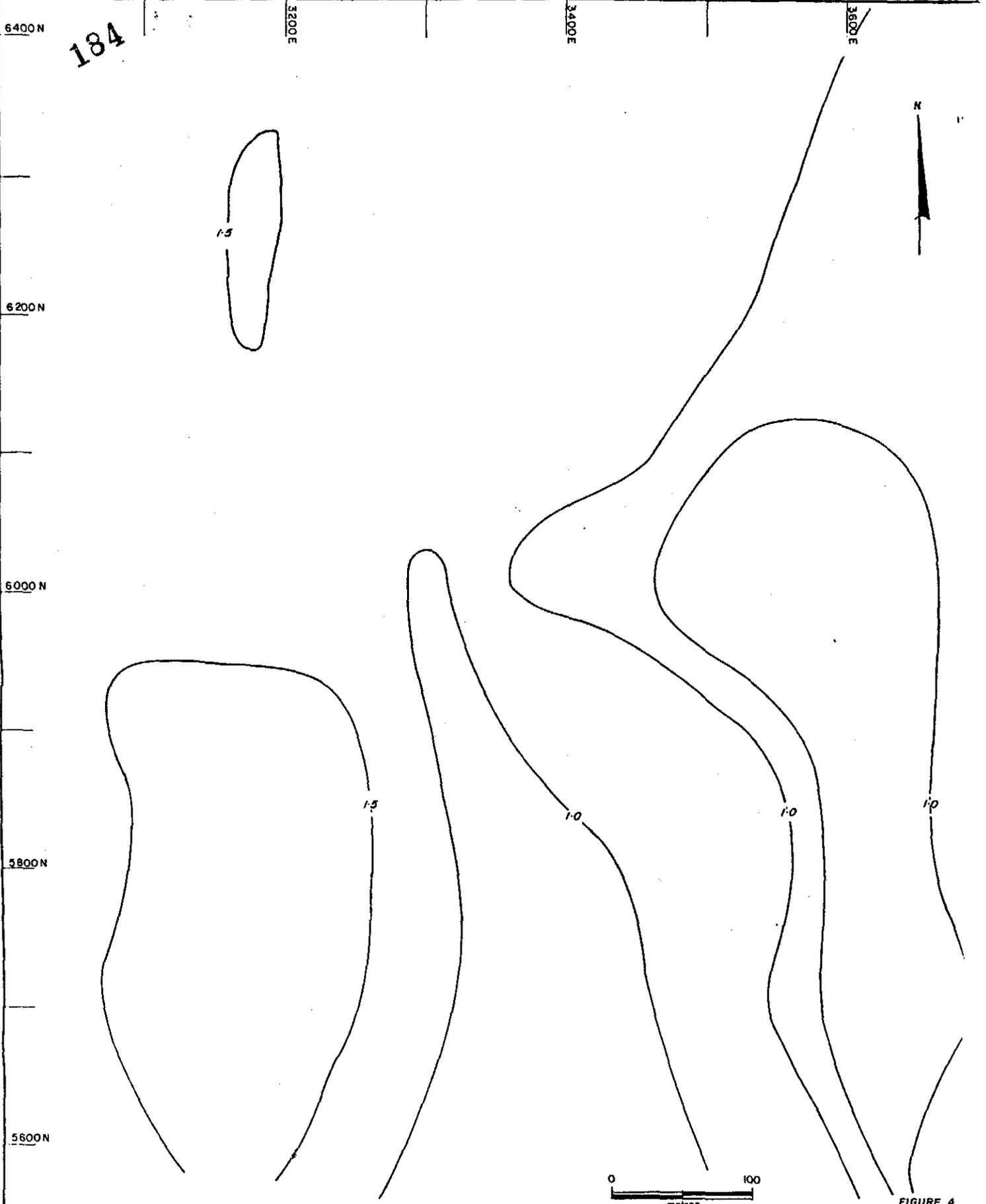


FIGURE 4

Aberfoyle Exploration Pty Ltd

REVISIONS			
Insj	Date	Inst	Date

TASMANIA
HATFIELD UTEM
 LOOP 18 - CHANNEL 4 DATA

Compiled: ETE
 Drawn: ETE
 Traced: EUM
 Checked:
 Plate No. HT 68

Location Code K55/6/44

Scale: 1: 2500

Date: April, 1985

5 cm

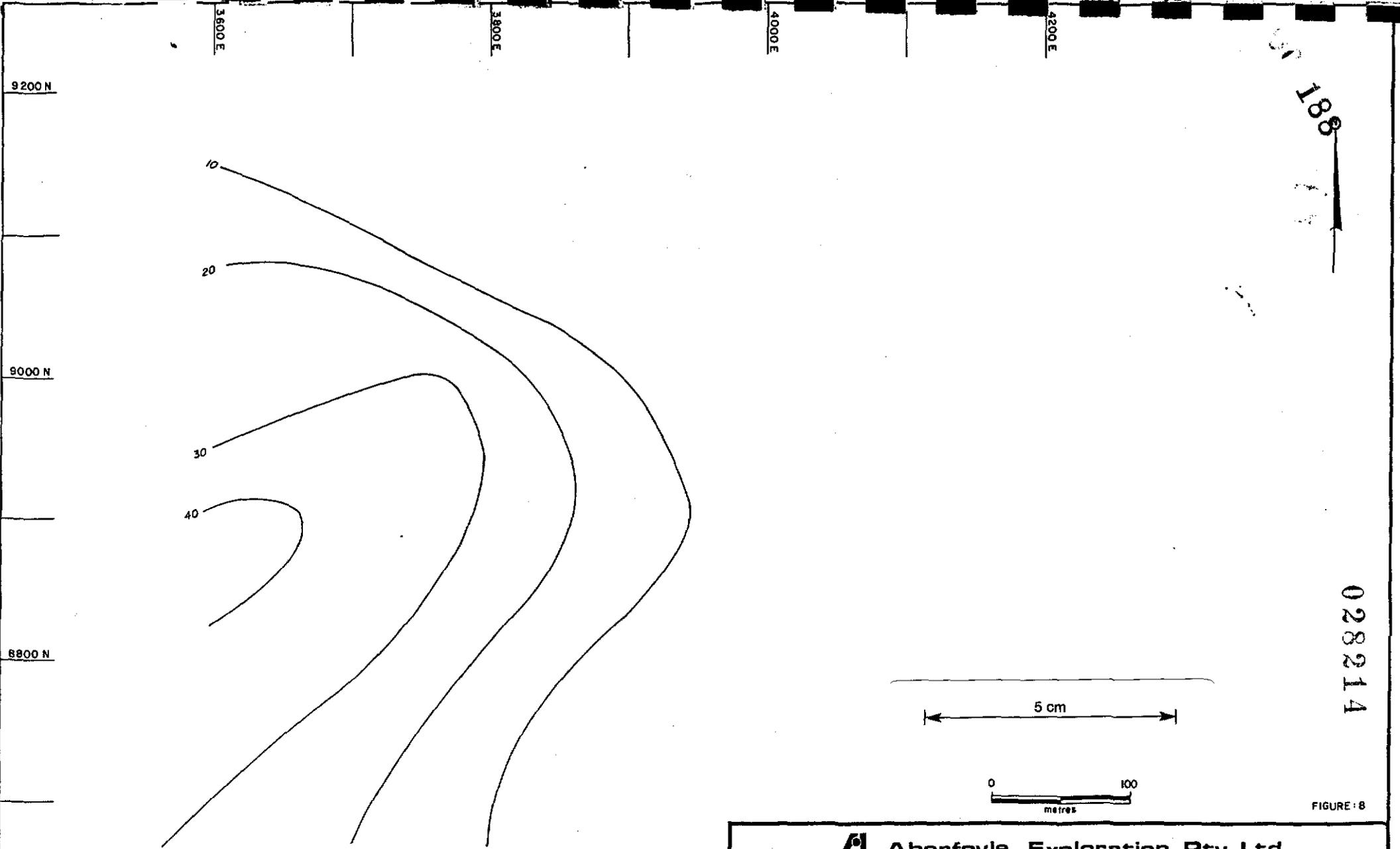
FIGURE 5

CLIENT : Aberfoyle LOCATION : Hatfield Tx LENGTH : 1000m
 JOB # : 384 LINE : 58 (5800mN) DISTANCE : 12 km
 DATE : 23-2-85 BEARING : N90E BEARING : E-W
 OPERATOR : BC α-SPACING : 50m DIRECTION : N
 PLOT OF : P, UNITS : Ω III

185

fHz	1	2	3	4	5	6	7	8	9	fHz	
2048	79	172	48	79	40	30	22	18	143	15	2048 4096
1024	(129)	(12)	(18)	80	(60)	(120)	(28)	(27)	(146)	14	1024 2048
512	44	181	38	86	53	22	21	10	124	13	512 1024
256	40	167	38	(52)	75?	27	27	9	108	12	256 512
128	(168)	(667)	(171)	(5470)	(3083)	(33)	(31)	(25)	(232)	11	128 256
64	26	210	201	249	111	28	20	52	171	10	64 128
32	70	69	94	848	349	101	71	25	293	9	32 64
16	121	1286	216	1434	631	192	156	65	630	8	16 32
8	192	2285	416	2330	1066	338				7	8 16
4										6	4
2										5	2

028211



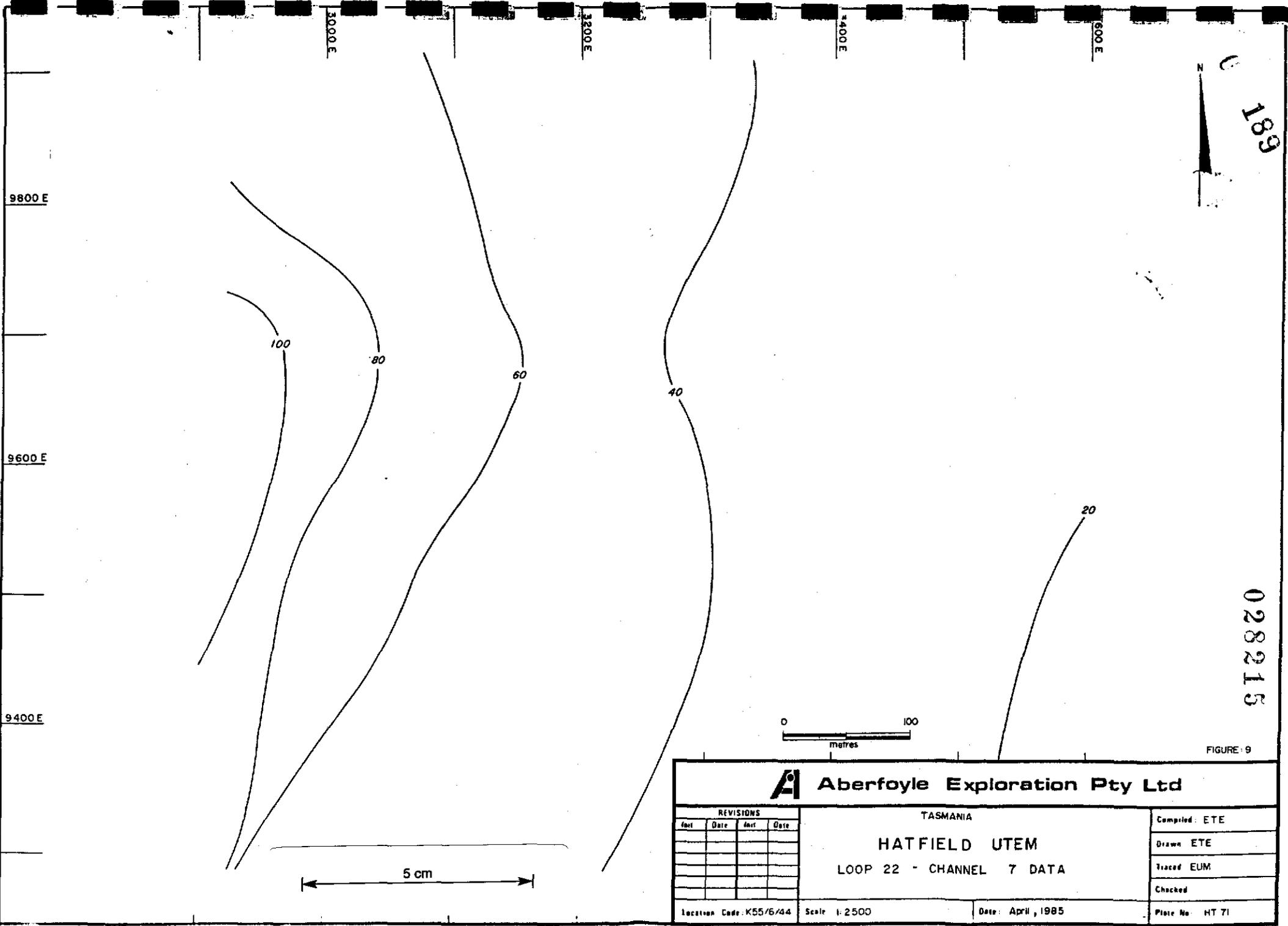
188

028214

FIGURE 8

A				Aberfoyle Exploration Pty Ltd			
TASMANIA				Completed: ETE			
HATFIELD UTEM				Drawn: ETE			
LOOP 21 - CHANNEL 7 DATA				Traced: LML, EUM			
Location Code: K55/6/44				Scale: 1:2500			
Date: April, 1985				Checked:			
Date:				Plate No: HT 70			

REVISIONS			
Inst	Date	Inst	Date



189

028215

FIGURE 9

A Aberfoyle Exploration Pty Ltd																																		
TASMANIA																																		
HATFIELD UTEM																																		
LOOP 22 - CHANNEL 7 DATA																																		
<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>Inst</th> <th>Date</th> <th>Inst</th> <th>Date</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		REVISIONS				Inst	Date	Inst	Date																									Compiled: ETE Drawn: ETE Traced: EUM Checked:
REVISIONS																																		
Inst	Date	Inst	Date																															
Location Code: K55/6/44		Scale: 1:2500	Date: April, 1985																															
			Plate No: HT 71																															

190



9800 N -

9600 N -

9400 N -

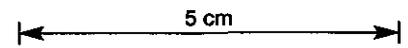


FIGURE 10



Aberfoyle Exploration Pty Ltd

TASMANIA

HATFIELD UTEM

LOOP 22 - CHANNEL 5 DATA

Compiled: ETE

Drawn: ETE

Traced: EUM

Checked:

Plate No. HT 72

REVISIONS

Int	Date	Int	Date

Location Code: K55/6/44

Scale: 1:2500

Date: April, 1985

40

35

35

30

25

30

35

40

3000 E

3200 E

3400 E

3600 E

028216

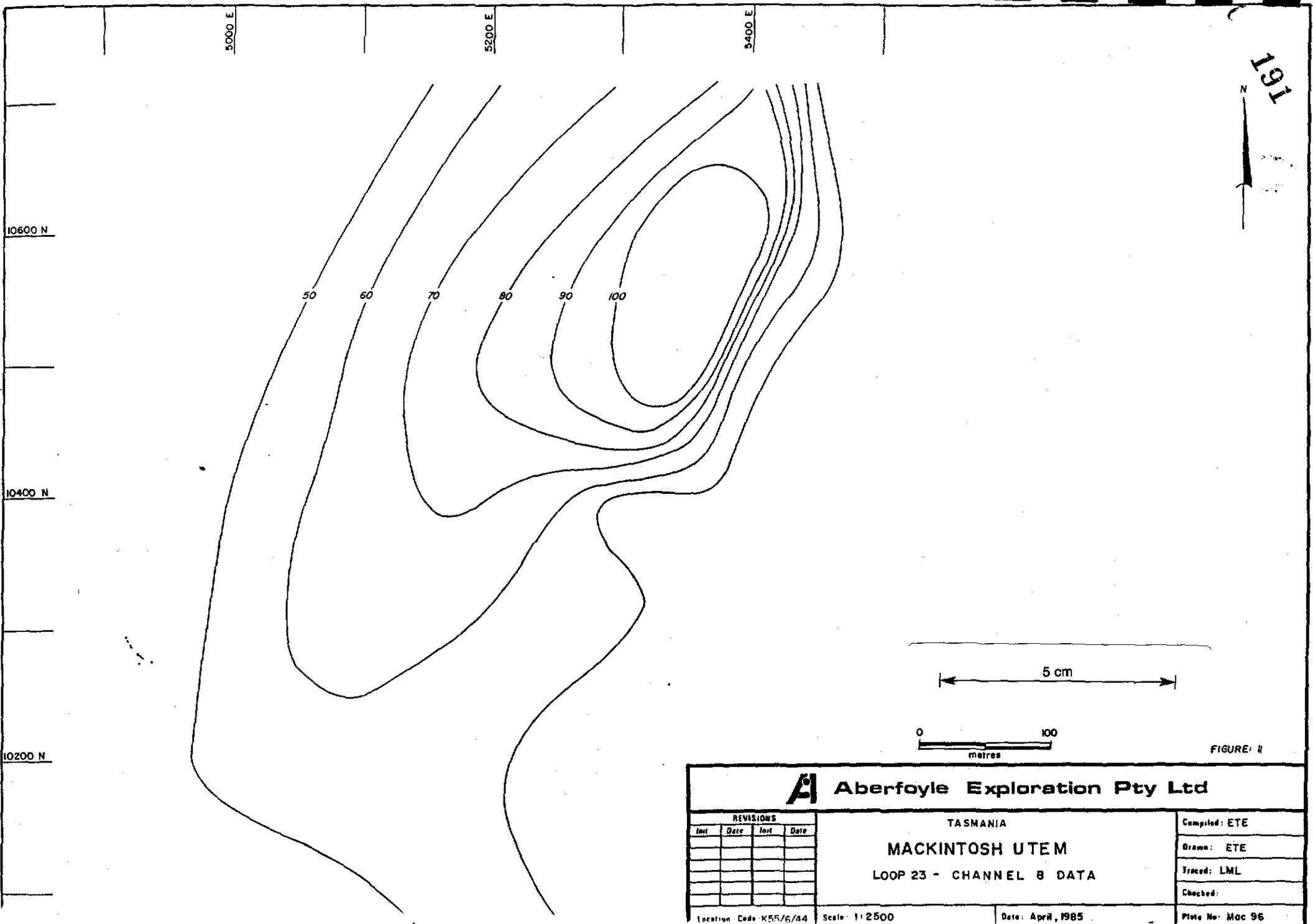
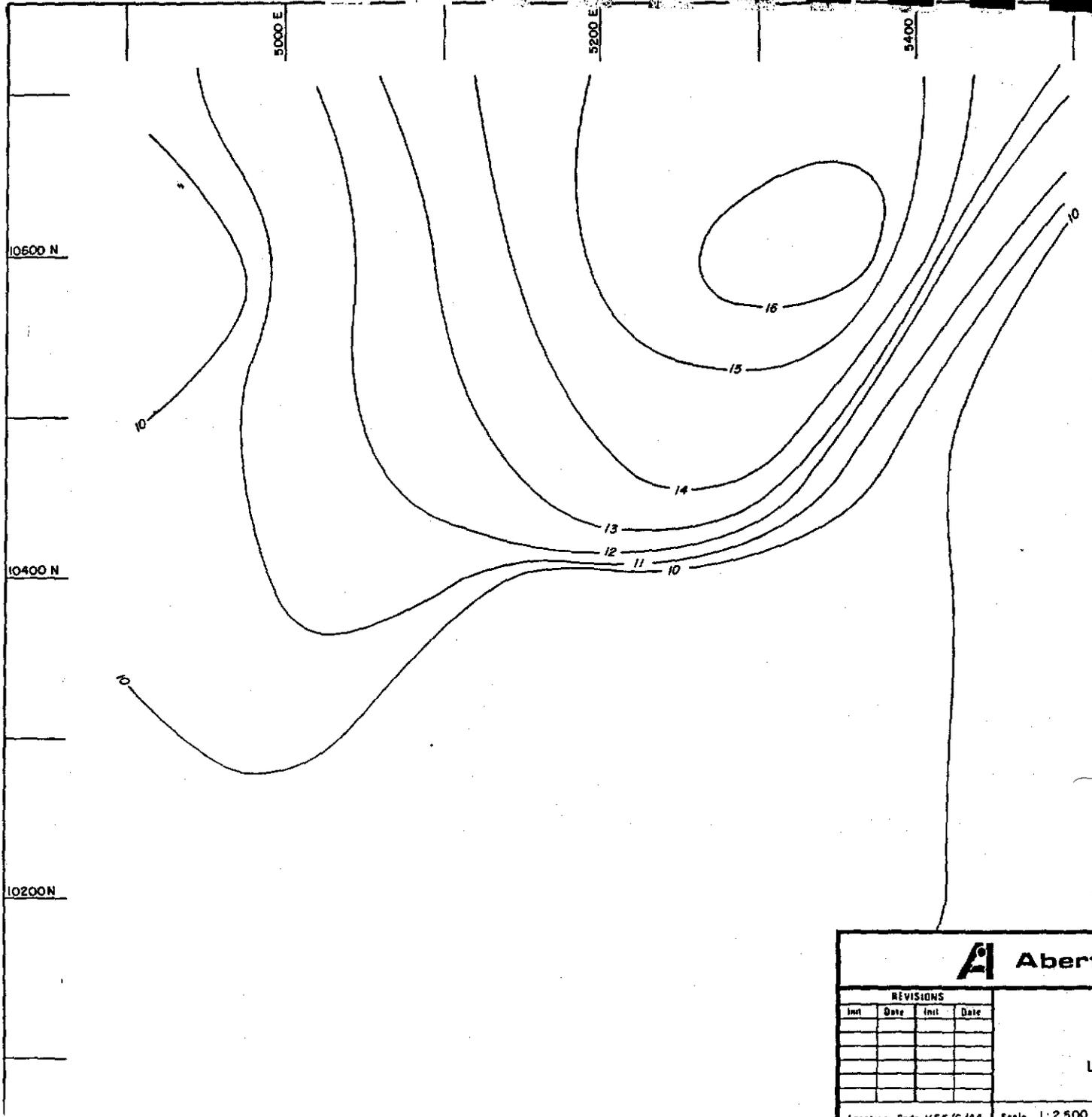


FIGURE 11

A Aberfoyle Exploration Pty Ltd																														
TASMANIA																														
MACKINTOSH UTEM																														
LOOP 23 - CHANNEL B DATA																														
<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>Int</th> <th>Date</th> <th>Int</th> <th>Date</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		REVISIONS				Int	Date	Int	Date																					Compiled: ETE Drawn: ETE Traced: LML Checked:
REVISIONS																														
Int	Date	Int	Date																											
Location Code K55/6/44		Scale: 1:2500	Date: April, 1985																											
			Plate No: Mac 96																											

028217



192

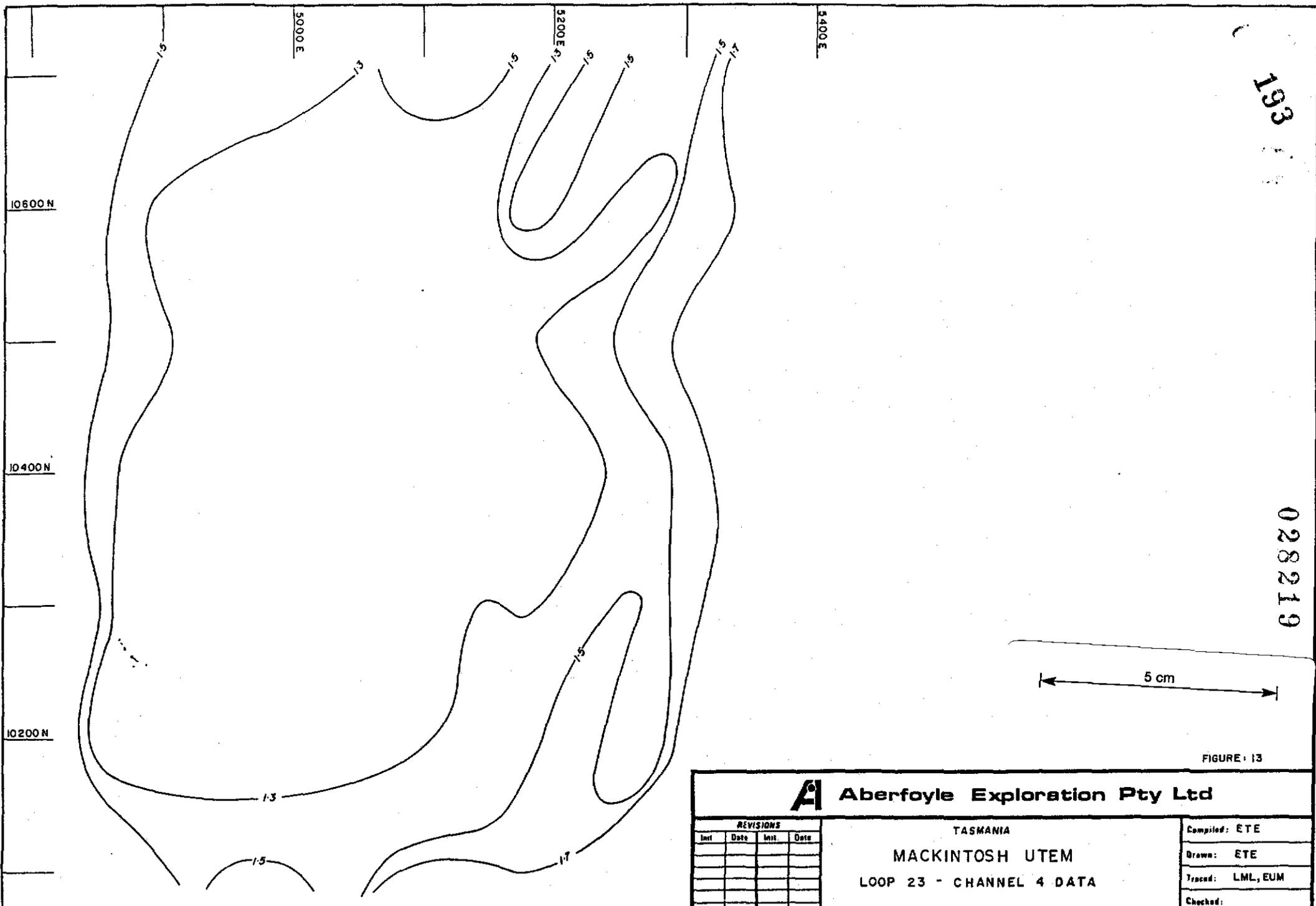
028218

FIGURE 12

A Aberfoyle Exploration Pty Ltd

REVISIONS				TASMANIA MACKINTOSH UTEM LOOP 23 - CHANNEL 6 DATA	Compiled: ETE
Init	Date	Init	Date		Drawn: ETE
					Treated: LML
					Checked:
					Plate No: Mac 95

Location Code: K55/6/44 Scale: 1:2500 Date: April, 1985



193

028219

5 cm

FIGURE 13

 Aberfoyle Exploration Pty Ltd				TASMANIA		Compiled: ETE																															
				MACKINTOSH UTEM		Drawn: ETE																															
LOOP 23 - CHANNEL 4 DATA		Traced: LML, EUM		Checked:																																	
<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>Inst</th> <th>Date</th> <th>Inst</th> <th>Date</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>				REVISIONS				Inst	Date	Inst	Date																										
REVISIONS																																					
Inst	Date	Inst	Date																																		

6100E

6200E

6300E

6400E

6500E

6600E

6700E

194

028220

10700N

10600N

10500N

10400N

10300N

10200N

10100N

10000N

30

23

20

15

10



FIGURE 14

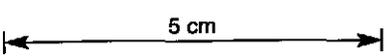
A Aberfoyle Exploration Pty Ltd

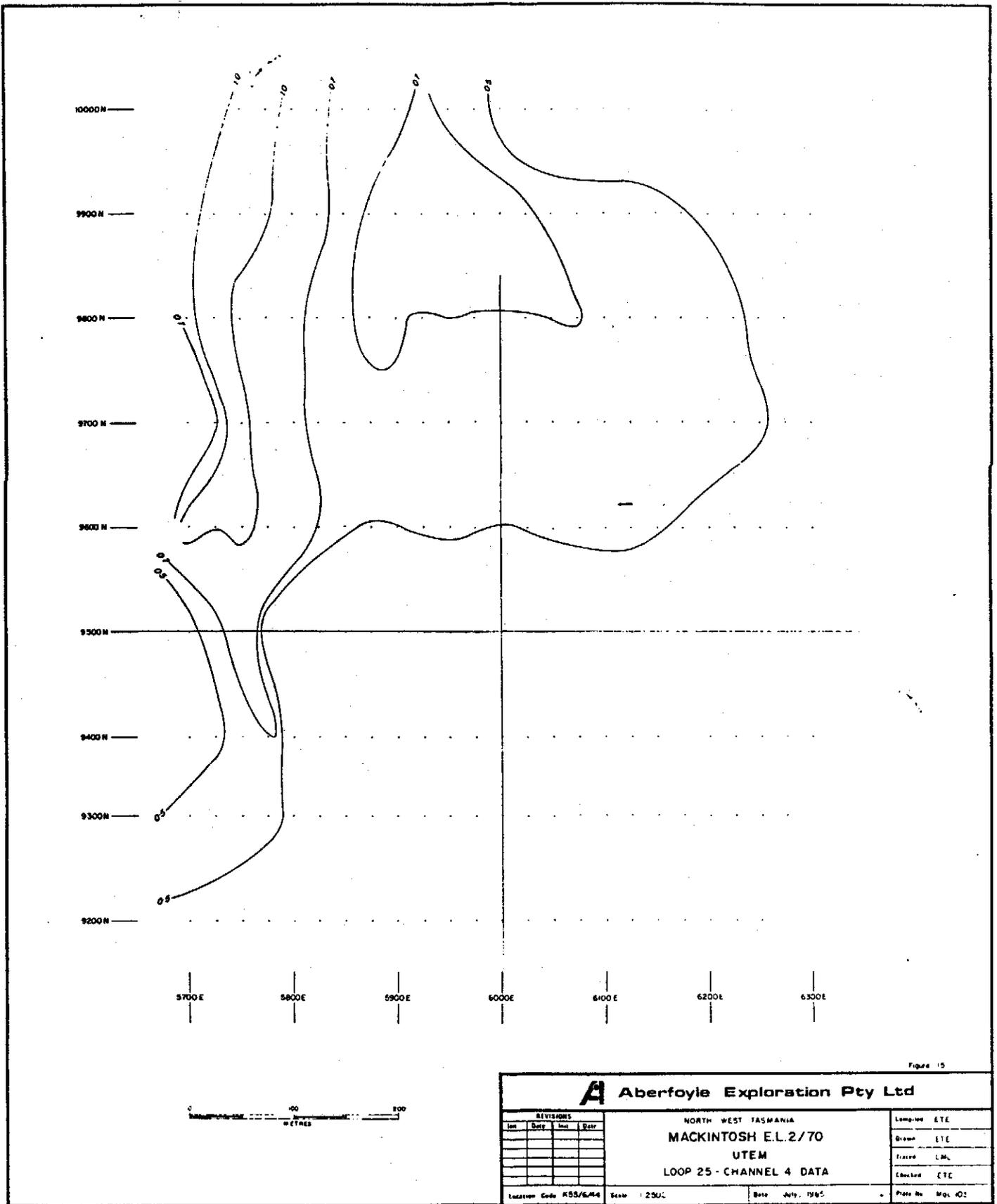
REVISIONS			
Init	Date	Init	Date

TASMANIA
MACKINTOSH UTEM
 LOOP 24 - CHANNEL 8 DATA

Compiled:	ETE
Drawn:	ETE
Traced:	EUM
Checked:	

Location Code: K55/6/44 Scale 1: 2500 Date February, 1985 Plate No Mac 92





5 cm

196

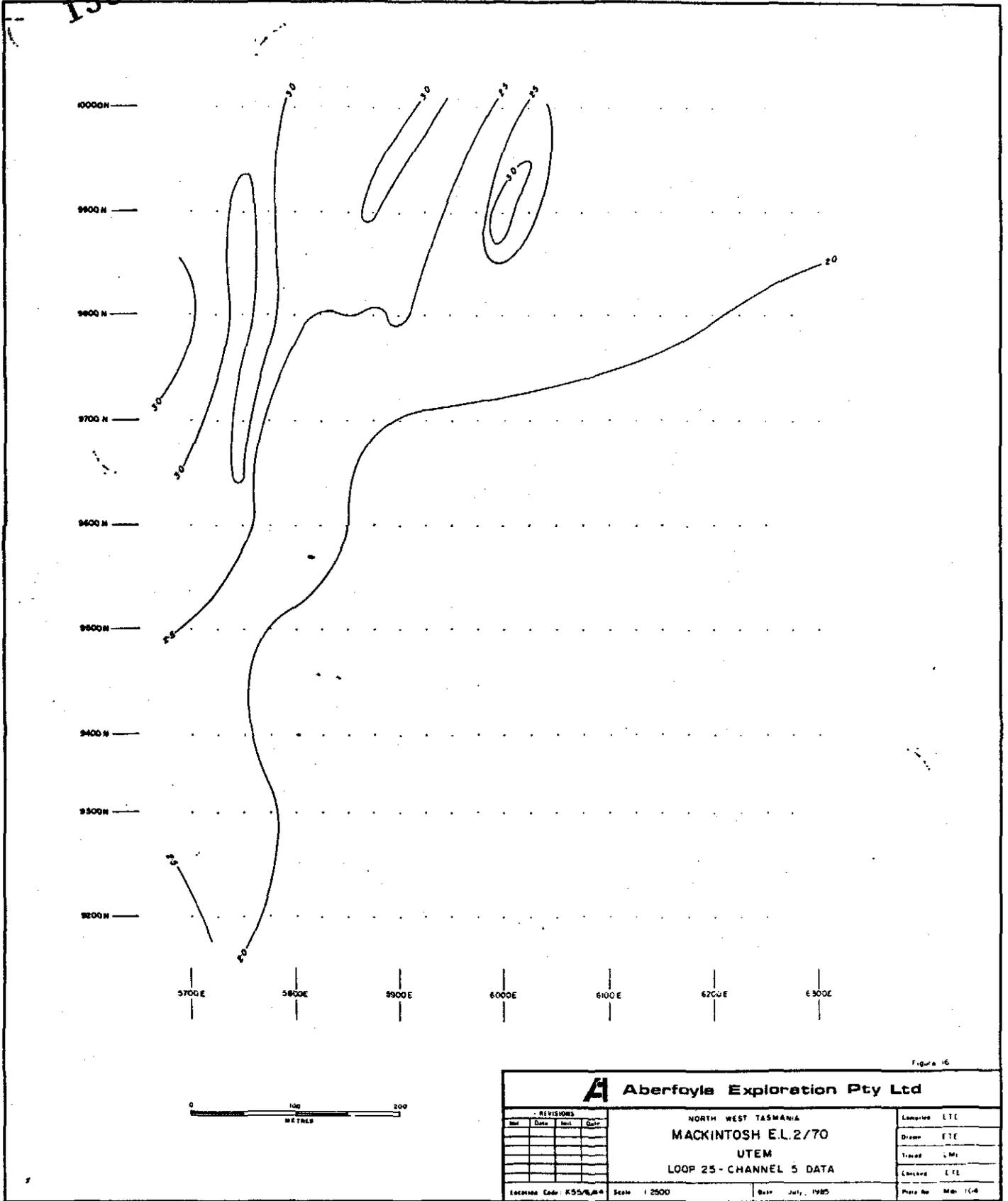


Figure 16

A Aberfoyle Exploration Pty Ltd			
NORTH WEST TASMANIA			Location E.T.C.
MACKINTOSH E.L. 2/70			Drawn E.T.C.
UTEM			Traced L.M.
LOOP 25 - CHANNEL 5 DATA			Checked E.T.C.
Location Code: K55/6,64		Scale: 1:2500	Date: July, 1985
Revisions		Photo No. Map: 104	
No.	Date	By	Check

5 cm

197

028223

APPENDIX I

APPENDIX IComputer Modelling to Determine Depth Detection Limits of the UTEM System for Hellyer and Que River Sized TargetsA) Introduction

Before doing any mathematical modelling, the parameters of the target must be determined. For Hellyer, I initially chose dimensions of 600 x 120 x 30 metres and for Que River (PQ lens), 500 x 100 x 8 metres. For resistivity I used a value of 0.4 ohm-metres, which gives Hellyer a conductivity x thickness product (conductance) of 75 Siemens and Que River 20 Siemens. The conductance value for Hellyer is probably a little low and that for Que River a little high but both are close enough to make this a valid exercise.

Initially the body is oriented horizontally and positioned beneath the approximate centre of the UTEM transmitter loop, which has a size of 800 x 800 metres. The transmitter frequency is 25 hertz.

B) Initial Model Results

The response from the Hellyer model outlined above was computed for several different depths. The results from the deepest model that was found to be detectible are shown in figure A1. The depth was 300 metres, based on a detectibility limit of approximately 0.5% of the primary field for channels 4 and 5. It should be noted at this point that in order to compare these results with the data shown in Appendix II, the polarity must be reversed.

Figure A2 shows the results for the Que River model at a depth of 150 metres, judged to be the depth detection limit for this smaller body. Because it is now channels 5 and 6 that must be depended upon to outline the target, it is doubtful that this body would be seen beneath the shale unit on the Mackintosh and Hatfield licences, because channel 6, and to a lesser extent channel 5, respond to the shale unit. Under these geological conditions, the depth detection limit for a PQ lens sized target would be about 100 metres.

The differences between the two responses in figures A1 and A2 are very important. The Que River model response is narrower, because the body is narrower; has a higher amplitude at early times, because the body is shallower; and decays more quickly because the body has less conductance.

C) Changes to the Initial Models

The model used for Hellyer up to this point only represents about 10 million tonnes of ore and is therefore a little too small to represent the known Hellyer ore body. In figure A3, all parameters have been kept the same except for the intermediate dimension (width) which has been raised to 200 metres increasing the tonnage to about 16 million tonnes. This widens the response and makes the amplitude larger at all times. Using a detectability limit of about 0.5% for channels 4 and 5, it is clear that this very large body in this orientation would easily be seen at 300 metres and probably even 50% deeper.

Another factor that affects the depth detection limit is the orientation of the body with respect to the transmitter loop. In all cases examined up to this point, the target has been horizontal and

located beneath the centre of the transmitter loop. This leads to a maximum coupled situation, the same as if there is a vertical target positioned ideally outside the loop. Any maximum coupled situation results in the largest possible anomalous response.

Figure A4 is the same model as figure A3 except that the body dips 45 degrees to the right, taking it out of the plane of maximum coupling, thereby reducing its response. It can now be seen that this very large body would barely be detectable at 300 metres, just because of dip.

D) Modelling the Sirotem System

Figure A5 shows the Sirotem response for the same model used for UTEM in figure A3. Except for the polarity, the response is almost identical. However it is possible that the amplitude near the important time of about 2 milliseconds (where the ore body response would overcome geological noise) dominates the expected noise level more so than UTEM. However field tests are necessary to substantiate this hypothesis. It is certain that this possible advantage would be marginal and would only exist in cases where the transmitter loop was positioned very close to the surface trace of the conductor.

E) Conclusions

- 1) A Hellyer sized ore body (600 x 200 x 30 metres) can be detected to a depth of about 300 - 400 metres depending on the orientation of the body with respect to the transmitter loop.
- 2) A Que River sized ore body (500 x 100 x 8 metres) can be detected to a depth of about 150 metres in electrically simple

(i.e. no shales) geological environments and to a depth of about 100 metres where there are difficulties with overlying units.

- 3) Bodies intermediate in size can be seen to intermediate depths.
- 4) The Sirotem unit has no major advantages over the UTEM unit in this environment but may be marginally better for detailed work. It has major disadvantages for reconnaissance work.

In summary, ground electromagnetics should have a major contribution to Aberfoyle's future exploration work in Tasmania, but its limitations must be recognized to ensure that no ore bodies are overlooked in areas of particular importance.

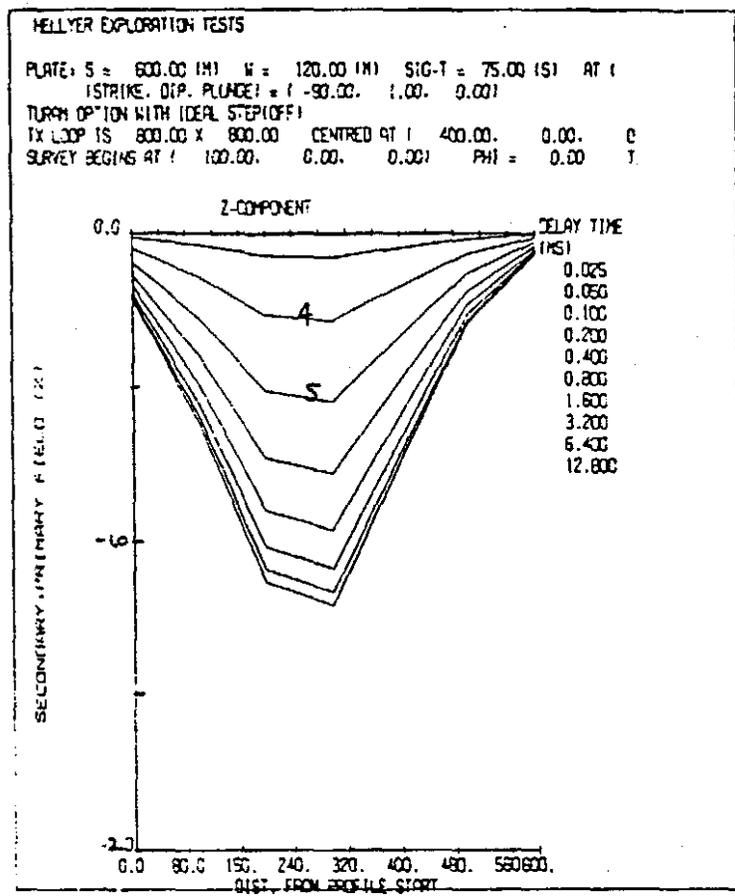


FIGURE A1: HELLYER SIZED BODY (600 X 120 METRES;
75 SIEMENS) AT A DEPTH OF 300 METRES.
DIP = 0

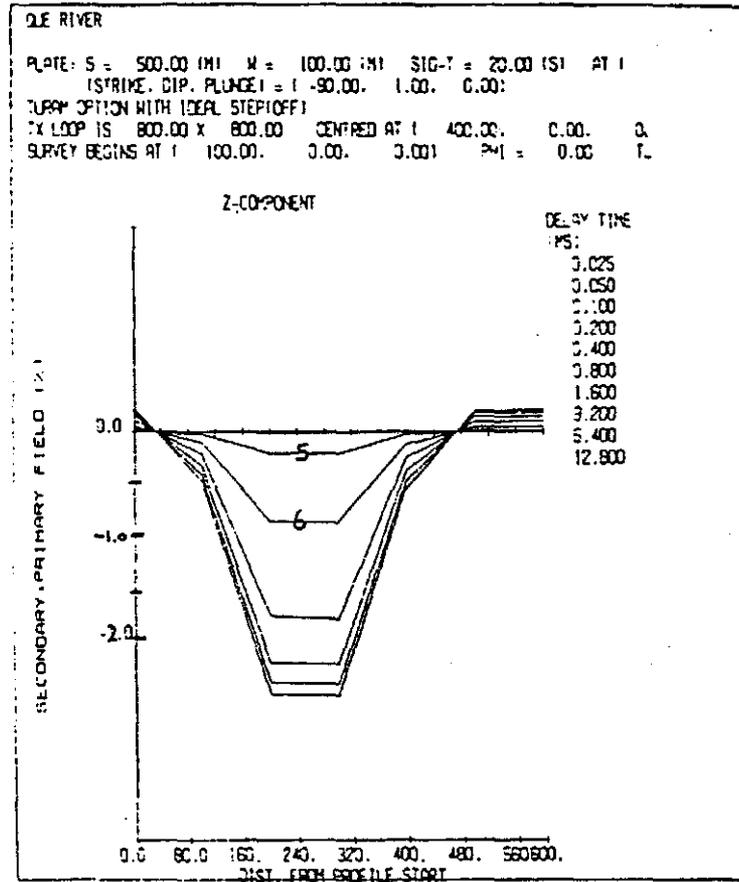


FIGURE A2: QUE RIVER SIZED BODY (500 X 100 METRES;
 20 SIEMENS) AT A DEPTH OF 150 METRES.
 DIP = 0

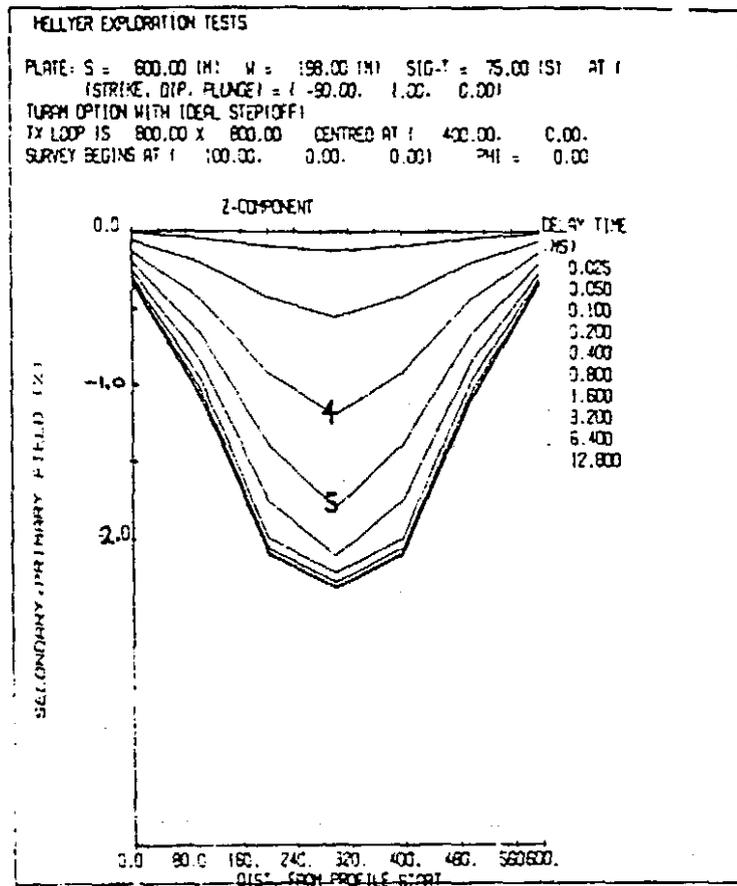


FIGURE A3: ENLARGED HELLYER MODEL (600 X 200 METRES;
 75 SIEMENS) AT A DEPTH OF 300 METRES.
 DIP = 0

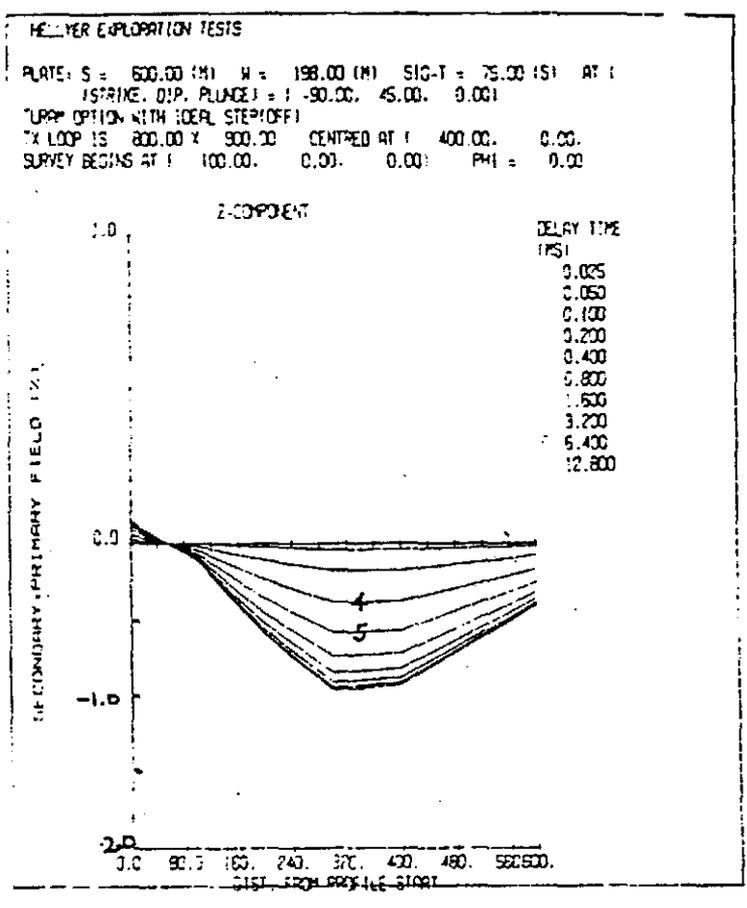


FIGURE A4: ENLARGED HELLYER MODEL (600 X 200 METRES;
 75 SIEMENS) AT A DEPTH OF 300 METRES.
 DIP = 45°

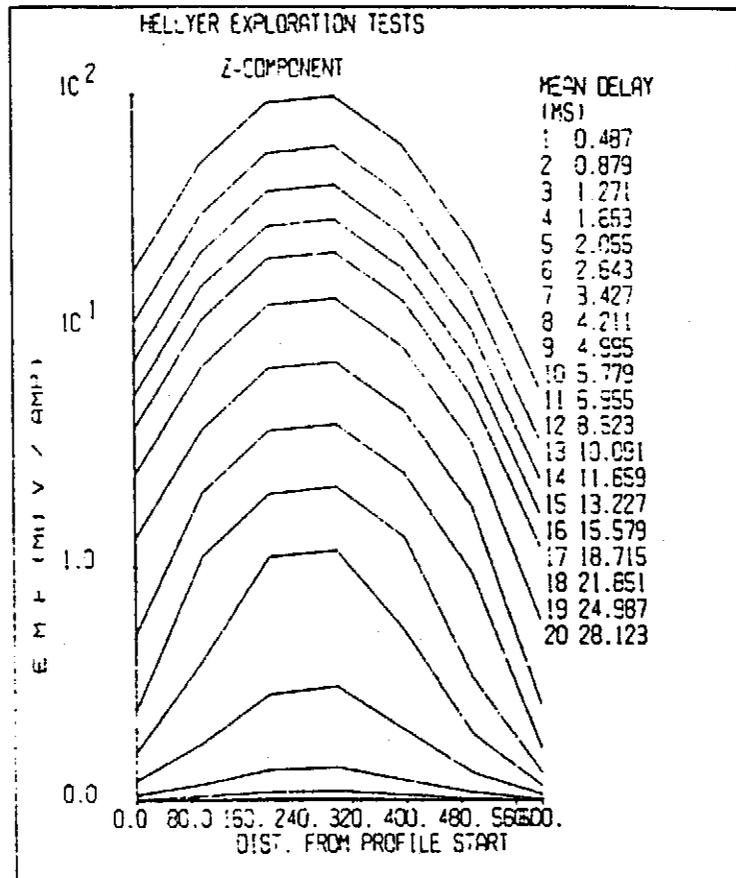


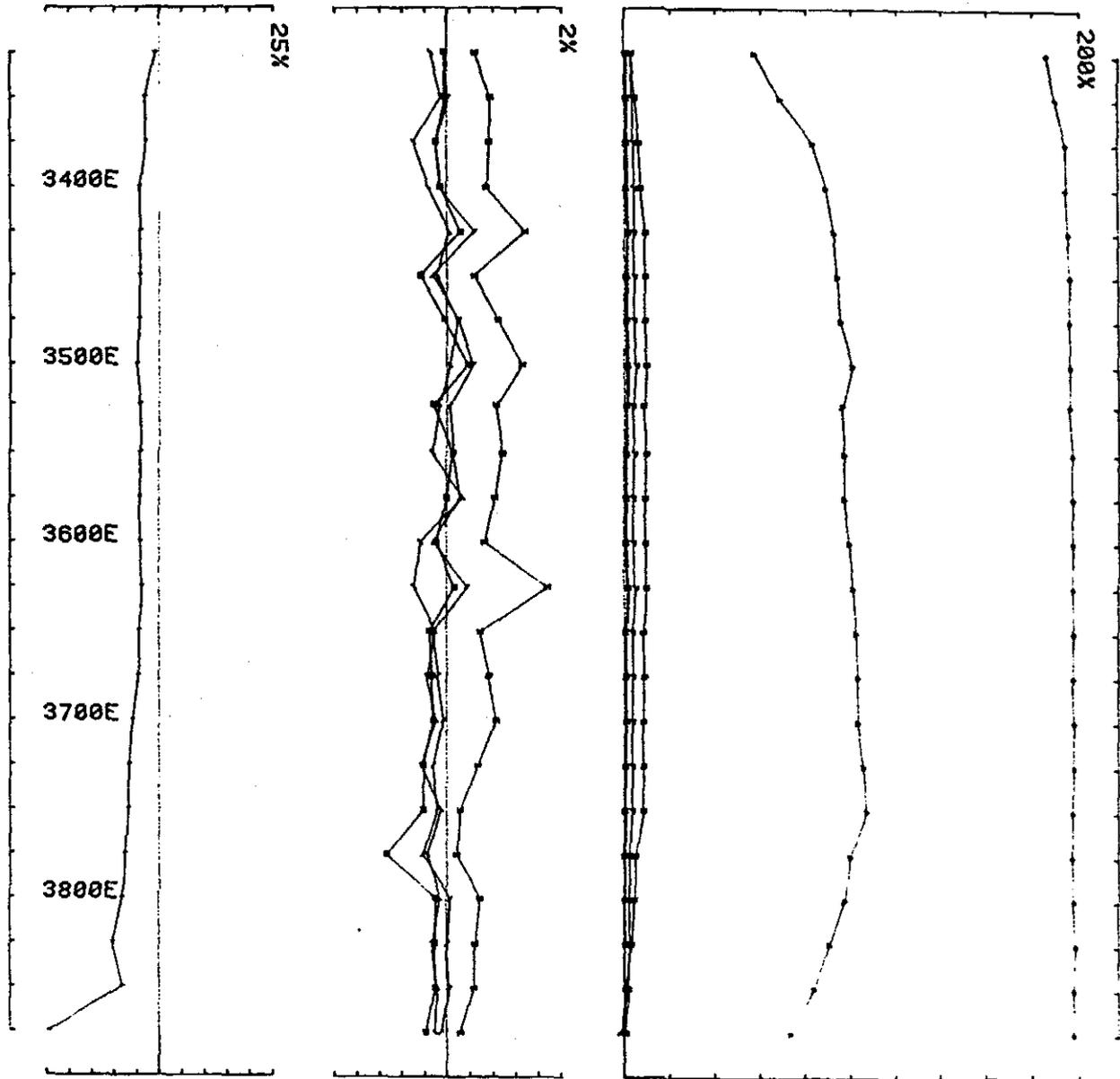
FIGURE A5: SIROTEM RESPONSE FOR AN ENLARGED HELLYER MODEL (600 X 200 METRES; 75 SIEMENS) AT A DEPTH OF 300 METRES.

DIP = 0

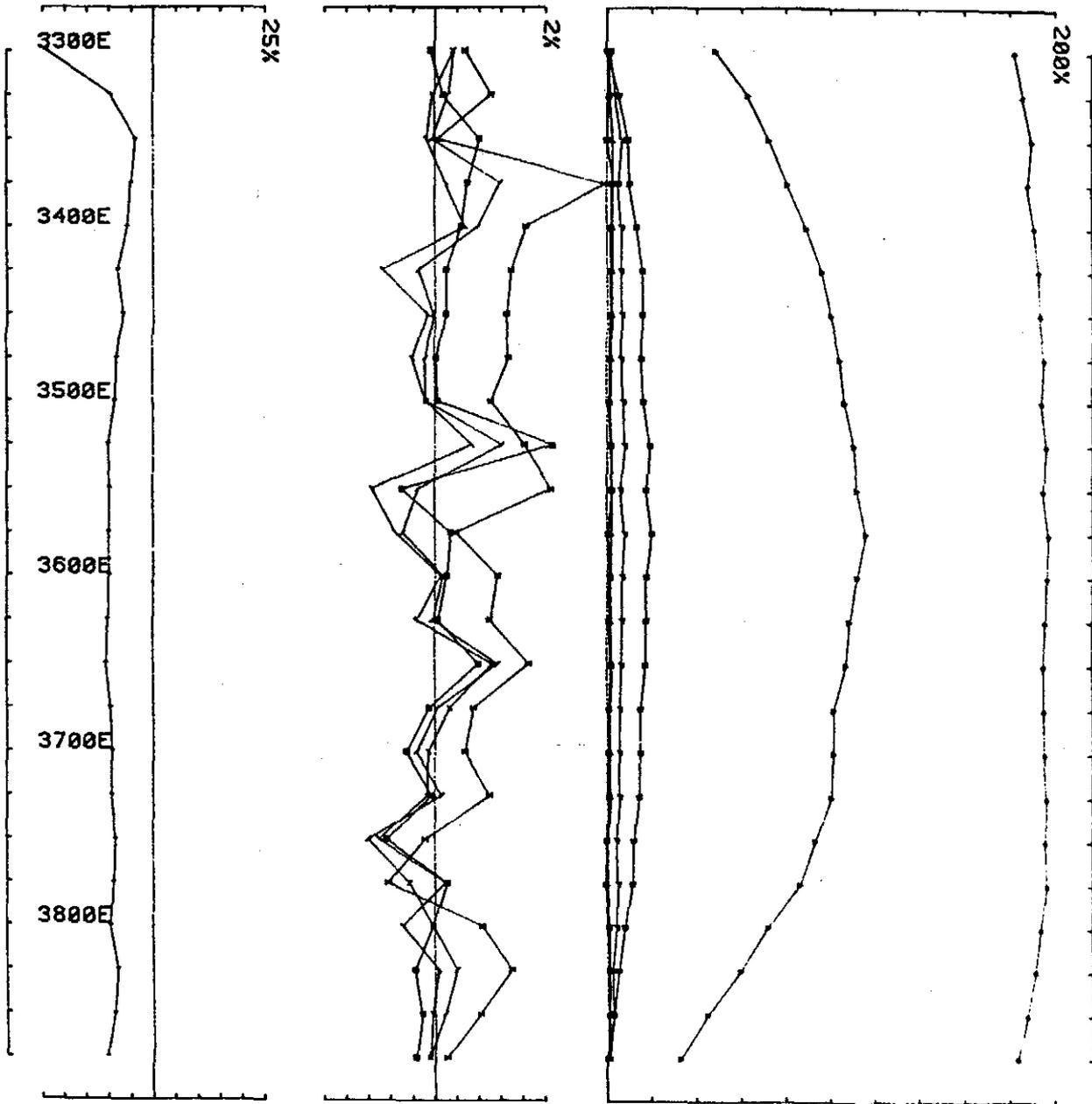
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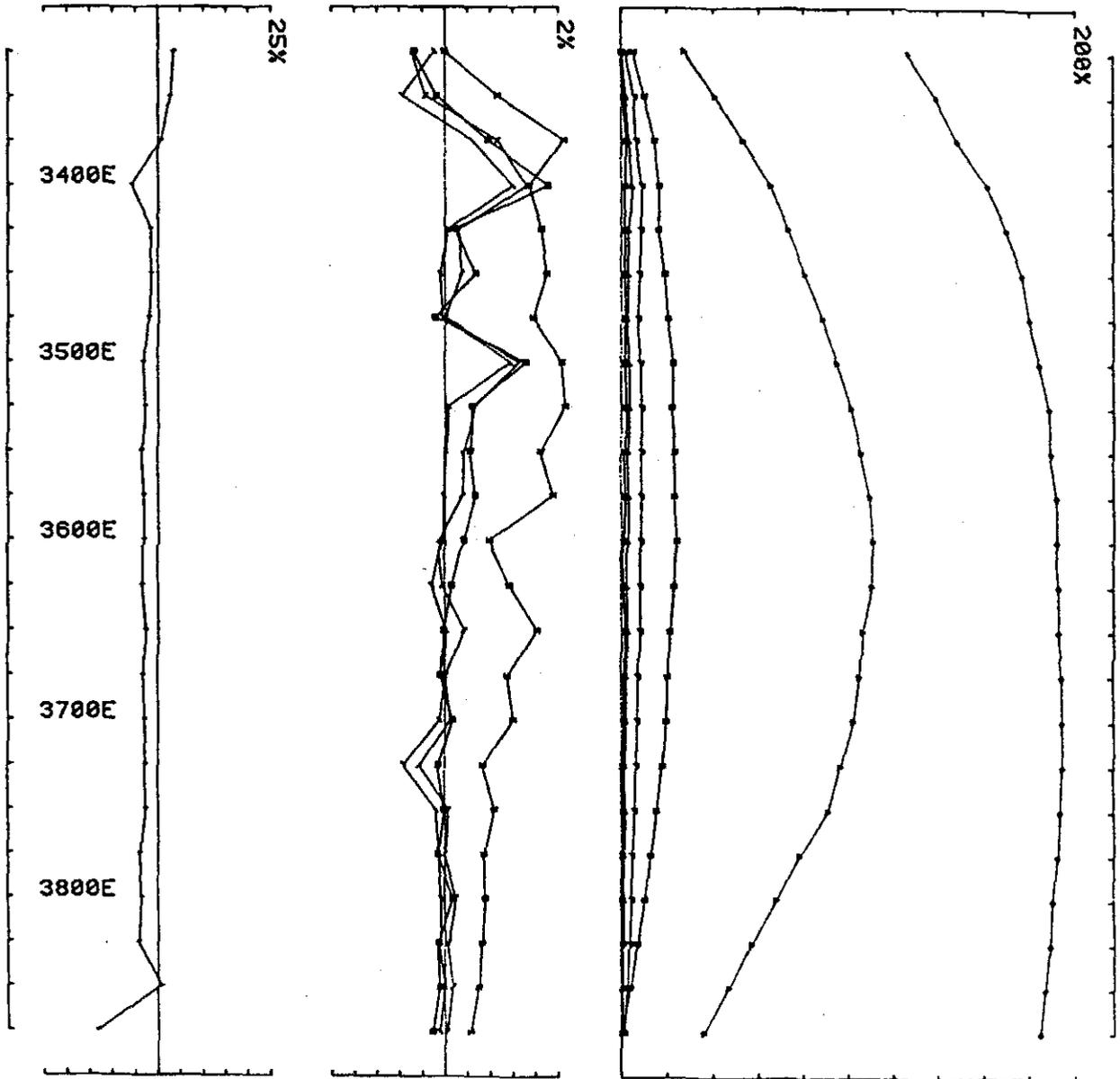
APPENDIX II



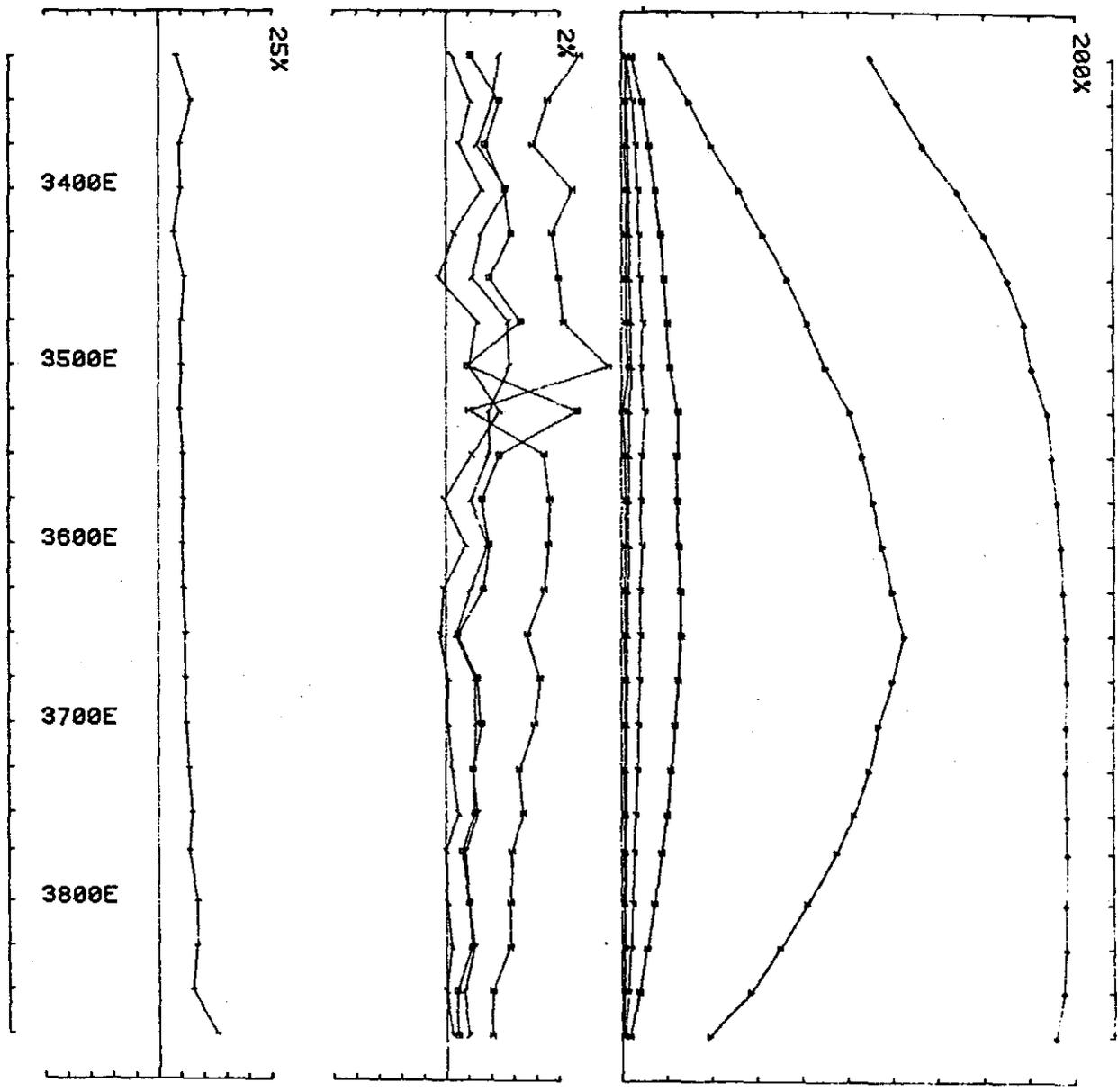
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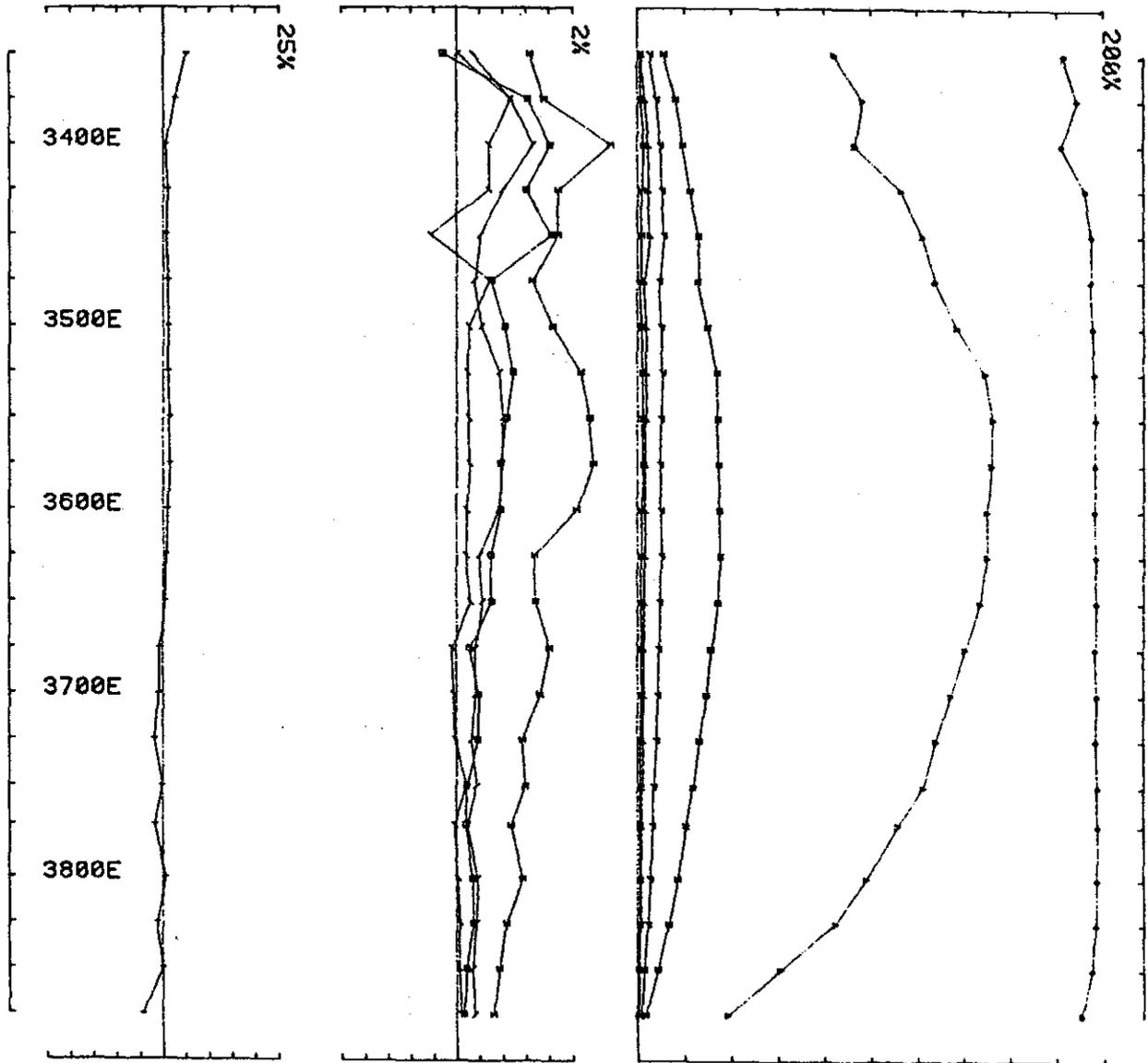


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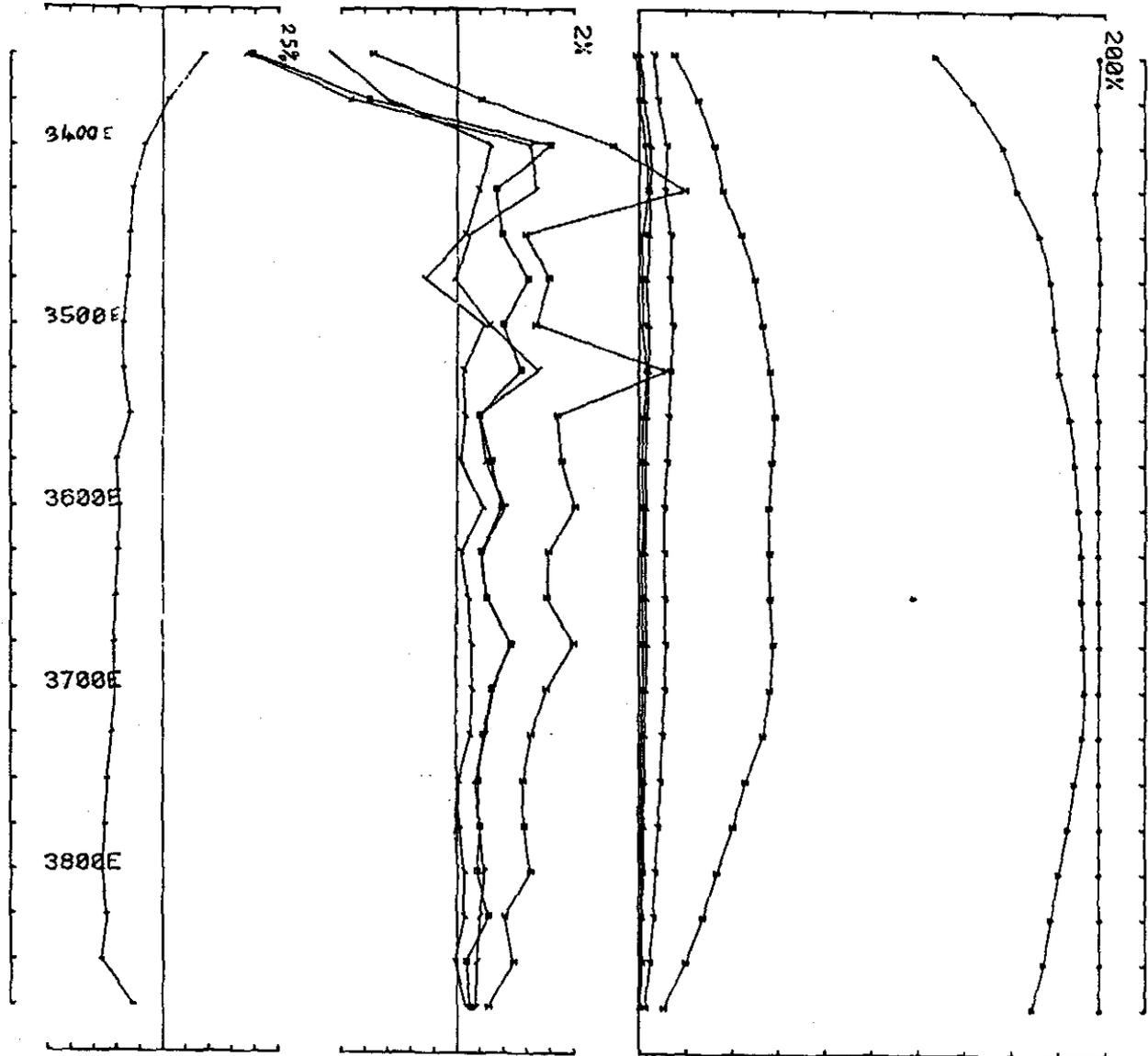


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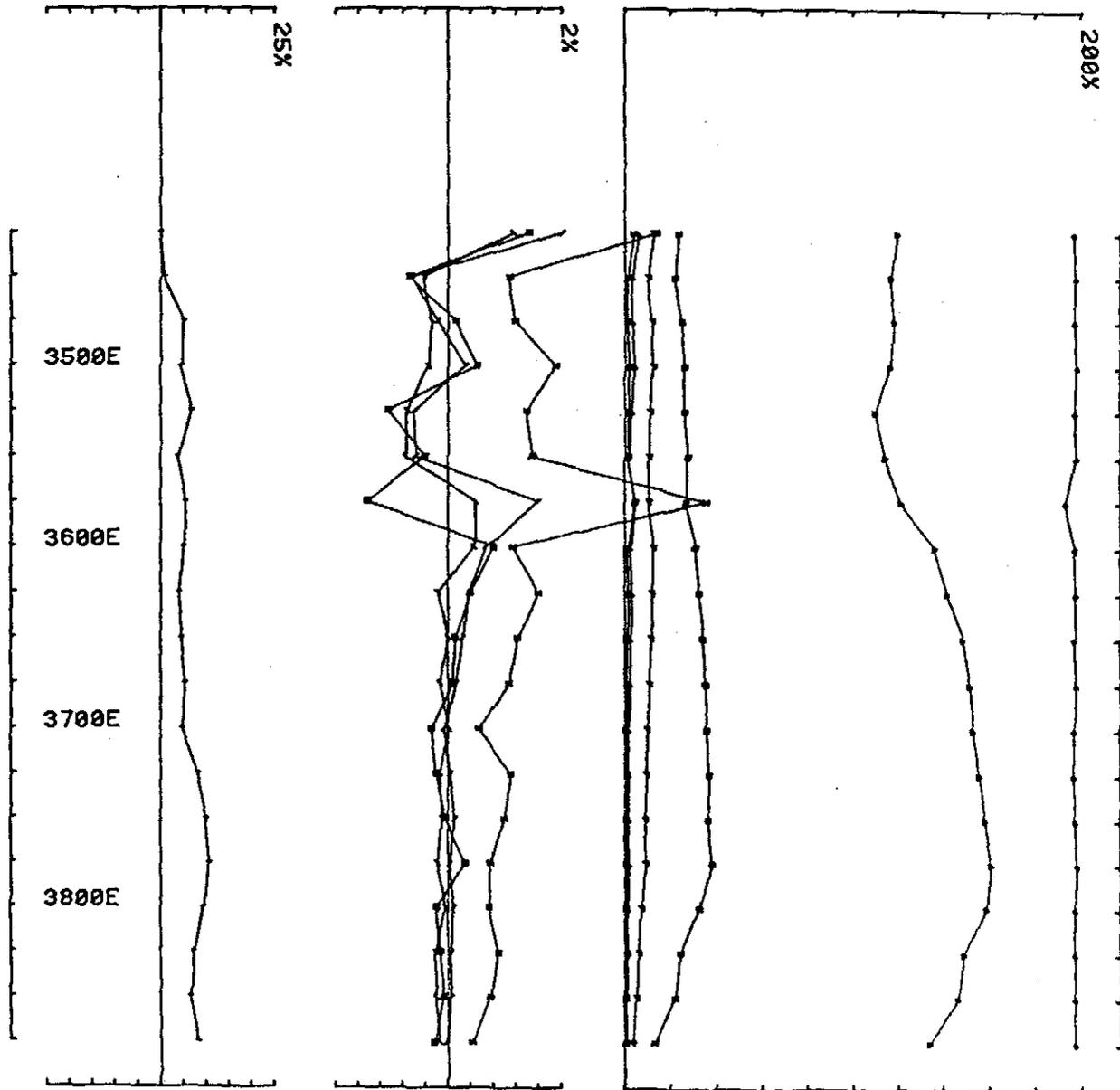
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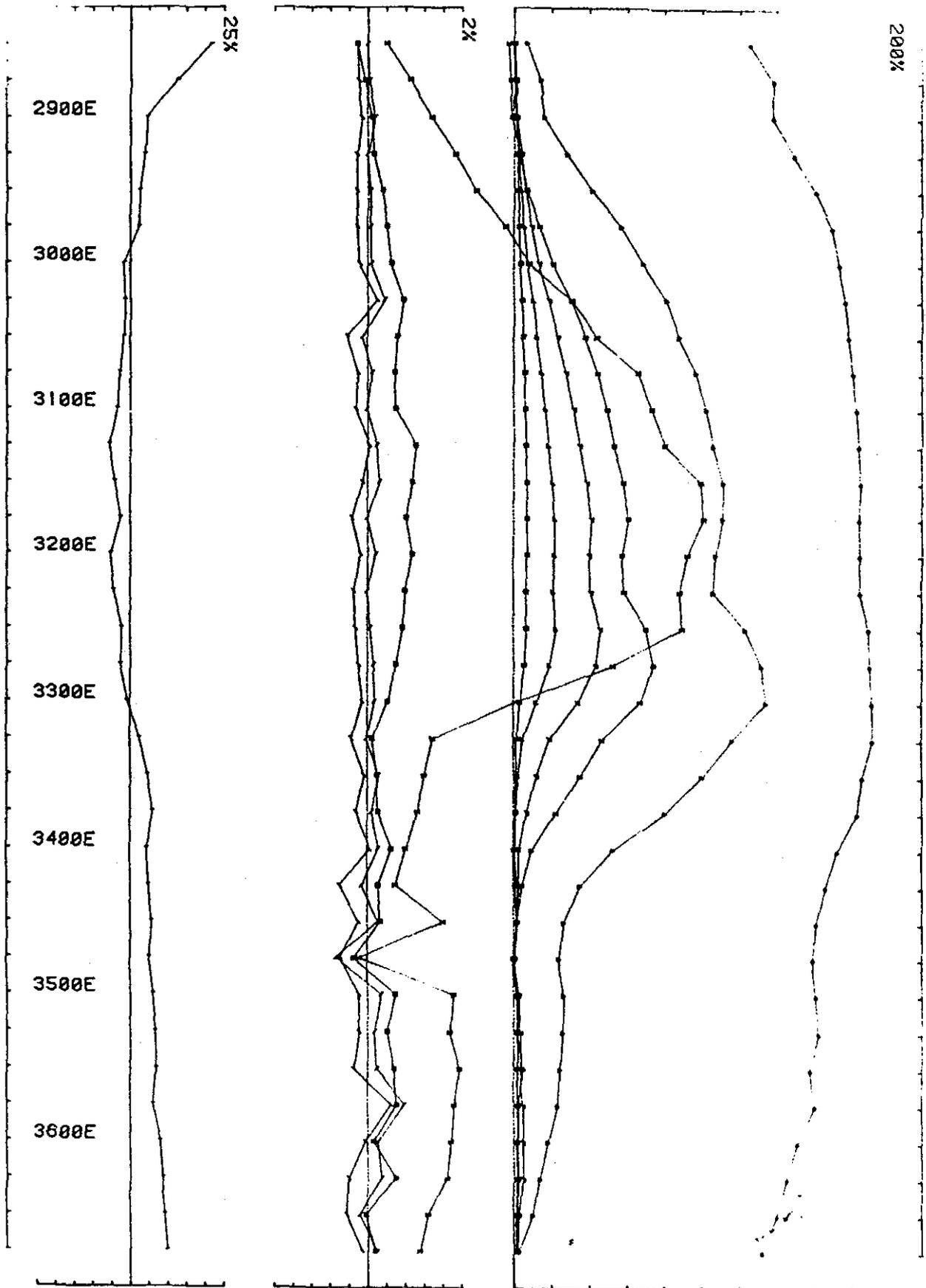
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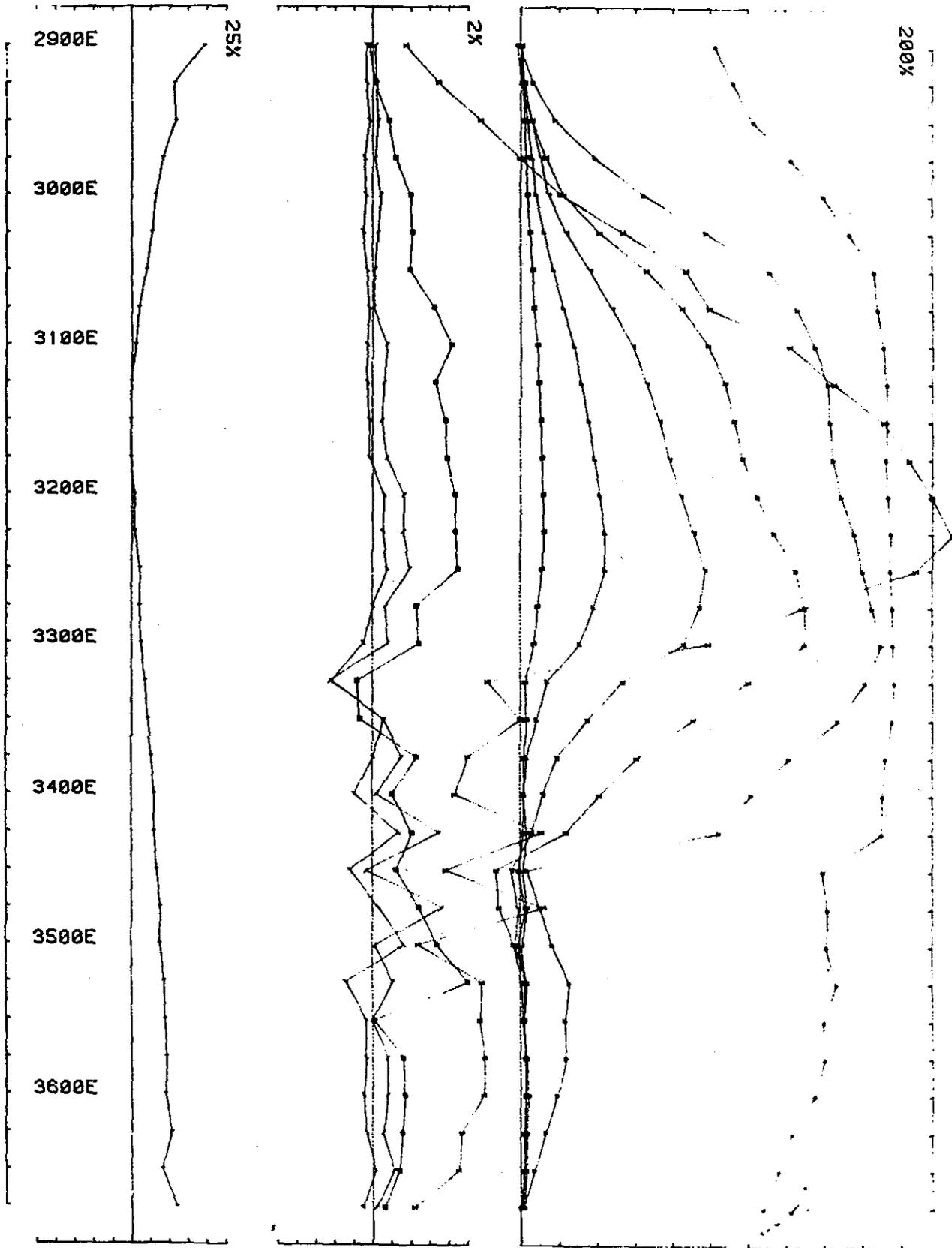
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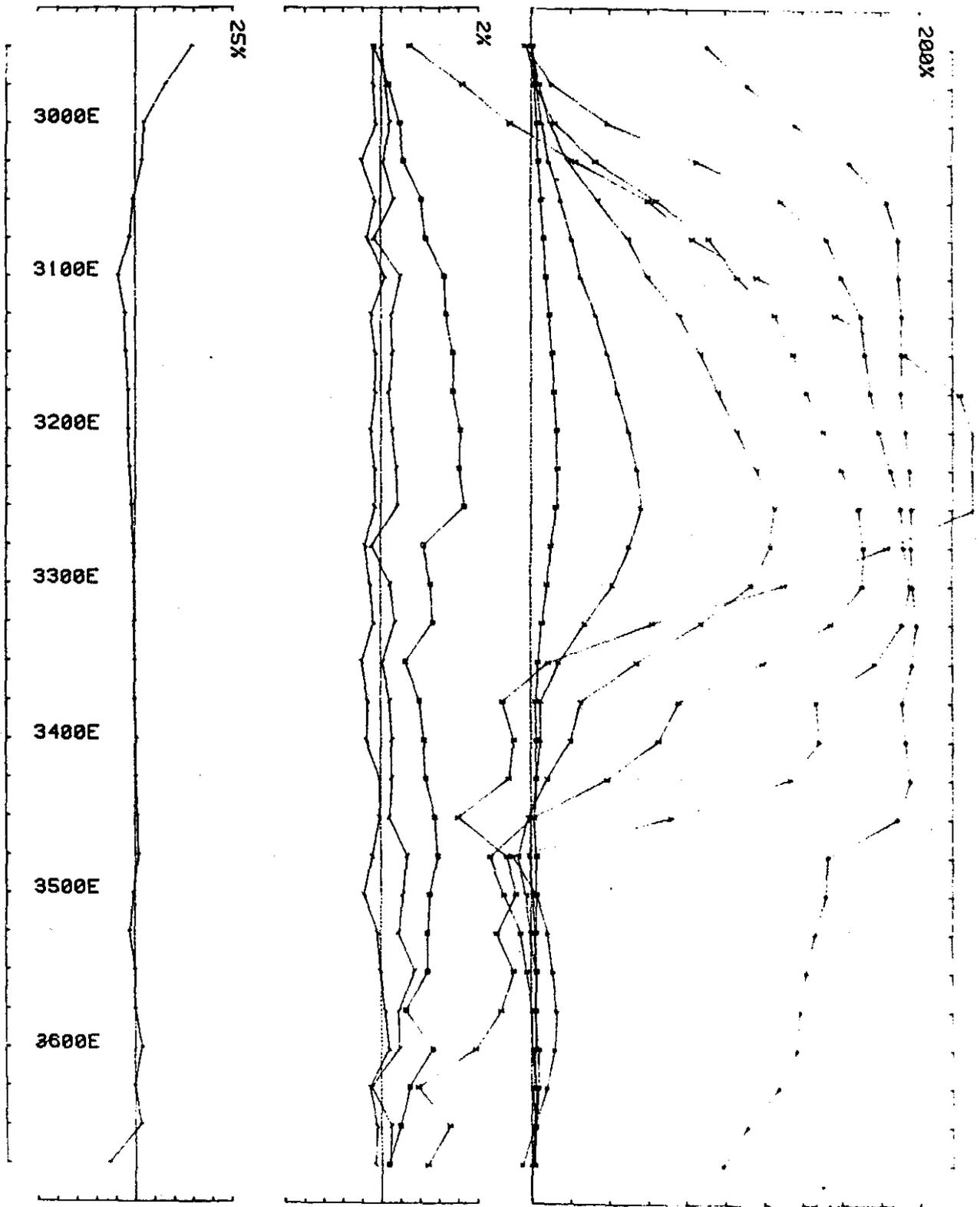


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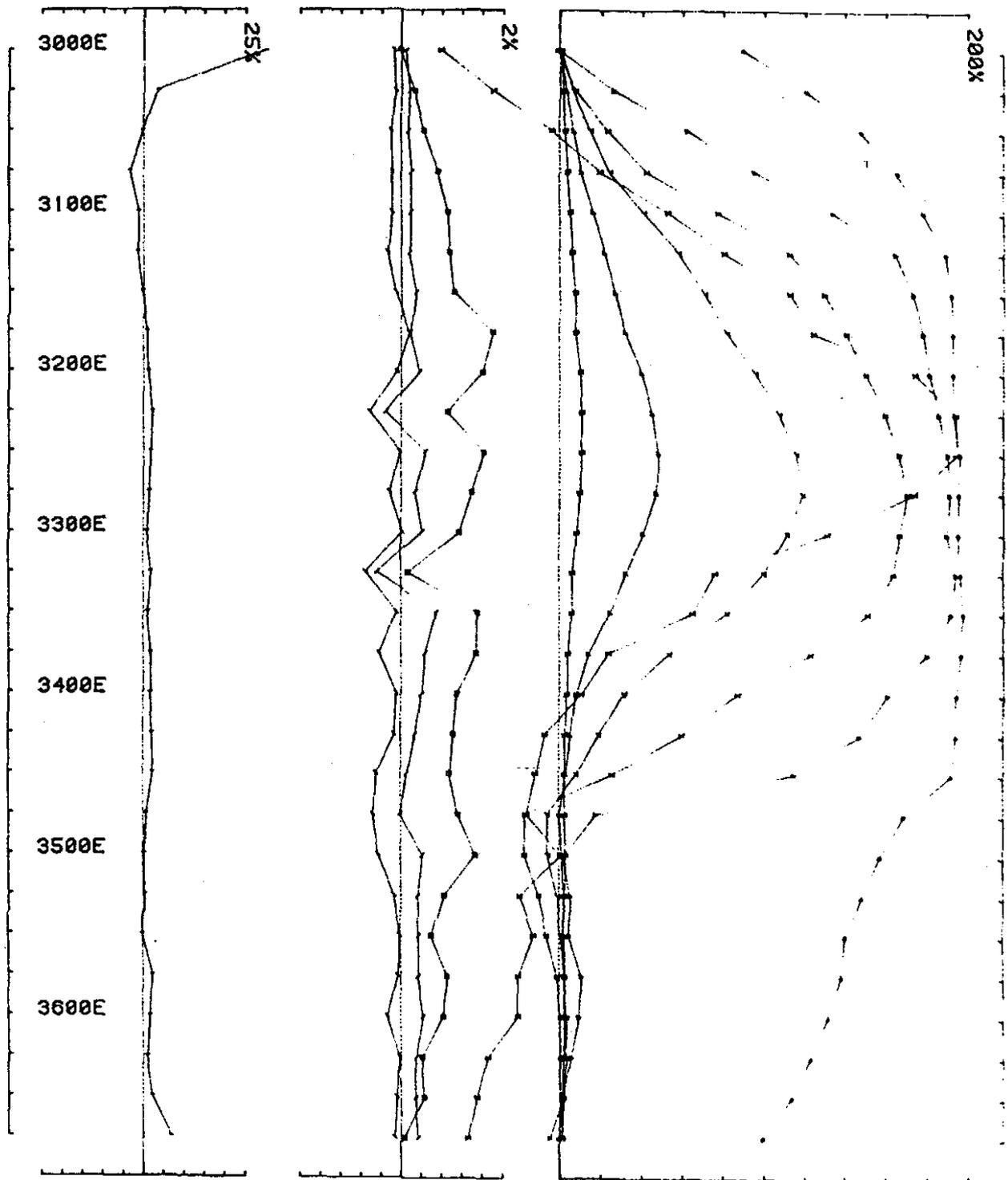


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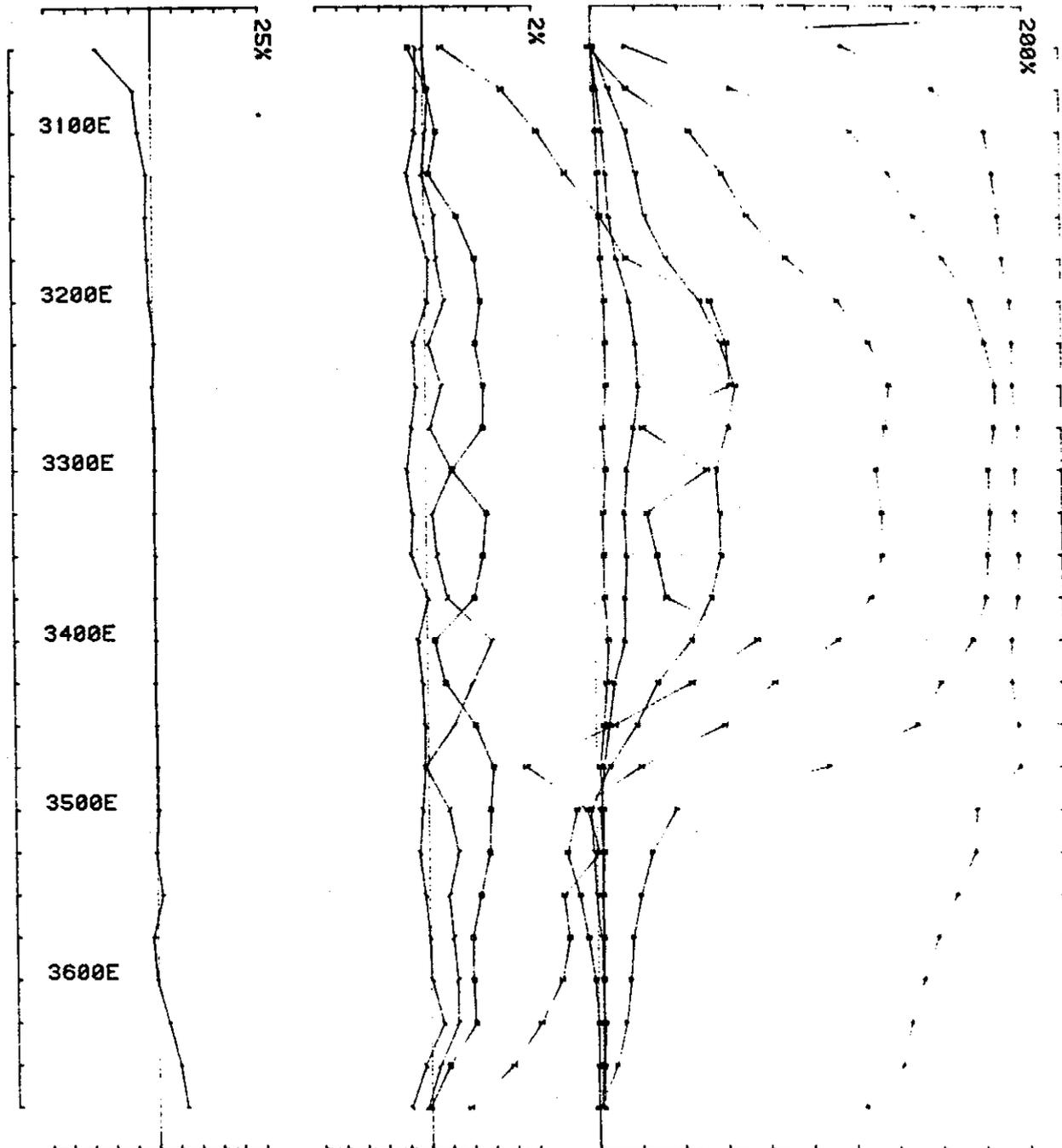
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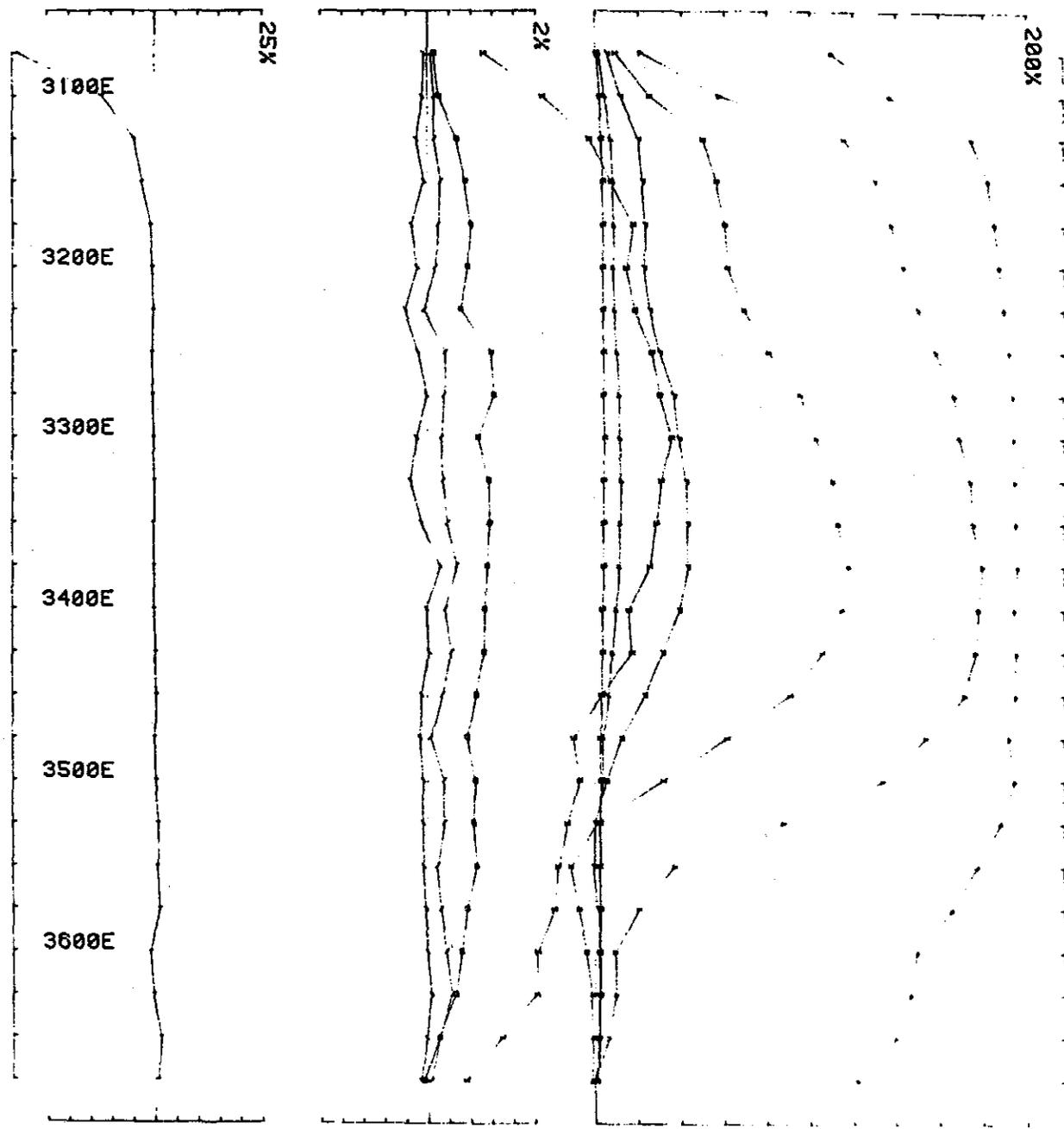


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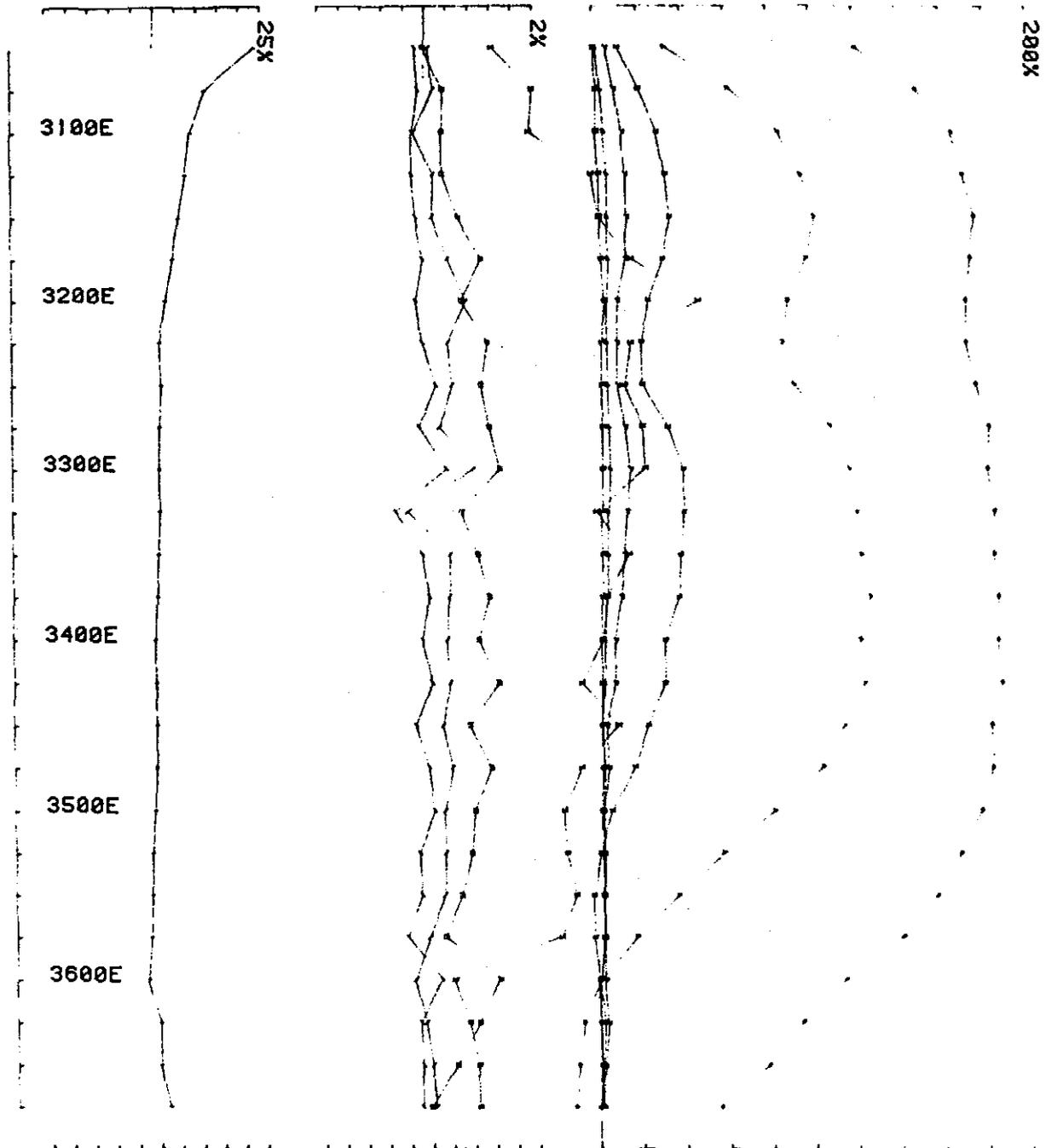


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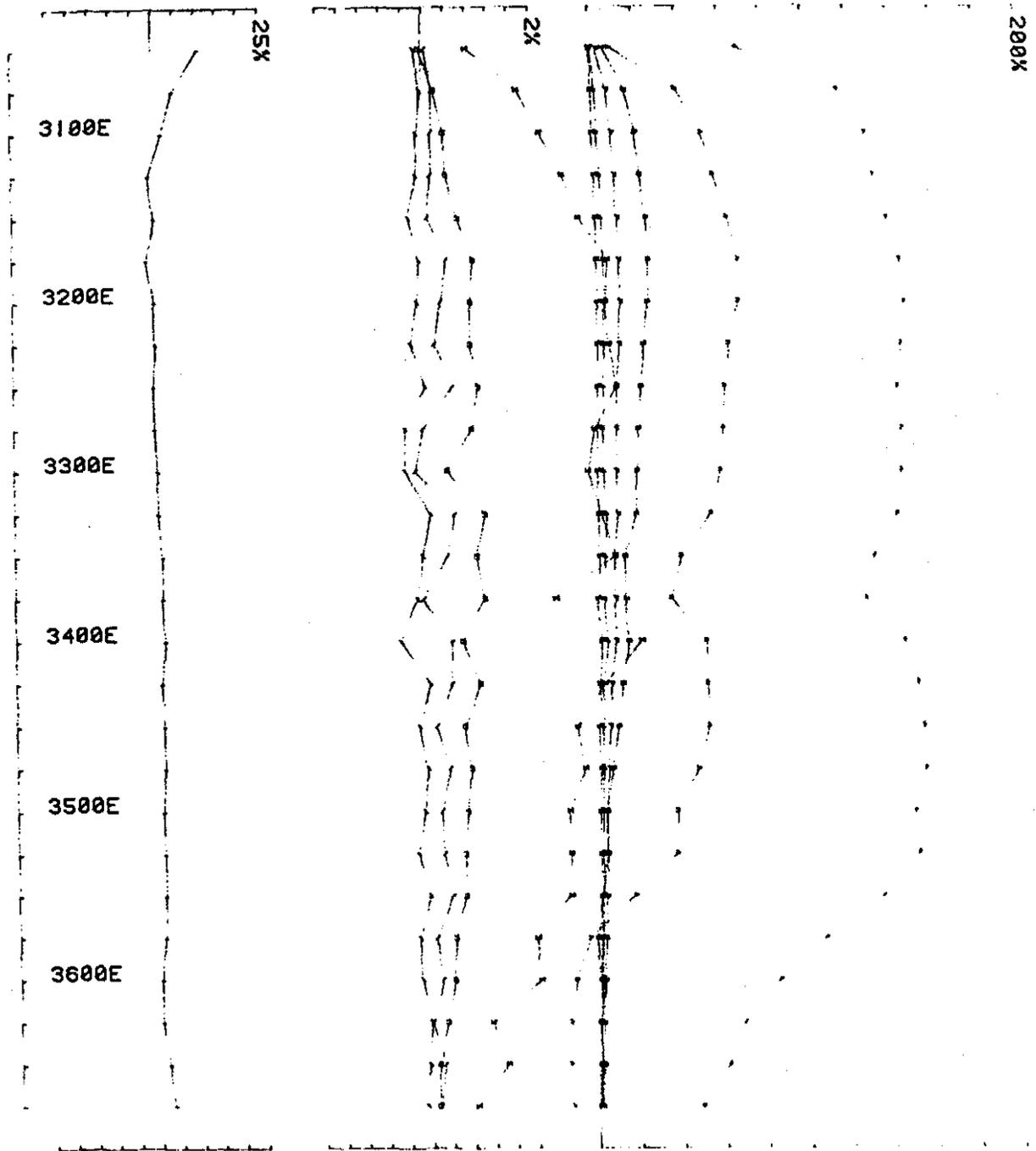
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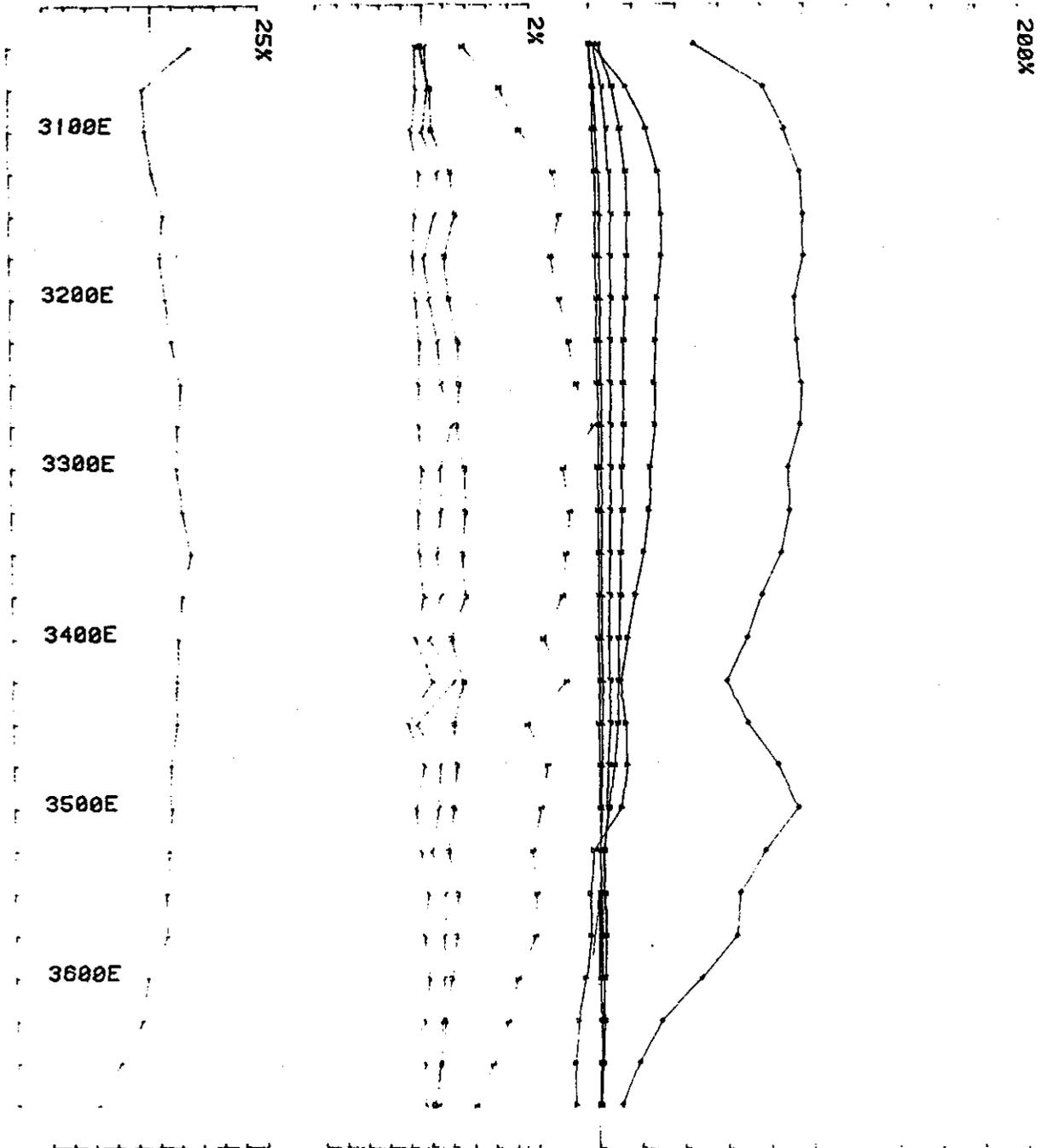
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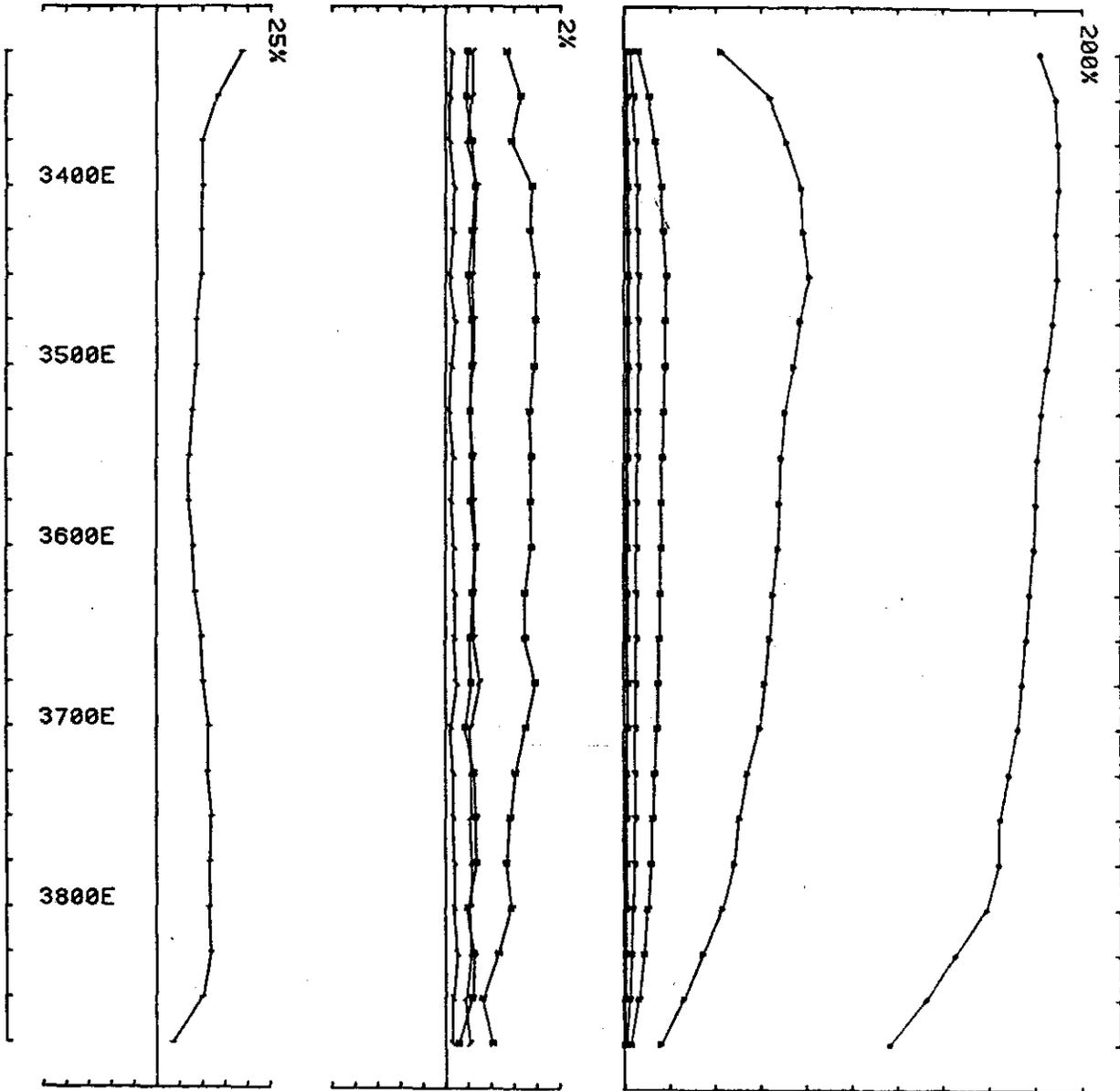
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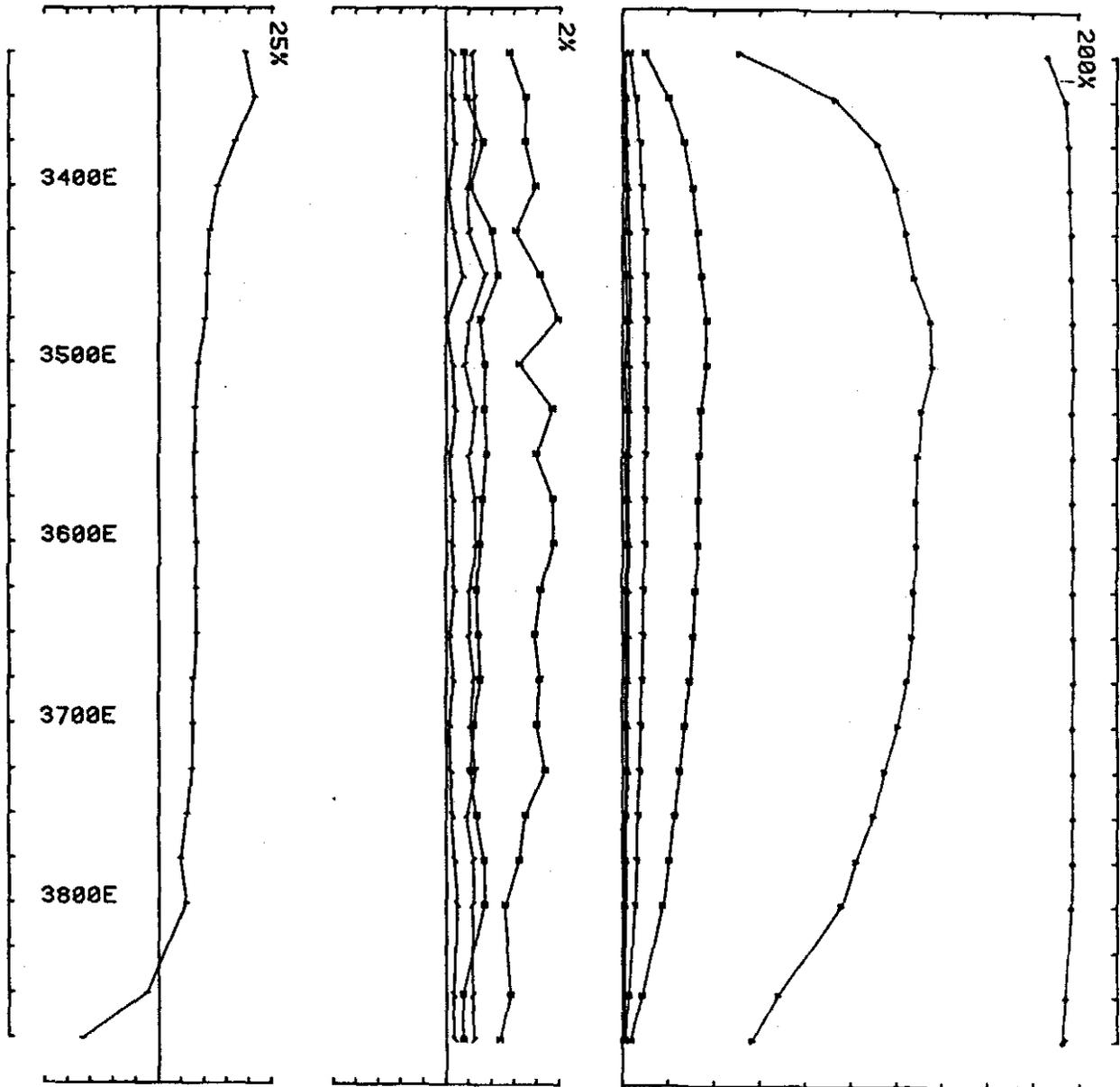
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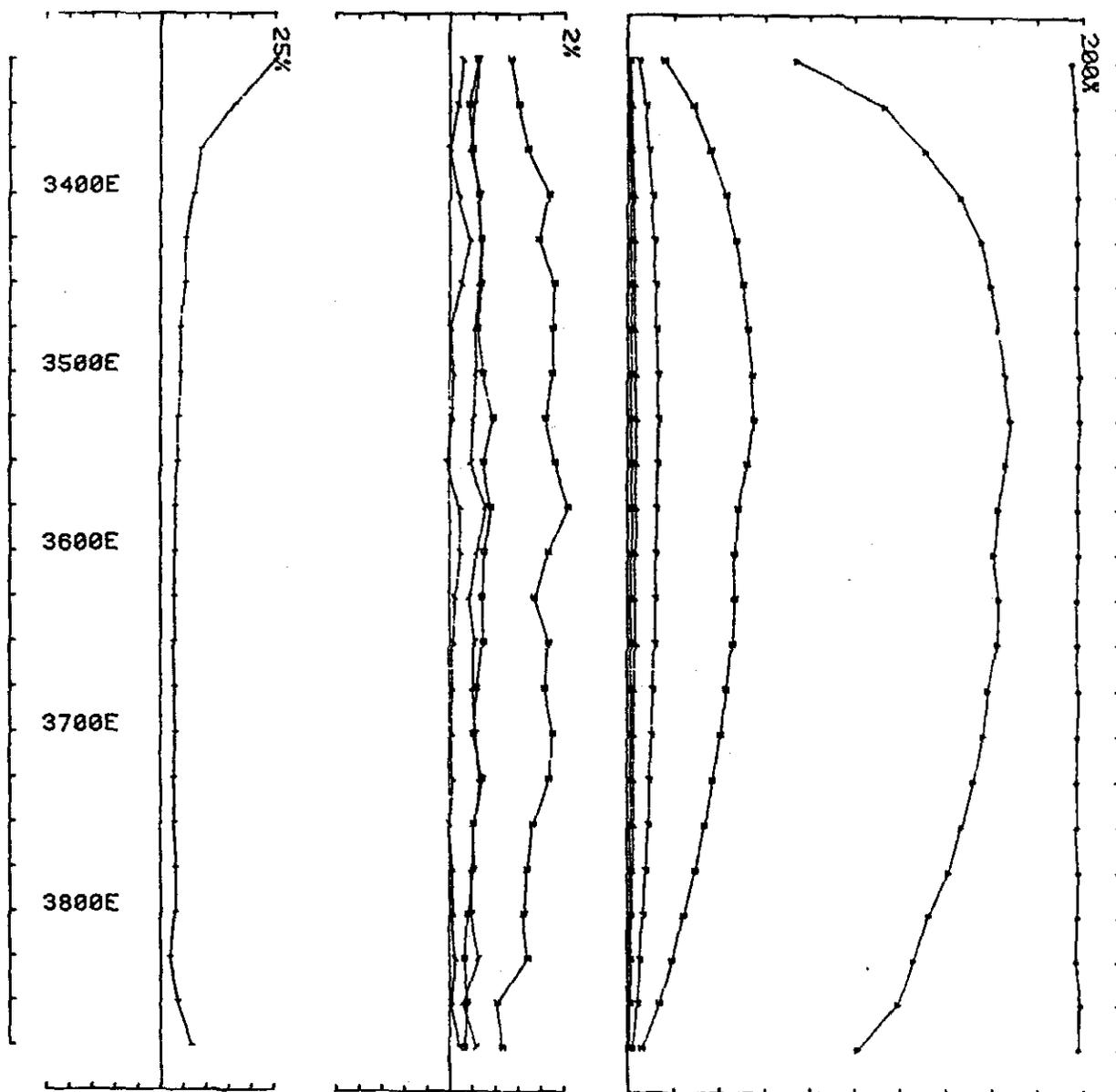
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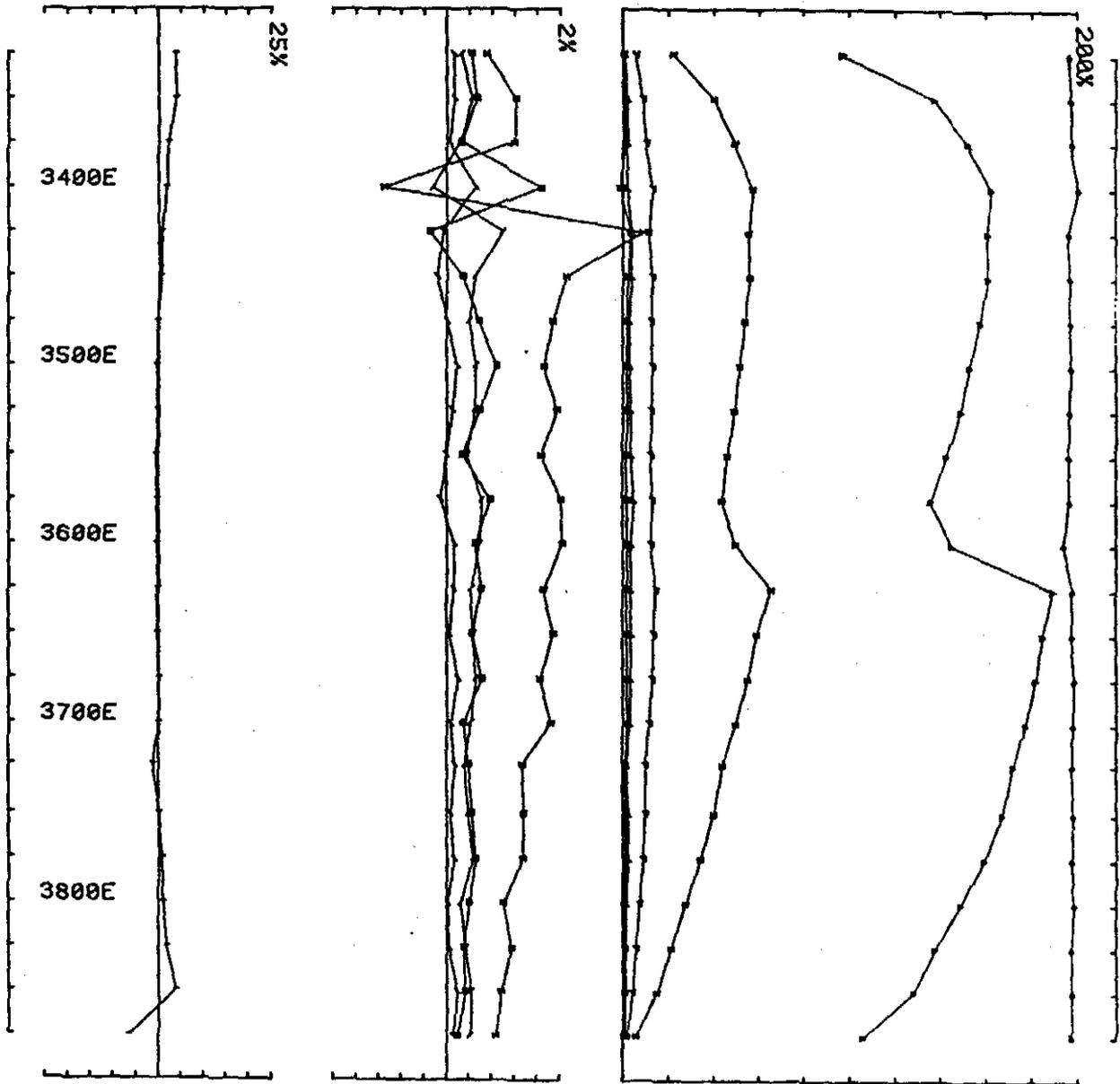
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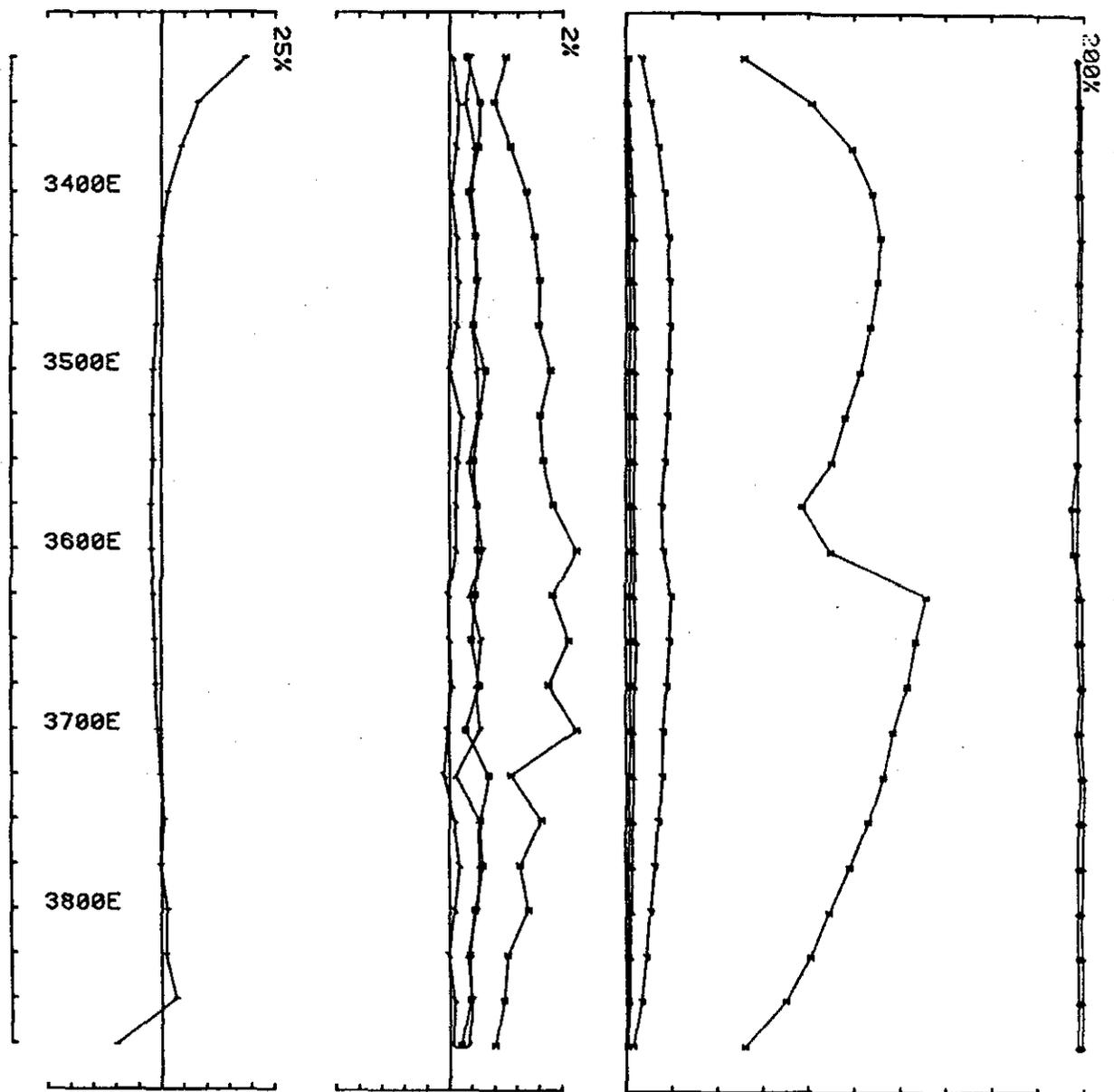
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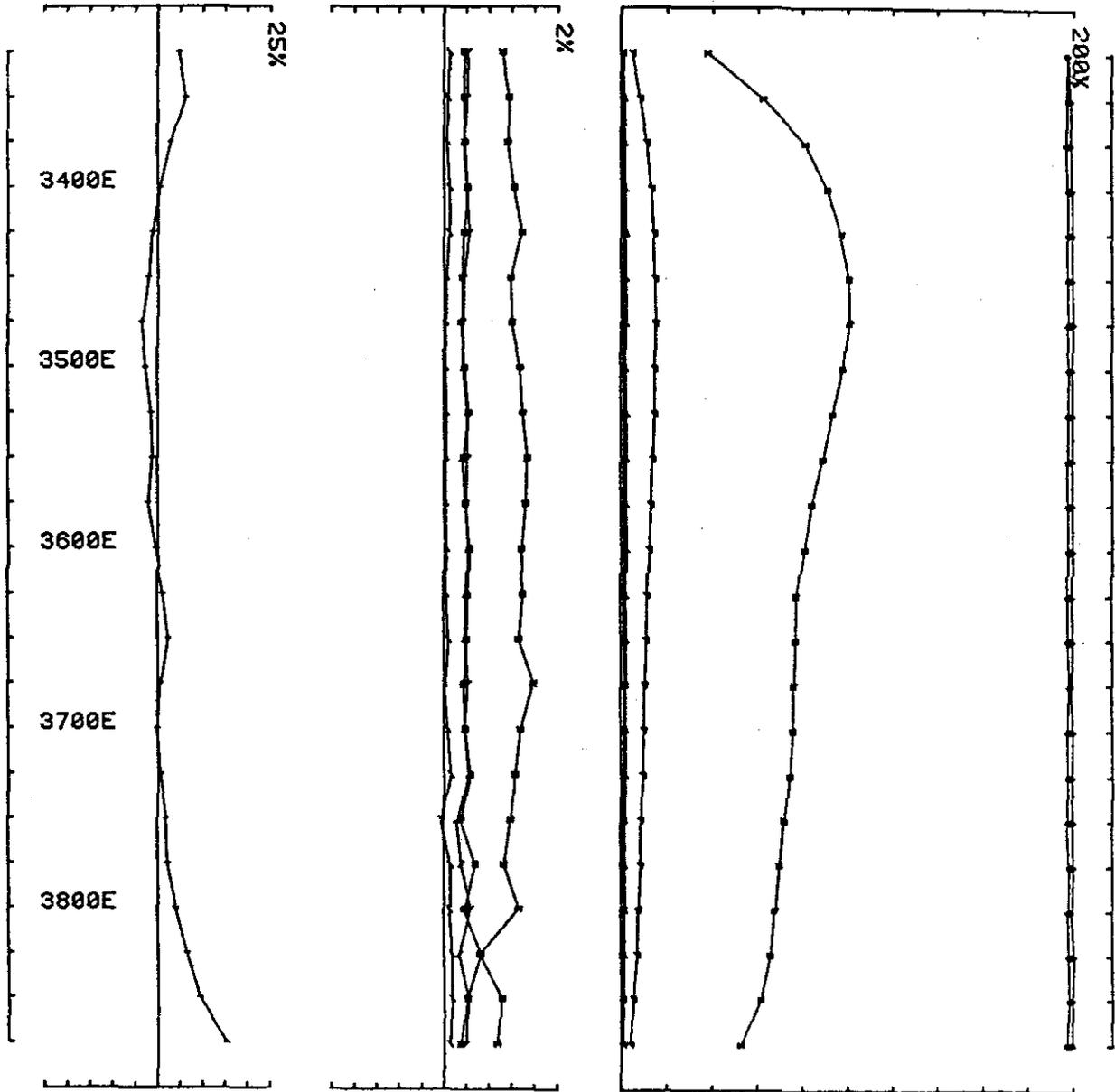
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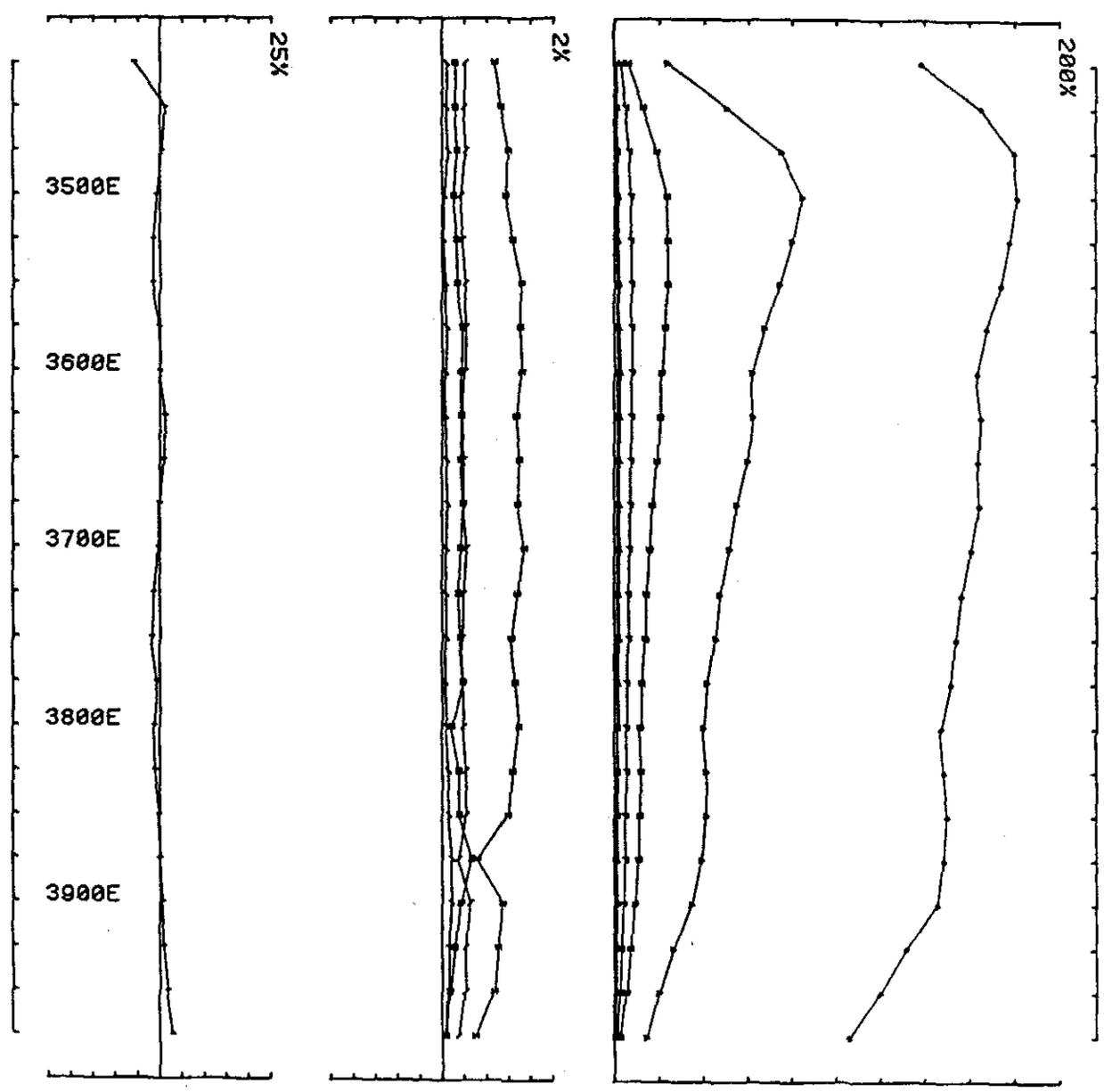
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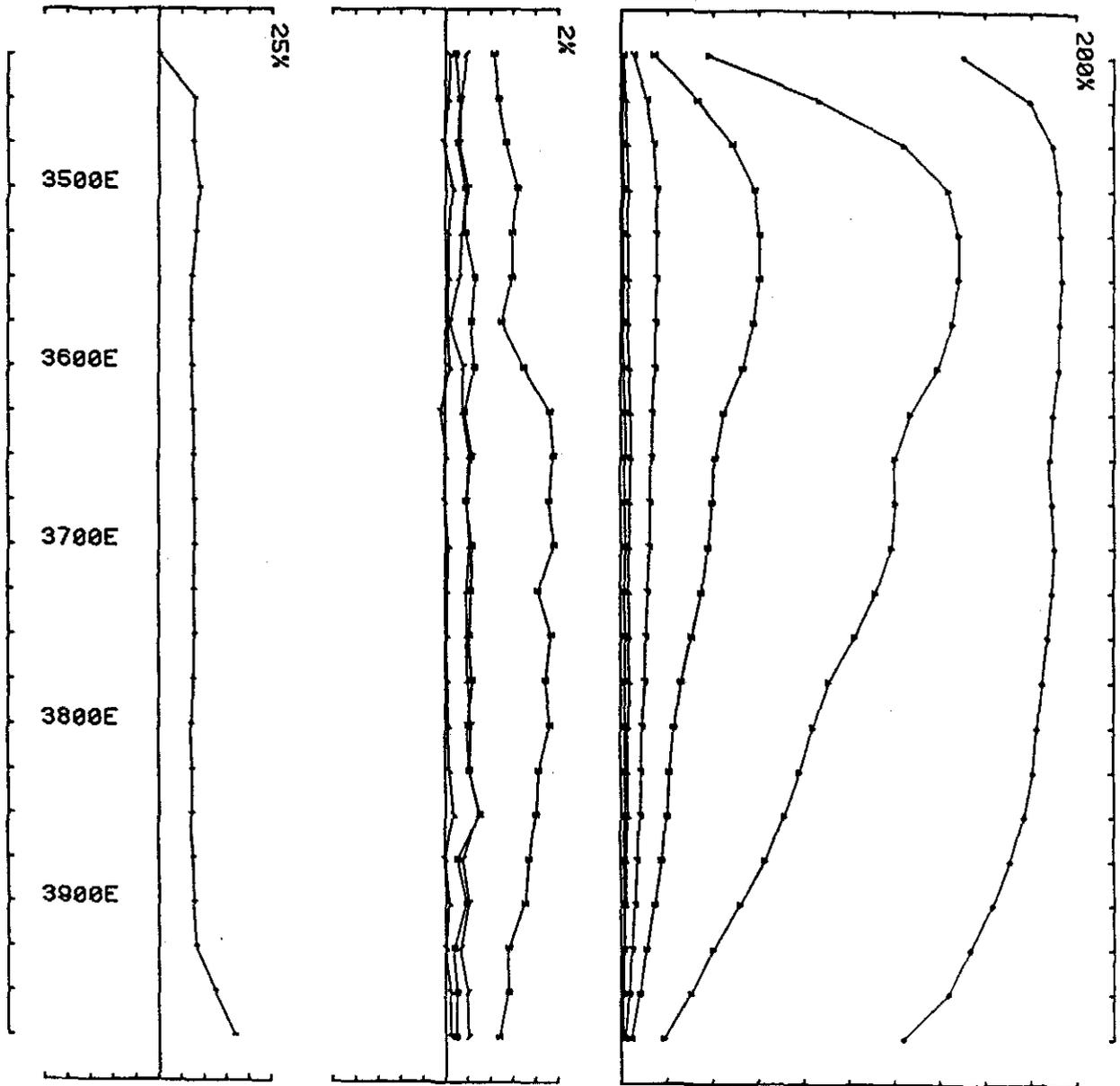
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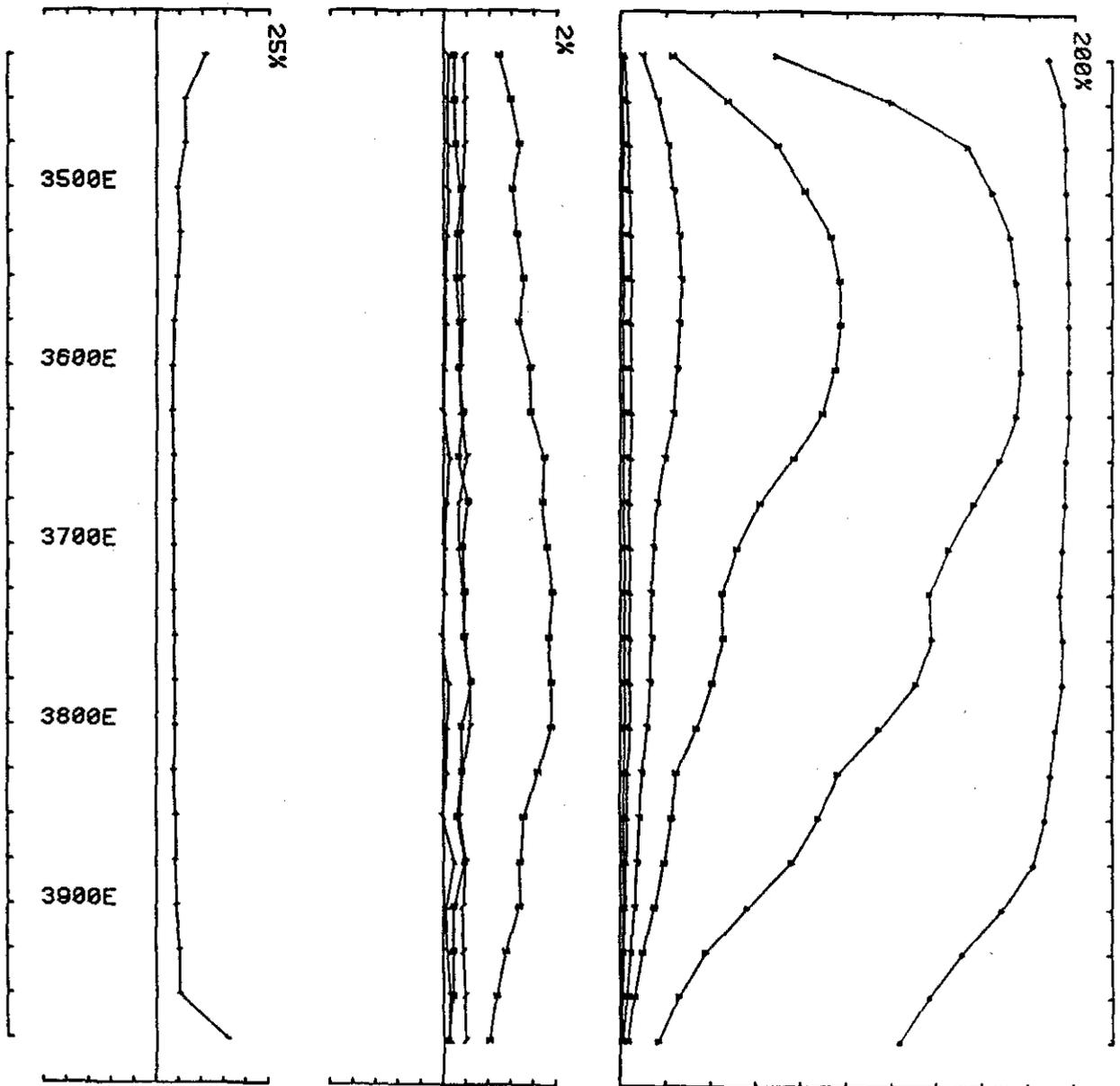
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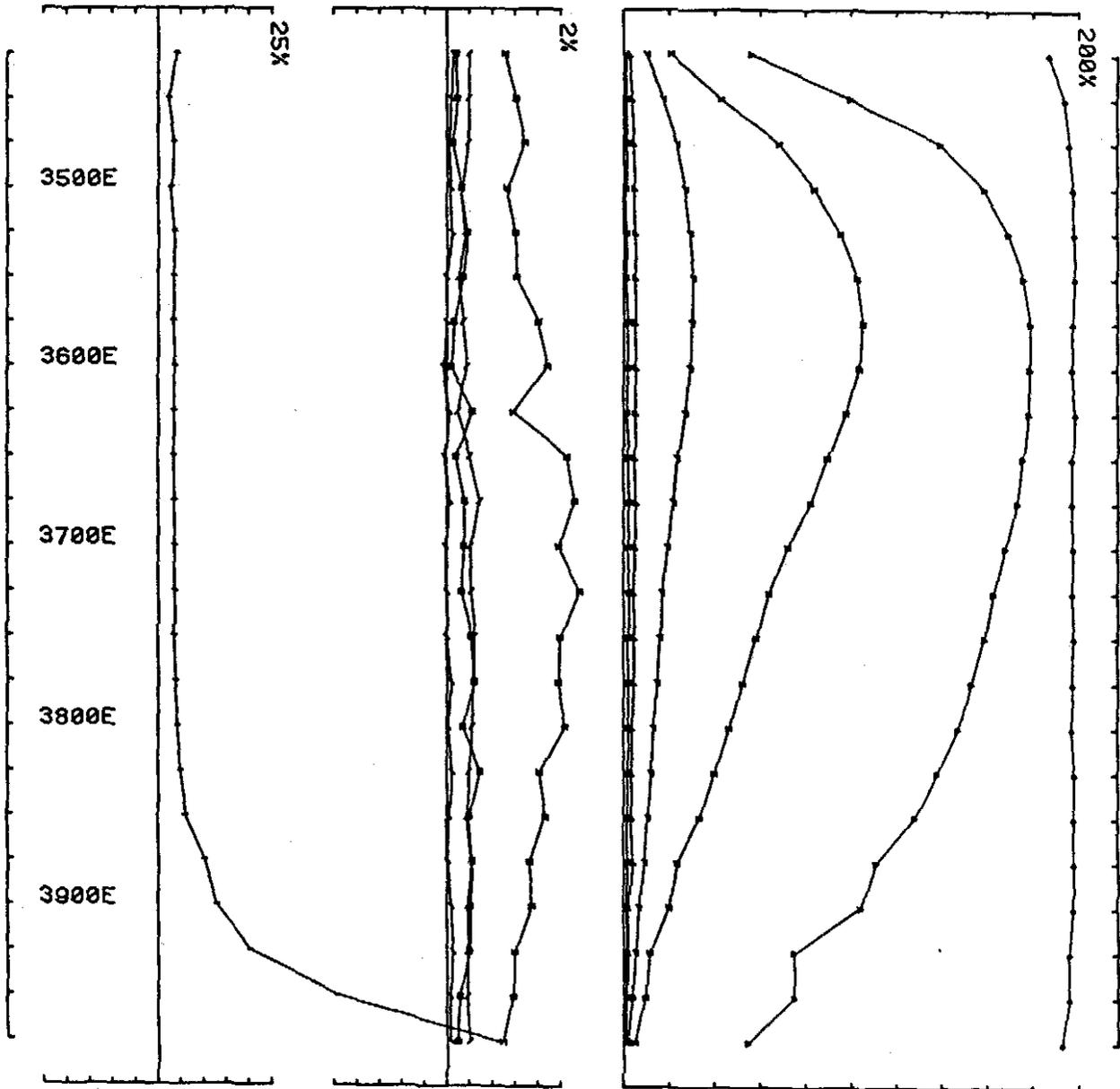
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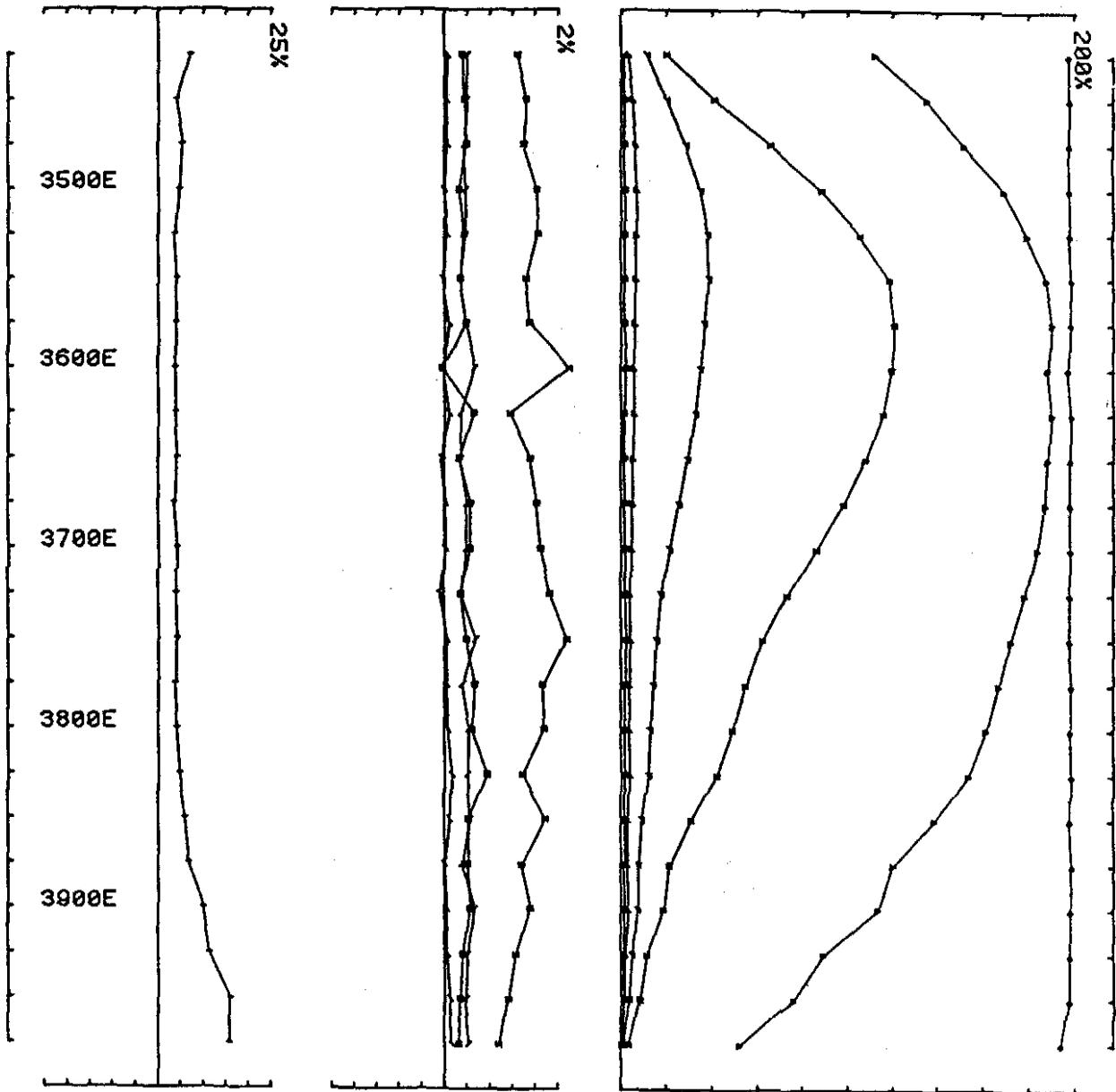
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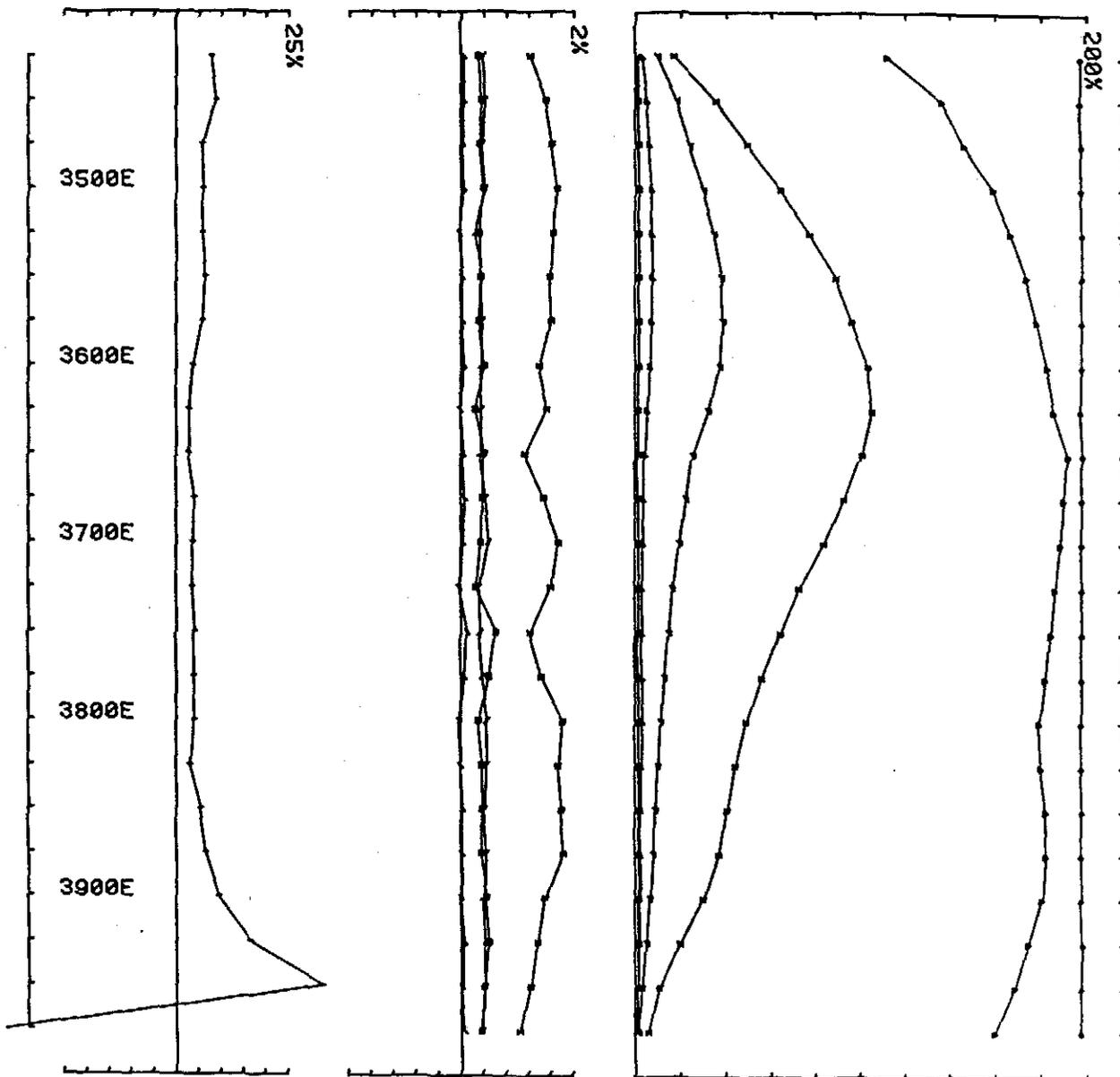
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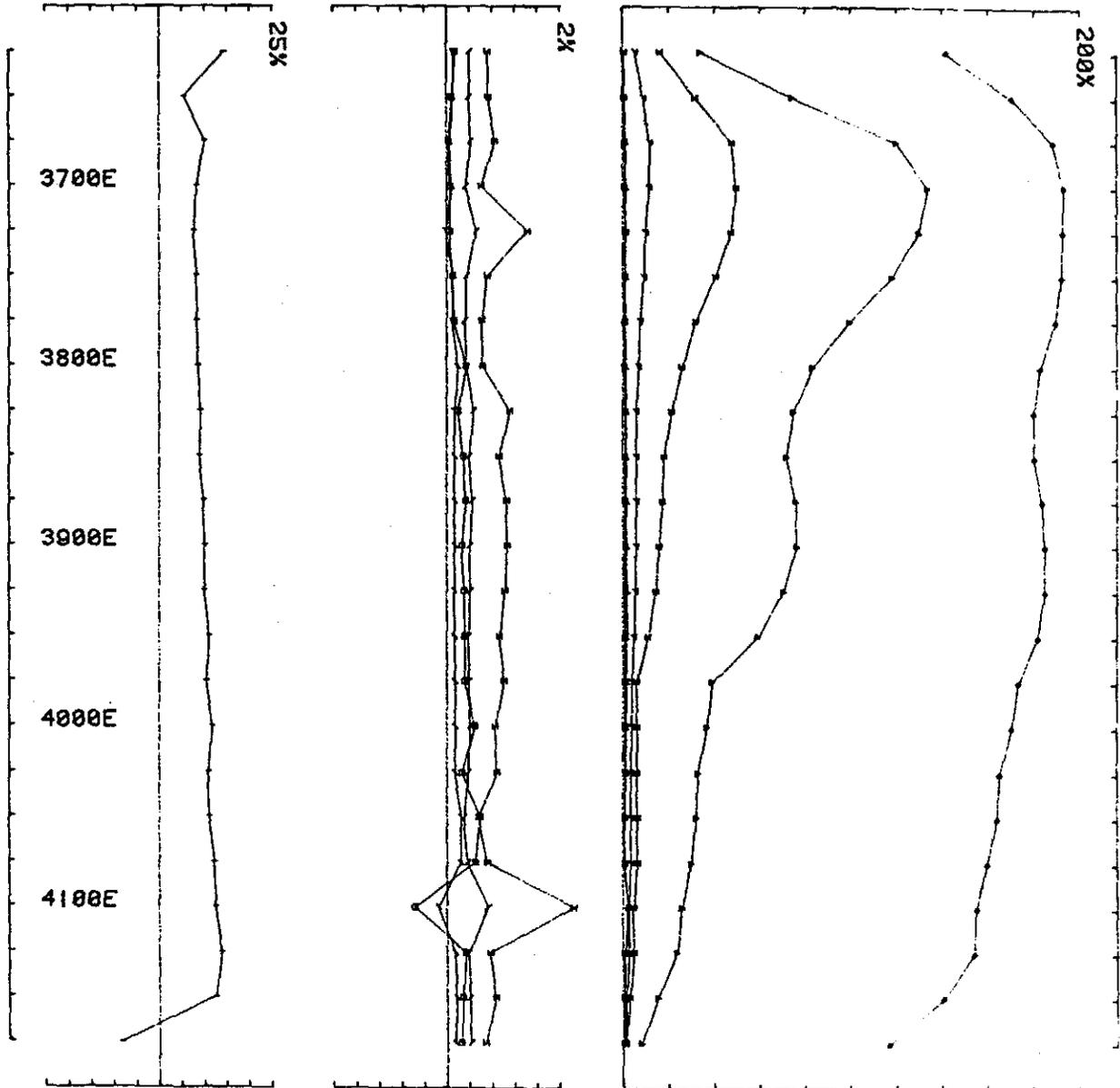
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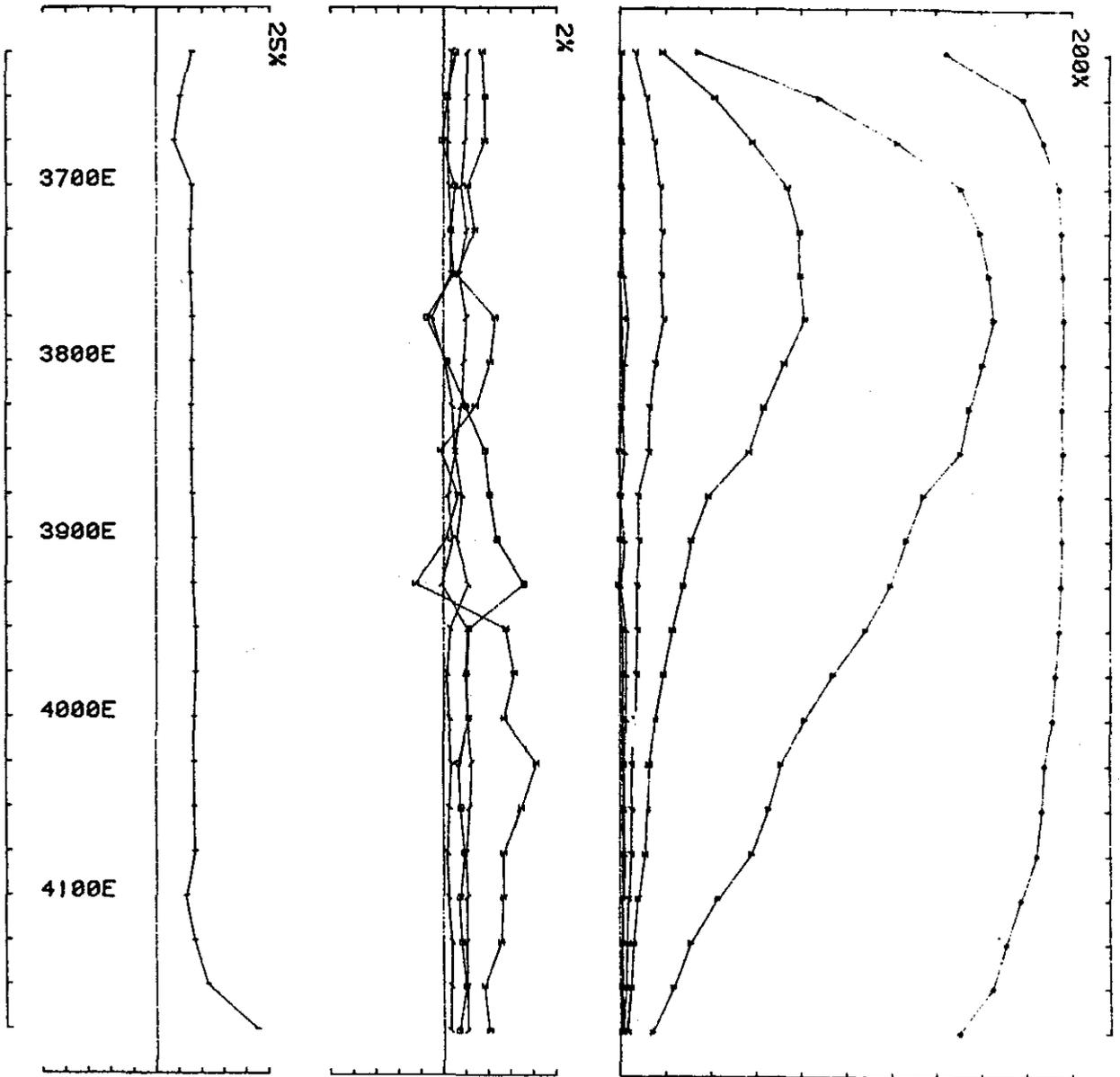
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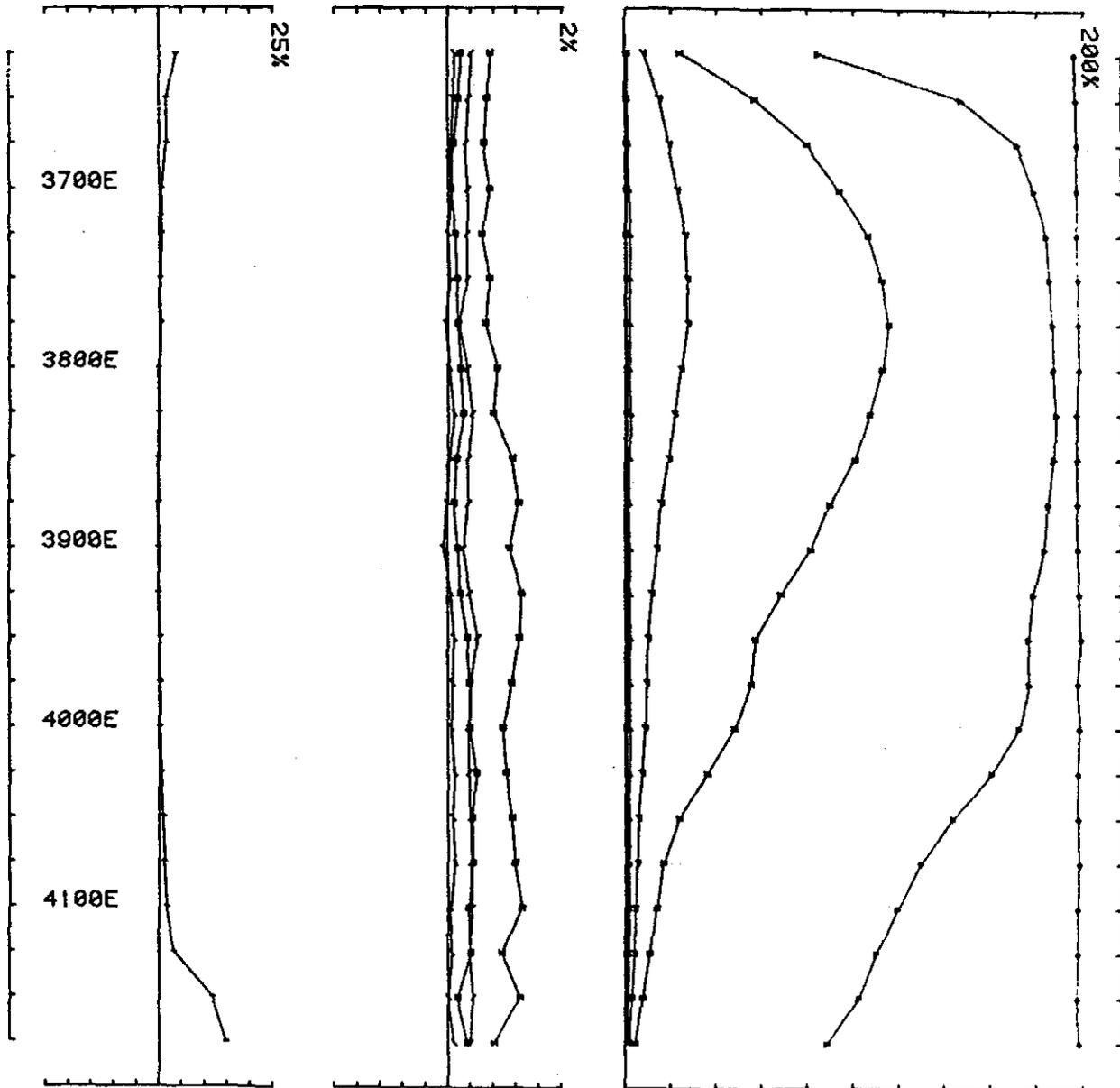
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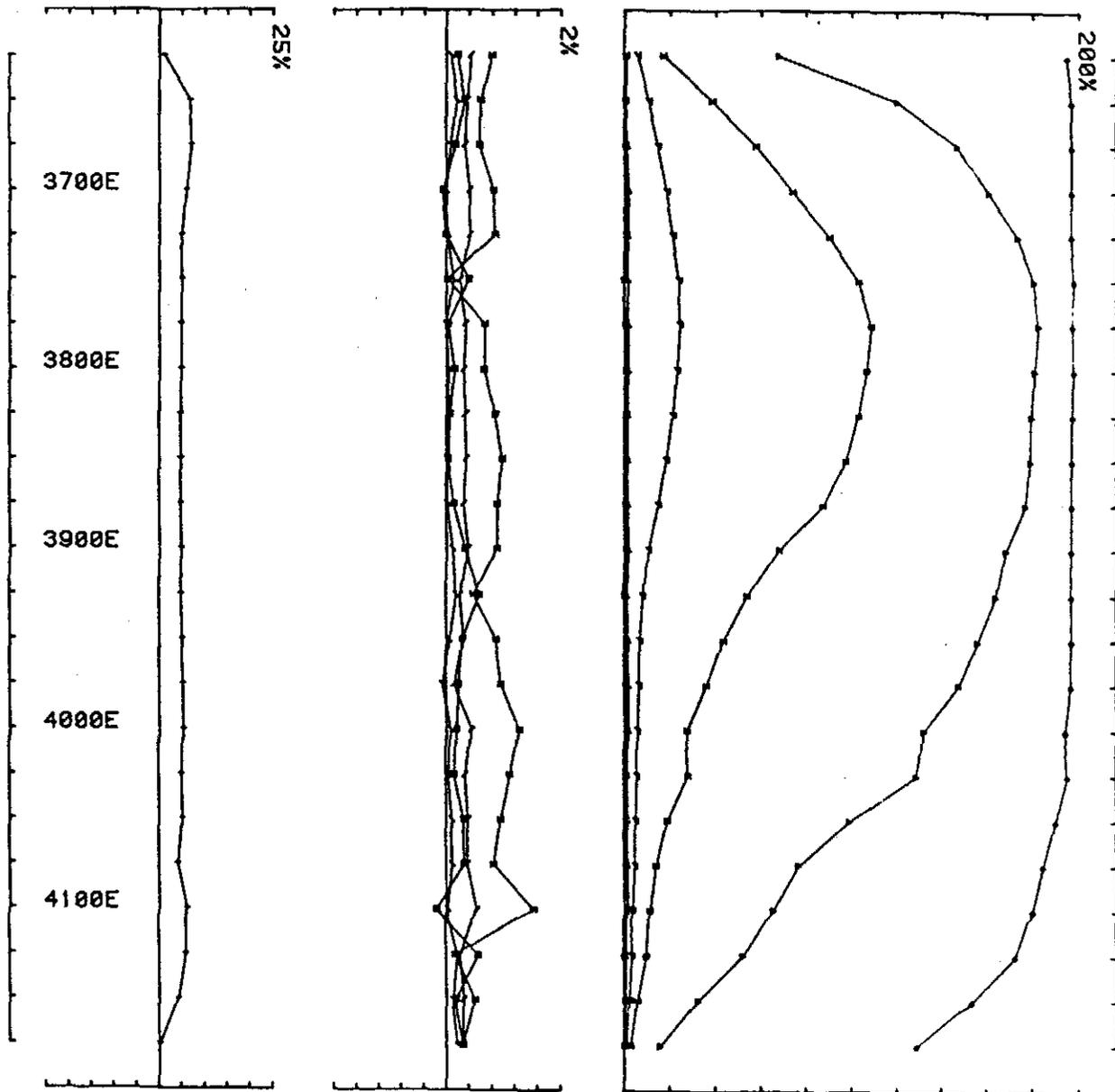
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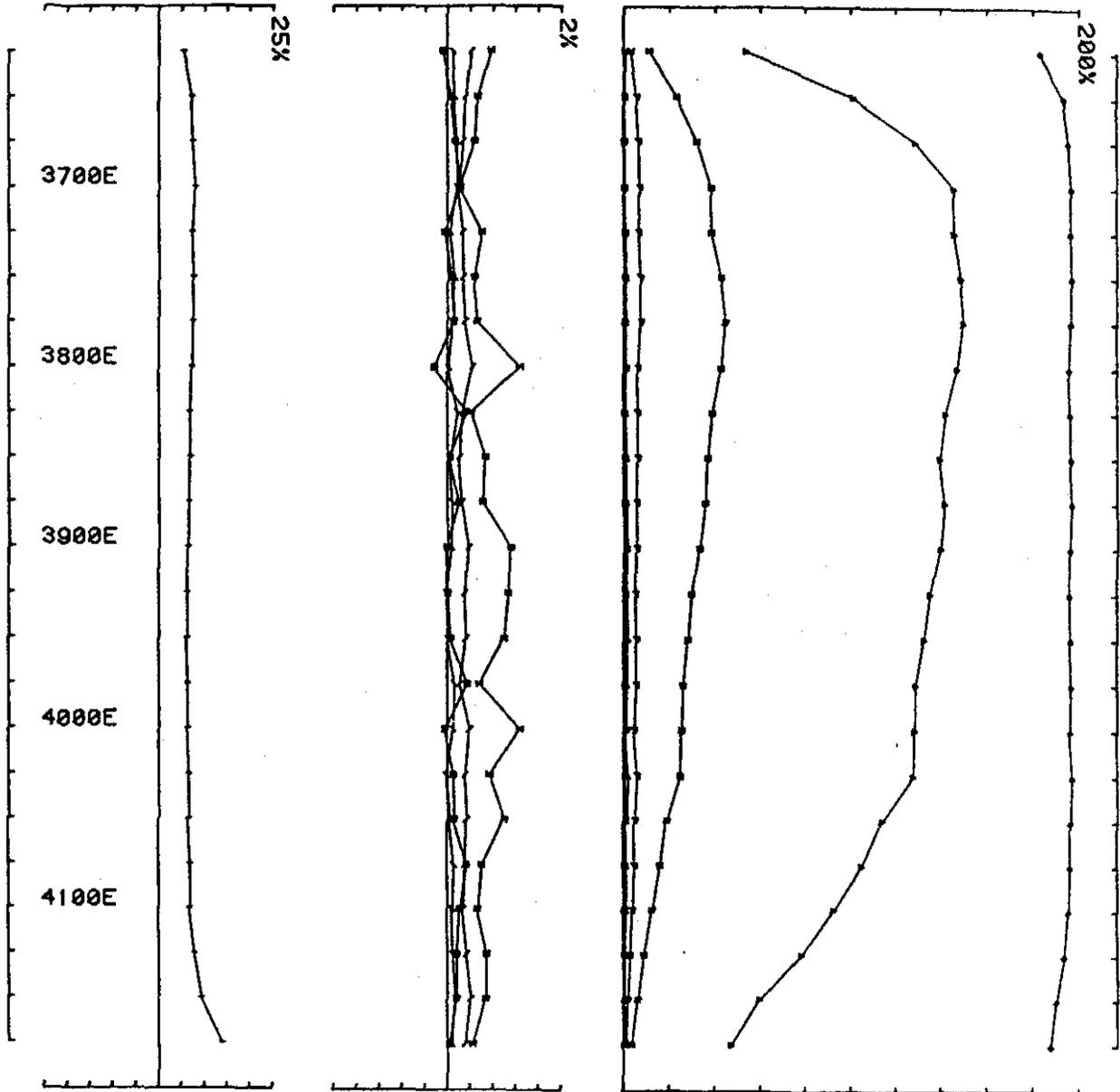
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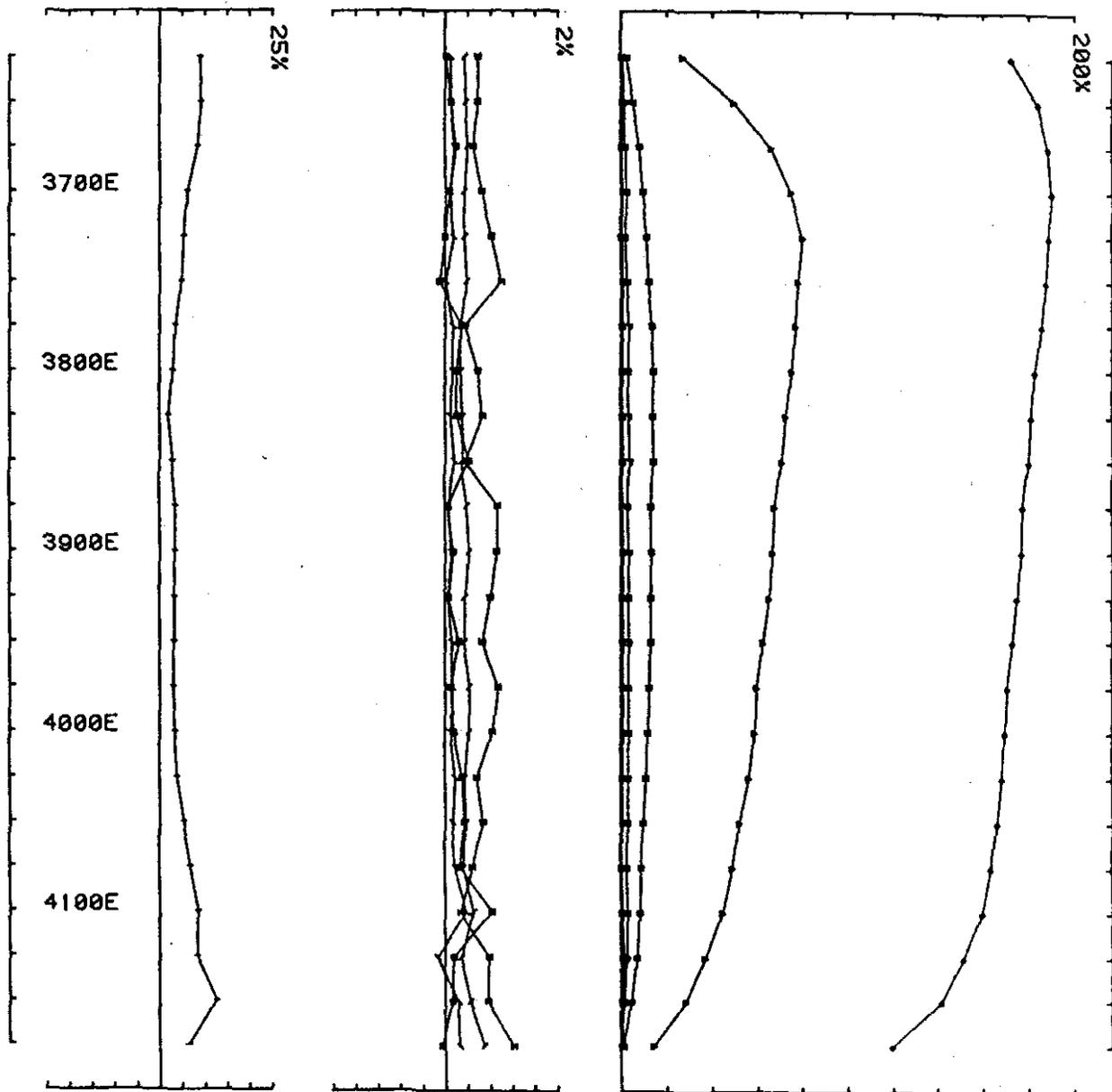
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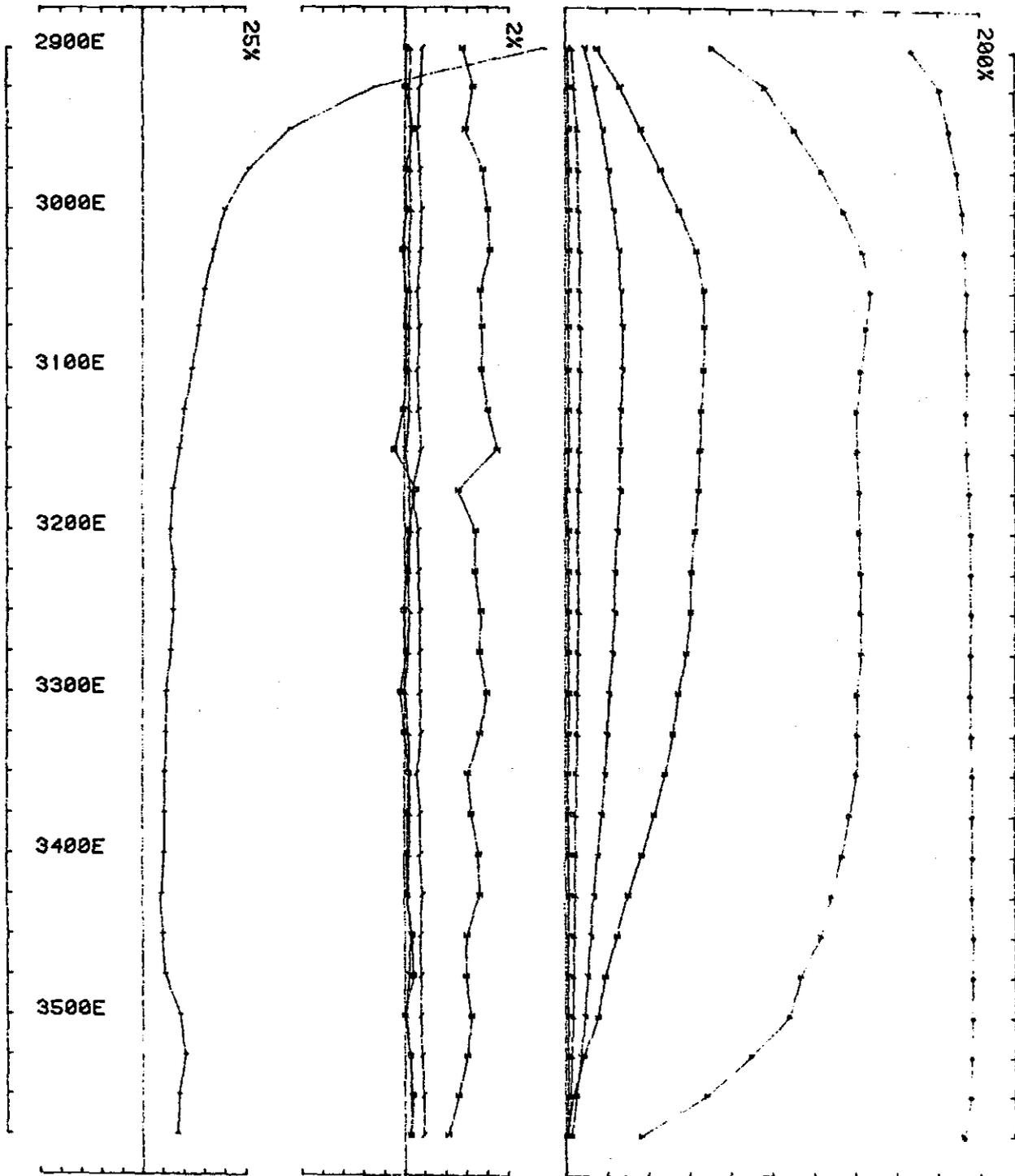
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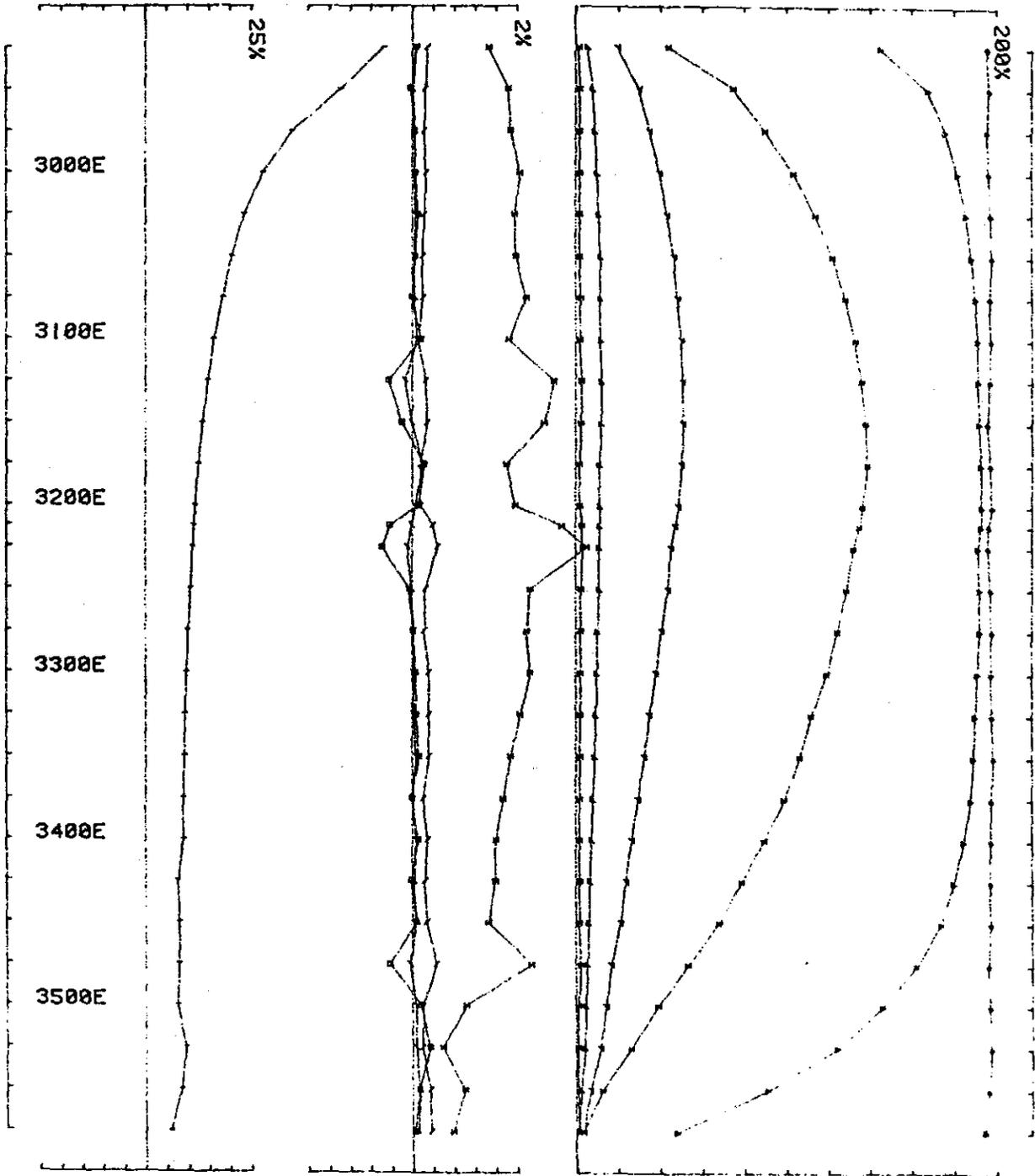
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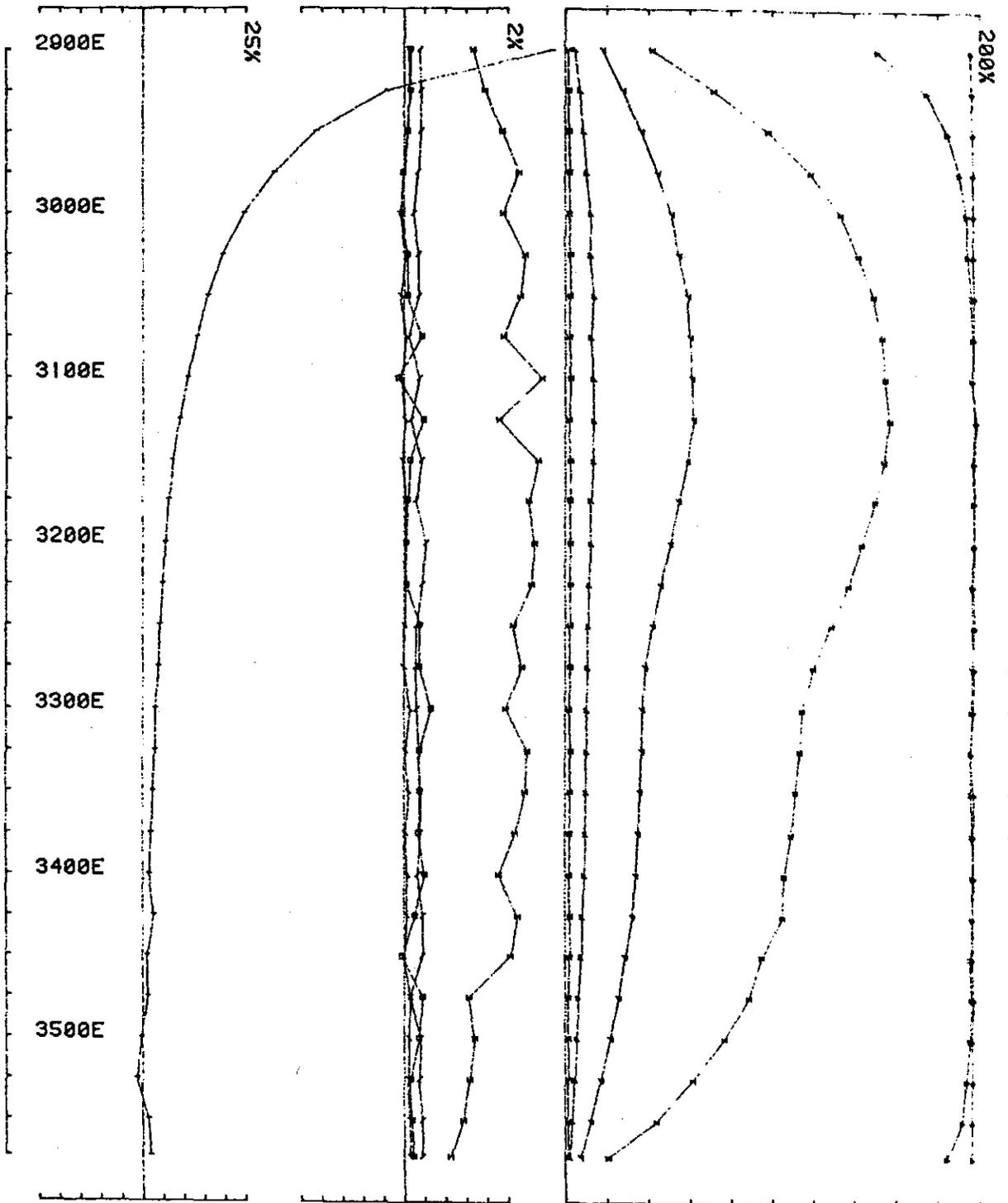
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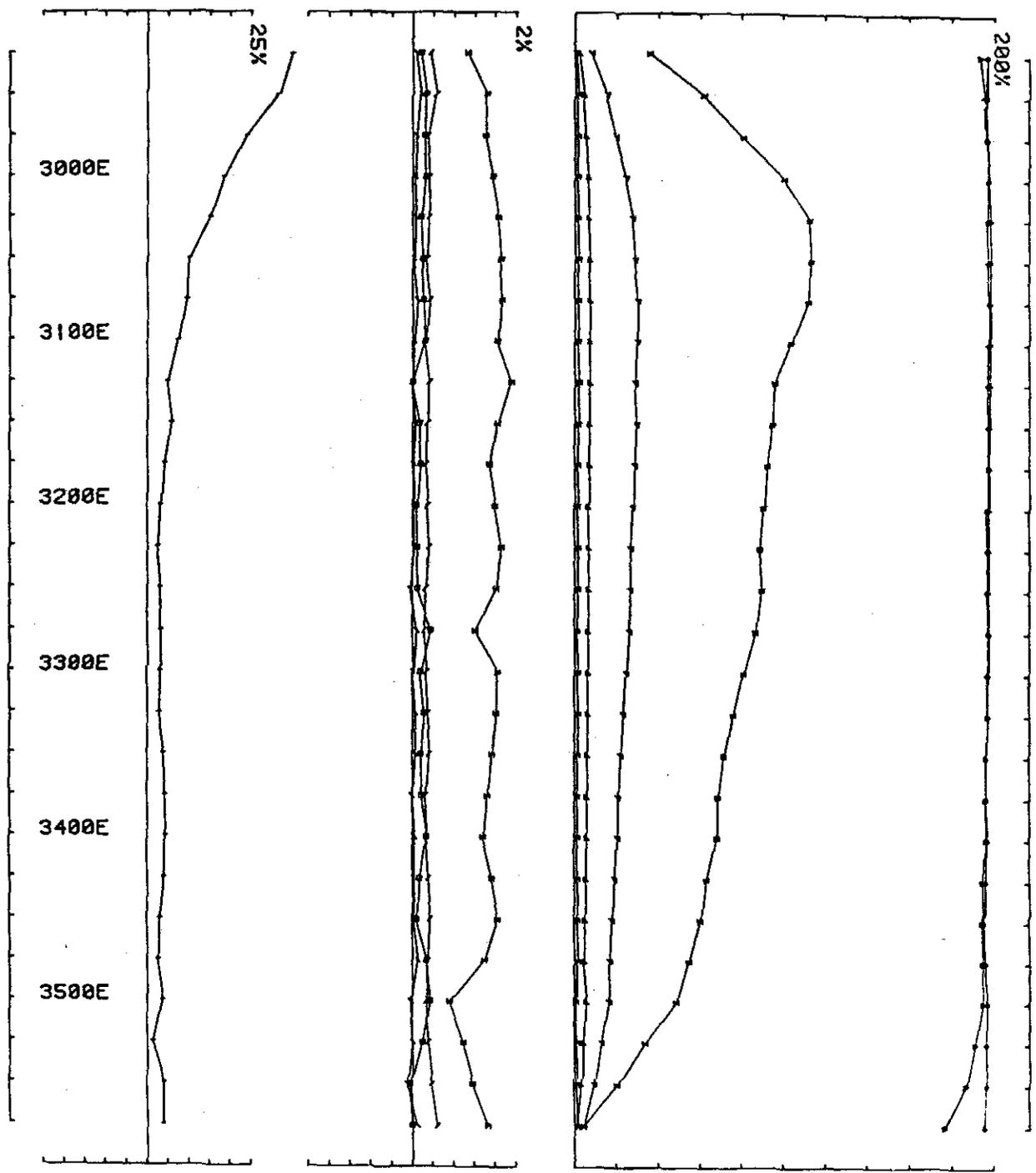
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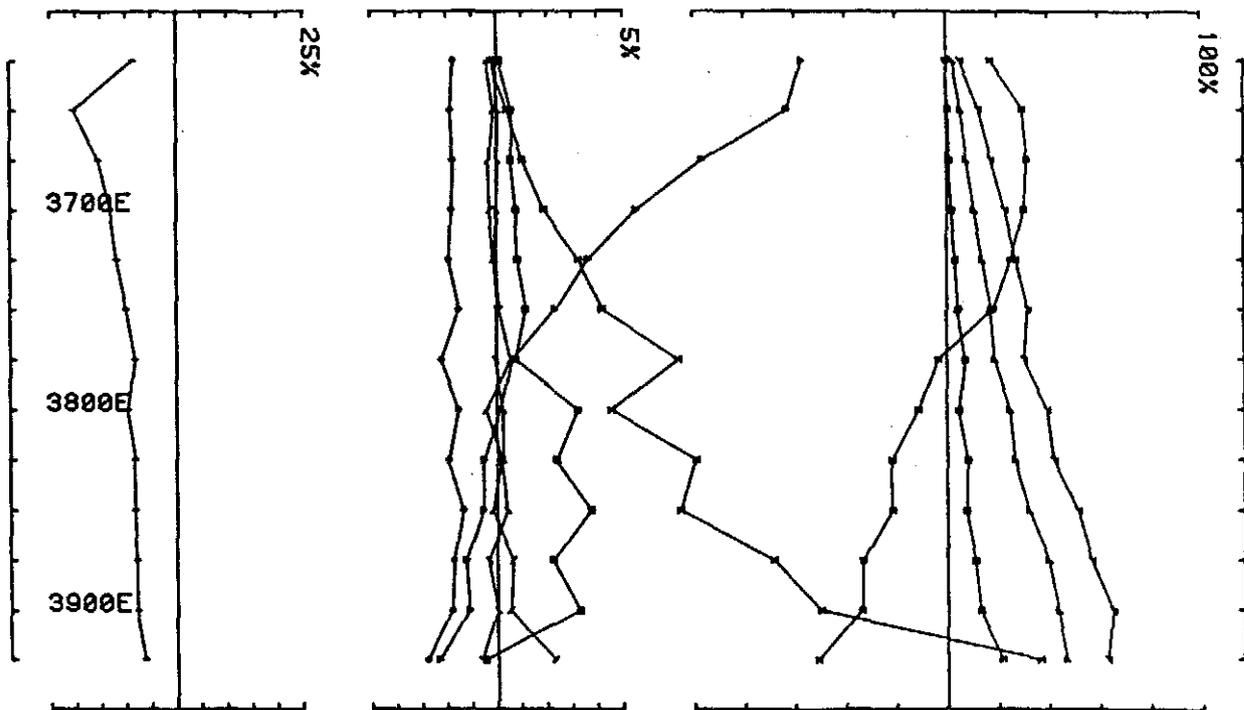
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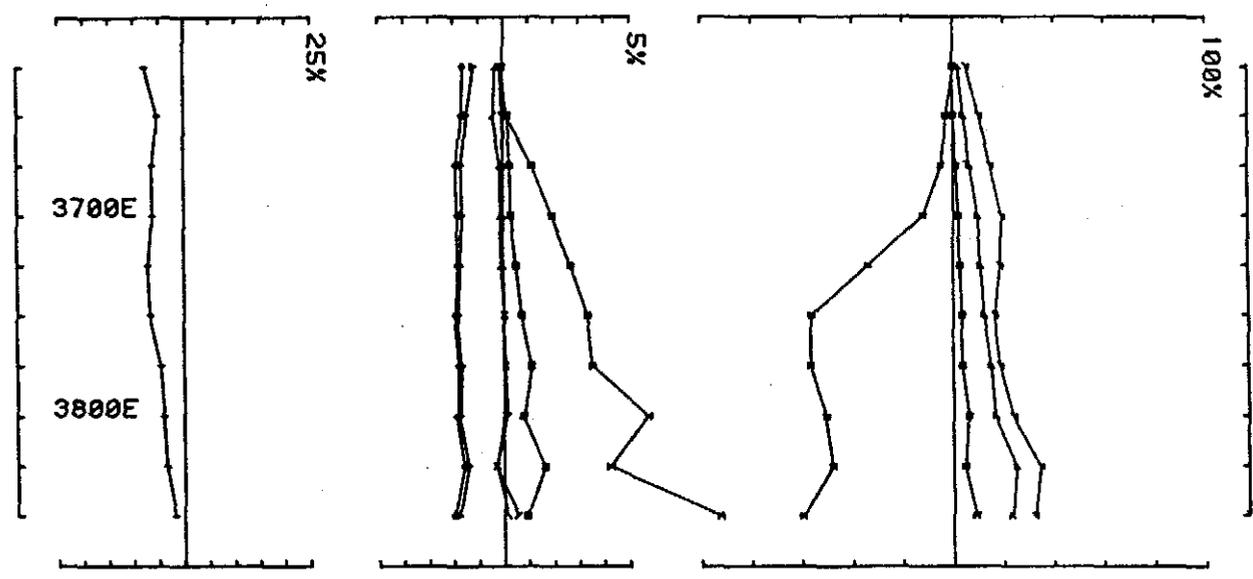
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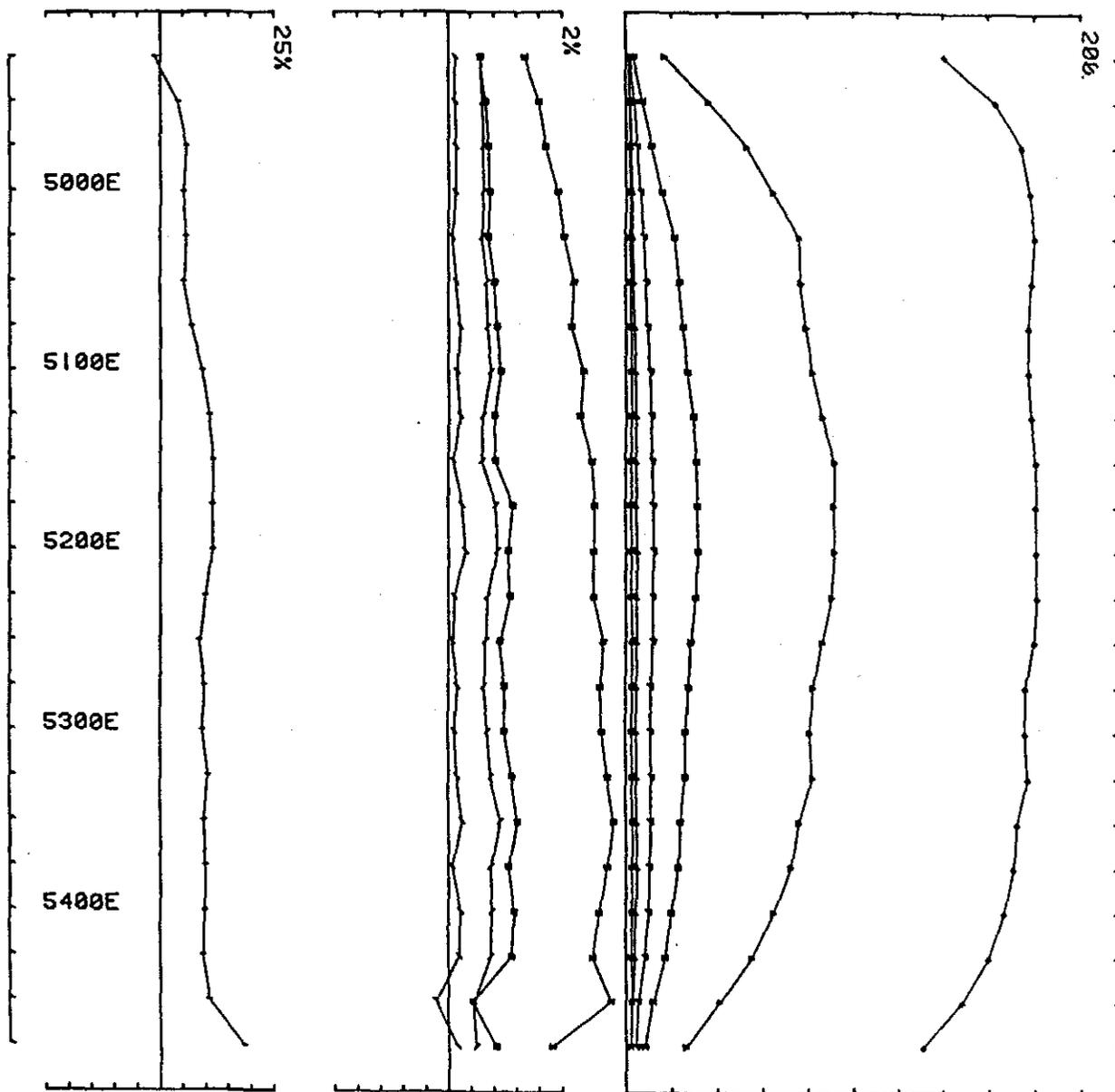
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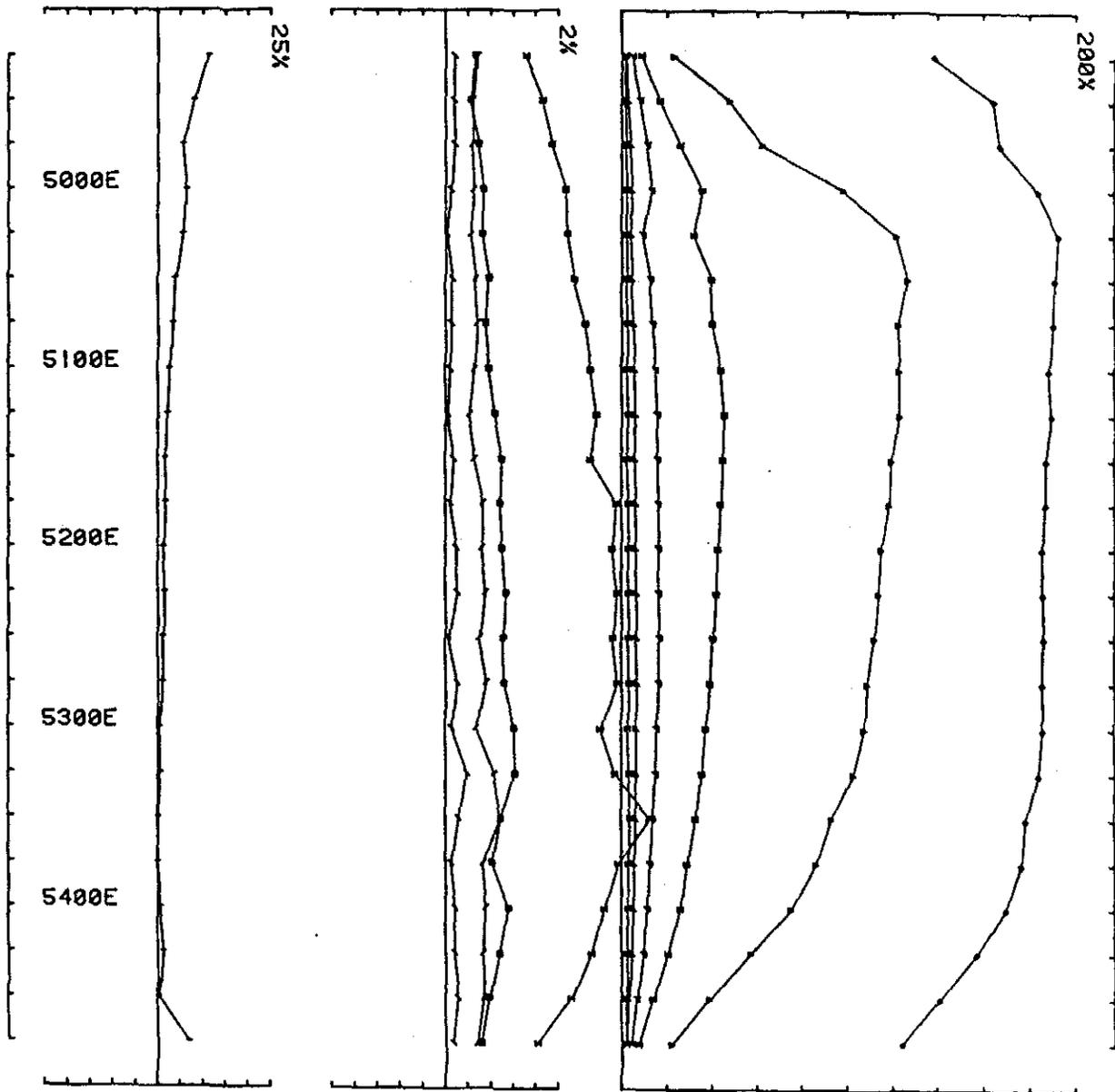
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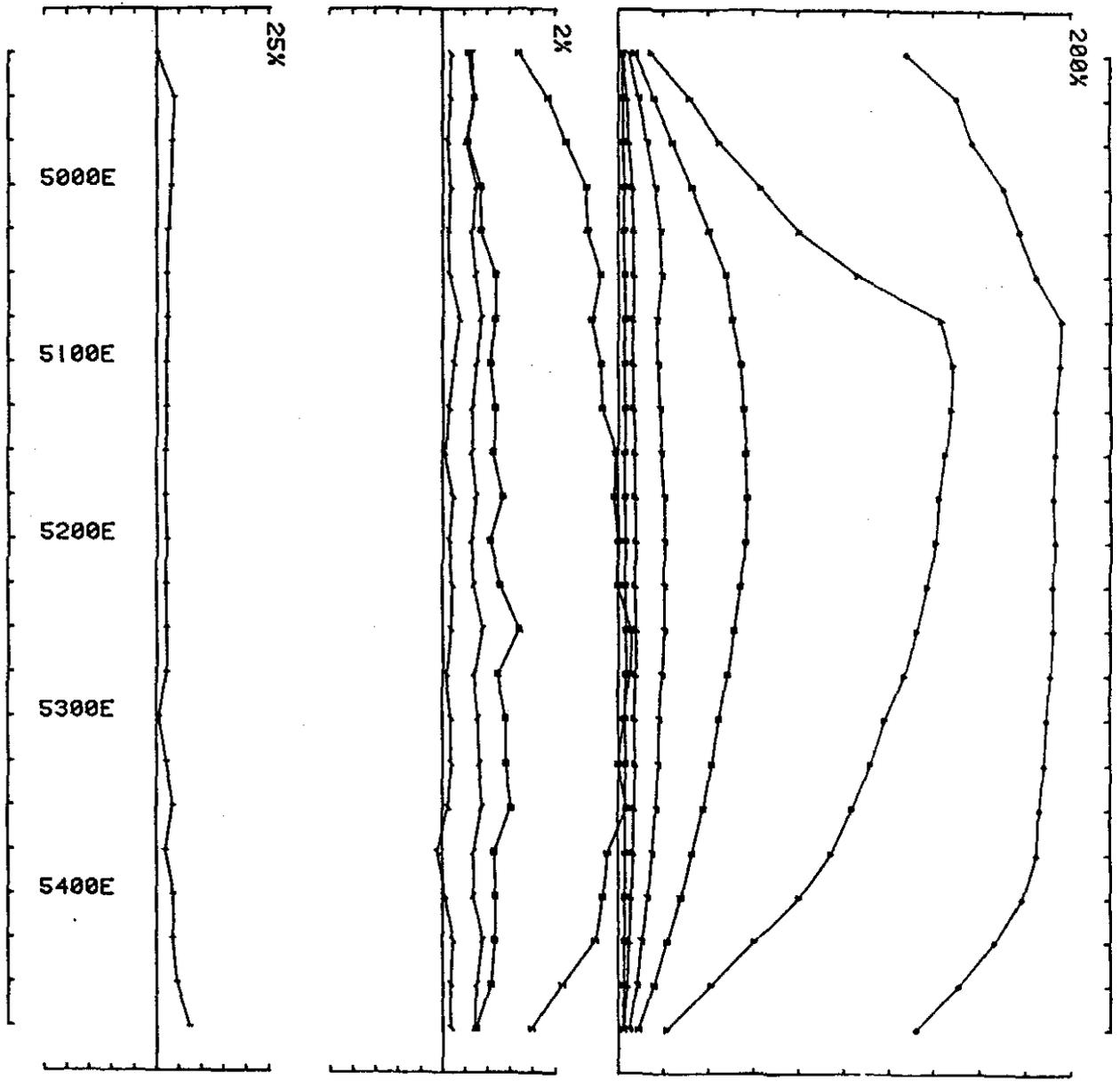
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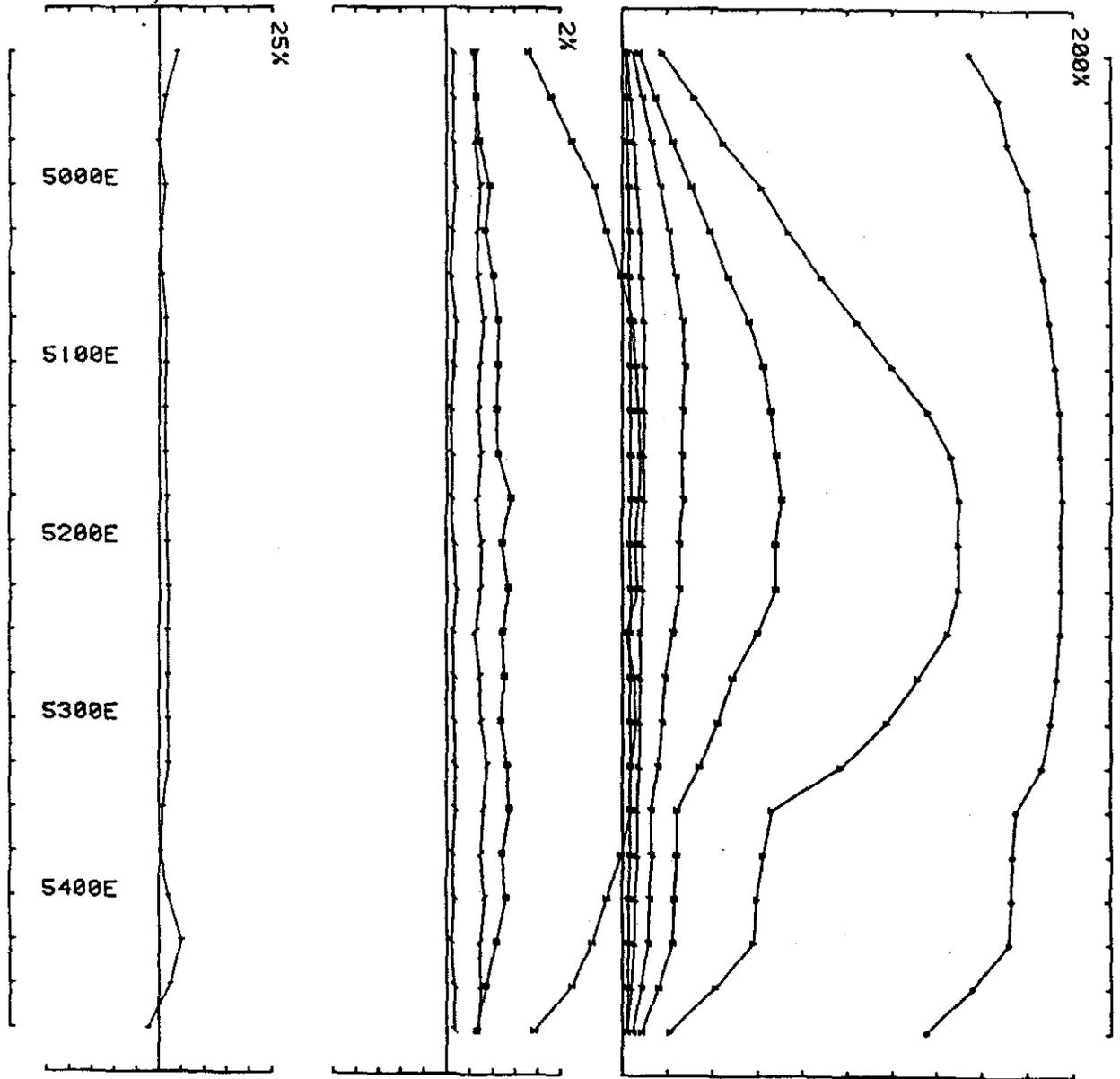
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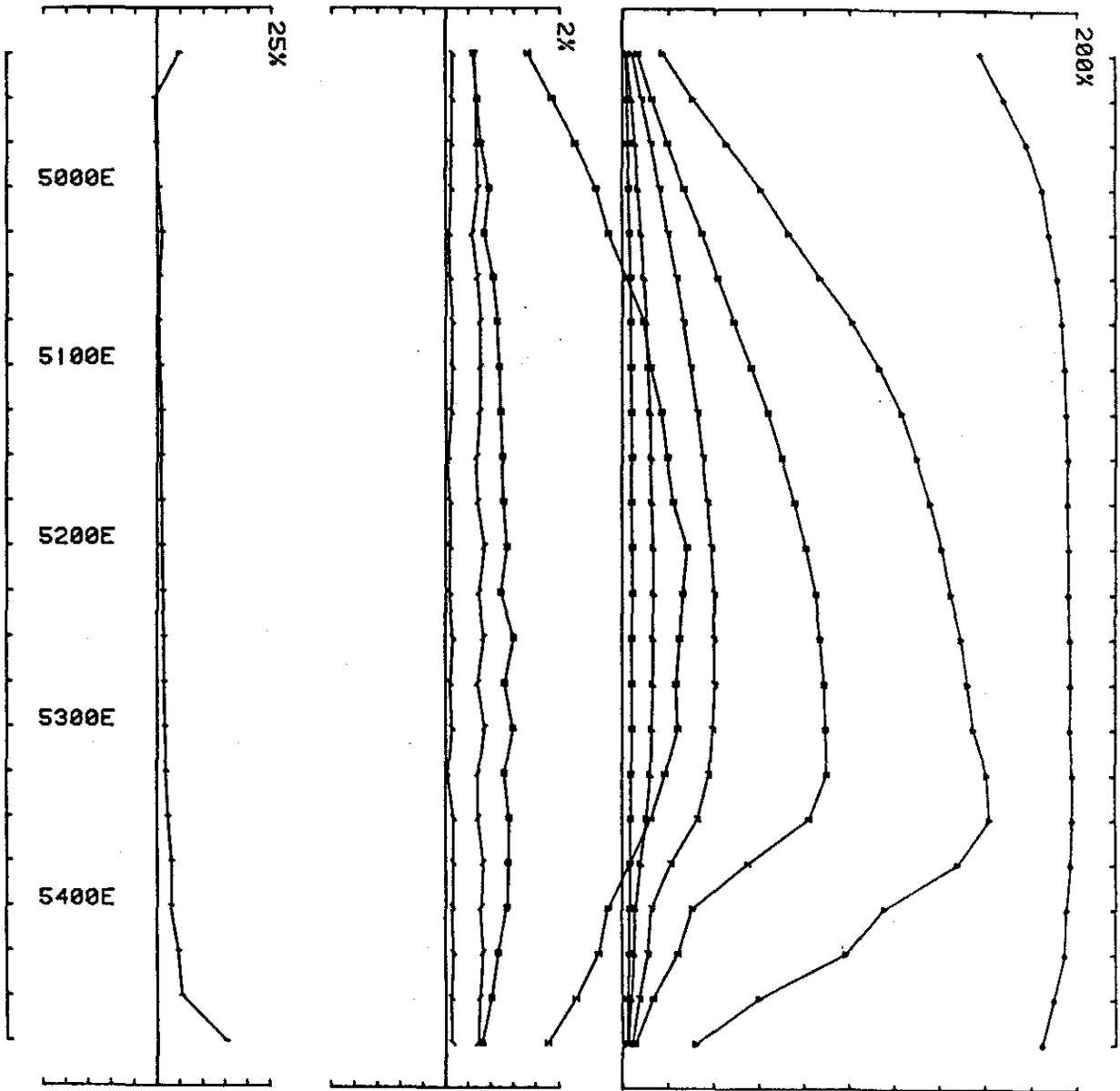
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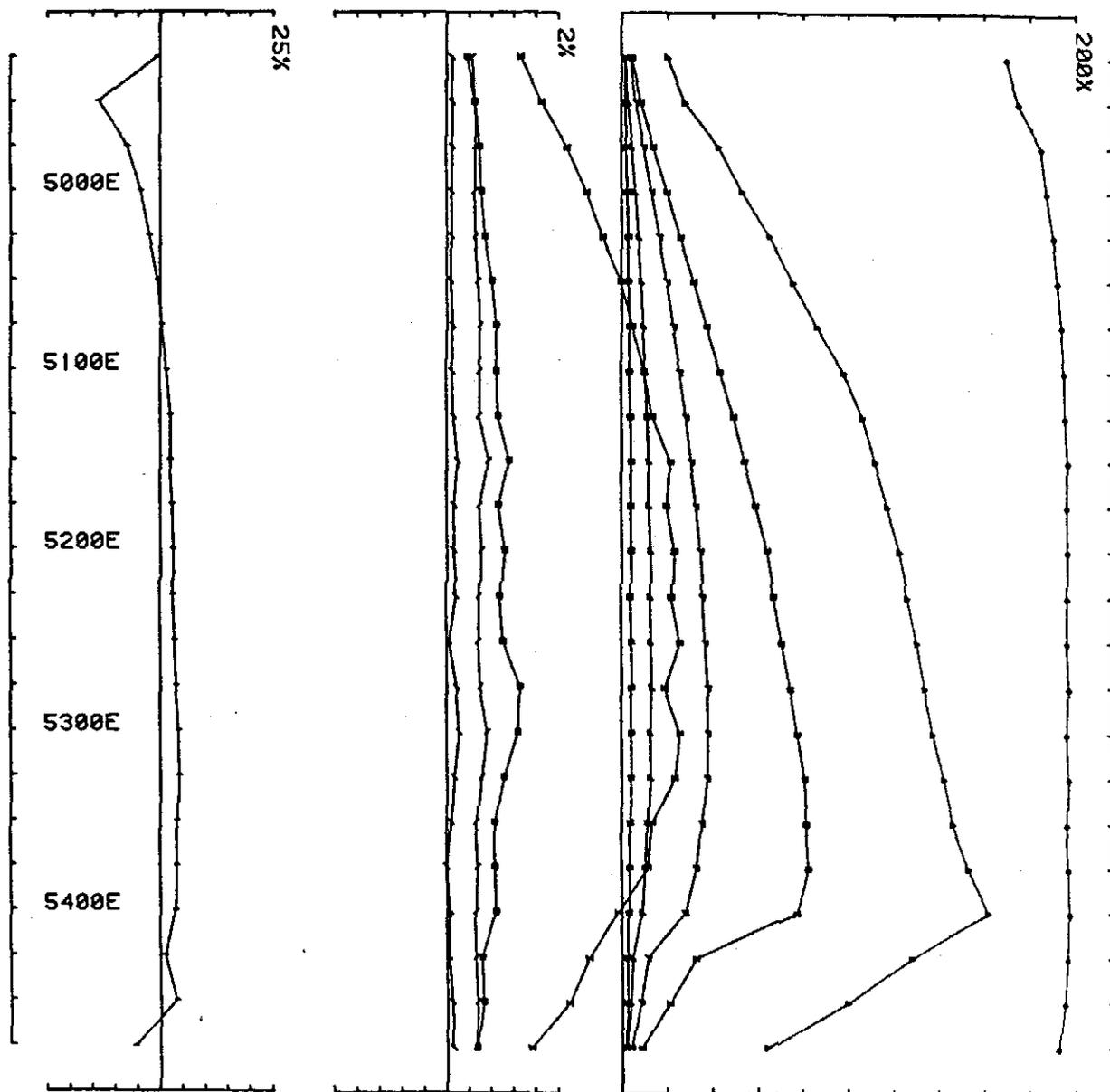
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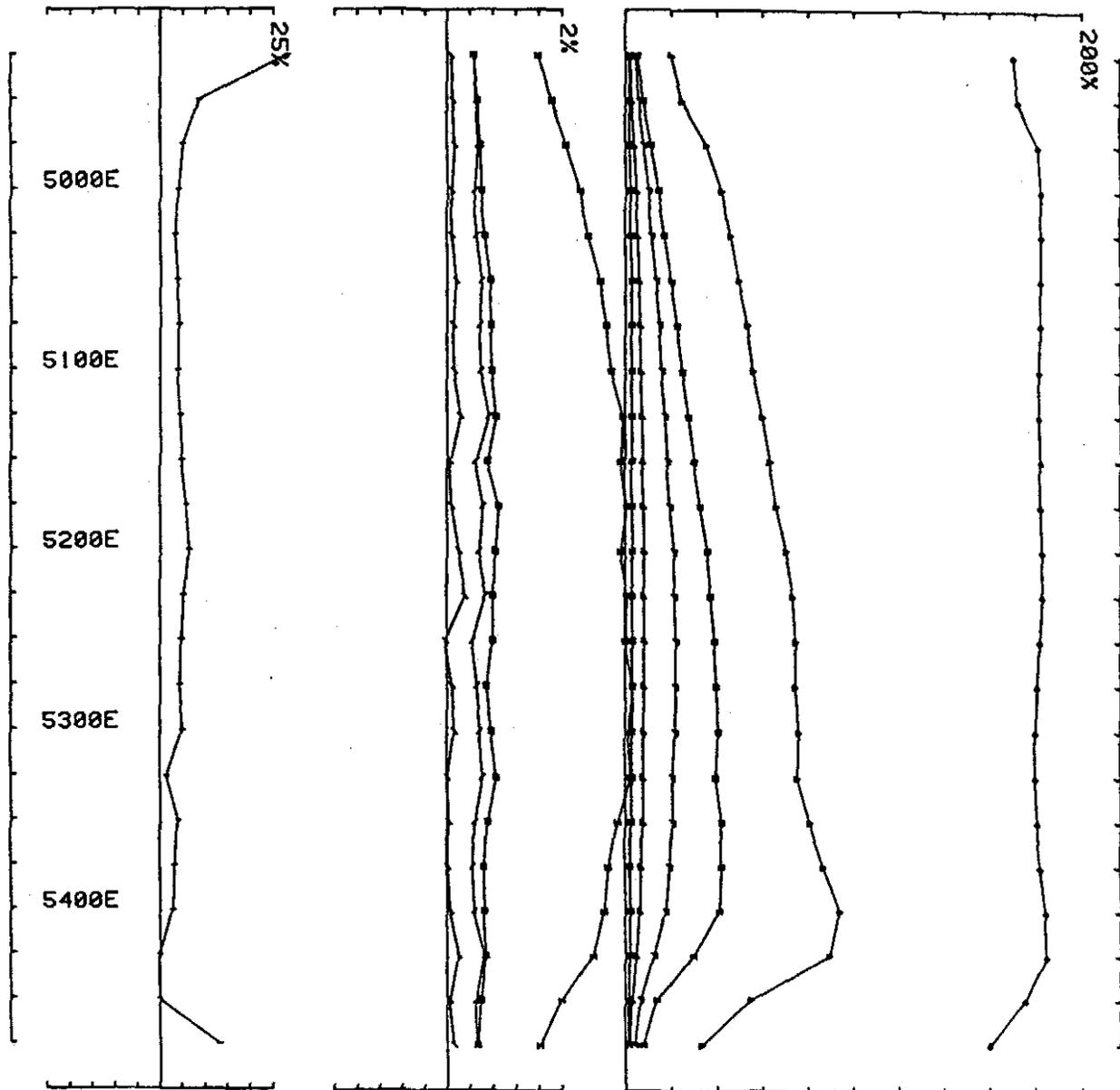
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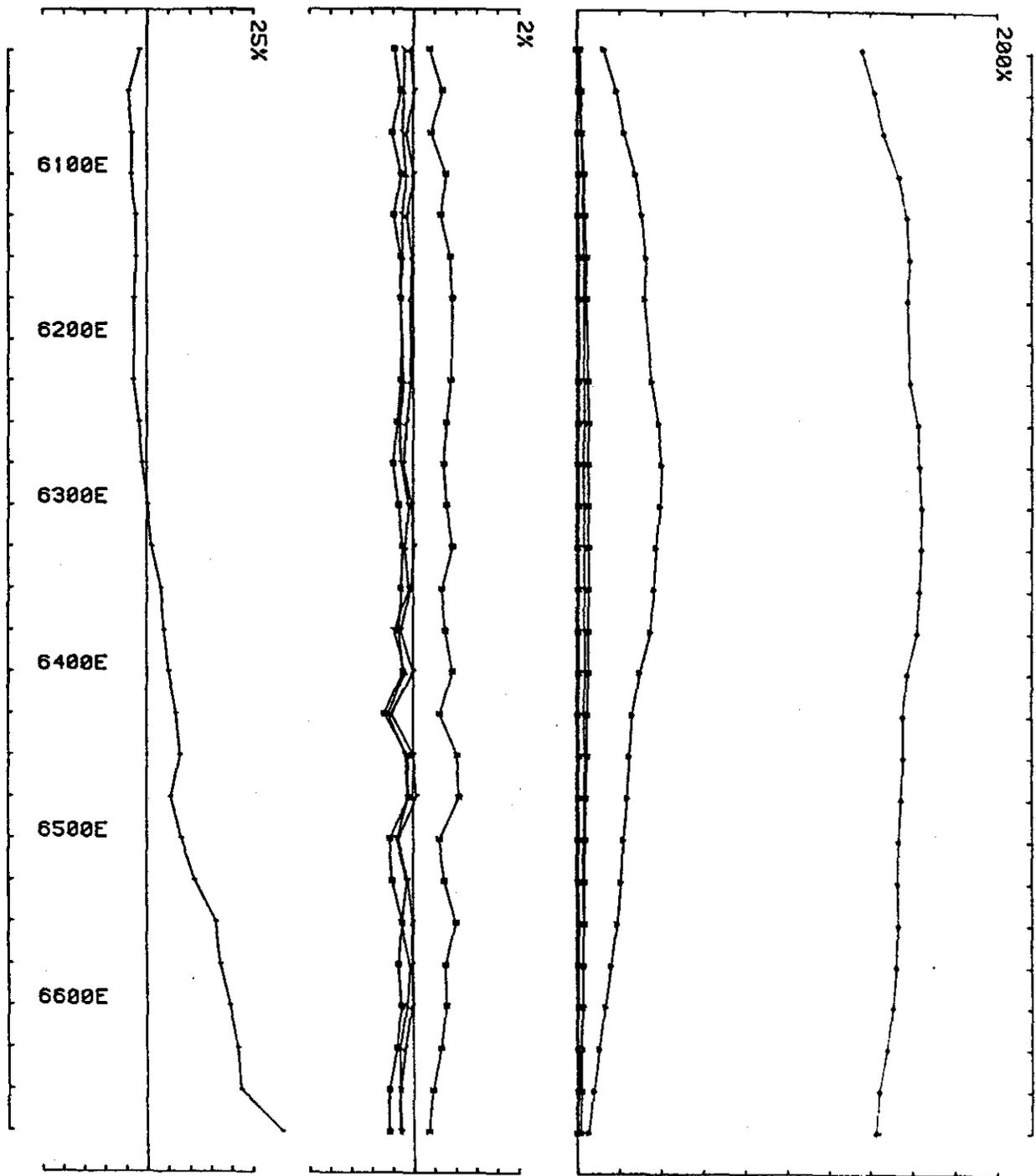
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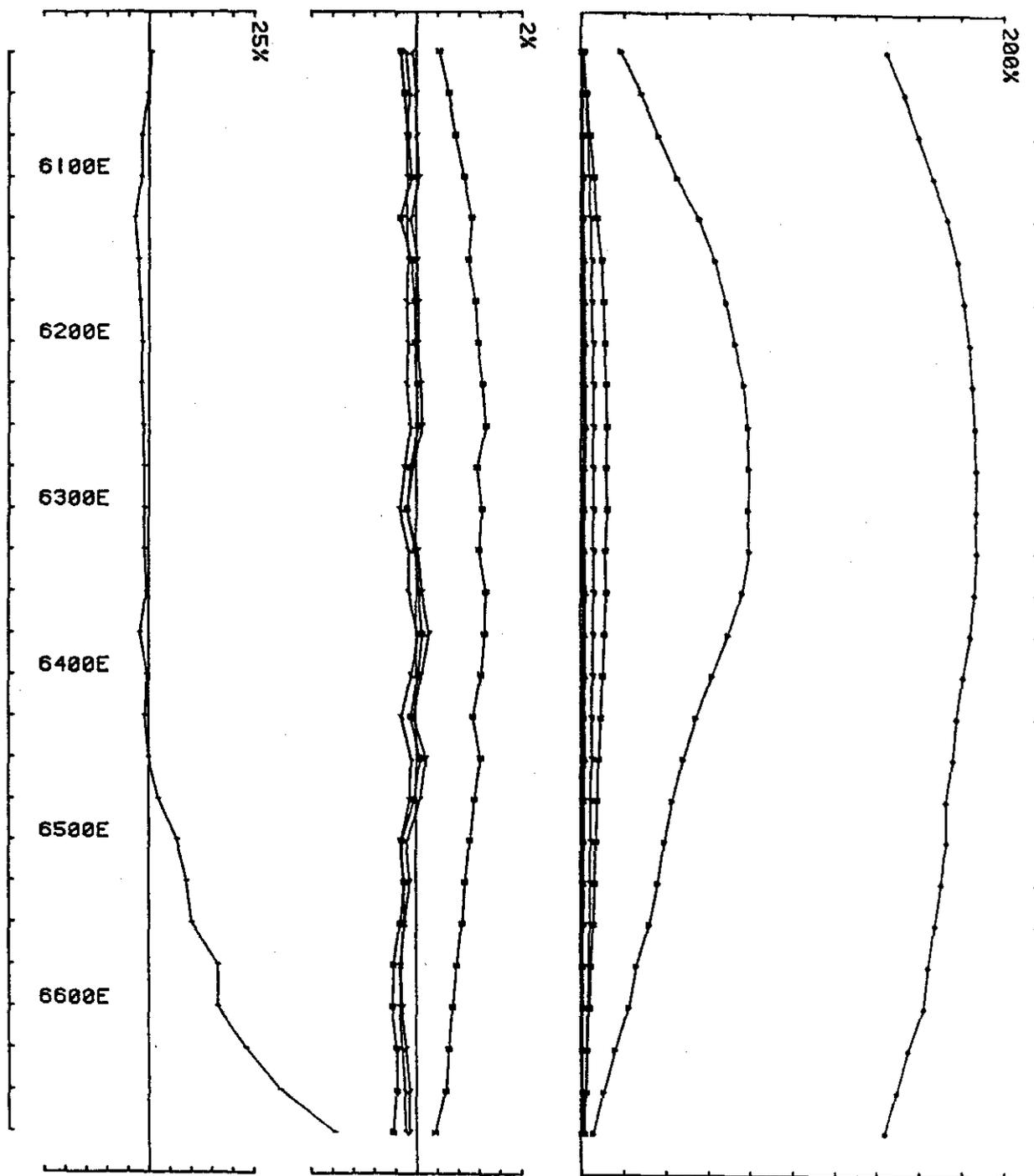
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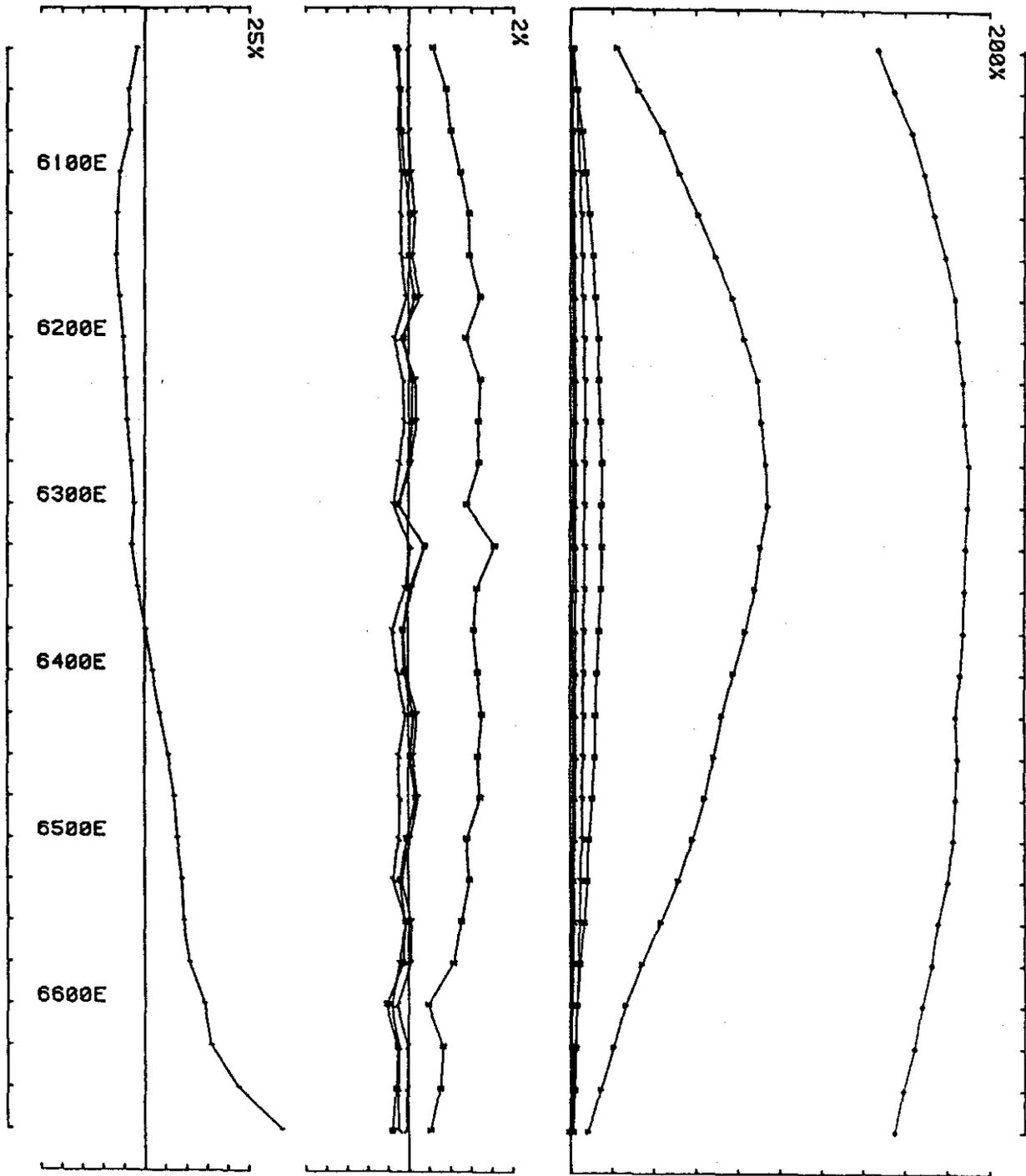
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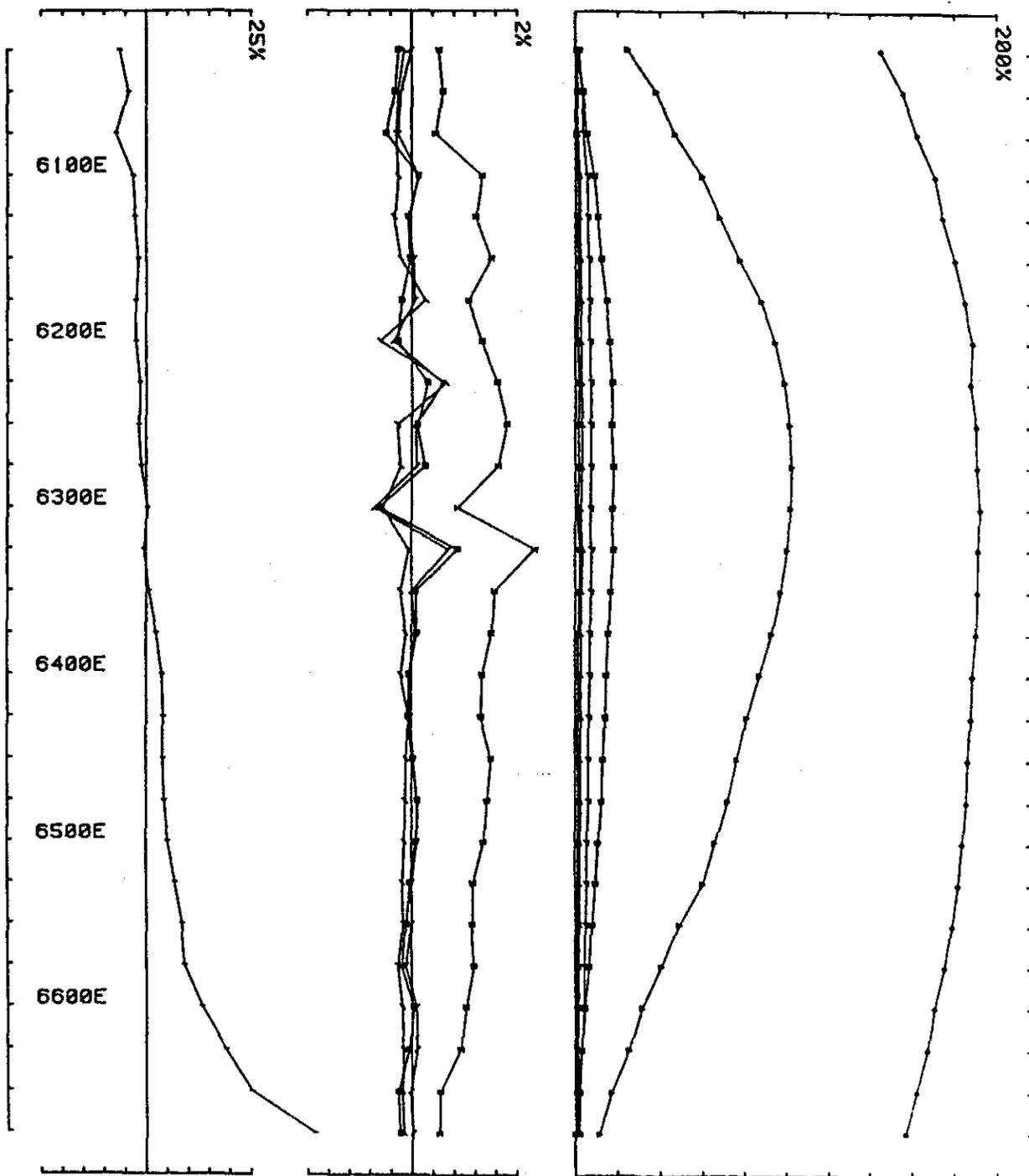
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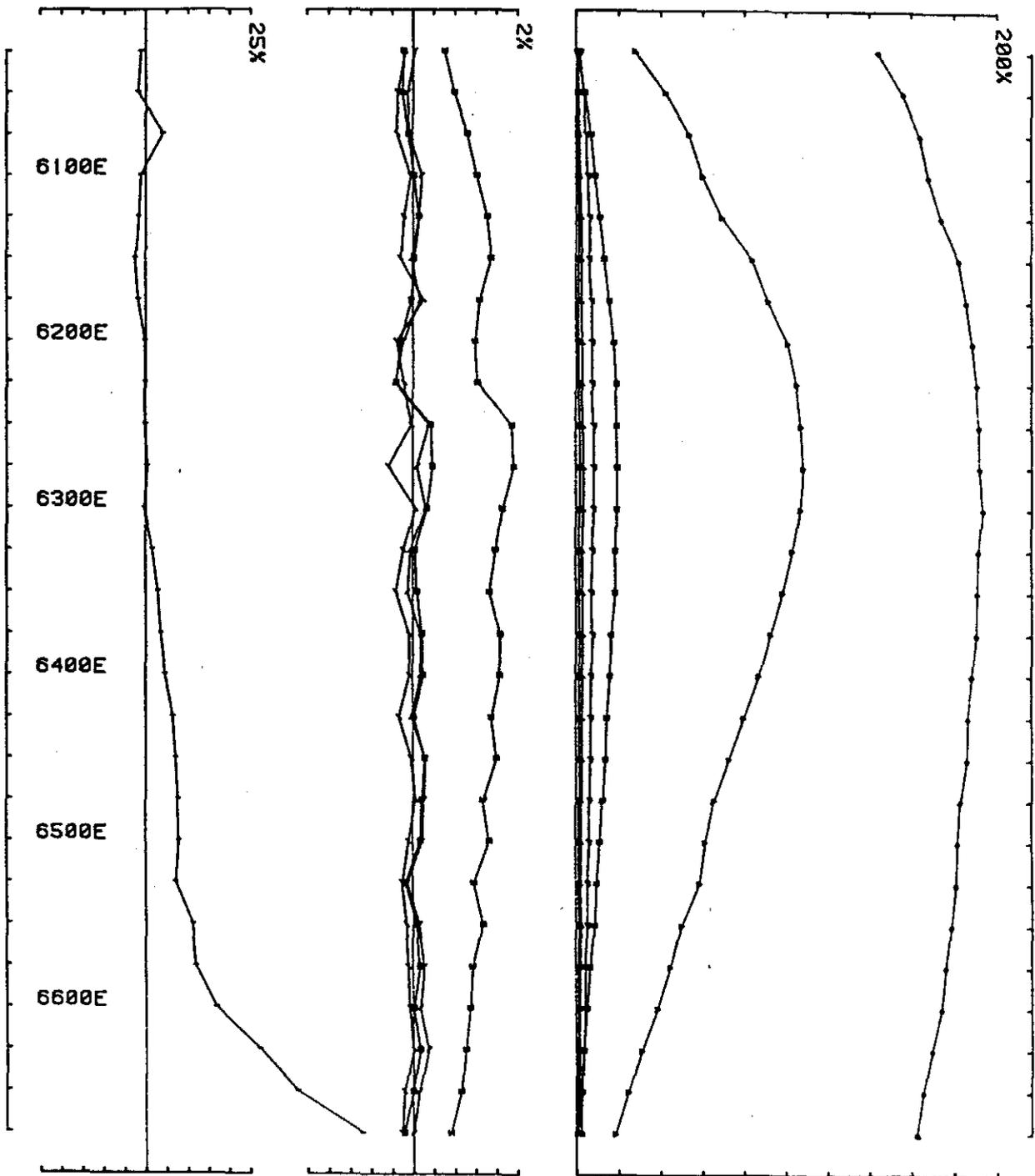
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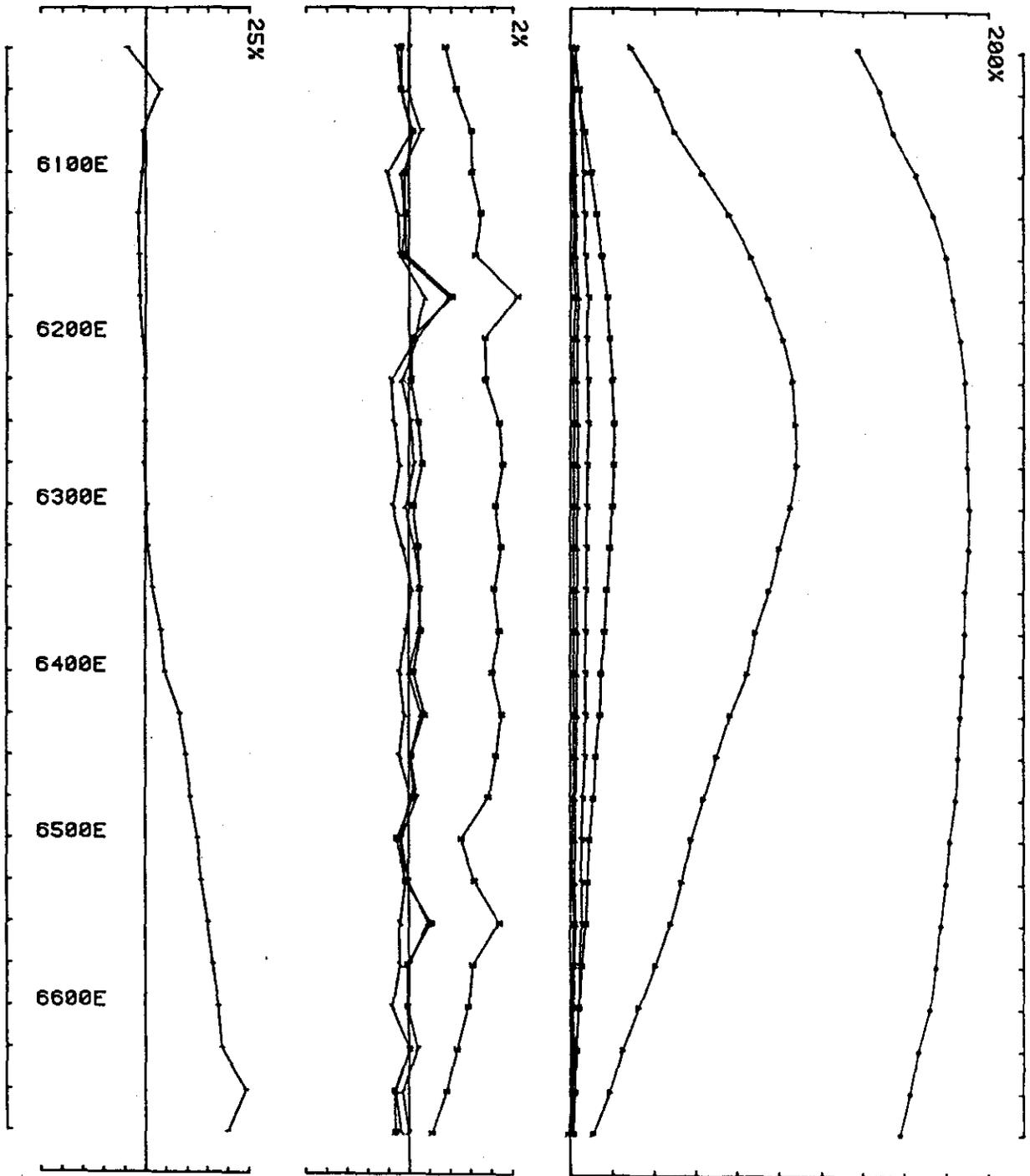
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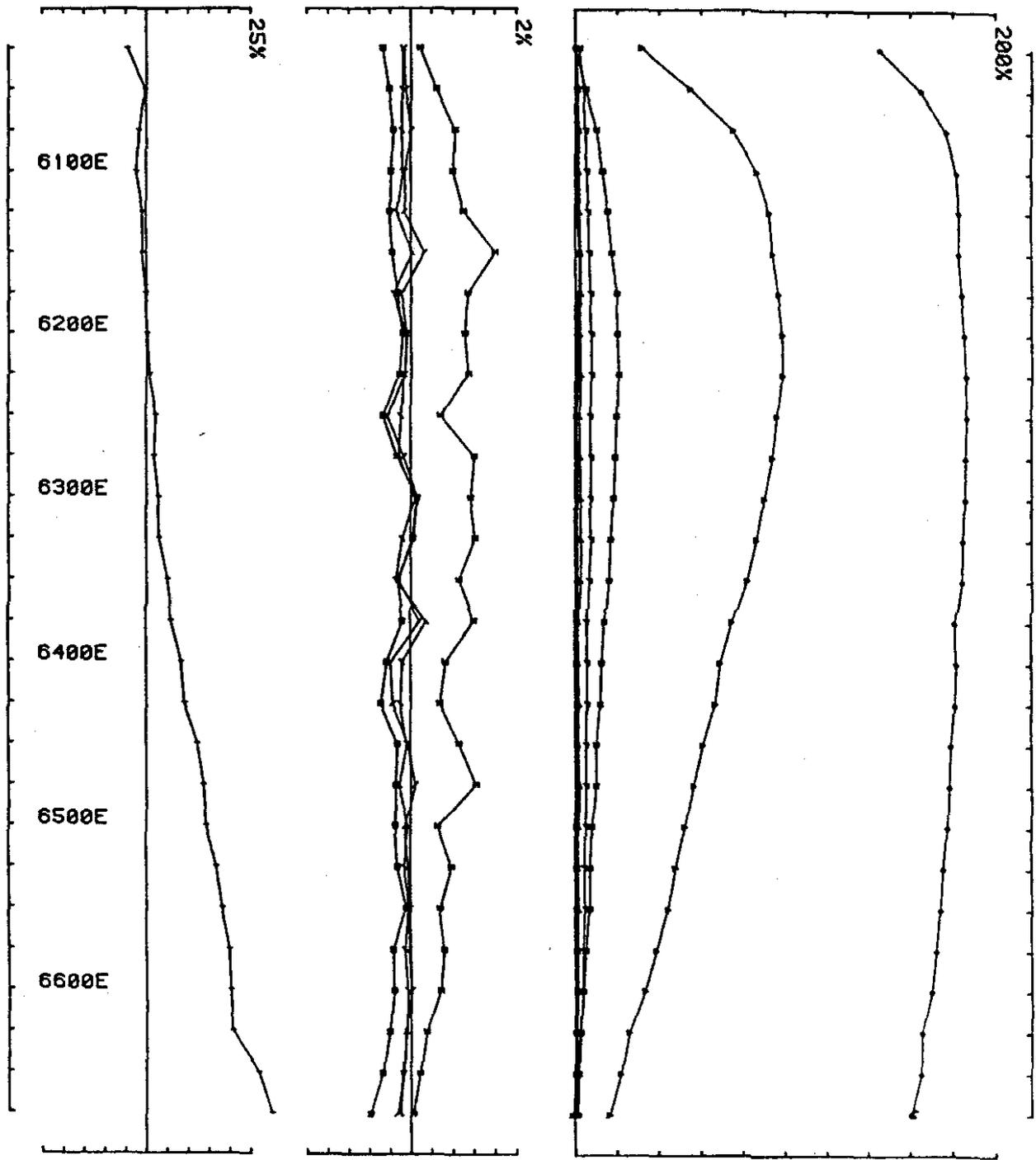
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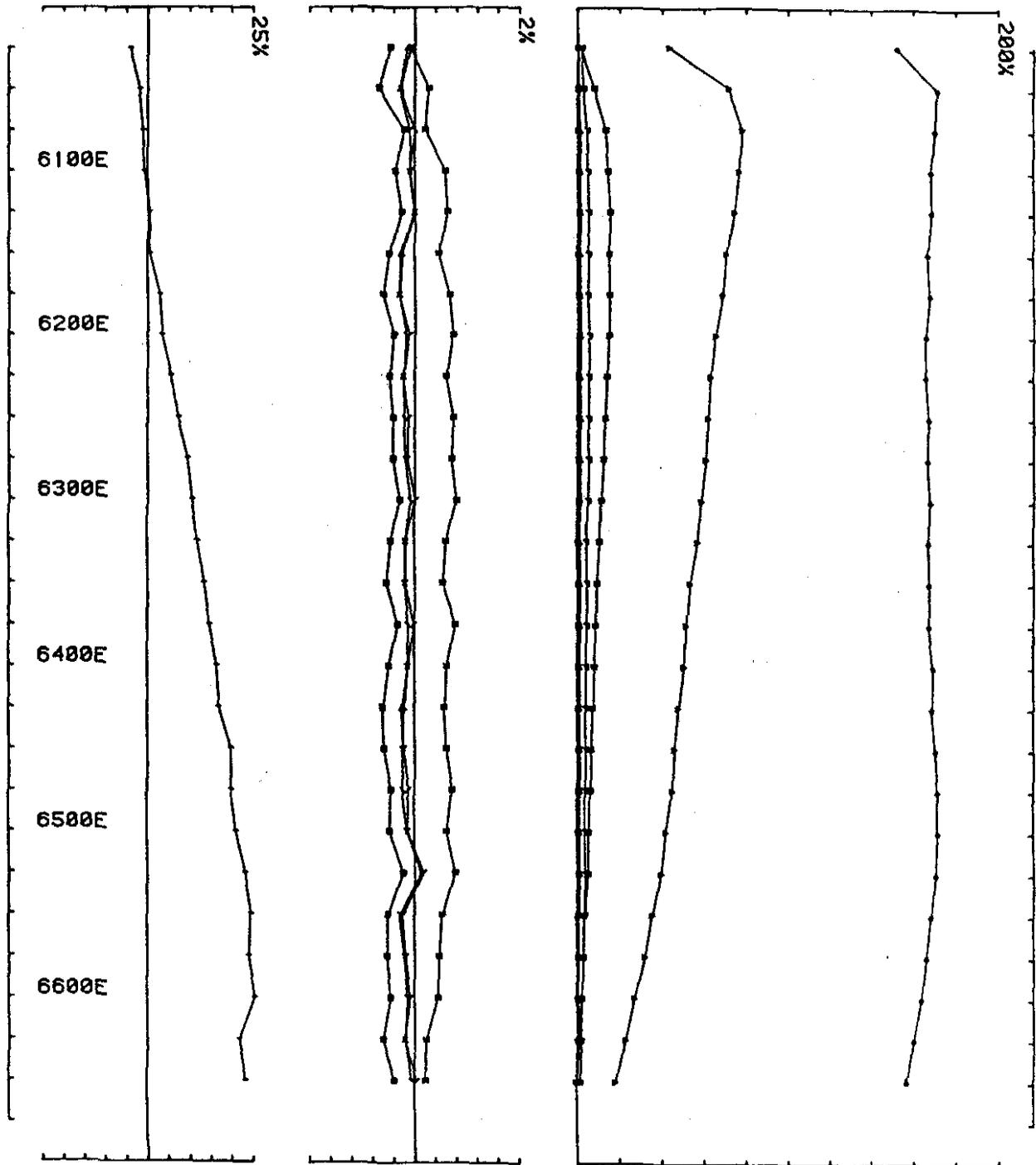
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Loopno 0024 Line 10400N component Hz secondary Ch 1



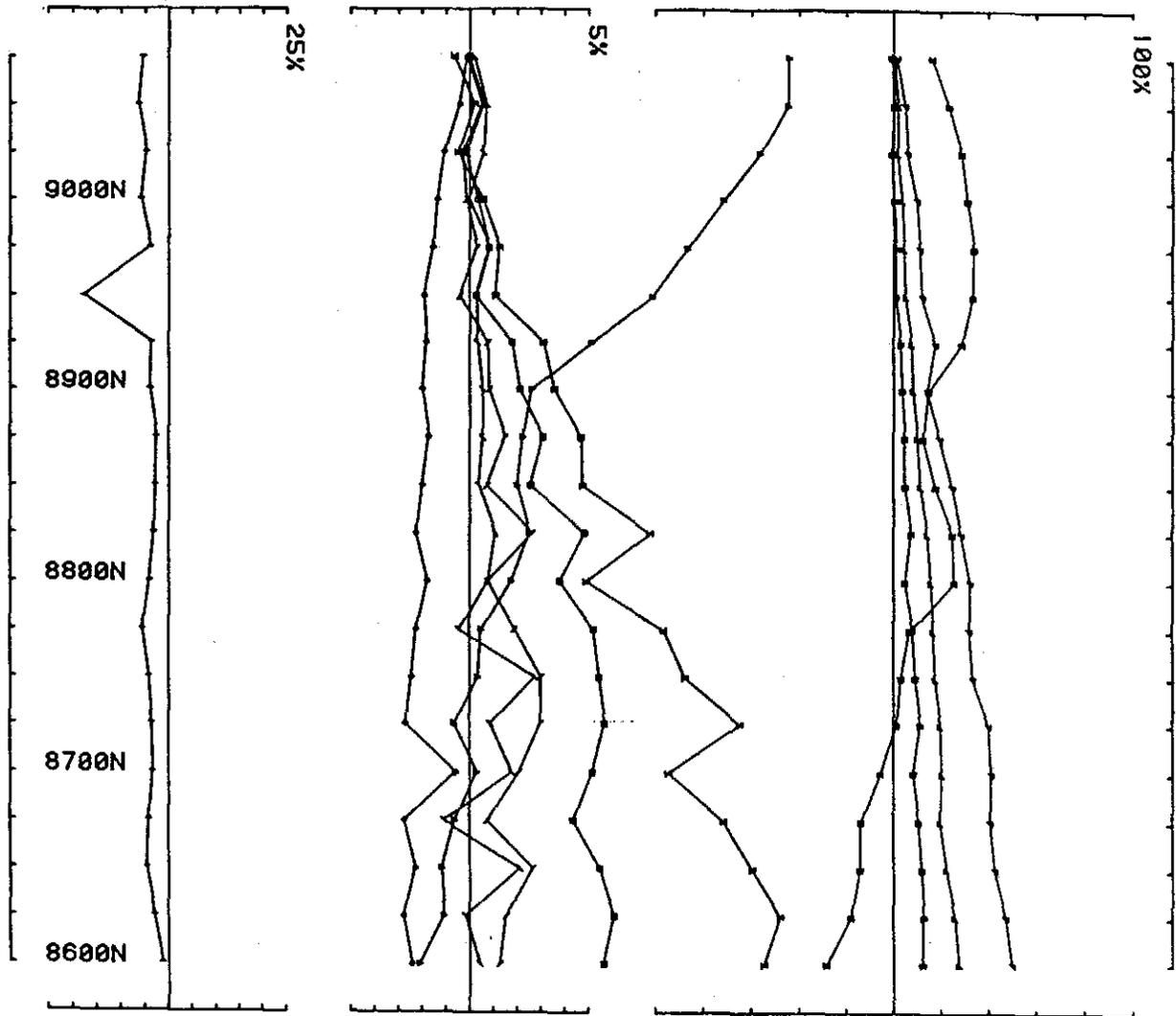
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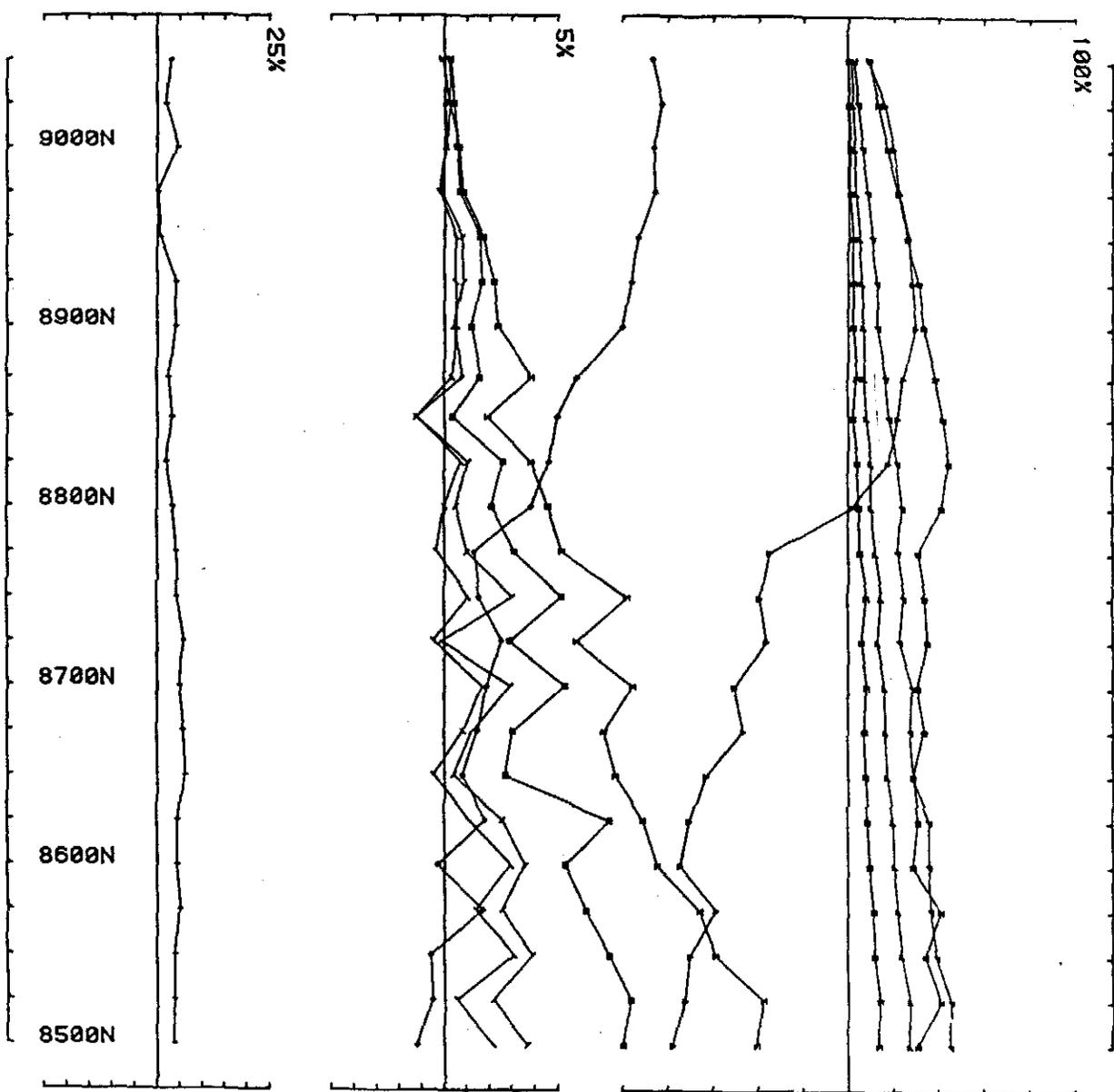
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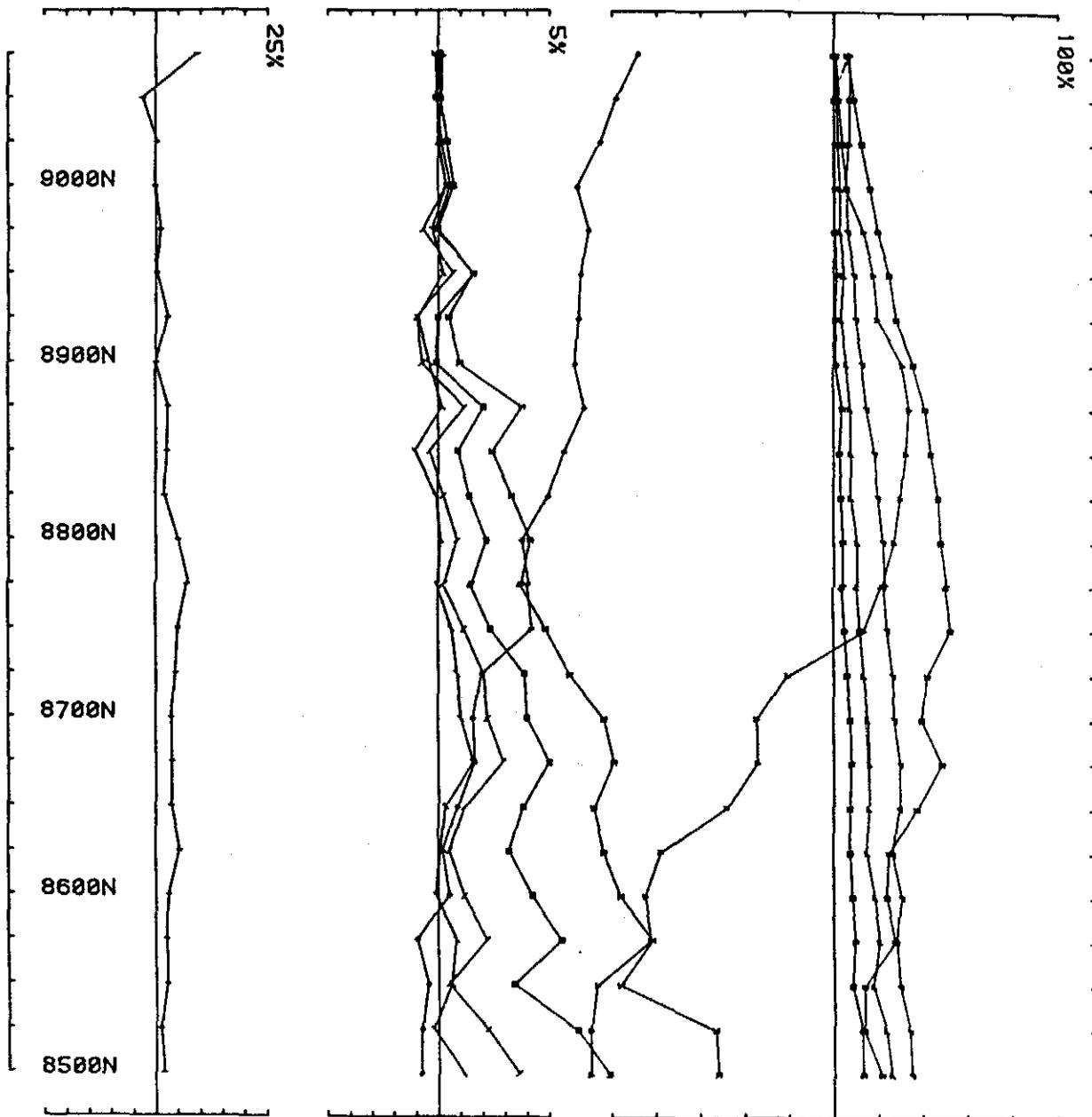
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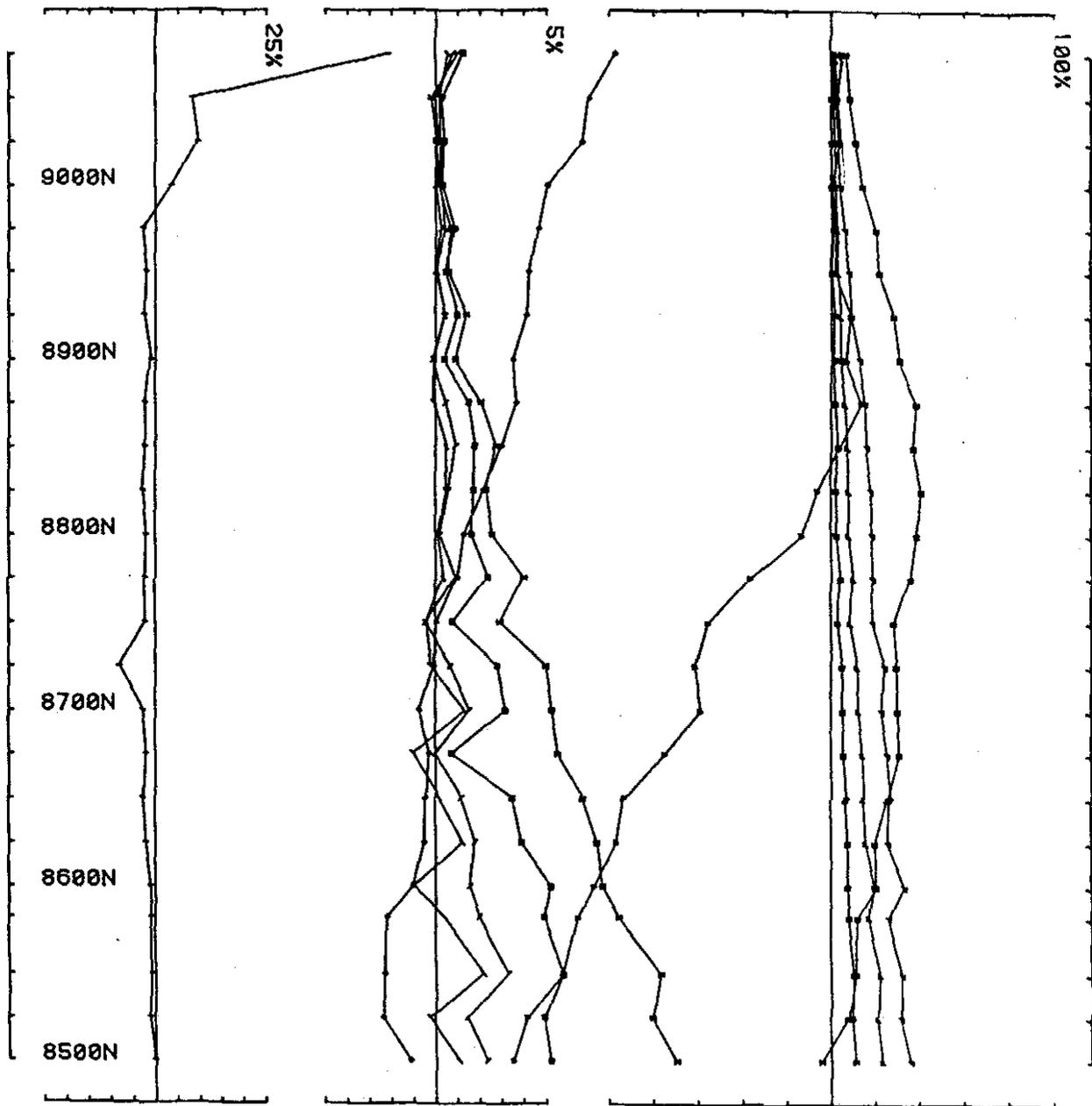
UTEM SURVEY conducted by PMM PA0 Job 8549
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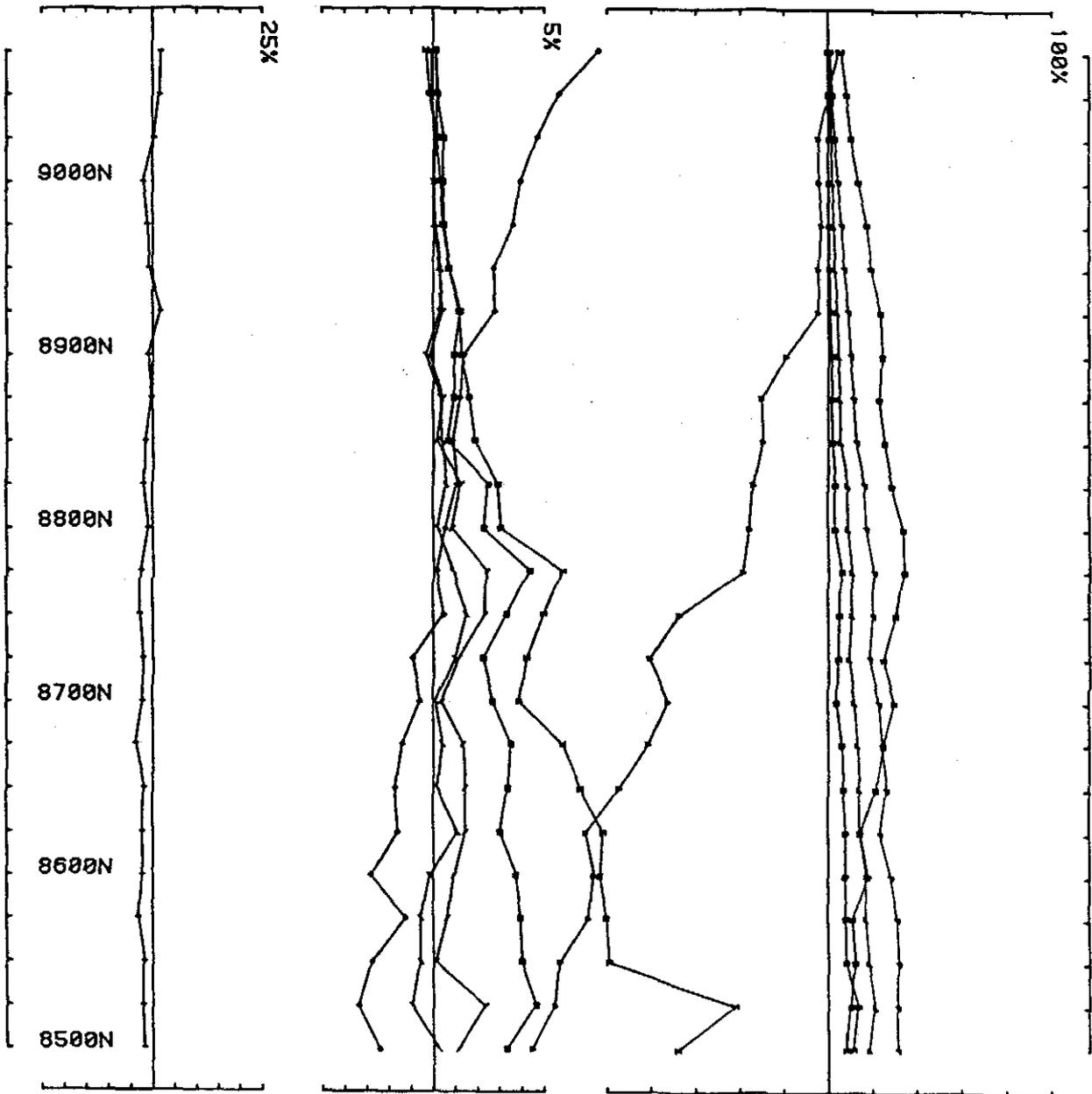
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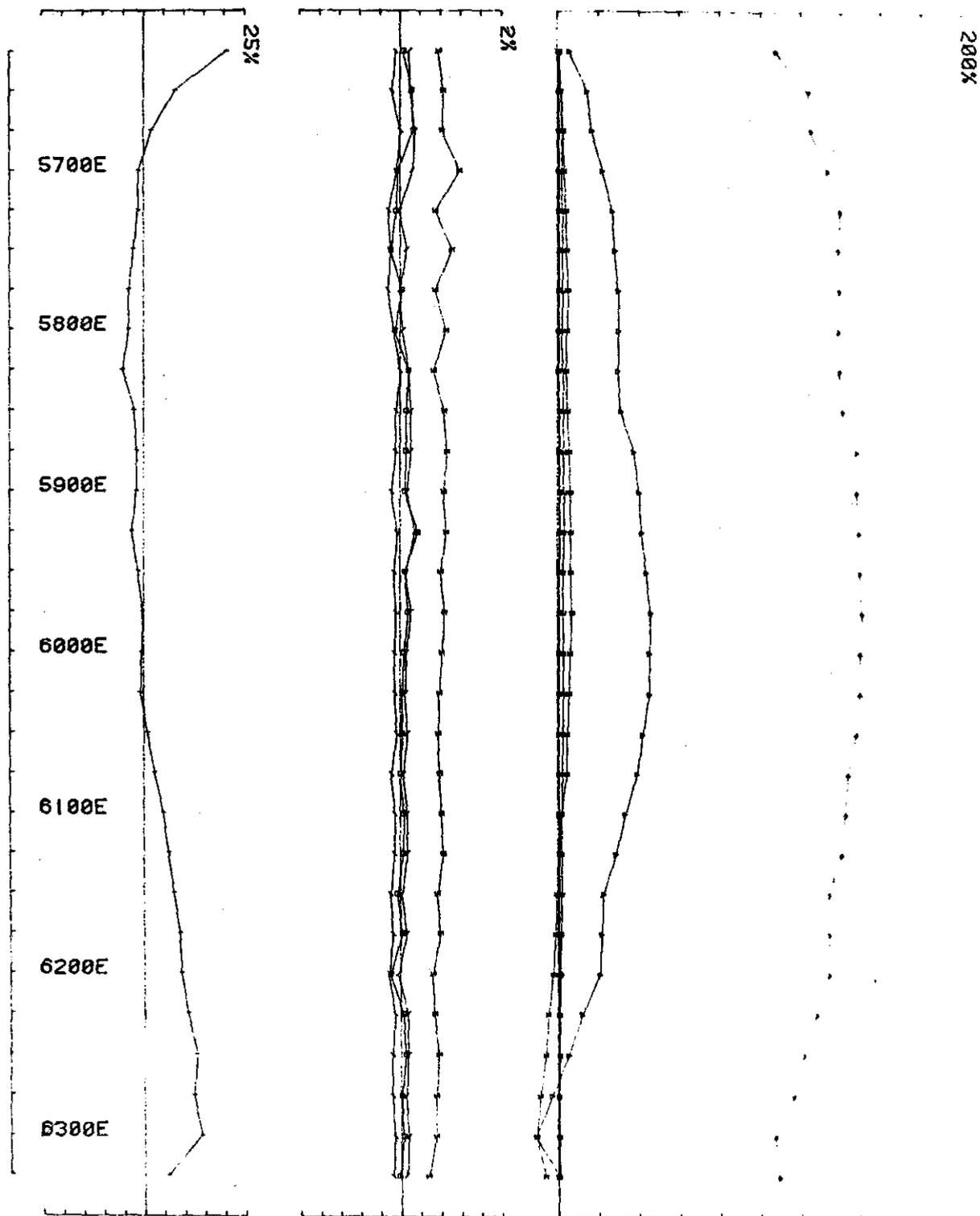
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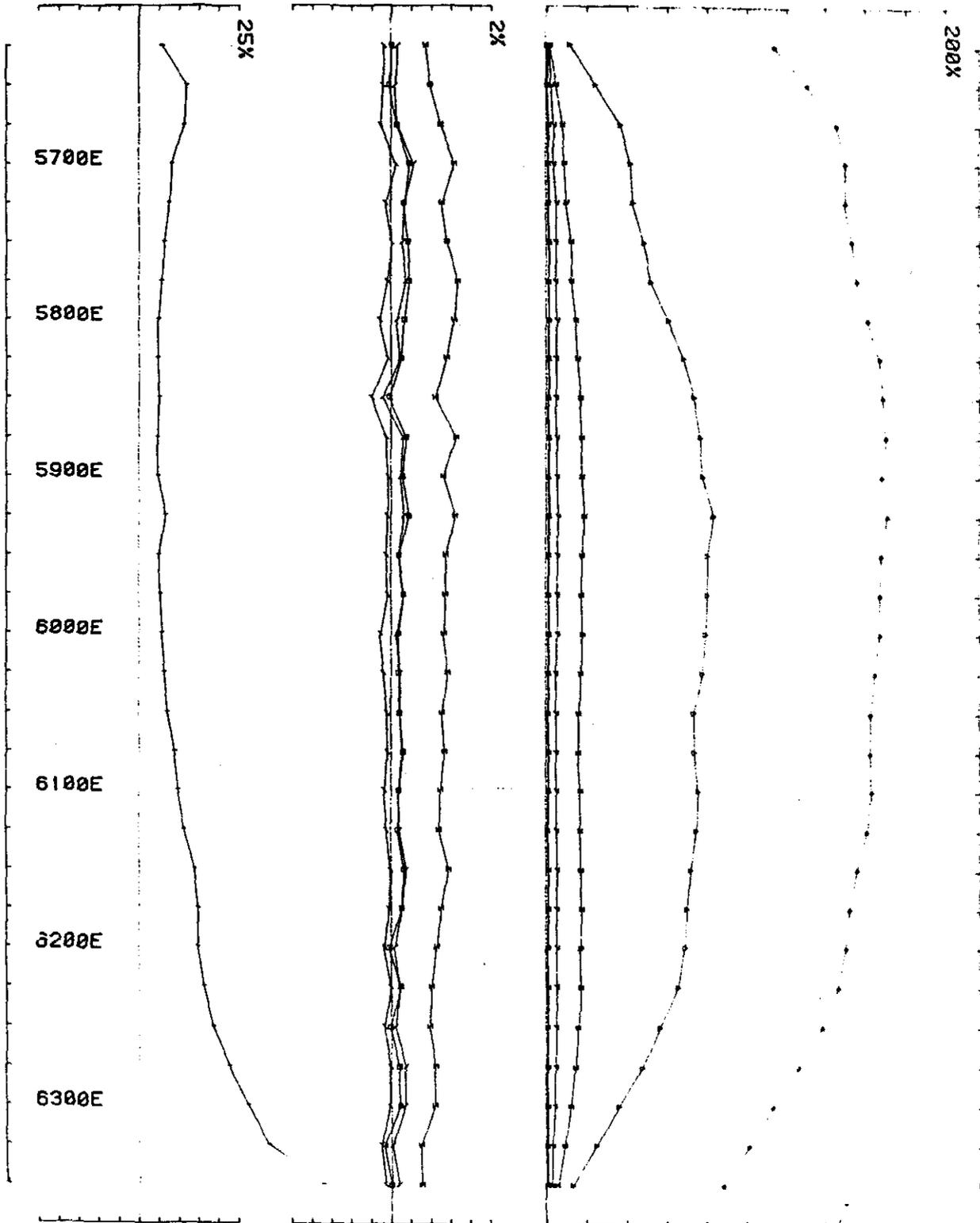
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Project Area Hellyer Survey for Aberfoyle Exploration freq(hz) 26.230
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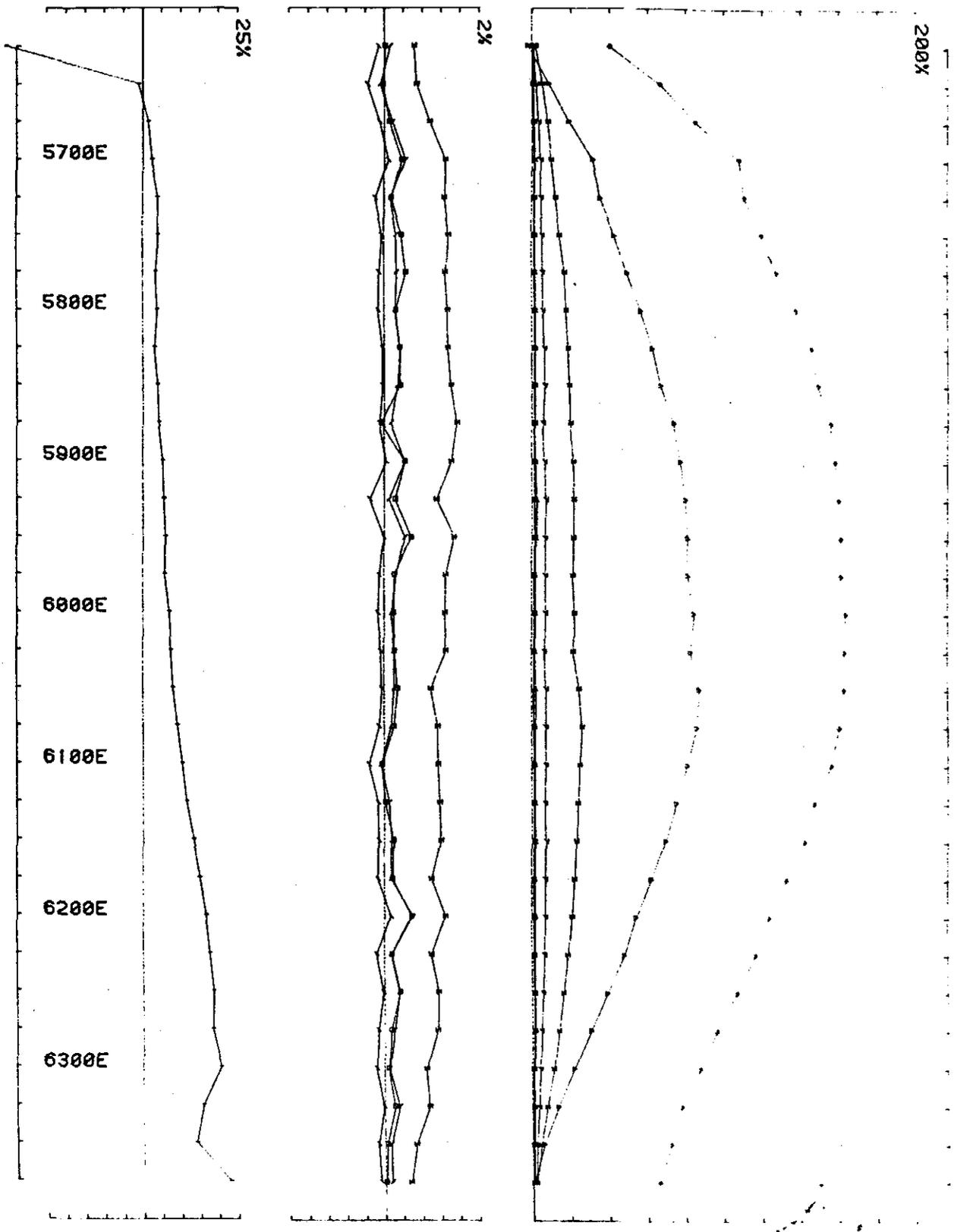
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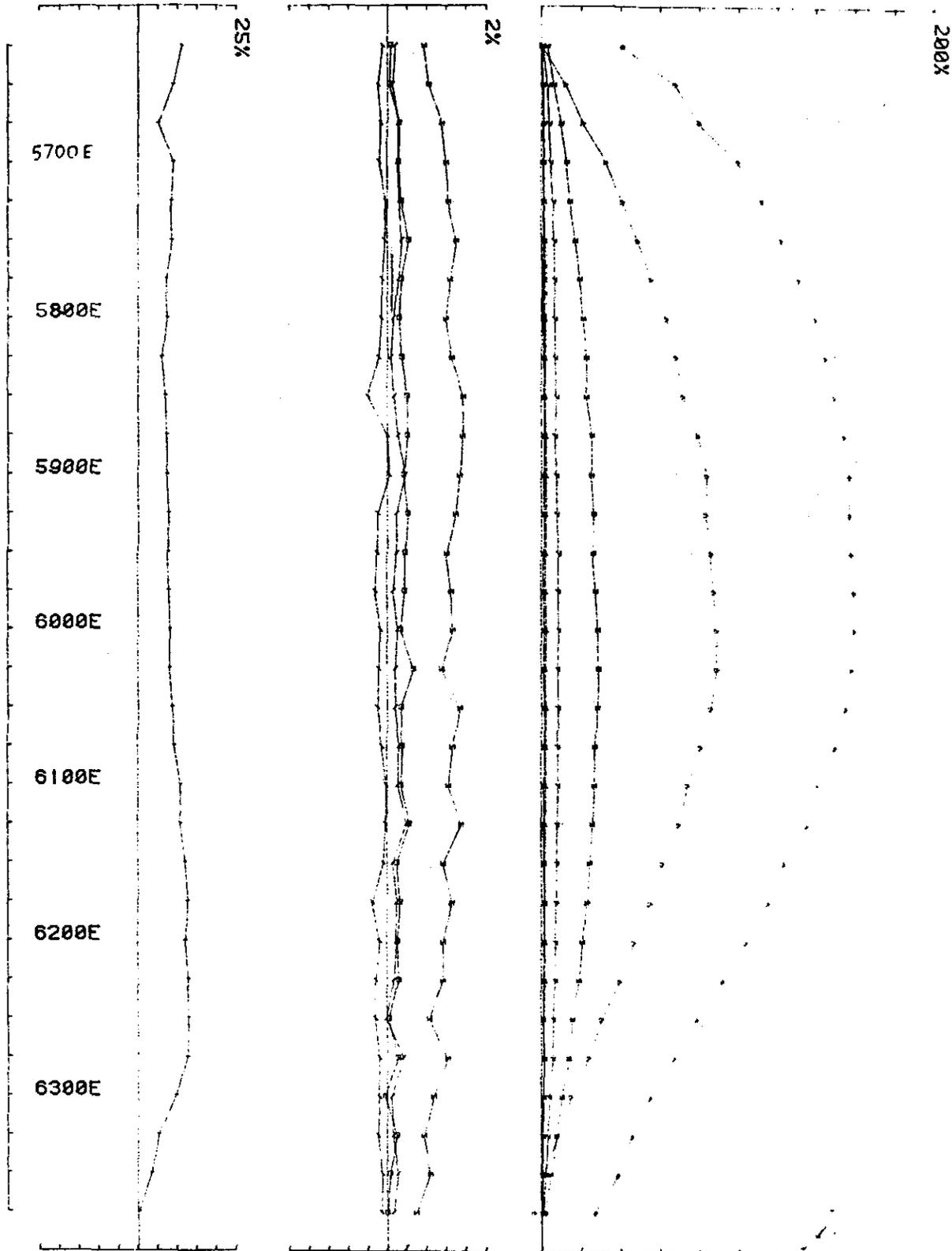
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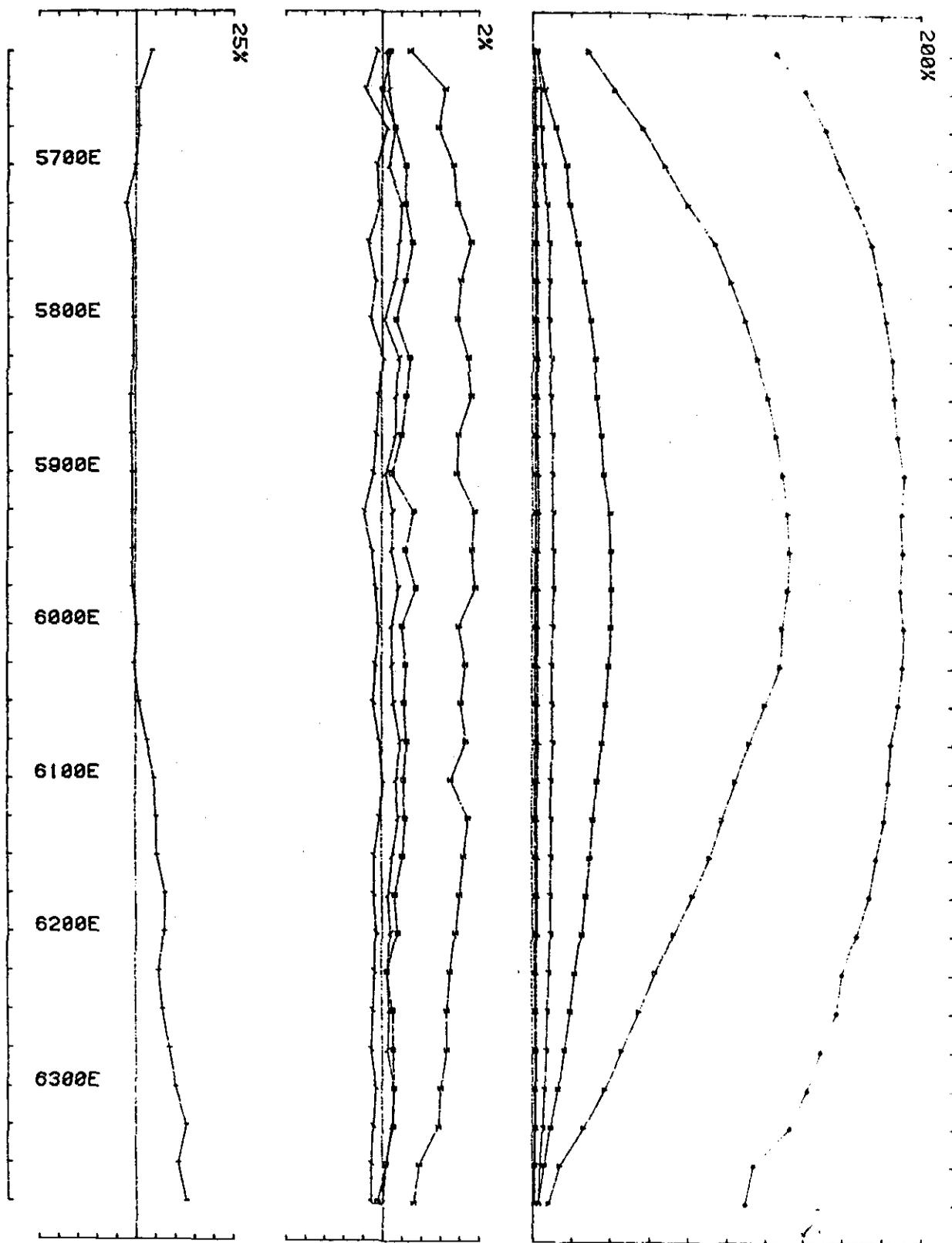
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Project Area Hallyer Survey for Aberfoyle Exploration freq(hz) 26.230
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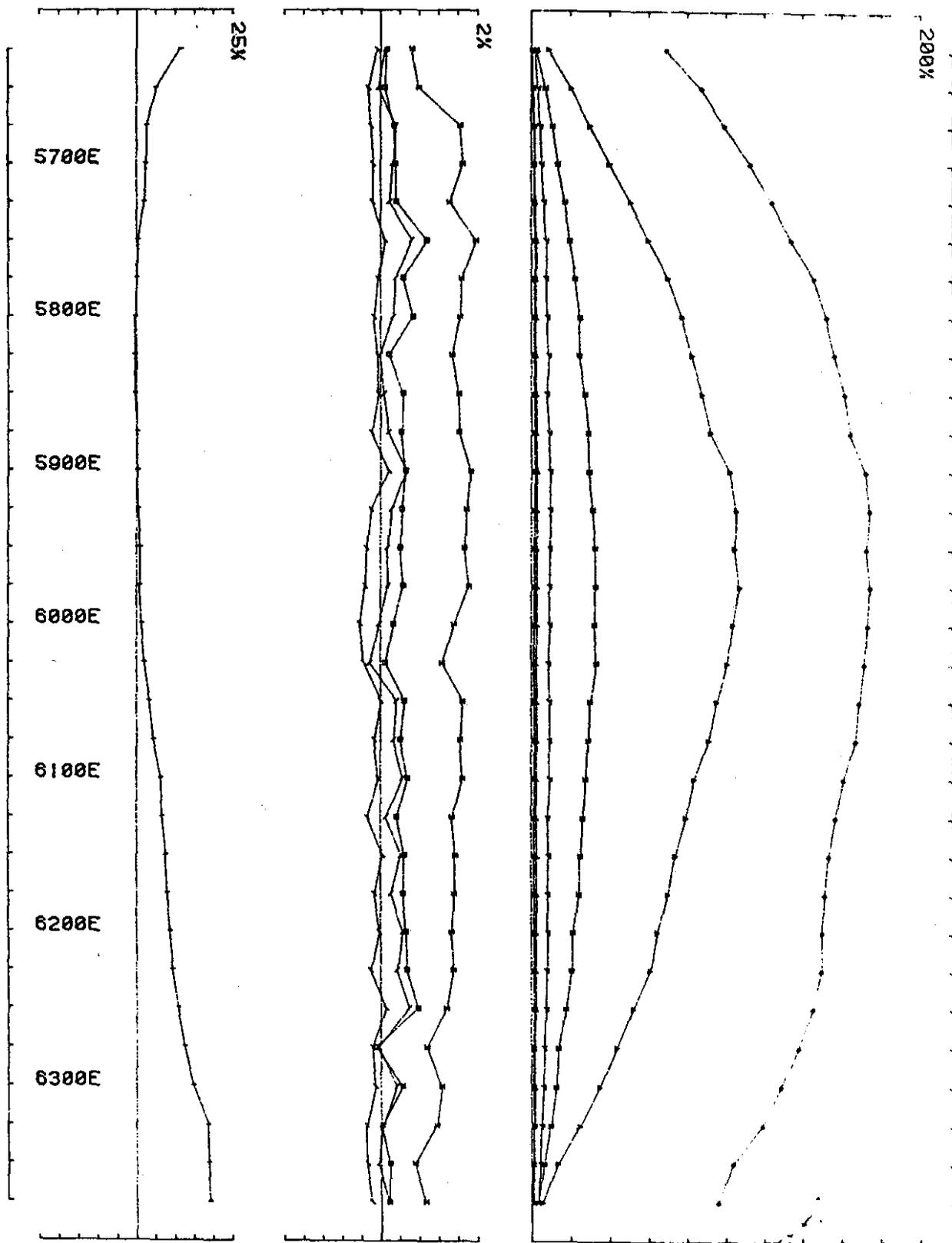
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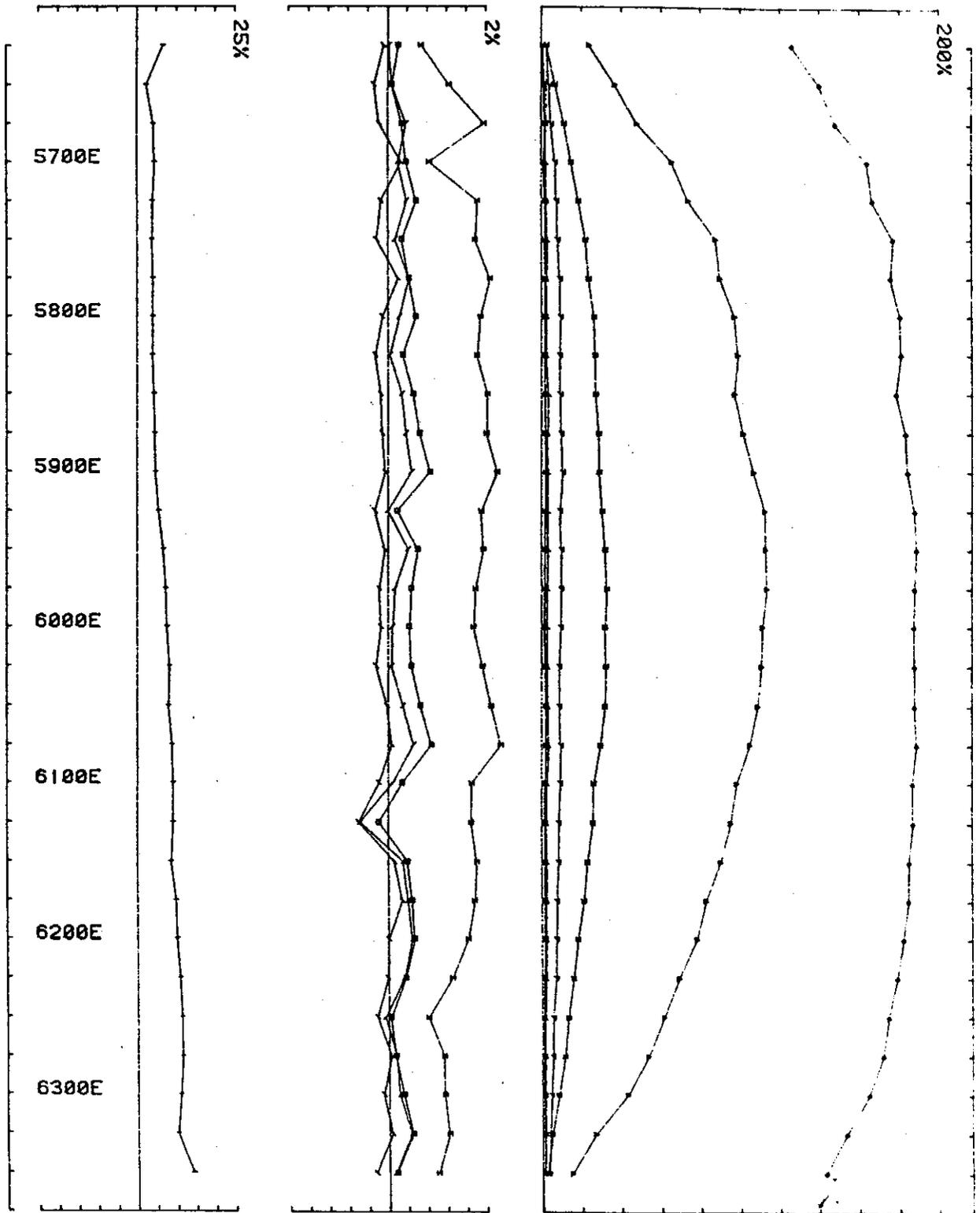
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Loopno 0025 Line 9600N component Hz secondary Ch 1

273

028299



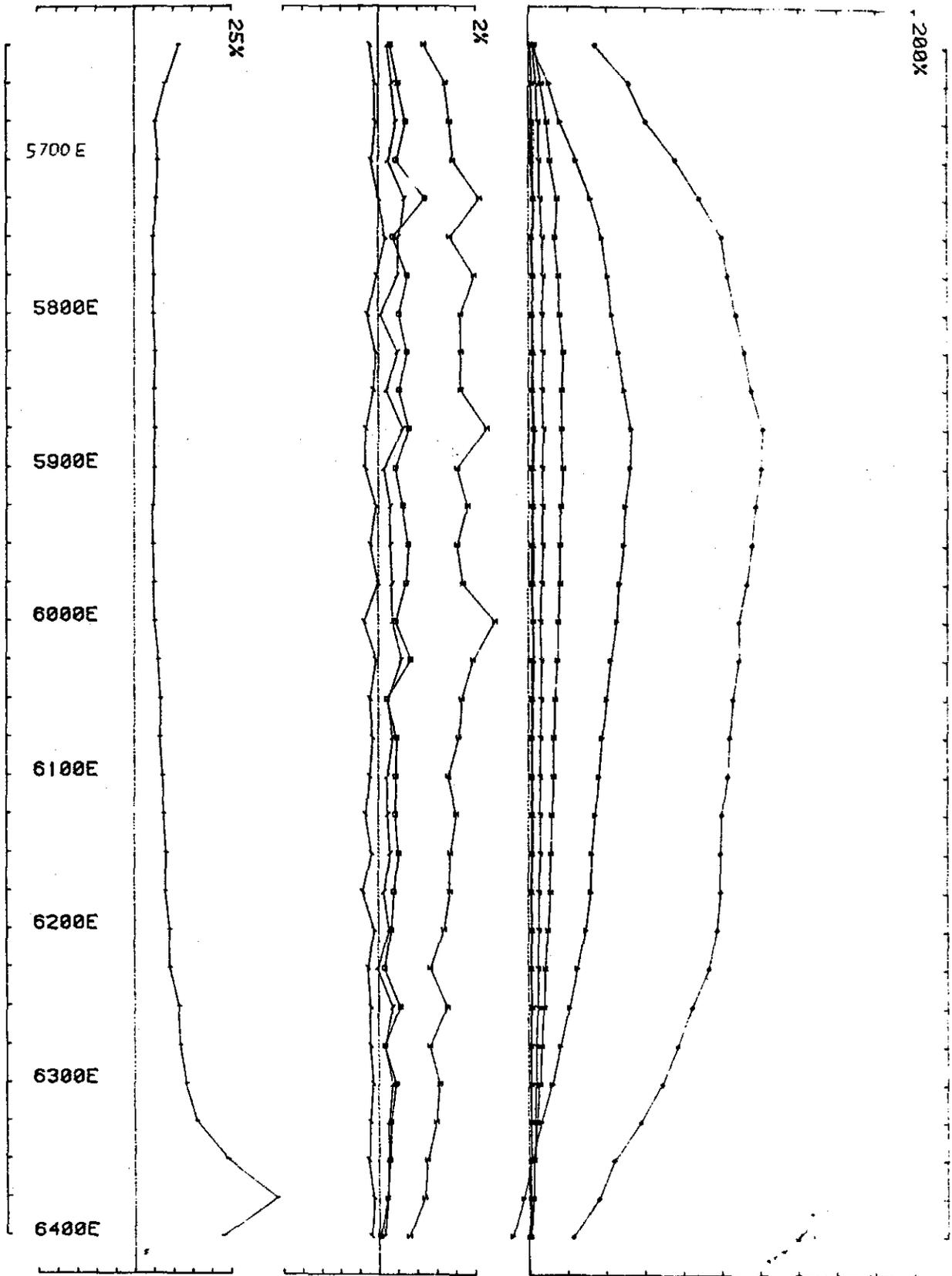
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Loopno 0025 Line 9700N component Hz secondary Ch 1.



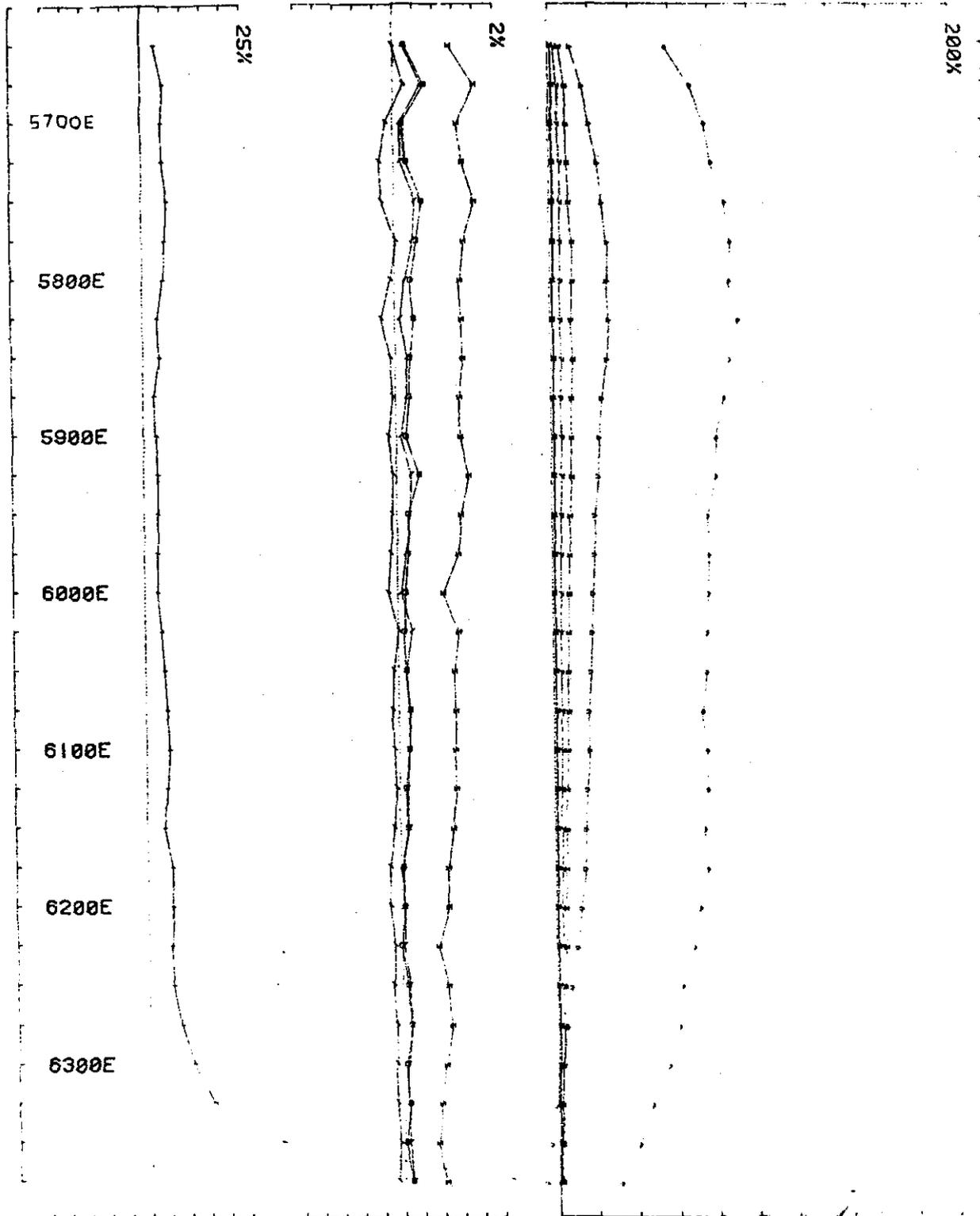
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275

028301



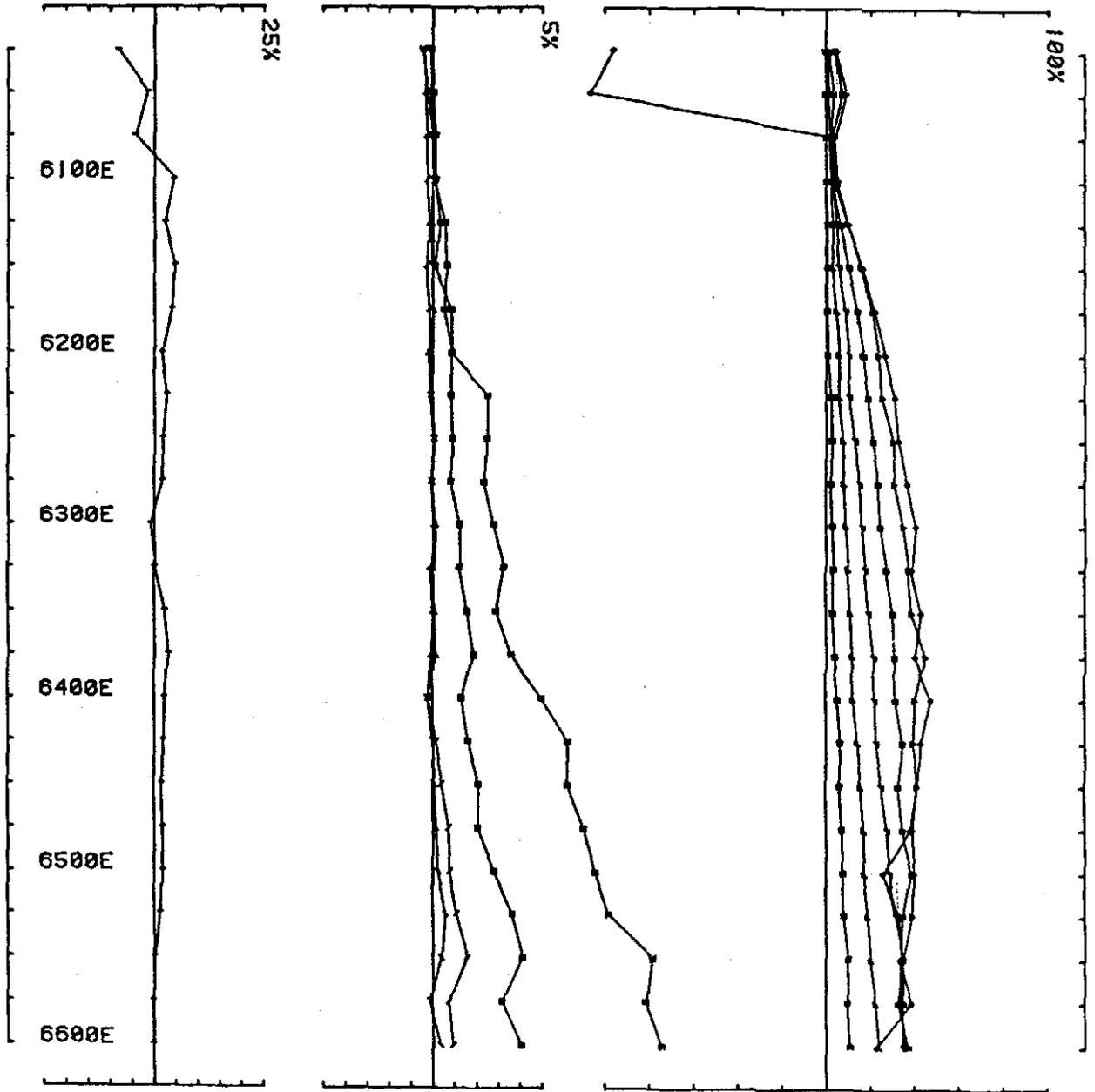
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Loopno 0025 Line 9900N component Hz secondary Ch 1



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Project Area Hellyer Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0025 Line 10000N component Hz. secondary Ch 1.

277

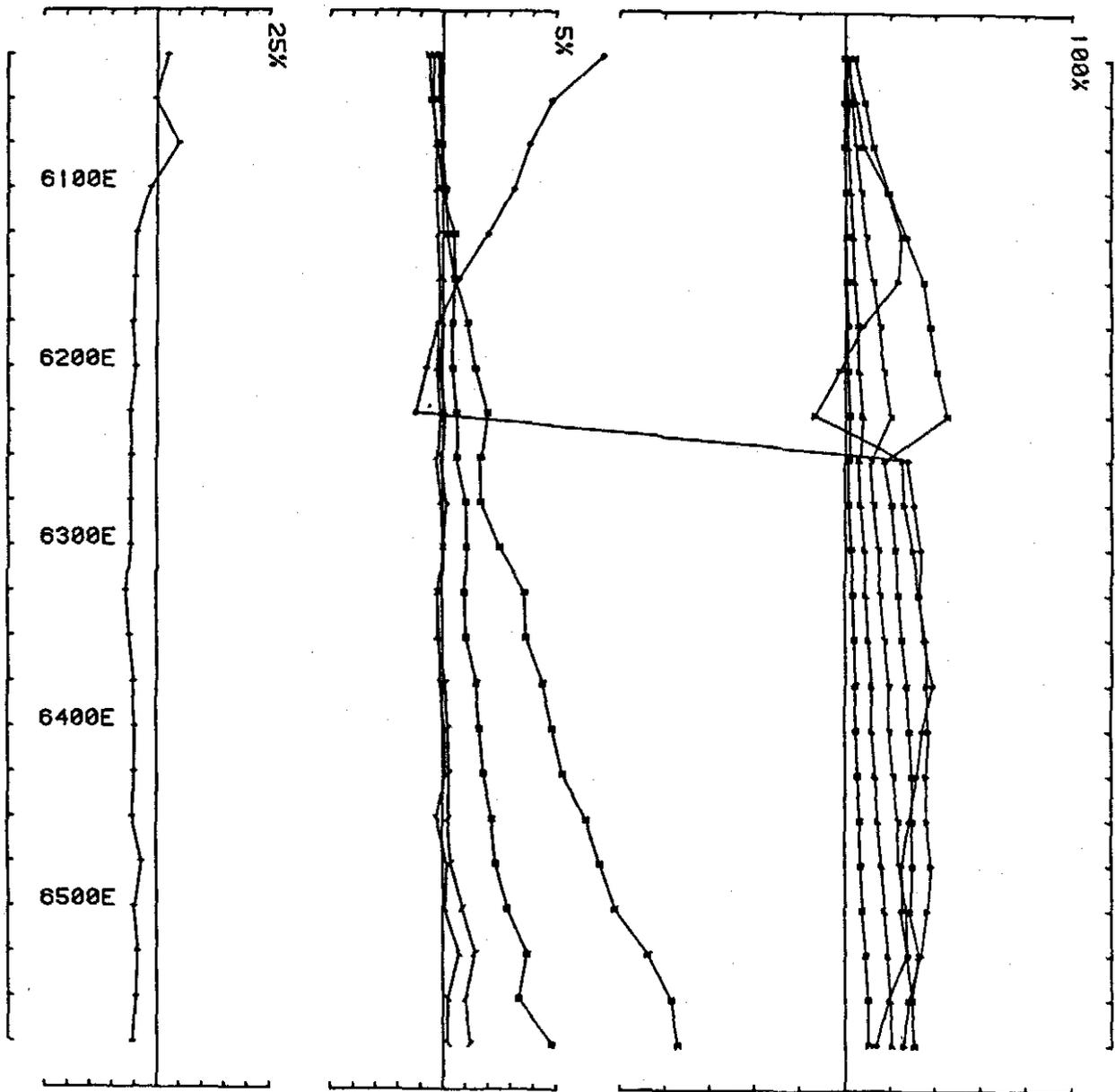
028303



UTEM SURVEY conducted by PMM DGH Job 8548
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Loopno 0027 Line 10200N component Hz secondary Ch 1

278

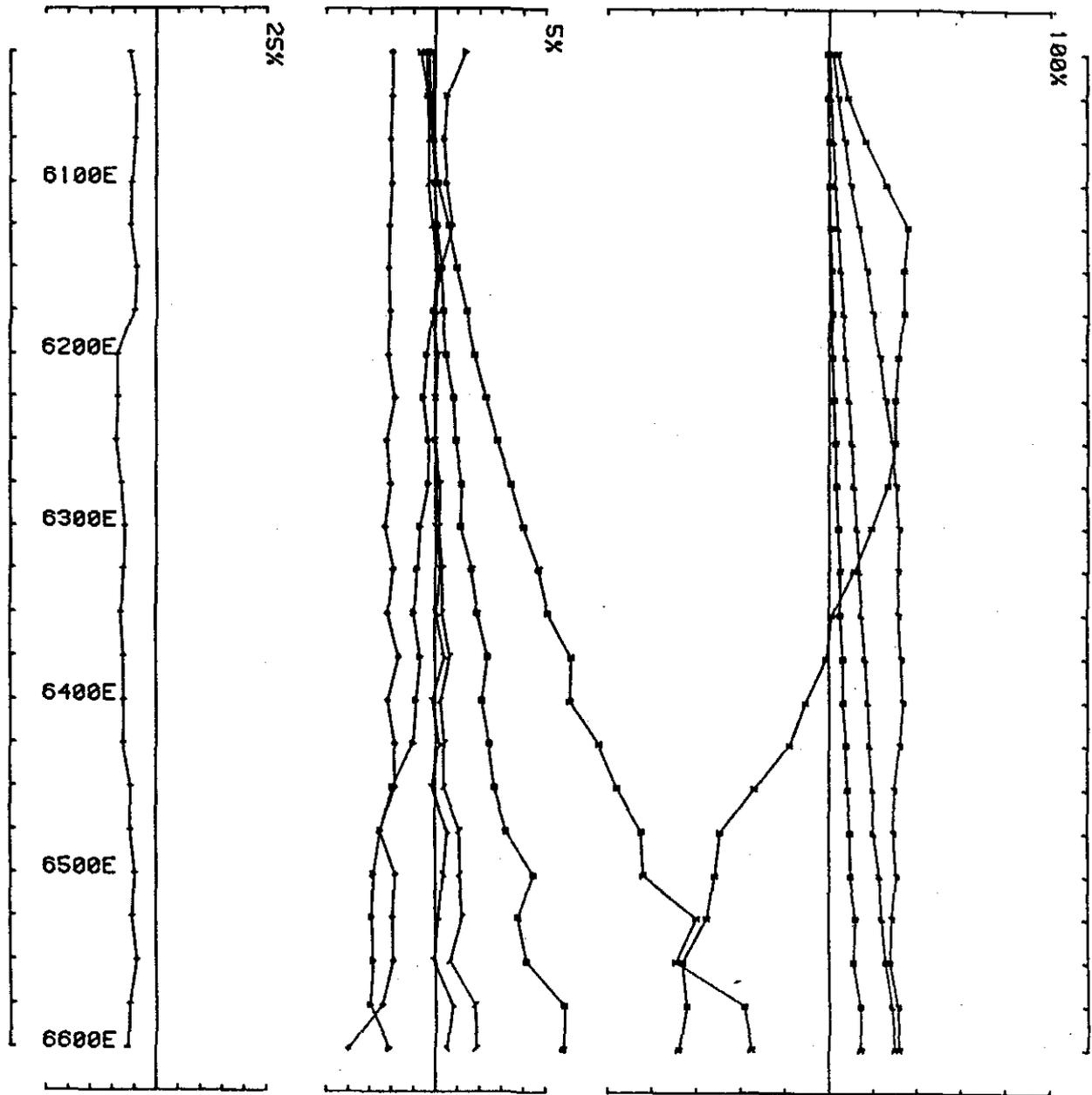
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Project Area Hallyer Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0027 Line 10300N component Hz secondary Ch 1

279

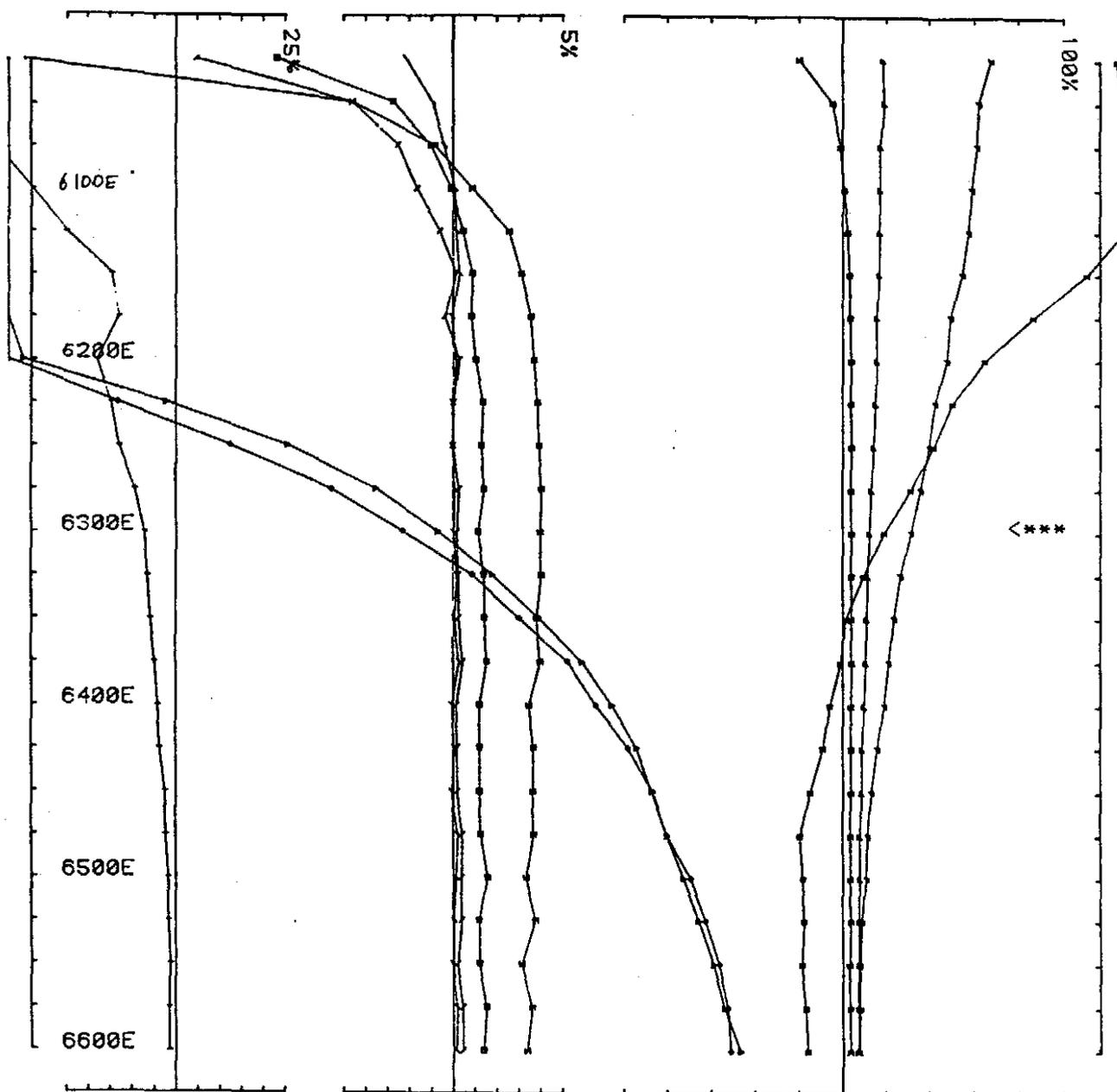
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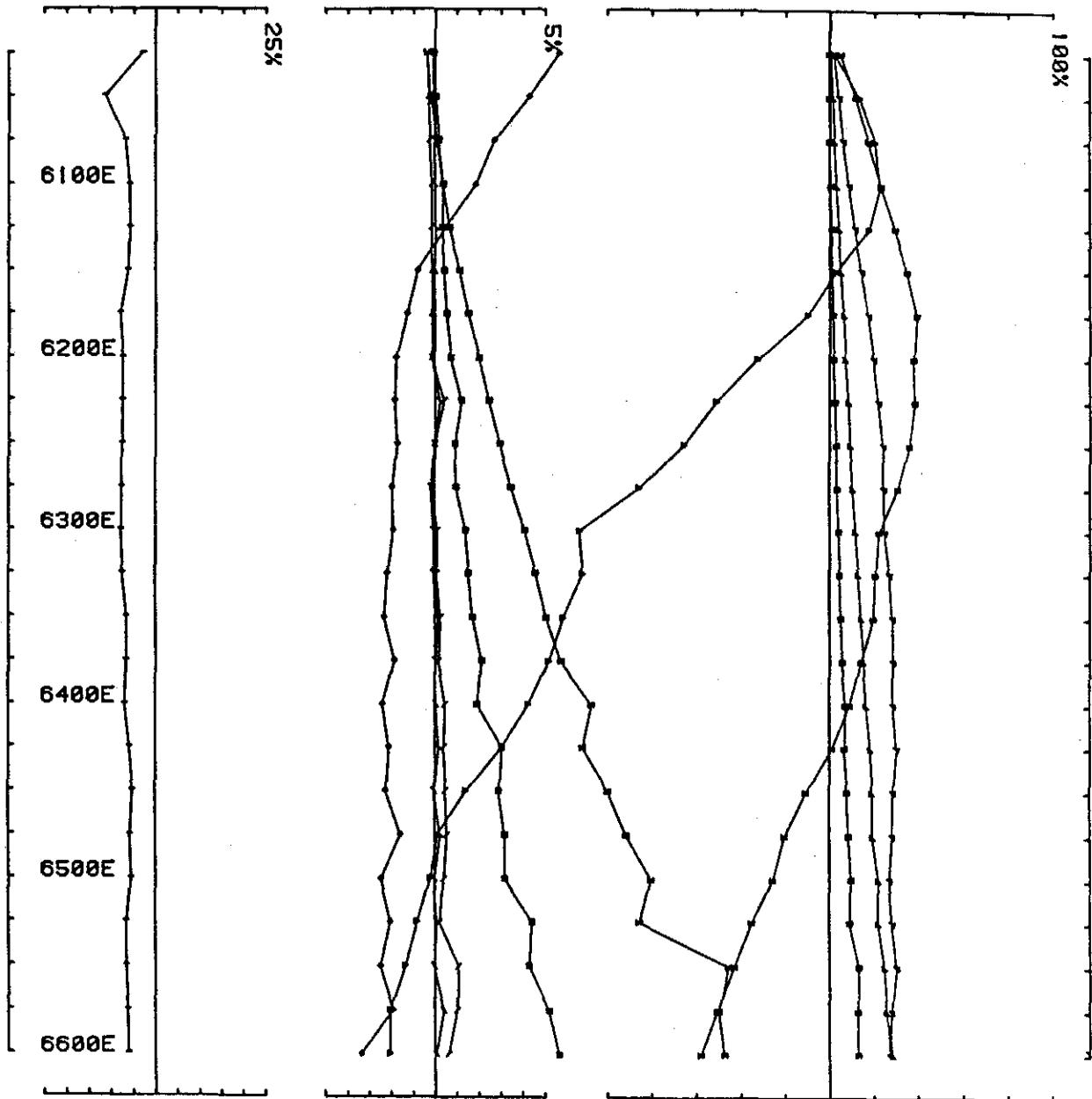
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Loopno 0027 Line 10400N component Hz secondary Ch 1.

280

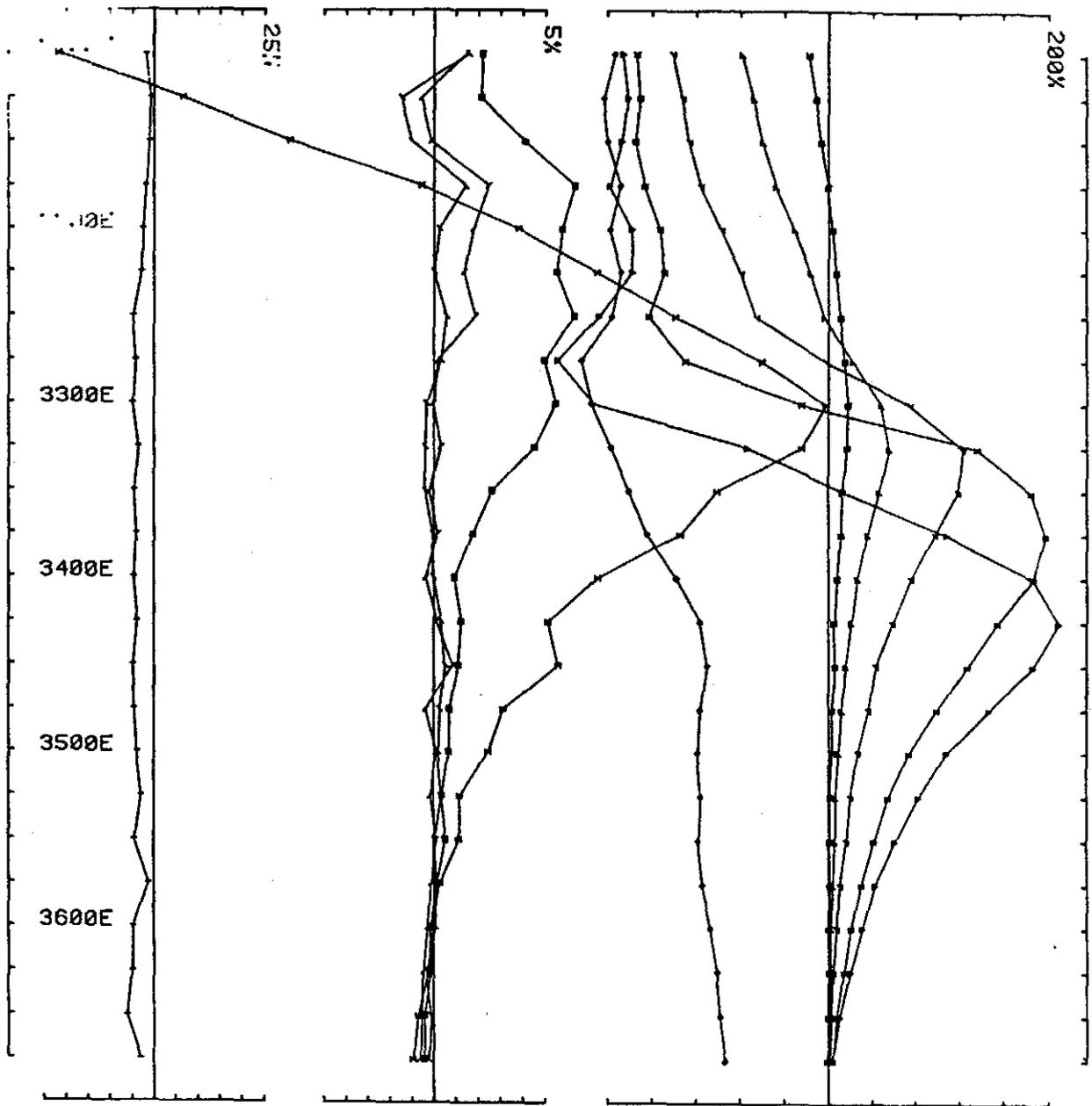
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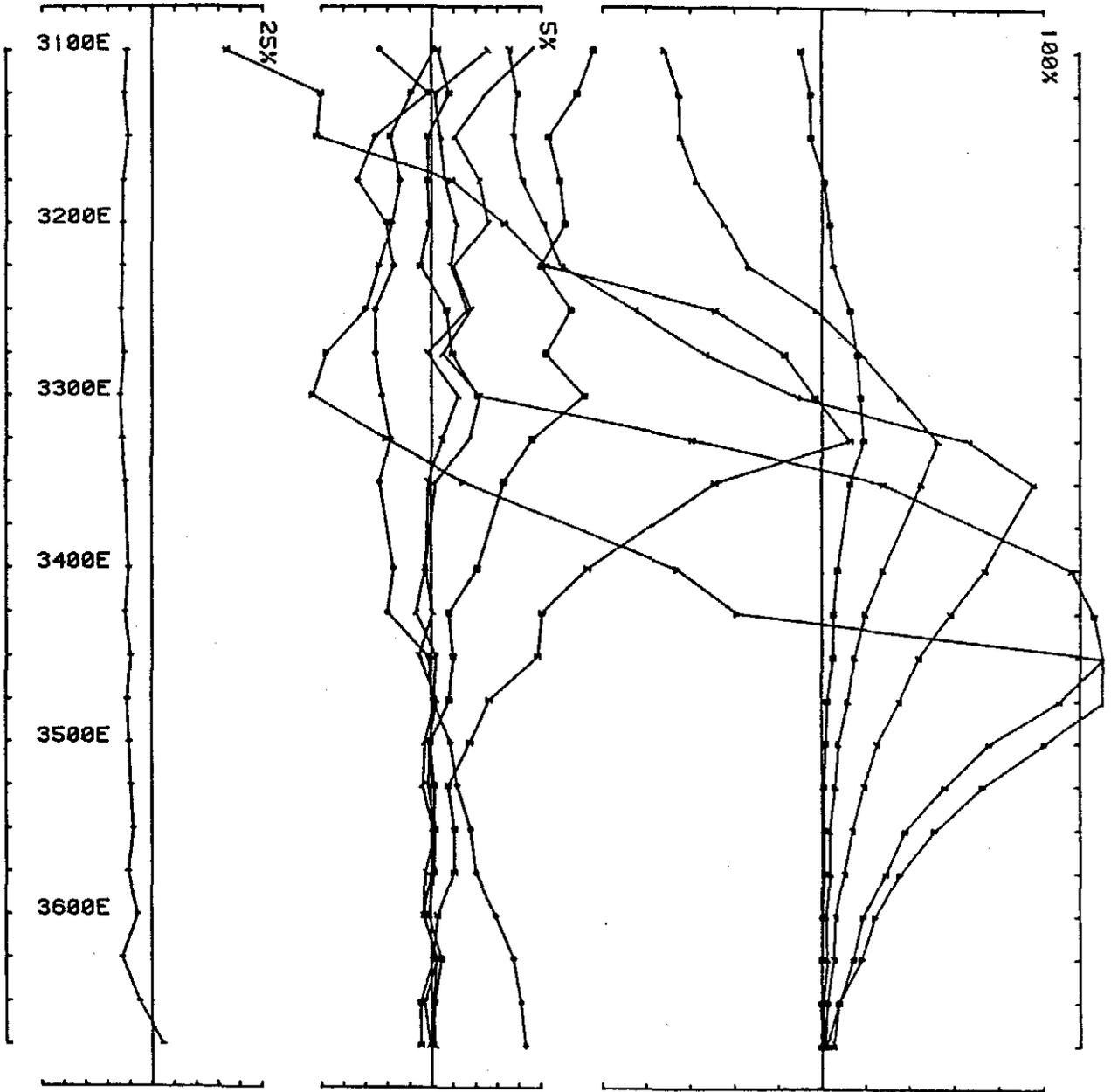
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Loopno 0027 Line 10400N component Hz secondary Ch 1



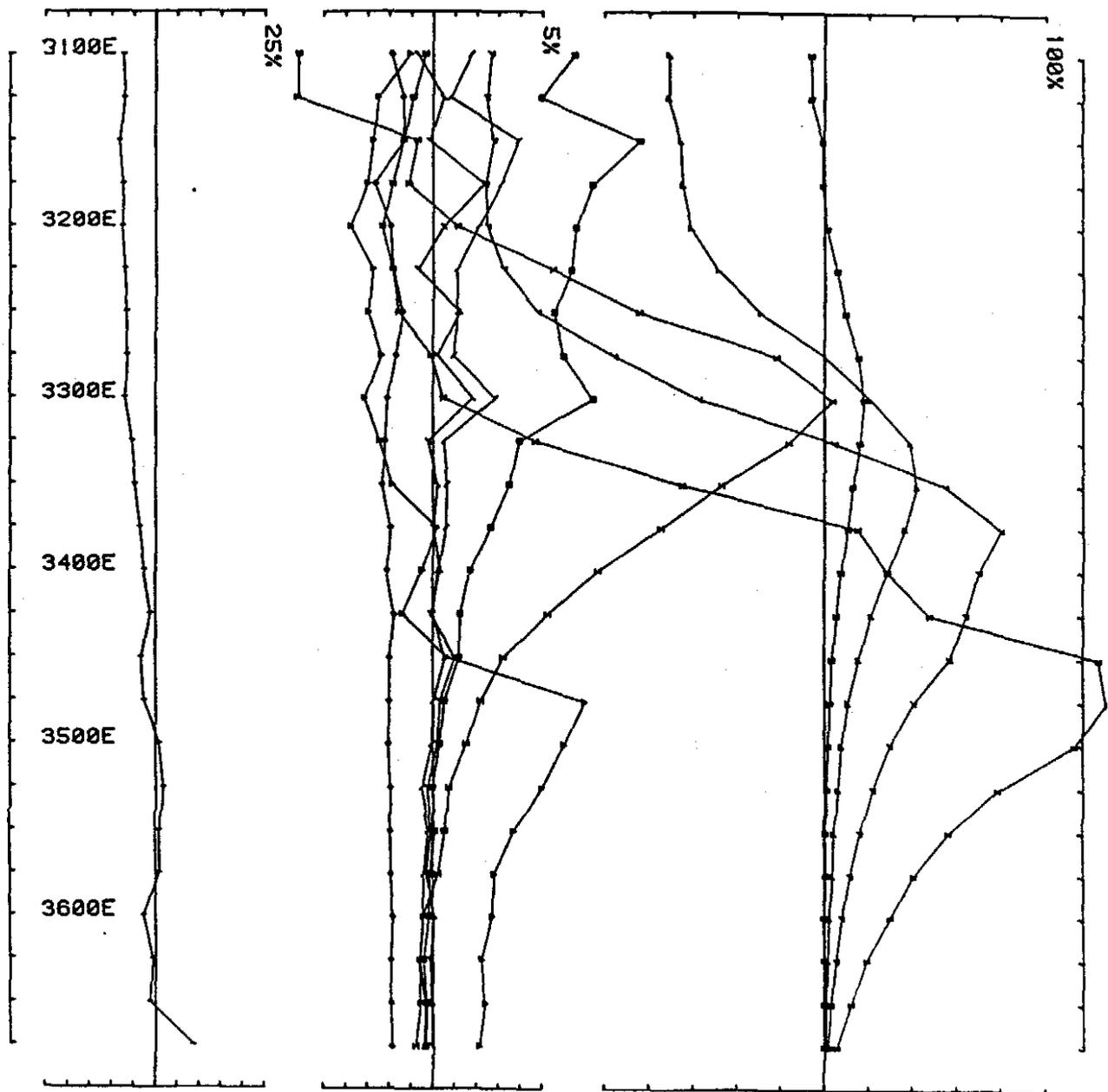
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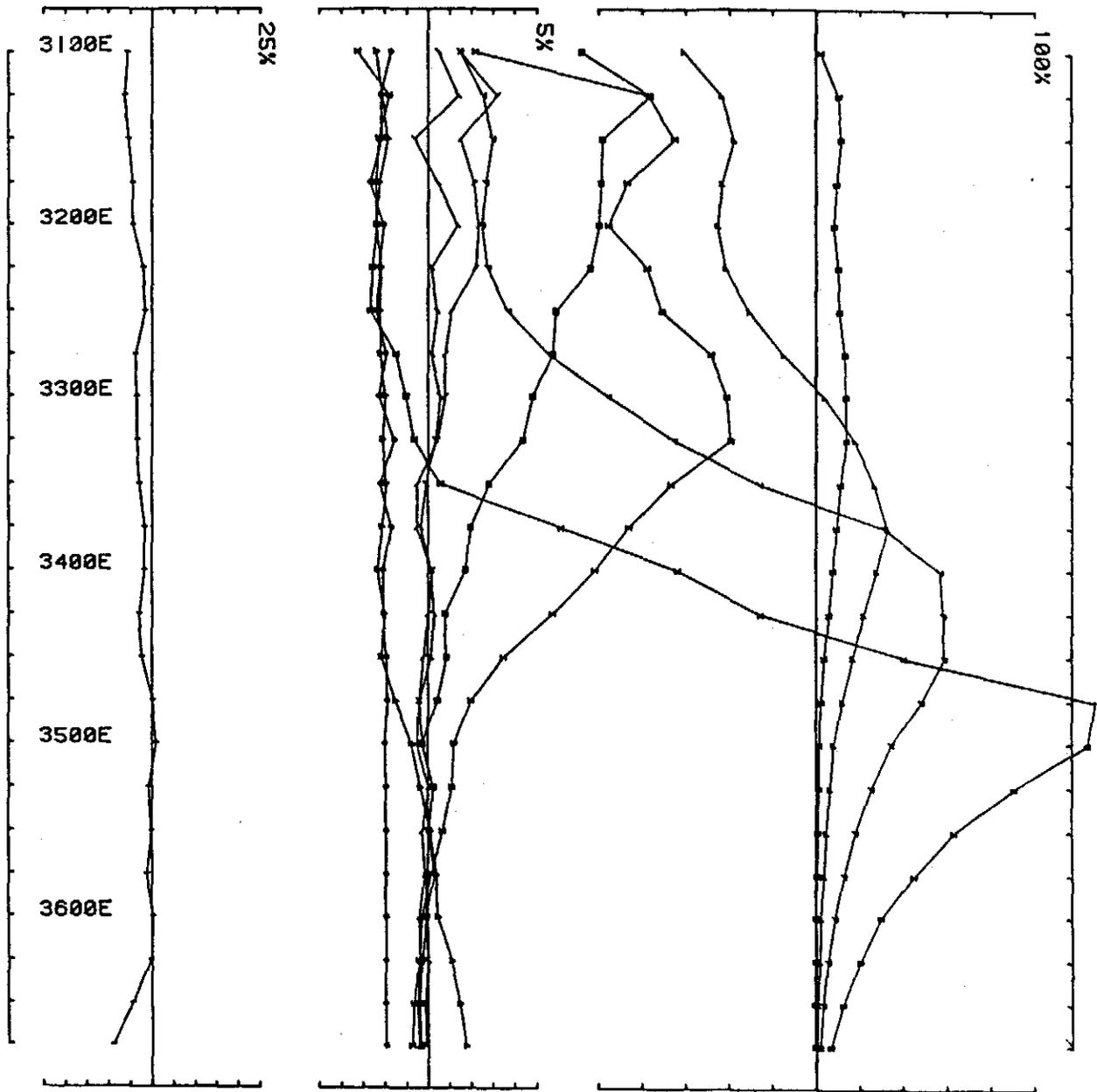
UTEM SURVEY conducted by PMM DGH Job 8549
Project Area Mt. Charter Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0028 Line 5600N component Hz secondary Ch 1



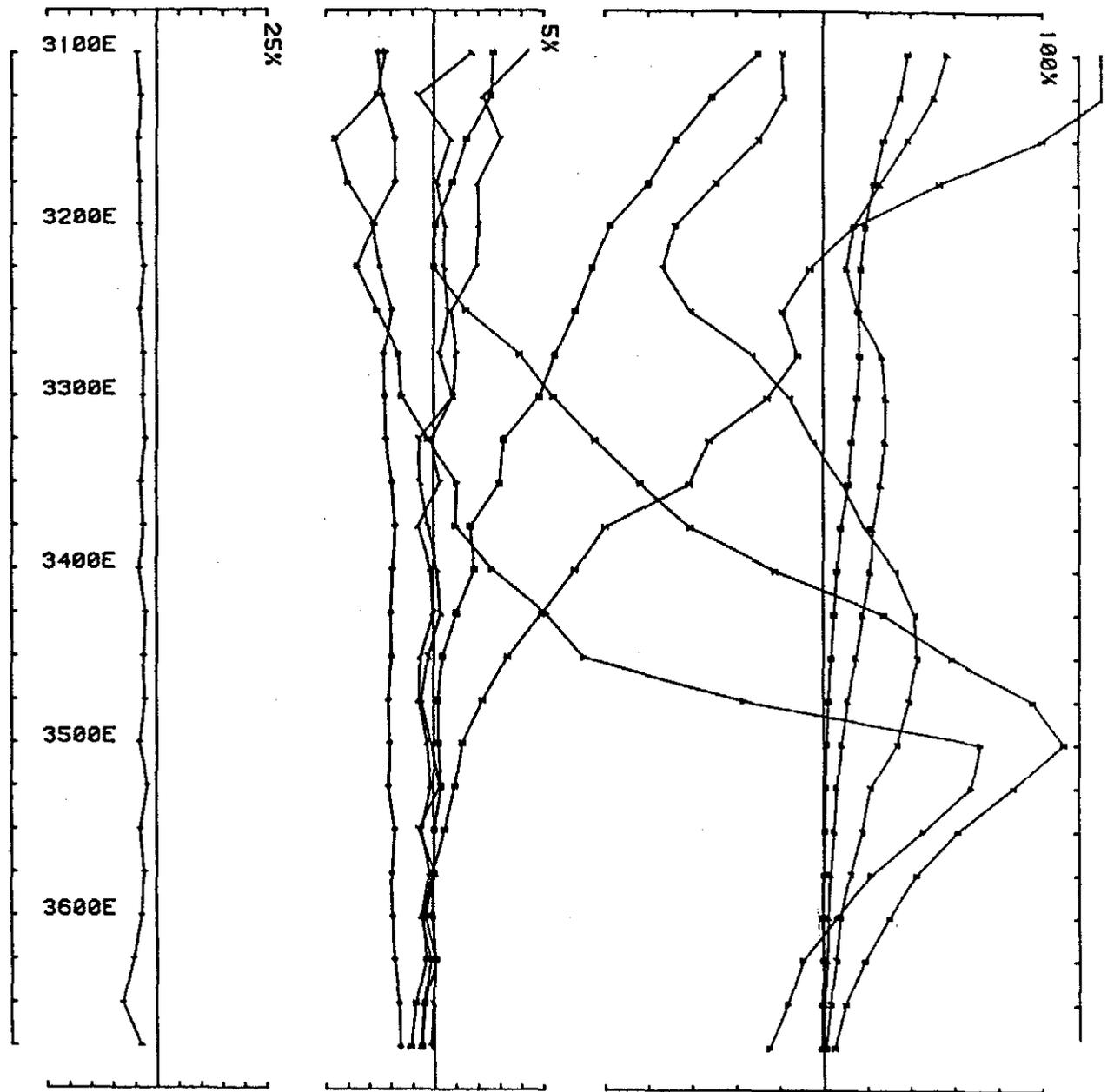
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Project Area Mt. Charter Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0028 Line 5700N component Hz secondary Ch 1.



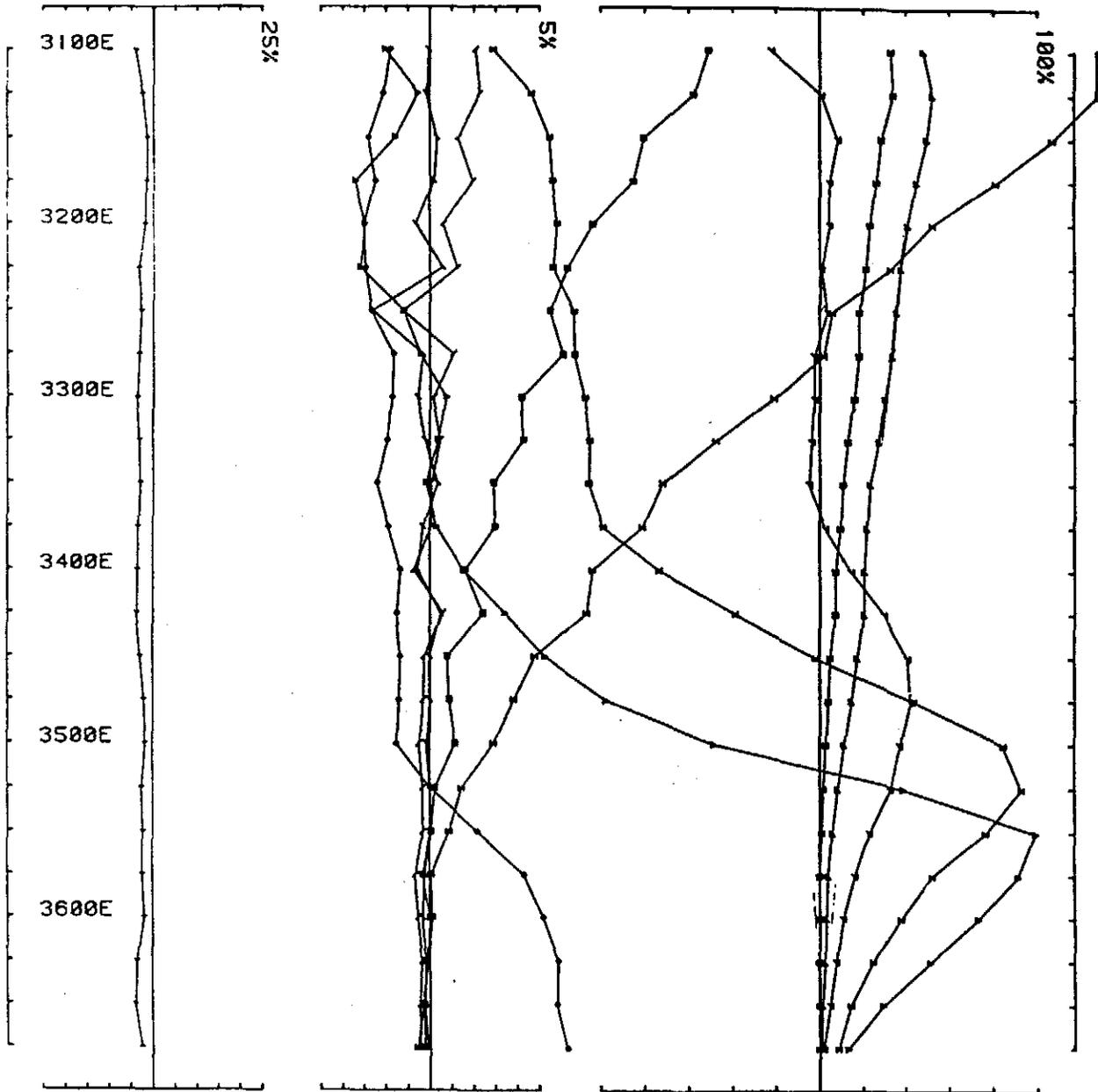
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Project Area Mt. Charter Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0028 Line 5800N component Hz secondary Ch 1.



UTEM SURVEY conducted by PMM DGH Job 8549
Project Area Mt. Charter Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0028 Line 5900N component HZ secondary Ch 1



UTEM SURVEY conducted by PMM DGH Job 8549
Project Area Mt. Charter Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0028 Line 6000N component Hz secondary Ch 1.



UTEM SURVEY conducted by PMM DGH Job 8549
Project Area Mt. Charter Survey for Aberfoyle Exploration freq(hz) 26.230
Loopno 0028 Line 6100N component Hz secondary Ch 1

288

028314

APPENDIX I

PROJECT : MACKINTOSH
 PROSPECT : SCITCHBACK VOLCANICLASTICS

DIAMOND DRILL LOG

HOLE NO: MAC-1
 PAGE: 1 of 9
 LOGGED: AMH
 DATE: APRIL 1985

DEPTH	DRILL RONS	CORE LOG	LITHOLOGY		ALTERATION	VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH		
			ROCK NAME	DESCRIPTION		TYPE	INTENSITY								
2	06 0.05		TRICONE 2.0												
4	15 0		RHYOLITE LAVA (R.L.)	CREAM, QUARTZ PORPHYRITIC RHYOLITE. 5% VOLUME, 1-5mm VESICLES, FLATTENED AND ALIGNED 7.5-8cm.											
6	14 0.2														
8	15 0.6														
10	16 0.51		7.8												
12	15 1.01		BLACK SHALE (br. SL)	BLACK, VERY FINELY (CLIM) DANDIED SHALE											
14	17 0.32														
16	12 0.88														
18	09 0.21														
20	16 0.51														
22	15 1.35														
24	05 0.29		17.7												
26	15 1.18		VESICULAR BASALT LAVA (B. ves. L.)	WEATHERED, DULL PALE GREEN BASALT. CARBONATE WEATHERED OUT OF VESICLES. RARE CHEST INDICATING PILLOW FACIES											
28	08 0														
30	10 0.81														
32	08 0.19														
34	19 1.24														
36	15 1.32														
38	14 0.91														
40	15 0.45														
42	15 0.71														
44	12 0														
46	16 0.5														
48	12 0														
50	16 0.1														
52	15 0														
54	16 0.2														
56	15 0.1														
58	16 0.2														
60	14 0.1														

289

028315

ABERFOYLE EXPLORATION

PROJECT : MACKINTOSH

PROSPECT : SWITCHBACK VOLCANICLASTICS

DIAMOND DRILL LOG

028316

HOLE NO: MAK-1
 PAGE: 3 of 9
 LOGGED: AMH
 DATE: APRIL 1985

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH			
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY										
86	1001		VESICULAR BASALT LAVA (B.V.L.L.)			2										
88	1003					2										
91	1001						2									
93	3004						2									
94	3000															
96	3001															
98	2301					2										
100	1000															
102	0800															
104	1004		A30		A30											
107	0902		BASALT BRECCIA (B.W.)	DARK GREEN, DISTINCTIVELY CRACKLE BRECCIATED NON-VESICULAR LAVA. LARGE FRAGMENTS (1-5cm) IN A MATRIX OF FINE (2-5mm) ANGULAR FRAGMENTS AND CARBONATE	WEAK PALE GREEN (TUCHITE) ALT. OF LARGER FRAGMENT CORES; LATER(?) CHLORITE ALT. OF SMALLER MATRIX FRAGMENTS AND RIMS OF LARGER FRAGMENTS.	2										
108	1604															
110	0701															
112	1102															
114	2000															
116	1003		10-3	As from 50-2-103-0	10-3											
118	2202		VESICULAR BASALT LAVA (B.V.L.L.)	As from 50-2-103-0	WEAK PERVASIVE PALE GREEN (SPIN, CHAB) ALS. SALMON PINK FERROSILICA ALT. IN VESICLES AND BRECCIA MATRIX CARB ONATE.	2										
120	2803															
122	1201		11-7		11-7											
124	1201		ANDESITE LAVA BRECCIA (A.L.L.)	HIGHLY ANGULAR FRAGMENTS, 1-100mm, OF BROWN STAINING (SIDERITE?) GREEN ANDESITE IN A PINK CHERTY MATRIX. RANK CHERTY FRAGMENTS.	STRONG IRONIST STAINING	4										
126	3100															
128	2805		12-9		12-9											
130	1201		ANDESITE LAVA (A.L.)	FINE GRAINED, PREDOMINANTLY MASSIVE ANDESITE LAVA WITH IRREGULAR PATCHES AND VENS OF CREAM CARBONATE (QUARTZ COMMON 1-5um CHLORITE SPK -	WEAK, PERVASIVE PALE GREEN SIB/CARB. ALT. PATCHES OF ILLITE ASSOCIATED.	?										
132	2805															

390

F2
11-2, 4cm, 40°

F
14, 30cm, slightly
weathered rubble

F
11-2, 30cm, FROX
RUBBLE

For 33077 at 1076; For 103-0-10-3
BASALT BRECCIA. QUARTZ/CHLORITE
MATRIX, SERICITE/CHLORITE/
CARBONATE ALTERED CLASTS.
RElict PRIMARY CHROMITE

(PINK ALTERATION - LATE
PHASE WHICH HAS ENTERED
BASALT THROUGH FAULT?)

→ BROWN STAINING OF VESICLES,
MATRIX CARBONATE BELOW
FAULT.
PRG. 33078 AT 11-2m DEP 11-9-12-1

"ANDESITIC" BRECCIA, STRONG
SERICITISED, VARIABLY CHLORITE/
SIDERITE ALT. CLASTS IN SERICITE/
DOLOMITIC/CHERT MATRIX.
MINOR CLASTS OF CHERT

ABERFOYLE EXPLORATION

PROJECT : MACKINTOSH
 PROSPECT : SWITCHBACK VOLCANICLASTICS

DIAMOND DRILL LOG

028317

HOLE NO: MAC-1
 PAGE: 4 of 9
 LOGGED: AMH
 DATE: APRIL 1985

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH		
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY								
128	77	0	ANDESITE LAVA (A.L.)	MAY BE VESICLES OR ASPEN FANG PHENOCRYSTS. SIMILAR APPEARANCE TO BASALT BUT DISTINGUISHED BY LACK OF ROUND VESICLES.	PERMANENT PALE GREEN SERICITE (CARBONATE ALTERATION)	2	127.0	2m - 20cm CONTACTED QUARTZ/CARB. VEINS. CARB. VEIN EDGE, ATZ CORES. LARGER VEINS HAVE PINK/BROWN JEWELRY CORE.								
130																
132	30	0.1						2	127.4, 127.8 - WHITE ASSOC. WITH VEINING.							
134																
136																
138	20	0					[PARTLY PERMANENT PURPLE] KHAKI (FOLI?) ALT.									
140							139.5									
142							140.7	3								
144	30	0.3					VERY WEAK PERMANENT PALE GREEN SERICITE CARBONATE ALT.	1								
146	17	0.2														
148	31	0						1								
150																
152	24	0.1					152.2		150.3	IRREGULAR BROWN STAINING OF CARBONATE IN VEINS						
154	31	0.2					KHAKI (CINDERITE? FOLI?) ALT.	3								
156	17	1.5					154.5									
158	13	0			STRONG PALE GREEN SERICITE (CARB. ALT. AROUND FAULT											
160	0.5	0.4			158.6											
162	20	0.8			KHAKI (CINDERITE?) ALT. AROUND FAULT.	4										
164	6.0	0.7			WEAK PALE GREEN PERMANENT SERICITE CARBONATE ALT.	1										
166																
168	4.0	0.0			158.7											



THE 355077 IS NO. REP 134.5-140.7
 "ANDESITE" BRECCIA.
 CLASTS AND ZONES OF STRONGLY
 SERICITISED AND CARBONATE
 STAINED LEUCO-ANDESITE.
 MATRIX OF SERICITE, DOLOMITE,
 CHERT, CONSPICUOUS MARTITE
 PRIMARY MALACONITE.

F 145.0 30cm, FOLX
RUBBLE
 F 147.1 30cm, FOLX
RUBBLE.
 F 152.1 10cm, RUBBLE
 F 158.2
 FAULT ZONE.
 WEAKLY FOLX
 STAINING RUBBLE
 AND PSD. MANY
 QUARTZ FROM
 157.0 TO 159.0
 MATRIX CLAST
 L. 158.3

OVER

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSA
PROSPECT : SWITCHBACK VOLCANICLASTICS

028318

HOLE NO: MAC-1
PAGE: 5 of 9
LOGGED: AMH
DATE: APRIL 1985

DEPTH	DRILL RUSH	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
170	03 04		ANDESITE LAVA (A.L.)		OLIVE/KHAKI (SIDERITE?) ALT. + WEATHERING AROUND FAULT.	3	"	2						
172	07 04		172-0	FAULT CONTACT?	172-0									
174	16 06		VEESICULAR BASALT LAVA (B.V.L.L.)	DARK GREEN, FINE GRAINED MASSIVE BASALT LAVA WITH SPARSE QTZ CRYST. FILLING OVAL VESICLES.	PALE GREEN PERALUNE SER/CARB? FUCHS ALTERATION	1								
176	20 01													
178	08 05													
180	22 03													
182	24 0													
184	32 01													
186	30 02													
188	18 02				PALE GRN SPOTTY PEARL SHELL/CARBONACT. MIN AROUND FAULT.	5		2						
190	21 01				PALE GREEN PERALUNE FUCHSITEL/SER/CARBON ALT.	1								
192	17 04													
194	51 01				PERALUNE FUCHSITEL ALT., INCREASING INTENSITY TO LOWER CONTACT.	4		2						
196	31 01			GREEN-BLACK SHALE WITH PAINT PRIMARY BANDING, SEVERELY DISRUPTED BY VEINING.										
200	20 02													
202	20 02													
204	20 02													
206	20 02													
208	20 02													
210	20 02													
212	20 02													
214	20 02													
216	20 02													
218	20 02													
220	20 02													
222	20 02													
224	20 02													
226	20 02													
228	20 02													
230	20 02													
232	20 02													
234	20 02													
236	20 02													
238	20 02													
240	20 02													
242	20 02													
244	20 02													
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248	20 02													
250	20 02													
252	20 02													
254	20 02													
256	20 02													
258	20 02													
260	20 02													
262	20 02													
264	20 02													
266	20 02													
268	20 02													
270	20 02													
272	20 02													
274	20 02													
276	20 02													
278	20 02													
280	20 02													
282	20 02													
284	20 02													
286	20 02													
288	20 02													
290	20 02													
292	20 02													
294	20 02													
296	20 02													
298	20 02													
300	20 02													

222

35505 of 2057
Zone of Tholeiitic Siderite
Carbide marginal porphyry
between dioritic and
fine sandstone and alt.
quartz porphyry in
35500.

203-0 - 205-7
Quartz porphyry intrusion
along shale band. 10m
bands of contact alteration
on lower margin.

35500 at 205-2. Ref 203-0 - 205-7
Quartz porphyry. Corroded
Qtz and minor siderite
Albite fracture in granodiorite
of siderite quartz, feldspar
and siderite.

OVER

OVER

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSH
PROSPECT : SWITCHBACK VOLCANIC

HOLE NO: MAC-1
PAGE: 7 of 9
LOGGED: AMH
DATE: April 1985

028320

DEPTH	BELL RUNS CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
		ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
254		DACITE LAVA (D. L.)		"	2	CARBONATE/CARBONATE AS REGULAR STRAIGHT SIDES VEIN, 3-10MM, AND RARE IRREGULAR MATRIX PATCHES	2						
258			257.0 MAJORE FLOW BANDS NOW BRECCIATED LAVA. PATCHES, SPOTS, BANDS OF DARK GREEN CHLORITE - (RECRYSTALLINATION OF GLASSY PHASE?)	259.0 PERVIOUS PINK FELDSPH ALT.	3	1-2mm DARK GREEN CHLORITE VEINING FROM 252.4	(1)						
262				262.0 PATCHY PERVIOUS PINK FELDSPH ALT	4								
264	700			265.0 STRONG PERVIOUS PINK FELDSPH ALT.	5		2 (2)						
278			(278 - RUBBLE IN CHLORITIC ZONE)		5	(278.0 - CHLORITE VEIN?)	2 (2)						
287			287.0 LAVA HAS FLOW BRECCIA CHARACTERISTIC FROM 287.0 TO EOL. 295.3	287.0 PATCHY PERVIOUS PINK FELDSPH ALT	4		2 (2)						

254

APPENDIX J

298

028324

20 MAY REC'D

MAC-1

Central Mineralogical Services



39 Beulah Road
Norwood, S.A. 5067
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Mr. A.M. Hespe
Geologist
Aberfoyle Exploration Pty. Ltd.
P.O. Box 952
BURNIE / TAS. 7320

16th May, 1985

REPORT CMS 85/5/2

YOUR REFERENCE:	Letter dated 19.4.1985
DATE RECEIVED:	7th May, 1985
SAMPLE NOS.:	355076 - 355085
SUBMITTED BY:	A.M. Hespe
WORK REQUESTED:	Petrology

Copy for

H.W. Fander, M. Sc.

Copy to:
The Chief Geologist
Aberfoyle Exploration Pty. Ltd.
144, Camberwell Road
HAWTHORN EAST / VIC. 3123

MAC-1

REPORT CMS 85/5/2

Ten split core samples from DDH MAC 1 were received for petrological examination. Representative thin-sections were prepared and examined together with their respective offcuts, with carbonate stain tests performed as warranted. Attached tabulated descriptions summarise the microscopic data and include interpretative comments.

Summary

This suite comprises thoroughly altered chromiferous basaltic and non-chromiferous leuco-andesitic volcanics with interspersed rhyolitic minor intrusives, altered sedimentary facies, and tectonic breccias.

Volcanics exhibit marked and typically pervasive sericite-chlorite-quartz (+ albite) assemblages, complexed to varying degrees by carbonate impregnations. Mesoscopic colouration is variable from grey (sericitic) to green-grey (chloritic), with patchy yellowish (leucoxene-pigmented sericitic), bright green (fuchsitic), and khaki (sideritic) zones reflecting subtle variations in alteration assemblages.

As sampled, the drilled sequence reflects an interbanding or interfingering of basalts (lavas, lithic tuffs, lava breccias) and leuco-andesitic volcanics which include subaqueous chert-matrixed flow breccia types. There is some evidence of faulting, however, and the sporadic rhyolitic minor intrusives (quartz- or strictly quartz-feldspar porphyries), which appear atypical of hitherto examined Que-Hellyer area intrusives, are conceivably fault-controlled dykes. These rocks may be compared with minor Devonian intrusive porphyries, developed for example at Mount Bischoff, and represent a probable source of sideritic carbonate alteration and veining which overprints the pervasive sericite-chlorite-quartz-calcite assemblage.

D. Cowan, B. Sc.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
355-076 (T.S. 53253) 428	Amygdaloidal Basalt. Calcite-microcrystalline quartz pseudomorphs after pyroxene phenocrysts, frequent quartz + calcite amygdales in a groundmass of kaolinitic/calcite-stained, albitised plagioclase microlaths; kaolin-calcite mesostasis.	Porphyritic, finely amygdaloidal, basaltic.	Fine relict primary chromite. Traces of muscovite in amygdales.	Altered, mildly weathered, amygdaloidal/porphyritic basalt. Calcite-kaolin assemblage appears secondary after chlorite-albite-quartz.
355-077 107-6	Basalt Breccia. Clasts of sericitic to chloritised/calcite-stained, porphyritic/variably amygdaloidal basalt. Matrix of microcrystalline quartz with interspersed clots, films of chlorite, minor clots of albite.	Randomly sorted, angular to irregular, submillimetric to centimetric, semi-dimensionally orientated clasts.	Relict primary chromite, relics of albitised plagioclase.	Flow-structured basaltic breccia, quartz-chlorite-matrixed with sericitised to chloritised clasts. Coarse green clasts are relatively chloritic-carbonated types.
355-078 118-6	"Andesitic" Breccia. Clasts of extensively sericitised/variably chlorite- and sideritic carbonate-stained leuco-andesitic lava. Matrix of weakly sericitic, dolomitic, cryptocrystalline impure chert.	Random angular to irregular, submillimetric to centimetric clasts. Featureless matrix.	Conspicuous oxidised/leucoxenised opaques. Minor clasts of chert.	Impure chert-matrixed, subaqueous "andesitic" (as distinct from basaltic) lava flow breccia. Clasts include minor perlitic-devitrified types.
355-079 140-0	"Andesitic" Breccia. Clasts, zones of extensively sericitised/carbonate-stained quartz-siderite-amygdaloidal leuco-andesitic lava. Minor stringers, matrix of sideritised dolomitic chert.	Flow-structured to brecciated, amygdaloidal to scoriaceous.	Conspicuous martitised primary magnetite. Minor fine muscovite in sideritic amygdales, stringers.	Massive to flow-brecciated, amygdaloidal leuco-andesitic lava. Minor chert matrix. Interspersed interclast vugs of siderite, quartz, muscovite. Affinities with 355078.
355-080 205-3	Quartz Porphyry. Disseminated corroded quartz minor sericitic albite phenocrysts in a groundmass of sericitic microgranular quartz, sericitised feldspar, semi-pervasive clots of sideritic carbonate.	Banded, felsitic (primarily glassy in part).	Thinly disseminated leucoxenised opaques; minor traces of pyrite.	Thoroughly quartz-sericite-siderite-altered quartz(-feldspar) porphyry; banded, semi-chilled minor intrusive characteristics.
355-081 213-5	Breccia. Clasts of pervasively sericitised leuco-andesitic, similarly altered basaltic lava, sericitic impure chert and pelitic ash. Sericite matrix with interspersed films, clots of sideritic carbonate, minor clots of fuchsite.	Phyllitic, sericite-matrixed breccia with randomly sized angular clasts.	Traces of chromite in altered basalt clasts. Conspicuous leucoxene stainings. Rare fine pyrite.	Composite (altered andesite, basalt, cherty, pelitic ash) tectonic breccia characteristics. Sericite-matrixed; sheared/phyllitic.
355-082 245-8	"Scoriaceous Breccia". Clasts of sericitised-chloritised/variably siderite-impregnated basaltic pumice, vesicular lava clasts, minor similarly altered "andesite" clasts. Matrix of sericitic-silicified pelitic ash.	Poorly sorted psammitic lithic fragmental with a phyllitic shearing overprint.	Disseminated chromite; traces of pyrite.	Thoroughly altered; relatively sheared ash-matrixed basaltic lithic tuff. Affinities with 355076, 077 in terms of composition.
355-083 339-2	Amygdaloidal Andesite. Albitised/sericite-calcite-stained plagioclase phenocrysts, frequent fine quartz amygdales in a thoroughly chlorite-calcite-sericite-altered, felsitic to plagioclase-microlathic groundmass.	Semi-glomeroporphyritic, finely amygdaloidal, flow-banded, weakly flow-brecciated. Weakly stressed.	Conspicuous leucoxenised opaques. Sporadic chlorite-selvedged calcite veinlets, vugs.	Thoroughly altered porphyritic-amygdaloidal leuco-andesitic lava. Affinities with 355079, compositionally and texturally.

3500

Sample No.	Classification - Composition	Fabric	Accessories	Comments
355-084 346.1	<u>Scoriaceous Breccia</u> . Clasts of thoroughly sericite-chlorite-quartz-altered/variably calcite-impregnated, vesicular to pumiceous basaltic lava. Fine to semi-sericitic white mica matrix.	Analogous to 355082, coarser-grained clasts, relatively phyllitic matrix.	Leucoxenised opaques, chromite, traces of pyrite. Minor clots of sideritic carbonate.	Close affinities with 355082, but coarser-grained and sericite- rather than altered ash-matrixed. Interpreted as a pumiceous flow-breccia rather than strictly pyroclastic.
355-085 (T.S. 53262) 205.7	<u>Quartz Porphyry/Altered Psammopelite</u> . Altered quartz porphyry (sim. 355080, sericite- and siderite-veined) in contact with sericitised/siderite-stained arkosic fine sandstone. Interzone of thoroughly sericitised chilled-marginal porphyry.	Porphyry analogous to 355080. Phyllitic-displacive sheared contact. Stressed veinlets.	Carbonaceous matter, syngenetic pyrite in altered sandstone. Minor pyrite in sericitic chilled margin.	Minor intrusive "rhyolitic" porphyry with a narrow, thoroughly sericitised chilled marginal contact zone. Sericite- and subsequently siderite-veined; mildly sheared.

SAMPLE NO: 355076
LOCATION: DDH MAC-1/42.8m
REPRESENTATIVE OF: 32.3 - 45.2
REMARKS: Vesicular basalt above ore position. Describe mineralogy and texture. Does it contain chromite? Is weathered fragment of the same composition?

SAMPLE NO: 355077
LOCATION: DDH MAC-1/107.6m
REPRESENTATIVE OF: 103.0 - 110.3
REMARKS: Brecciated zone within basalt. What is the composition of the fragment and the matrix? What is the composition of the larger pale green fragments?

SAMPLE NO: 355078
LOCATION: DDH MAC-1/118.6
REPRESENTATIVE OF: 115.9 - 122.1
REMARKS: What is the matrix composition of this breccia? Are fragments variably weathered/alterd basalt as in previous two samples?

SAMPLE NO: 355079
LOCATION: DDH MAC-1/140.0
REPRESENTATIVE OF: 139.5 - 140.7
REMARKS: This rock type is probably vesicular basalt as in previous samples. What type of alteration has caused the grey/khaki colouration of this sample. Any chromite?

SAMPLE NO: 355080
LOCATION: DDH MAC-1/205.3
REPRESENTATIVE OF: 203.0 - 205.7
REMARKS: Describe texture, composition, alteration of this rock. Does it have any intrusive characteristics?

SAMPLE NO: 355081
LOCATION: DDH MAC-1/213.5
REPRESENTATIVE OF: 206.6 - 225.2, 226.6 - 249.0
REMARKS: What is composition of large buff coloured fragments, matrix and soft yellow mineral?

303

SAMPLE NO: 355082
LOCATION: DDH MAC-1/295.8
REPRESENTATIVE OF: 295.3 - 296.4
REMARKS: Interpreted to be a lithic tuff. Is the composition similar to basalt of previous samples?

SAMPLE NO: 355083
LOCATION: DDH MAC-1/339.2
REPRESENTATIVE OF: 334.0 - 340.0
REMARKS: Interpreted to be a basalt. What is the alteration type. Any chromite?

SAMPLE NO: 355084
LOCATION: DDH MAC-1/346.1
REPRESENTATIVE OF: 346.0 - 358.0
REMARKS: Is this a basaltic lithic tuff similar to 355082?

SAMPLE NO: 355085
LOCATION: DDH Mac-1/205.7
REPRESENTATIVE OF: 205.7
REMARKS: Contact between possible intrusive (355080) and shale. Is the white band between the intrusive and shale a contact metamorphic effect? Is the intrusive dacitic or rhyolitic?

Central Mineralogical Services



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BURNIE / TAS. 7320

2nd August, 1985

REPORT CMS 85/7/39

YOUR REFERENCE:	Letter dated 19.7.1985
DATE RECEIVED:	23rd July, 1985
SAMPLE NOS.:	355176 - 355178
SUBMITTED BY:	A.M. Hesse
WORK REQUESTED:	Petrology

Copy to:
The Chief Geologist
Aberfoyle Exploration Pty. Ltd.
144, Camberwell Road
HAWTHORN EAST / VIC. 3123

H.W. Fander for
H.W. Fander, M. Sc.

MAR-1

REPORT CMS 85/7/39

Three drill core samples from DDH/MAC-1 were received for petrological examination. Representative thin-sections were prepared and examined together with the respective offcuts. Microscopic data is summarised in the attached tabulated descriptions, which include interpretative comments.

Summary

This suite includes two examples of thoroughly altered andesitic volcanics and a similarly intensely altered and weakly sheared scoriaceous breccia.

On the basis of relict features the andesites may be categorised as amygdaloidal lava (355176) and a lithic-vitric tuff of probable ignimbritic mode of origin (355177). The latter rock appears relatively felsic, mesoscopically, due to a relatively siliceous and sericitic alteration pattern which partly obscures the otherwise typical andesitic characteristics.

The breccia (355178) comprises largely strongly pumiceous, variably chromitiferous basalt clasts, but includes sporadic clasts of non-pumiceous andesite and, on this basis, the rock is "polymict". Andesite clasts are presumably xenoliths stripped from a pre-existing lava, but interpretation will be dependent on field evidence.

D. Cowan, B. Sc.

SAMPLE NO: 355177
LOCATION: MAC-1/290.0
REPRESENTATIVE OF: 287.9 - 295.3
REMARKS: Logged as dacite but perhaps a strongly
feldspar/silica altered porphyritic andesite.

SAMPLE NO: 3551788
LOCATION: MAC-1/320.6
REPRESENTATIVE OF: 319.0 - 326.0
REMARKS: Fuchsite altered basaltic volcanoclastic. Is this
unit polymict? What is being altered to form
fuchsite?

SAMPLE NO: 355176
LOCATION: MAC-1/308.0
REPRESENTATIVE OF: 296.4/319.0
REMARKS: Assumed to be an andesite lava because of a very low
chrome assay. Is this supported by petrology?

APPENDIX K

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSH
PROSPECT : A-ZONE

HOLE NO: HL-80
PAGE: 1 of 10
LOGGED: AMN
DATE: 12-4-85

DEPTH	DRILL RISE	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
2	30	0	BLACK SHALE	STRONGLY WEATHERED, BANDS OF BLACK CHALK.						0-11-3	OXID			
4	15	15		1.5 THINLY BLACK BANDS OF SHALE. FINE PYRITE (+PHALLOITE?) AT 40" H.						STRONGLY BROKEN	OXID			
6	10	78	6.5						6.5		OXID			
8	15	75	VEVICULAR BASALT LAVA.	NEARLY STERILE, CAVERNOS VEVICULAR BASALT. PEPPERITIC SHALE INCLUSIONS ON CONTACT.	9.0				IRREGULAR SPINDLING PATCHES OF PYRITE SUBORDINATE SHALE ZONES AND HIGHLY FUCHSITE ALTERED GRANULITE.	6.5	OXID			
10	15	67			FUCHSITE PERVASIVE IN PATCHES AND AS 1-2mm GREEN SPOTS	4				REINFORCEMENT OF ROCK FABRIC (i.e. VESICLES, ALTERATION PATCHES, PYRITE ZONES) AT 35" TO 40" TO C.D.	OXID			
12	15	44									OXID			
14	30	0		12.0 PALE GREEN/GREY VESICULAR BASALT. MINOR PEPPERITIC SHALE TO 2.5cm. VESICLES BOUNDED, 1-3mm FILLED WITH CARBONATE AND QUARTZ.				13.0		IRREGULAR PATCHES AND 2mm VESICLES OF CARBONATE, LENTIC QUARTZ	3			
16	15	12												
18	15	0												
20	15	1												
22	30	0												
24	15	0												
26	15	0												
28	15	0												
30	30	0												
32	15	0												
34	15	0												
36	20	0												
38	10	0												
40	15	0												
42	17	3												

306

NG
NG 40 0

42-

2

F 31.9, 100mm, RUBBLE

F 39.0, 100mm, RUBBLE

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSH
PROSPECT : A-ZONE

HOLE NO : NL-20
PAGE : 2 of 10
LOGGED : AMH
DATE : April 1985

028336

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
30	0	0	VESICULAR BASALT LAVA											
44	2-8	0												
46	4	0												
48	24	1												
50	20	2												
52	11	0												
54	30	3												
58	7	0												
58	23	0												
60	20	1												
62	31	1		62.5 7-30m ANGLETON PLUGS PRESENT IN 63.1 CORE/100% OF 2 METERS, MAXIMUM		62.0								
64	28	2					2	64.7						
66	50	2							65.0					
68														
70	27	0		69.8 0.5 to 5cm ANGLETON PLUGS PRESENT IN SERIAL/100% CORE		69.5								
72	22	1					3	72.0						
74	23	0												
76	23	1												
78	22	2												
80	31	4												
82	18	0												
84				84.0 0.5 to 6.0cm ANGLETON PLUGS PRESENT IN SERIAL/100% CORE/100% OF 2 METERS										

BLACK COLORFUL PATCHES
IN CORE/100% VEIN

310

ABERFOYLE EXPLORATION

PROJECT : MACKINTOSH

PROSPECT : A-ZONE

DIAMOND DRILL LOG

028337

HOLE NO: HL-80
 PAGE: 3 of 10
 LOGGED: AmH
 DATE: April 1985

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	Type	Intensity	Type	Intensity						
86	18	0	VESICULAR BASALT LAVA.	(Quartz texture?)		2								
88	30	1			97.3	4								
90	30	1		PALE GRAYS WEAKLY VESICULAR BASALT WITH DISTINCTIVE "MUD CRACK" OR P/CLAVATE VEINS	PEROVSKITE, FERRITE, MINOR ZIRCONITE, QUARTZ.									
92				(94-94.9 - FLOW BANDS, PORPHYRITIC TALK COLOUR, PYRITIC STRINGERS - A STAGE IN DEVELOPMENT OF "PORPHYRITIC DOLITE" TEXTURE?)		4		91.8						
94	30	0						"DISTINCTIVE "MUD CRACK" SHAPE VEINS, 1-10mm MAY HAVE A CARBONATE CAP; QUARTZ SILICOLE AND GY THESE ALTERATIONS FROM AFFECTING THIS ROCK TO A DEPTH OF 5mm Quartz may be (rare) CHERTY.						
96	30	0												
98														
100	30	1			99.8									
102	30	2			Now - altered? Rock is grey colour									
104														
106	30	1												
108	30	0		107.5	Grey/Green - dark, very weakly vesicular with porphyritic breccia texture - possibly a quartz texture. Fragments are very angular with size range comm to 5mm Matrix material is green/white sulphate silic.			107.5						
110								107.5						
112	30	1												
114	28	1												
116														
118	31	0												
120	A	0							112-122	PALE BROWN SIGNIF. BY VEIN & FINE GR. GROUND				
122	32	2												
124	34	0												
126														

311

62-0-63-8
 Ref. 355016 of 158; Ref. 55.4-57.8
 BASALTIC BRECCIA. CLASS OF SILICA/
 CALCITE ALTERED BASALTIC LAVA;
 MATRIX OF IRRITIC CHERT.
 PYRITIC STRINGERS AND VES WITH
 CARBONATISED SPHALERITE IN
 MATRIX. ULTRAFINE CHROMITE
 IN BASALT. SUBANGULAR FLOW
 BRECCIA.

Ref 355017 of 143; Ref 94.1-94.9.
 STRONGLY CHLORITE AND CALCITE
 ALTERED FLOW BANDS PORPHY-
 RITIC BASALT LAVA. DISSEM-
 INATED CHROMITE. CHLORITE/
 CALCITE AND CHLORITE/PYRITE
 STRINGERS.

107.5, 107.5, 107.5

112-122 PALE BROWN
 SIGNIF. BY VEIN
 & FINE GR. GROUND

ABERFOYLE EXPLORATION

DIAMOND DRILL LOG

PROJECT : MACKINTOSH

PROSPECT : A-ZONE

HOLE NO: HL-30

PAGE: 4 of 10

LOGGED: AmH

DATE: April 1965

028338

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE		WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	DIRECTION							
128	27	0													
130	31	11													
132	30	0													
134	31	0													
136	31	0													
140	31	0													
142	31	0													
144	30	0													
146	31	0													
148	31	0													
150	31	0													
152	30	0		CONTACT MINERALISATION TYPICAL VESICULAR ROARS WITH POINT SPALL VESICULAR VEINING.											
154	32	0													
156	31	0													
160	31	0													
162	31	0													
164	30	0													
166	31	0													
168	31	0													

152-5 30mm PATCH FINE
BRASS EQUIPMENT
154-5 IN CASE/RTS VEIN
156-5 15mm Patch AS ABOVE

154 (pink patch in vein)

156 (pink patch in vein)

155-0

312

ABERFOYLE EXPLORATION

PROJECT : MACKINTOSH

PROSPECT : A-ZONE

DIAMOND DRILL LOG

028340

HOLE NO: HL-80

PAGE: 6 of 10

LOGGED: AMH

DATE: April 1985

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH	
			ROCK NAME	DESCRIPTION									
212	32	2	BASALT LAVA.	TYPICAL VESICULAR BASALT LAVA "PAINT SPLASH" VESICLES/VEINING	"	4						212	
214												214	
216	30	0										216	
218	11	2										218	
220	14	0										220	
222	29	3						221.0 - 225.0 BROKEN CORE IN COREHOLE SECTION				222	
224	18	0										224	
226	9	0										226	
228	34	2										228	
230	09	1										230	
232	18	0										232	
234	31	1										234	
236	21	0										236	
238	8	0										238	
240	27	0										240	
242												242	
244	31	0										244	
246	31	0										246	
248	31	0										248	
250	31	0										250	
252												252	
					245.0	WHITE ORZ CARBONATE VEINS AS ABOVE WITH COMMON PINK SPICULE OR FLOCK AND MINOR BRIGHT GREEN QUARTZ							245
					246.7	ORZ/PURPLE PERVASIVE FELDSPAR/EPIDOTE	3						246
					247.7								247

31A

ABERFOYLE EXPLORATION

DIAMOND DRILL LOG

PROJECT : Mackintosh
 PROSPECT : A-ZONE

HOLE NO: NL-80
 PAGE: 7 of 10
 LOGGED: AMH
 DATE: Apr 1985

028341

DEPTH	DRILL RISE	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH		
			ROCK NAME	DESCRIPTION										
254	30	0	Basalt Lava	Typical vesicular basalt with "PART SPLASH" VESICLES VEINING	253.0	"	4							
254	30	0					PERVASIVE PINK (Fe/Si) ALK							
256	30	0					WEAK PERVASIVE FUCH SITE ALTERATION							
258	30	0												
260	30	0												
262	30	0												
264	30	0					263.0	"	4					
266	30	0					WEAK PERVASIVE FUCH SITE ALTERATION WITH 10% IRREGULAR BROWN AND PATCHES OF DARK GREEN CHLORITE							
268	30	0												
270	27	0						"	4					
272	31	0												
274	31	0						"	3					
276	31	0												
278	30	0						"	4					
280	30	0												
282	31	1			283.0	"	3							
284	31	0				"	2							
286	26	0				"	4							
288	29	0				"	2							
290	29	0												
292	31	0				"	2							
294														

315

283.0 - 285.0
 DRILLING CORE IN
 CHLORITE SECTION

ABERFOYLE EXPLORATION

PROJECT : MACKINTOSH

PROSPECT : A-ZONE

DIAMOND DRILL LOG

028343

HOLE NO: HL-80

PAGE: 9 of 90

LOGGED: AMN

DATE: APRIL 1985

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION								
330	0	0		308.5 - 338.0								
338	0	0		336.0								
340	0	0										
342	0	0				342.0						
344	0	0										
346	0	0										
348	0	0			348.2							
350	0	0										
352	0	0										
354	2.5	1										
356	0	0										
358	0	0										
360	23	1			360.6							
362	0	0										
364	0	0										
366	0	0										
368	0	0										
370	0	0										
372	0	0										
374	0	2										
376	0	2										
378	0	2										

30
14

PLT 35504 AT 326.8, REP 308.3-331.0
SIMILAR TO 35207V.
CLASTS OF ALBITE (CALCITE AND
SERICITE) CHARACTERIZED
ANDRITIC IN MATRIX OF
IMPURE CHERT AND QUARTZ/
ANRITIC. TRACE SPH + CAL IN
MATRIX V. 1.

PLT 35505 AT 349.7, REP 331.0-347.4.
CHROMITE BASALTIC LAVA.
SILICIFIED AROUND IRREGULAR
VEINS OF ALB/DIOPH/MONC/QTZ.
LATE CALCITE VEINLET.
TRACE PY, SPH, CAL IN
VEINS.
TRACES OF CHROMITE.

355.4 100%² QUARTZ
VEIN MATERIAL

358.0
GRT/CALC. VEINING AS FOR
309.0-309.5, BUT WITH
ONLY WEAK TRACE PY
AND SPH PRESENT

360.1 (5mm PATCH OF GARNET
IN QUARTZ VEIN)

378.6 (50mm PATCH OF
MONTECAROLITE IN
MATRIX V. 2)

ABERFOYLE EXPLORATION

DIAMOND DRILL LOG

PROJECT : MALCOLMSON

PROSPECT : A-ZONE

HOLE NO: NL-80

PAGE: 10 of 10

LOGGED: KMM

DATE: APRIL 1985

028344

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH	
			ROCK NAME	DESCRIPTION									
380	31	2			A	J							
382													
384	30	0			385-0								
386	30	0					386-0						
388													
390	31	0											
392	31	0											
394													
396	30	0											
398													
400													
402													
404													
406													
408													
410													
412													
414													
416													
418													
420													

318

317.4 EOM

319

APPENDIX L

320

028346

HL-80

21 MAY REC'D

Central Mineralogical Services



39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659

Mr. A.M. Hesse
Geologist
Aberfoyle Exploration Pty. Ltd.
P.O. Box 952
BURNIE / TAS. 7320

17th May, 1985

REPORT CMS 85/5/6

YOUR REFERENCE:	Letter dated 7.5.1985
DATE RECEIVED:	8th May, 1985
SAMPLE NOS.:	355086 - 355095
SUBMITTED BY:	A.M. Hesse
WORK REQUESTED:	Petrology

Copy to:
The Chief Geologist
Aberfoyle Exploration Pty. Ltd.
144, Camberwell Road
HAWTHORN EAST / VIC. 3123

H.W. Fander, M. Sc.

HL-80

Ten drill core samples from DDH HL 80 in the Hellyer area were received for petrological examination. Representative thin-sections were prepared and examined together with their respective offcuts. Attached tabulated descriptions summarise the microscopic data and include interpretative comments.

Summary

This suite comprises altered basaltic to leuco-andesitic lavas and lava breccias, with intercalated tuffaceous to volcanomict (reworked tuffaceous) psammopelitic sediments.

Volcanics are extensively altered to the degree that the subtly contrasting basaltic and andesitic types are poorly contrasted. This tenuous distinction is thus made on relict textural grounds, and in part on the basis of accessory primary minerals, notably the relative abundance of titanopaques (conspicuous in andesitic rocks), and the presence or absence of chromite. Both facies include massive and (subaqueous) flow-brecciated types, and the tenuous distinction may be more apparent than real.

The typical alteration assemblage comprises chlorite and sericite with varying proportions of quartz and carbonate (calcite, typically ferroan and grading into siderite). Some rocks exhibit breccia-matrix and vein quartzo-feldspathic assemblages, and these postdate the pervasive (chloritic-sericitic) assemblage. Carbonate (+ quartz) veining is typically temporally late, but predates mild stress effects.

Sediments are variably carbonaceous and pyritic and reflect alteration features analogous to those in the basic-intermediate lavas. The pyritic sulphide assemblage appears partly syngenetic and partly introduced contemporaneously with the broadly syndepositional alteration. Pelitic sediments include a minor pyritic chert component, and similar facies appear in sediment-matrixed lava breccias.

D. Cowan, B. Sc.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
55-36 T.S. 3277)	"Basaltic" Breccia. Clasts of sericitic cherty silicified, weakly calcite-stained, weakly quartz-amygdaloidal "basaltic" lava. Matrix of sericitic chert. Interspersed veinlets, vugs of chalcedonic quartz (+ calcite); pyritic-sericitic stringers.	Weakly dimensionally orientated, submillimetric to centimetric angular clasts; crudely crustiform matrix.	Fine to ultrafine chromite, leucoxenised opaques. Traces of sphalerite in chalcedonic vugs.	Chert-matrixed, subaqueous basaltic flow breccia with interclast chalcedonic vugs, crosscutting pyritic-sericitic stringers. Mildly sheared.
55-87	Carbonated Basalt. Calcite, subordinate microcrystalline quartz and chlorite. Sporadic irregular chlorite-selvedged calcite veinlets; pyritic chloritic stringers.	Relict finely porphyritic, with mildly contorted flow-banding.	Thinly disseminated chromite.	Thoroughly chloritised/extensively calcitised flow-banded porphyritic "basaltic" lava with irregular pyritic chlorite stringers. Incipiently sheared.
55-88	Amygdaloidal Basalt. Frequent calcite-quartz (+ chlorite, minor epidote) amygdales in a groundmass of albitised plagioclase microlaths, chloritic, subvitic mesostasis with fine clots of calcite, sideritic carbonate.	Flow-orientated amygdales, fine basaltic-textured groundmass. Weakly stressed.	Sporadic irregular calcite-quartz veinlets. Traces pyrite, galena, sphalerite in amygdales.	Chlorite-carbonate-altered/calcite-quartz-veined/amygdaloidal semi-chilled basaltic lava. Minor sideritic carbonate replacement of calcite.
55-89	Altered "Andesite". Sericitic/albitised plagioclase phenocrysts in a thoroughly sericitised, variably calcite-stained groundmass. Sporadic boudinaged chloritic quartz veinlets; frequent irregular sideritic carbonate veinlets.	Porphyritic, with a semi-boudinaged, perlitic-devitrified groundmass.	Leucoxenised opaques. Disseminated pyrite in chloritic quartz veinlets.	Sericitised perlitic-devitrified porphyritic leuco-andesite. Mesoscopic fragmental features reflect boudinaging of perlitic structure, veinlets.
55-090	Tuffaceous Psammopelite. Framework of sericitised lithic (lava) clasts, subordinate sericitic-albitised feldspar, minor quartz grains. Sericite-cherty quartz matrix; interspersed sericitic foliae.	Silty to fine to medium sandy clastic. Banded, sericite-foliated phyllitic. Weakly pyritic chert-	Semi-concordant stressed siderite (+ quartz) veinlets. Traces carbonaceous matter, "syngenetic"	Weakly carbonaceous-pyritic/pyritic chert-parted tuffaceous psammopelite. Extensively sericitised, moderately sheared. Conspicuous clastic leucoxene.
355-091	Tuffaceous Psammopelite. Framework of albitised weakly sericitic, splintery to angular plagioclase, minor quartz grains, sericitised lithic clasts. Chlorite matrix. Interspersed carbonaceous sericitic shale bands, partings.	Analogous to 355090; relatively shale-parted, finer-grained (silty to fine sandy).	Ultrafine syngenetic pyrite (concentrated in shale units). Conspicuous clastic leucoxenic semi-opaques	Close affinities with 355090, relatively shale-parted, feldspathic in comparison. Minor concordant, weakly stressed veinlets of sideritic carbonate.
355-092	Volcanomict Lithic Sandstone. Framework of sericitic, variably silicified/carbonate-stained felsic intermediate lava clasts, minor albitised plagioclase grains. Pyritic carbonaceous pelite matrix. Sporadic quartz-albite	Angular-subangular, pelite-matrixed, slumped, medium sandy clastic. Stressed veinlets.	Semi-pervasive fine to ultrafine pyrite in altered lava clasts. Disseminated sphalerite in quartz-calcite veinlets.	Strongly volcanomict (reworked tuffaceous), shale-matrixed lithic sandstone. Sericite-carbonate-quartz-altered, veined; pyritised and moderately sheared.
355-093	"Andesitic Breccia". Zones, clasts of chloritised/albitised plagioclase-porphyritic, chlorite-amygdaloidal leuco-andesitic lava. Sparse matrix, "stringers" of sericitic-chloritic pyritic pelite. Minor irregular calcite-quartz veinlets.	Massive to flow-brecciated/pelite-matrixed, porphyritic, sub- to trachytic microtextured lava.	Conspicuous fine leucoxenised opaques in altered lava.	Pyritic shale-matrixed, subaqueous leuco-andesitic flow breccia. Affinities with 355086 in terms of mode of origin, but "andesitic" rather than "basaltic".

878820

324

028350

7th May, 1985

1.

SAMPLE NO : 355086
LOCATION : DDH HL80/85.8
REPRESENTATIVE OF : 62.5 - 63.8, 83.4 - 87.8
REMARKS : Describe texture and composition of fragments and matrix. Possibly a quench texture.

SAMPLE NO : 355087
LOCATION : DDH HL80/94.3
REPRESENTATIVE OF : 94.1 - 94.9
REMARKS : What is the cause of the banding in this rock? What is the composition of the rock and does it have any affinities to 355088, into which it grades. What minerals occur in the veins?

SAMPLE NO : 355088
LOCATION : DDH HL80/171.5
REPRESENTATIVE OF : 152.0 - 301.2
REMARKS : Example of typical vesicular basalt.

SAMPLE NO : 355089
LOCATION : DDH HL80/302.2
REPRESENTATIVE OF : 301.2 - 303.0
REMARKS : A medium-fine grained epiclastic unit.

SAMPLE NO : 355090
LOCATION : DDH HL80/303.2
REPRESENTATIVE OF : 303.0 - 305.7
REMARKS : Laminated, slump structured siltstone; possible ore horizon. Describe composition of light and dark bands. What is the soft yellow-green mineral?

SAMPLE NO : 355091
LOCATION : DDH HL80/304.2
REPRESENTATIVE OF : 303.0 - 305.7
REMARKS : Similar to 355090

325

028351

7th May, 1985

2.

SAMPLE NO : 355092
LOCATION : DDH HL80/304.8
REPRESENTATIVE OF : 303.0 - 305.7
REMARKS : Probably of similar composition to 355090, 355091;
more pyrite and disrupted texture.

SAMPLE NO : 355093
LOCATION : DDH HL80/307.8
REPRESENTATIVE OF : 305.7 - 308.3
REMARKS : Possibly a mixture of grey/black sediment (is in
previous 3 samples) with pale brown feldspar/silica
altered basalt.

SAMPLE NO : 355094
LOCATION : DDH HL80/325.8
REPRESENTATIVE OF : 308.3 - 331.0
REMARKS : Example of pink (feldspar/silica?) altered basalt.
What is the alteration type?

SAMPLE NO : 355095
LOCATION : DDH HL80/341.4
REPRESENTATIVE OF : 331.0 - 397.4
REMARKS : Example of wholly altered basalt from below possible
ore horizon. How does it compare with basalt from
above ore horizon? (355088). Any chromite in
either of these two samples? What is the
composition of the vein phases? Is the paler green
phase of the basalt due to alteration associated
with the vein phase?

APPENDIX M

PROJECT : MACINTOSH

PROSPECT : _____

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

028354

HOLE NO: MAC-4

PAGE: 2 of 9

LOGGED: AmH

DATE: Aug. 1961

DEPTH	DRILL NUMBER	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION								
44				Matrix of blue-grey chert or qtz (carb. vein material) Probable hydroclastic as indicated by spalling-off of fine angular fragments from sections of massive lava at 43-04		QUARTZ AND CEMENT CARBONATE 3						
46												
48												
50												
52												
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94												
96												
98												
100												

328

Core Lost

GRADATIONAL CONTACT
OVER 40'

60-6, 60-7, 60-8, 60-9
60-10, 60-11, 60-12, 60-13, 60-14, 60-15, 60-16, 60-17, 60-18, 60-19, 60-20, 60-21, 60-22, 60-23, 60-24, 60-25, 60-26, 60-27, 60-28, 60-29, 60-30, 60-31, 60-32, 60-33, 60-34, 60-35, 60-36, 60-37, 60-38, 60-39, 60-40, 60-41, 60-42, 60-43, 60-44, 60-45, 60-46, 60-47, 60-48, 60-49, 60-50, 60-51, 60-52, 60-53, 60-54, 60-55, 60-56, 60-57, 60-58, 60-59, 60-60, 60-61, 60-62, 60-63, 60-64, 60-65, 60-66, 60-67, 60-68, 60-69, 60-70, 60-71, 60-72, 60-73, 60-74, 60-75, 60-76, 60-77, 60-78, 60-79, 60-80, 60-81, 60-82, 60-83, 60-84, 60-85, 60-86, 60-87, 60-88, 60-89, 60-90, 60-91, 60-92, 60-93, 60-94, 60-95, 60-96, 60-97, 60-98, 60-99, 60-100

60% Py Rimmed
By fragments

61-7
62-7 60% Py Rimmed by fragments

60-24 65% Py Rimmed
By fragments

47-6
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100-5

80-4
80-9

62-9

Basalt Lava

74-2
75-7
76-1

82-5
83-5
84-5
85-5
86-5
87-5
88-5
89-5
90-5
91-5
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99-5
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74-2
75-7
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99-5
100-5

PROJECT : Mackintosh

PROSPECT : _____

ABERFOYLE EXPLORATION

DIAMOND DRILL LOG

028355

HOLE NO: MAC-4
 PAGE: 3 of 9
 LOGGED: AMH
 DATE: AUG. 1985

DEPTH	DRELL RUNS	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION								
86			B.m. IV.	BASALTIC LAPHILI VOLCANIC LAVA. SOME SHARP ANGULAR BASALT FRAGMENTS TO 10CM (A TUFF-LAVA MIXTURE?)								
88			B.m. IV.	AS ABOVE								
90			BASALT LAVA	DARK GREEN, MASSIVE, WEAKLY VESICULAR LAVA. GEORGINAL CONTACT OVER 1.0m								
92												
94												
96												
98												
100												
102												
104												
106												
108												
110												
112												
114												
116												
118												
120												
122												
124												
126												

Very fine, greenish-grey to black ash tuff. Many to interstitial contact at high angle to C.A.

99.0
 99.5
 99.8
 100.0
 100.2
 100.4
 100.6
 100.8
 101.0
 101.2
 101.4
 101.6
 101.8
 102.0
 102.2
 102.4
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 124.8
 125.0
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 125.4
 125.6
 125.8
 126.0

91.5
 WHITE CARBONATE QUARTZ VEIN, MINOR PYRITE VESICLE FRAMES AS ABOVE
 PURPLE TINT (MANGANESE)

F 89.7-90.0m
 CARBONATE QUARTZ VEIN

F 114.1-114.4m
 CARBONATE QUARTZ VEIN

Ref. 35642, 89.7m, REP. 89.3-89.6
 Lithic tuff. Strongly altered basaltic matrix (andesitic calcite, chlorite, Mn. kaolinite, quartz, sericite, traces of pyrite and chromite) with vesicular lithic (lava) andite clasts.

126.4
 126.6

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSH

PROSPECT : _____

HOLE NO: MAC-4

PAGE: 4 of 9

LOGGED: Ann H

DATE: AUGUST 85

028356

DEPTH	DRELL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION		STRUCTURE		WEATHERING	VISUAL LOG	REMARKS	DEPTH	
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY									
128					127-3	PATCHY PERVIOUS PLE YELLOW-CREAN WHITE ALT. WITH 3mm FUCHSITE SPOTS.	6	QZ/CALC VEINING AS ABOVE - NO PUPPLE TINT	3								
130					133-4 131-5	BRUCIA ZONE, GRAY CRIST. MATRIX				132-6	0.5mm RAGGED PY PATCH						
132										133-4	10mm RAGGED PYRIC PATCH						
134																	
136																	
138					138-1												
140					BASALTIC POLYMIC BRECCIA VOLCANICLASTIC	MATRIX: CLASTIC 60:40 MATRIX: GRAY-BLUE CRIST FRAGMENTS: KANISO, ELONGATE, ANGLONIA WEAKLY VERICULAR BASALT; BLANCKITE, WISNY CREAN ILLITE ALTERED; FUCHSITE, SPATITE BASALT; RARE AMPHIBOLIC STRUCTURE. AVERAGE FRAGMENT SIZE: 25 MM.	4	RAGGED FLAME-LIKE PATCHES OF PALE YELLOW TO WHITE ILLITE WITH 3mm FUCHSITE SPOTS	2-3								
142																	
144																	
146																	
148																	
150					149-0	MATRIX: CLASTIC 70:30 MATRIX: GRAY-BLUE CRIST CLASTS: GRAY-GREEN CRIST SPATITE BASALT; MATTING: DARK GREEN-GRAY TRUSS STRUCTURED BASALT; RARE WILKY GREEN ILLITE ALTERED FUCHSITE SPATITE BASALT; RARE 3MM PYRIC FRAGMENTS BY BASALT REACT. 200-2100mm, UP TO 500mm	3		2-3	149-3	0.5mm RAGGED PY. PATCH						
152																	
154																	
156																	
158					155-1	MATRIX: CLASTIC 75:25 MATRIX: GRAY-BLUE CRIST CLASTS: EPIGLOTE, KANISO, ANGLONIA, CRISTITE SPATITE BASALT, WISNY CREAN, ILLITE ALTERED, FUCHSITE SPATITE BASALT; DARK GREEN-GRAY, EDHANT, AND ANHILIC FELDSPHINIC AMPHIBOLIC RARE AMPHIBOLIC TRAMMITE < 10mm ; DARK TRAMMITE 5mm	3		2-3	152-4	74 PATCHES						
160																	
162																	
164																	
166																	
168																	
170					166-7	CRISTITE & AMPHIBOLIC REACTED BASALTIC MATRIX				2-3	153-3	5mm RAGGED PY/CALCIA FRAGMENT					
172					167-4	CRISTITE & AMPHIBOLIC REACTED BASALTIC MATRIX				2-3	154-1	5mm RAGGED PY/CALCIA FRAGMENT					

330

REMARKS: *REMARKS IN Y8 BY ANOTHER
SEPARATELY.*

REMARKS: *SEE 355W3, 155-3, SEE PAGE 1551-1562
STORAGE CLASTS OF ANDRITIC
LAVA IN MATRIX OF IMPURE
CRIST AND AMPHIBOLIC WITH
CENTRAL AND VOLCANICLASTIC,
PERMINELY CRISTITE /
CARBONATE ALTERED.*

ABERFOYLE EXPLORATION

DIAMOND DRILL LOG

PROJECT : Mackintosh

PROSPECT : _____

HOLE NO: MAC-4

PAGE: 5 of 9

LOGGED: AMH

DATE: August 8

028357

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
170				PALE GRAY GREEN TRACED FRAGMENTS IN CLAY MATRIX INCLUDING THESE FRAGMENTS. No gray china in matrix.										
172			172-2	Feldspathic Andesite Lava Breccia	Dark Green-Green, Many Porphyritic Equant Sub-angular andesine clasts. An horn, rimmed by pink feldspar in matrix of gray chert.	AT CONTACT ANDESITE CHANGE IN PROGRAM TYPE ALTHOUGH MATRIX CONTAINS BY PINK FELDSPAR IN MATRIX OF GRAY CHERT.	172-2	Pink feldspar alteration Reminds andesite clasts.						
174			174-3		Andesite clasts as above but with more diffuse outlines in a murky matrix of pale brown ? feldspar. (After blue chert?)									
176			176-4	Andesite Lava Breccia	DIFFUSE, DRY GREEN PATCHES OF PORPHYRITIC ANDESITE, RARE WHITE EPIDYRITE FRAGMENTS IN FINE GRAY-GREEN VOLCANIC MASH. LAVA/VOLCANIC MASH DIPPER CONTACT 10m	CONTACT OBSERVED BY LOSS OF INTENSE DARK YELLOW SERICITE ALTERATION.								
178			178-0											
180			180-3	Sericitic Breccia (after contact lava?)	Dirty yellow andesite breccia fragments to 10cm in blue-gray cherty matrix. Some of yellow white, green after andesite. (After and breccia to following unit?)									
182			182-3	Dacite Lava	20m extent of this unit 2m to 10m unit extent									
184					BLACK TO DARK GREEN DYE OF LAVA TO INTERSTITIAL MATRIX COMPARED WITH REMOVING UNIT. Some zone of fine branching, feldspar and other interstitial material by white and feldspar TYPICAL CONTACT MASH MASH TO CONTACT MASH MASH TO CONTACT MASH									
186														
188														
190														
192														
194														
196														
198														
200														
202														
204														
206														
208														
210														

31

PPG 25644, 1672, REP 187-172-2
SHEARER CHERT, SERICITE M.A., MICRO
CRYSTALLINE QUARTZ, ANKERITE CREEP
CHERT, LEXON, OPAL, RARE CHERTITE
RARE IDENTIFIABLE TEXAS AND OTHER
FRAGMENTS
CHERT IN AND FINE MATRIX
MAY BE INTRODUCED
PPG 25546; 173-2, 172-2-173-2
ANDESITE LAVA CLASTS (PLUG, PINK
CHERT) → ALDITE; MURKY CHLORITE
LAVA MAT. IN MATRIX OF SERICITE
ASHT CHERT.
Compare 18-70, lower end of Hesper.

177-2
Breccia fragments
weakly aligned
at 40° to E.A.

172-4

184-3, 187-2, 188-2
sericitic

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSH

PROSPECT : _____

HOLE NO: MAC-4
 PAGE: 6 of 9
 LOGGED: AMH
 DATE: AUGUST 85

028358

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
212			Dacite LAVA.											
214														
216														
218														
220														
222														
224														
226														
228														
230														
232														
234														
236														
238														
240														
242														
244														
246														
248														
250														
252														

218-220: 200g; 600g;
RUBBLE; REMAINS?

BROKEN
CORE

228-230

232-234: 300g;
SERICITIC RUBBLE

236-238: 300g; SERICITIC
RUBBLE; CARBONATE VEINING
45°C.±

242-244: 100g; FINE
RUBBLE

244-0

2640 - 2500
 BAZITE IN VEINS?
 PER 35564, 2402, 250 (232-235)
 "Dacitic Tuff Lava."
 SERICITIC/CARBONATE PEGMATOIDAL
 FIBROUS TEXTURES IN SERICITIC
 CARBONATE ALTERED FELSIC GRAIN
 MAT. SIM. ALTERED SERICITIC (?)
 QUARTZ/LEAD ANTIMONY. FLOW
 RECRISTALLO. TRAILS OF
 CRYSTALLITE.

332

ABERFOYLE EXPLORATION DIAMOND DRILL LOG

PROJECT : MACKINTOSH

PROSPECT : _____

HOLE NO: MK-4

PAGE: 7 of 9

028359 LOGGED: AMH

DATE: 1/30/88

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION		VEINING		MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION	TYPE	INTENSITY	TYPE	INTENSITY						
264			DACITE LAVA											
266														
268														
270														
272														
274														
276														
278														
280														
282														
284														
286														
288														
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494														
496														
498														
500														

333

264-266
IR - LEAK FLOW SPONGE

276-280
IR - ZONED RUBBLE

CONTINUE OBSERVED
IN VEINING OVER
270m

GRADATIONAL
CONTACT OVER
270m

IR 276-280
Lava. Andesite/Dacite flow breccia
Sediment, micro-crystalline Qtz,
Andesite/Sillite, angular plagioclase
fragments, conspicuous
leucocratic SiO₂, trace pyrite,
chlorite. Pink and brown zones
due to leucitene.

276-280
IR - FERRUGINOUS
AND
SILICIFIED SPONGE

280-286
IR - FINE
AND
SILICIFIED SPONGE

286-290
IR - FINE
AND
SILICIFIED SPONGE

ABERFOYLE EXPLORATION
DIAMOND DRILL LOG

PROJECT : Mackintosh
PROSPECT : _____

HOLE NO: MAC-4
PAGE: 9 of 9
LOGGED: AMH
DATE: AUGUST 25

028361

DEPTH	DRILL RUNS	CORE LOSS	LITHOLOGY		ALTERATION	VEINING	MINERALISATION	STRUCTURE	WEATHERING	VISUAL LOG	REMARKS	DEPTH
			ROCK NAME	DESCRIPTION								
338												
340												
342												
344												
345.1												
346			ANORTHITE LAVA	GREY-GREEN MIMIVE LAVA.								
348												
350												
352												
354												
356												
358												
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362												
364												
366												
368												
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372												
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382												
384												
386												
388												
390												
392												
394												
396												
398												
400												

833
07

F 338 7; 70cm;
No. 20416;
R. L. 10/10/2

TK. 355472; 340; REP. 2352-345.1
ANORTHITE BRECCIA.
CLASTS - ALBITE PLAG. AND
CALCITE FLUORITE PREVALENT.
CILINDRICAL MORTARS

346.0 EON

APPENDIX N

337

Central Mineralogical Services



39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659

Mr. A.M. Hesse
Project Geologist
Aberfoyle Exploration Pty. Ltd.
P.O. Box 952
BURNIE / TAS. 7320

28th October, 1985

REPORT CMS 85/10/16

YOUR REFERENCE:	Letter dated 9.10.1985
DATE RECEIVED:	11th October, 1985
SAMPLE NOS.:	355462 - 355472
SUBMITTED BY:	A.M. Hesse
WORK REQUESTED:	Petrology

Copy to:
The Chief Geologist
Aberfoyle Exploration Pty. Ltd.
144, Camberwell Road
HAWTHORN EAST / VIC. 3123

H.W. Fander for
H.W. Fander, M. Sc.

MAC-4

338

REPORT CMS 85/10/16

Eleven drill core samples from DDH/MAC-4 were received for petrological examination. Representative thin-sections were prepared and examined together with respective offcuts, with carbonate stain tests performed as warranted. Attached tabulated descriptions summarise the microscopic data and include interpretative comments.

Summary

This suite comprises entirely more or less pervasively altered and variably sheared volcanics. Interpretation is thus based largely on relict compositional and textural features. On this basis, the rocks range from basaltic through andesitic to leuco-andesitic and dacitic. As sampled, the sequence is dominantly andesitic, with a medial dacitic-leucoandesitic sequence represented by samples 355466 to 355469 inclusive.

The majority of these rocks are fragmental types which may be variously classified as lava breccias or tuffs on the basis of relict features. Problematically, alteration effects, marked by more or less pervasive chlorite-sericite-carbonate + quartz, albite assemblages, and subsequent stress (shearing) overprints, obscure much of the finer textural detail.

Fragmentals include minor pelitic ash and impure (ashy) chert-matrixed types with affinities to those at Hellyer. Accessory traces of chromite appear in rocks ranging from (inferred primary) basaltic to dacitic composition, suggesting these volcanics, as a whole, represent a single petrogenetic suite.

D. Cowan, B. Sc.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
MAC-4 355462 (T.S. 54689) 85.4	<u>Lithic Tuff.</u> Fine to microcrystalline ankeritic carbonate, chlorite, microgranular quartz and varying proportions of sericite. Minor carbonate veins, late chloritic microfractures.	Psammite to lapilli grade lithic fragmental. Basaltic to andesitic and scoria clasts. Weakly sheared.	Traces of pyrite, minor traces of chromite. Disseminated leucoxenised opaques.	Thoroughly altered basaltic characteristics, but with sporadic "andesitic" lithic (lava) clasts. Weakly flow-structured. Includes minor crystal fragments (mainly chloritised pyroxene).
355463 65.0	<u>Andesitic Tuff.</u> "Megaclasts" of chloritised/sericite-carbonate-stained andesitic lava in a matrix of sericitic-chloritic, impure chert-cemented andesitic lithic-crystal tuff. Disseminated leucoxenised opaques.	Essentially a chert-cemented poorly sorted psammitic tuff with sporadic lapilli. Moderately sheared.	Ill-defined devitrified/ altered (sericitised) shards in matrix. Minor pyrite, minor traces chalcopyrite.	Subaqueous, ashy chert-cemented andesitic lithic-vitric-crystal tuff characteristics. Includes albitised plagioclase phenocrysts/crystal fragments; otherwise chlorite-sericite-carbonate-altered.
355464 69.2	<u>"Andesitic" Tuff.</u> Chlorite, semi- to sericitic white mica with varying proportions of microcrystalline quartz, cloudy ankeritic carbonate, disseminated leucoxenised opaques.	Poorly sorted (psammite to lapilli grade) lithic fragmental. Relatively sheared/ phyllitic.	Rare chromite. Locally conspicuous fine to ultrafine pyrite.	Detail obscured by alteration, relatively marked shearing. Includes some scoriaceous basaltic and tuffaceous sediment (siltstone) clasts. Mildly reworked.
355465 73.2	<u>Andesitic Breccia.</u> Clasts, "rafts" of albitised plagioclase-porphyrific, chlorite-sericite-carbonate-stained lava. Matrix of sericite-stained, crypto- to microcrystalline impure (pelitic ashy) chert.	Irregular, lapilli to agglomerate grade perlitic-devitrified clasts; vaguely vitroclastic matrix.	Leucoxenised opaques. Minor traces ultrafine pyrite in clasts, matrix.	Pelitic ash/impure (ashy) chert-matrixed subaqueous flow breccia characteristics. Strictly leuco-andesitic (i.e. trend dacitic). Brownish zones are relatively sericitic/carbonate-stained.
355466 244.8	<u>Dacitic Tuff Lava.</u> Sericite-carbonate-pseudomorphed feldspar phenocrysts in a pervasively sericitic, carbonate-stained felsitic groundmass. Minor similarly altered xenoliths, sparse quartz-carbonate amygdaloids.	Flow-banded/weakly flow-brecciated, weakly glomeroporphyritic, incipiently sheared.	Minor sheared sericitic carbonate veinlets, leucoxenised opaques, traces of pyrite, ultrafine chromite, chlorite.	Weakly flow-brecciated, amygdaloidal, devitrified, sericite-carbonate-altered and mildly sheared dacitic characteristics.
355467 278.4	<u>"Dacitic" Breccia.</u> Sericite and microcrystalline quartz with varying proportions of ankeritic to sideritic carbonate, frequent albitised plagioclase phenocrysts/fragments. Sporadic quartz, chlorite-carbonate veinlets.	Flow-banded Tuff lava-like, but confused by frequent sericitic fractures, irregular displacive veinlets, shear effects.	Disseminated to conspicuous ultrafine leucoxenic TiO ₂ . Minor traces of chromite, fuchsite, pyrite.	Relict features consistent with a leuco-andesitic/dacitic flow breccia. Mottled pinkish brown zones reflect leucoxenic pigmentation of relatively sericitised clasts.
355468 299.9	<u>Andesitic Tuff.</u> Clasts of chloritic, variably sericitic albitised plagioclase-porphyrific, variably quartz-amygdaloidal lava. Sparse matrix of quartz and carbonate. Sporadic carbonate-quartz veinlets.	Variably moulded to quartz-carbonate-matrixed, trachytic-textured clasts. Sheared/semi-phyllitic.	Leucoxenised opaques, minor traces ultrafine-grained pyrite.	Leuco-andesitic lithic tuff. The sporadic pale clasts are relatively quartz-amygdaloidal ("pumiceous") and reflect selective sericitisation.
355469 312.6	<u>Amygdaloidal Andesite.</u> Sericite and closely intergrown pale chlorite with thinly disseminated carbonated feldspar microphenocrysts. Sporadic carbonate-quartz amygdaloids, veinlets. Conspicuous quartz-carbonate micro-amygdaloids.	Flow-structured (sub-trachytic), strongly micro-amygdaloidal, weakly porphyritic. Stressed stockwork-style veinlets.	Leucoxenised opaques. Minor traces ultrafine pyrite (host rock), fine-grained chalcopyrite (veinlets).	Compositional affinities with 355468, although finer detail obscured; interpreted as leuco-andesitic. Semi-chilled ?flow-marginal characteristics.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
355470 323.1	Andesitic Breccia. Clasts of variously sericite-chlorite-altered to semi-selectively silicified, albitised plagioclase-porphyritic lava, minor similarly altered pumice clasts with a sparse quartz-carbonate-sericite-chlorite matrix.	Randomly sorted, semi-dimensionally orientated, partly moulded clasts. Sheared/semi-phyllitic.	Leucoxenised opaques, minor traces ultrafine pyrite. rare chromite.	Textural detail obscured by shearing, but relict features consistent with a flow-marginal breccia. "Andesitic" relict compositional features in contrast to the leuco-andesitic 355-468.
355471 333.0	Andesite. Albitised to sericite-carbonate-pseudomorphed feldspar and leucoxenitic quartz semi-pseudomorphed ferromag phenocrysts in a thoroughly sericite-carbonate-altered groundmass. Sporadic irregular ankeritic carbonate veinlets.	Strongly porphyritic, "andesitic", with a vaguely perlitic groundmass. Mildly sheared.	Leucoxenised opaques. Minor traces of fine to ultrafine pyrite.	Pervasively sericite-carbonate-quartz-altered, carbonate-veined, mildly sheared andesitic lava. Simple porphyritic andesitic fabric; no fragmental features.
355472 341.0 (T.S. 54699)	Andesitic Breccia. Interspersed clasts of relatively carbonate-stained and pervasively chloritised, albitised plagioclase/chloritised ferromag-porphyritic lava with a sparse chlorite matrix. Minor carbonate veinlets.	Poorly sorted, variably quartz-amygdaloidal, "andesitic"-textured, partly moulded clasts; phyllitic matrix.	Leucoxenised opaques, minor traces of ultrafine pyrite.	Flow-marginal breccia characteristics. Selectively chloritised clasts were possibly primarily relatively glassy types. Textural affinities with 355470.

340

SAMPLE NO : 355462
LOCATION : DDH MAC-4, 85.4m
REPRESENTATIVE OF : 84.3 - 86.6
REMARKS : Weakly fuchsite altered basaltic lithic tuff.

SAMPLE NO : 355463
LOCATION : DDH MAC-4, 165.0m
REPRESENTATIVE OF : Zone of andesite clasts within 155.1-166.3.
REMARKS : Feldsparphyric andesite fragments in a cherty matrix. Confirm that clasts are andesite. What is the composition of the matrix and of small fragments in the matrix?

SAMPLE NO : 355464
LOCATION : MAC-4, 169.2
REPRESENTATIVE OF : 168.4 - 172.2
REMARKS : Polymict volcanoclastic. Identify composition of all fragments. Any sulphide fragments?

SAMPLE NO : 355465
LOCATION : MAC-4, 173.2
REPRESENTATIVE OF : 172.2 - 178.8
REMARKS : Feldsparphyric andesite fragments in a cherty matrix. What is the composition of the matrix? What is the composition of the brown alteration rimming the andesite fragments?

SAMPLE NO : 355466
LOCATION : MAC-4, 244.8
REPRESENTATIVE OF : 196.3 - 275.1
REMARKS : Dacite lava

SAMPLE NO : 355467
LOCATION : MAC-4, 278.4
REPRESENTATIVE OF : 277.9 - 280.5
REMARKS : Andesitic lapilli volcanoclastic. Selected fragments are pink feldspar silica altered.

SAMPLE NO : 355468
LOCATION : MAC-4, 299.9
REPRESENTATIVE OF : 293.0 - 308.7
REMARKS : An andesitic volcanoclastic with rare angular 1-2 cm dacite (?) fragments.

SAMPLE NO : 355469
LOCATION : MAC-4, 312.6
REPRESENTATIVE OF : 308.7 - 318.2
REMARKS : Vesicular basalt lava. Any chromite?

342

SAMPLE NO : 355470
LOCATION : MAC-4, 323.1
REPRESENTATIVE OF : 318.2 - 327.0
REMARKS : Similar to 355468

SAMPLE NO : 355471
LOCATION : MAC-4, 333.0
REPRESENTATIVE OF : 327.0 - 332.2
REMARKS : Dacite lava. Is it similar to 355466?

SAMPLE NO : 355472
LOCATION : MAC-4, 341.0
REPRESENTATIVE OF : 333.2 - 345.1
REMARKS : Andesitic volcaniclastic, similar to 355468
and 355470?

343

APPENDIX O

FIELD

34A

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028370

UTEM SURVEY SOUTH OF
MT CHARTER

E T EADIE
MARCH 1984

345

028371

REPORT ON THE UTEM SURVEY SOUTH OF MT. CHARTERS AND RECOMMENDATIONS
FOR FURTHER WORK

INTRODUCTION

During the first two weeks of February 1984, twenty kilometres of UTEM were collected to cover the prospective Mt. Reid Volcanics south of Mt. Charters. Three distinct but weakly conductive trends were located, two of which correlate very closely with the mapped shale volcanic contact. The third trend falls within the volcanics, in an area of anomalous base metal geochemistry.

In addition to these distinct trends, there is one area of slightly anomalous conductivity that can be traced down from the 1983 survey. There are also several isolated anomalies that are not clearly understood.

INTERPRETATION

The conductors have been divided into three separate zones, two of which continue down from the previous UTEM work (H and J).

The interpretation is summarized in Table 1. Zone J3 alone requires further discussion.

All UTEM anomalies from past and present surveys are shown on Plate MAC 77.

ZONE J3

A schematic representation of the interpretation is shown in Figure 1. The response must be described as weak because it dies off by Channel 7 (200 microseconds). This is very similar to the best part of the D1 anomaly which returned 10 - 15 metres of up to 50% pyrite in drilling. This amount of conductive sulphides should be expected in Zone J3.

The shape of the anomaly suggest a moderate dip to the west. The depth interpretation causes some ambiguity. Using the shape of the anomaly for the interpretation, a depth of 50 - 100 metres is indicated. However, an estimate based on the amplitude indicates a depth of less than 25 metres. One possible explanation is that the conductivity decreases towards the surface, either by a decrease in thickness or sulphide percentage.

This interpretation partially explains two other apparently surprising observations. The first is that there is no obvious source of the anomaly in the costeans. The second is that there is no P.F.E. anomaly in the IP data (frequency domain, 0.3 - 3 hz, 50 metres dipole, n = 1 to 4). These two observations lend support to the model that there is very little sulphide close to surface.

Because of interpretation of variation in the conductors thickness, two drill holes are proposed to test the target. The first is meant to intersect the body at a moderate depth to test the interpretation. If the results are at all positive, a second hole should be drilled to test the body at a greater depth.

There is one other point that must be mentioned with regard to Zone J3. There appears to be a very small, shallow, conductive body at approximately 4320E (± 5 m) on Line 4000N. This could be just noise or a cultural effect, but it also could be caused by a feature (pod of massive sulphides?) that could be of geological interest.

CONCLUSIONS and RECOMMENDATIONS

The UTEM survey has picked up several features that require geological and geochemical follow up. Of these, only Zone J3 can be considered a high priority target. Two drill hole locations have been recommended; the first at 4225E on Line 3800N and the second at 4125E on Line 3800N. Both should be drilled towards the east at about 45° (see Figure 1).

Several other zones within the volcanics have not yet been covered with UTEM. These are shown on Plate MAC 80. All of the volcanics should be covered with UTEM at the first opportunity.

TABLE 1

ZONE	LOOP	MAP (1:2500)	LOCATION	E.M. RESPONSE	I.P. ASSOCIATION	COMMENTS
H7 amended from last report	3, 4	D, L	3600N, 45400E to 5400N, 45000E	Large wide zone of slightly anomalous conductivity.	Very broad weakly conduc- tive zone corresponding with EM interpretation on most of the lines where IP is done.	Probably caused by a slightly pyritic geological unit; follow up by a geological inspection and a review of the geochem.
J1 amended from last report	1979 UTEM, 14	M	3200N, 4425E to 4200N, 3975E	Questionable to reason- ably strong (I4200N) conductor.	Good correlation especially to north.	Probably caused by shales. Geological inspection necessary.
J3	14	M	3600N, 4375E to 4000N, 4225E	Weak to well-defined conductor; more discus- sion in text.	Conductivity, but no chargeability anomaly on all lines.	Correlates well with a geochem anomaly and is right in an area of extreme geological interest. Drilling will be necessary.
K1	4	L	3200N, 6050E	Very weak single line conductor.	No IP done.	Follow up with geology and geochem.
K2	4, 13	K, L	2600N, 5975E to 3200N, 6275E	Very weak conductor.	No IP done.	Probably shale contact. Follow up with geology and geochem.

348

028374

ZONE	LOOP	MAP (1:2500)	LOCATION	E.M. RESPONSE	I.P. ASSOCIATION	COMMENTS
K3	4	L	2800N, 5725E	Weak single line response.	No IP done.	Follow up with geology and geochem.
K4	13	T	1800N, 6175E	Weak response, open to south.	No IP done.	Follow up with geology and geochem. Follow further to south with EM if of interest.

349

028375

350

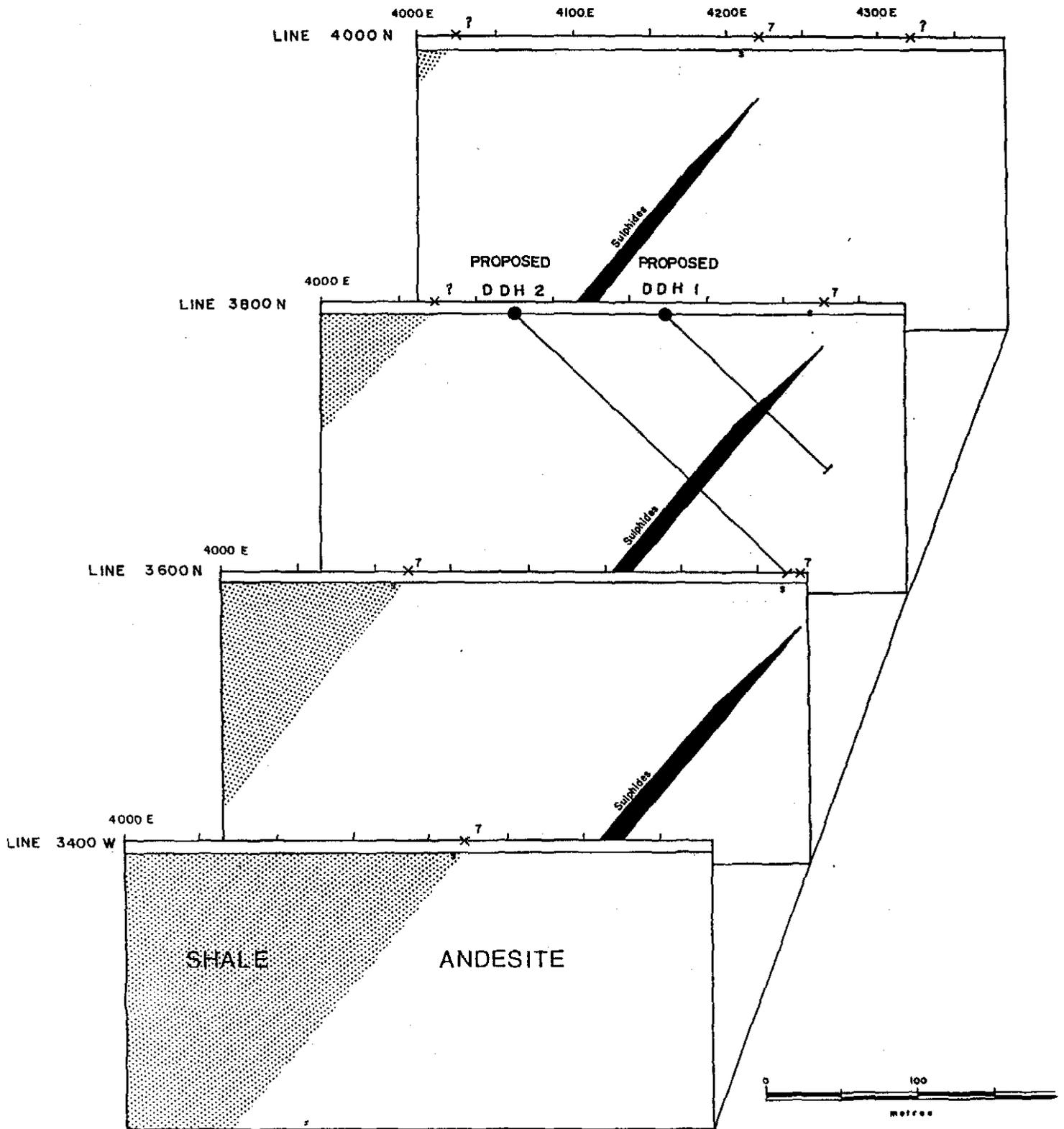
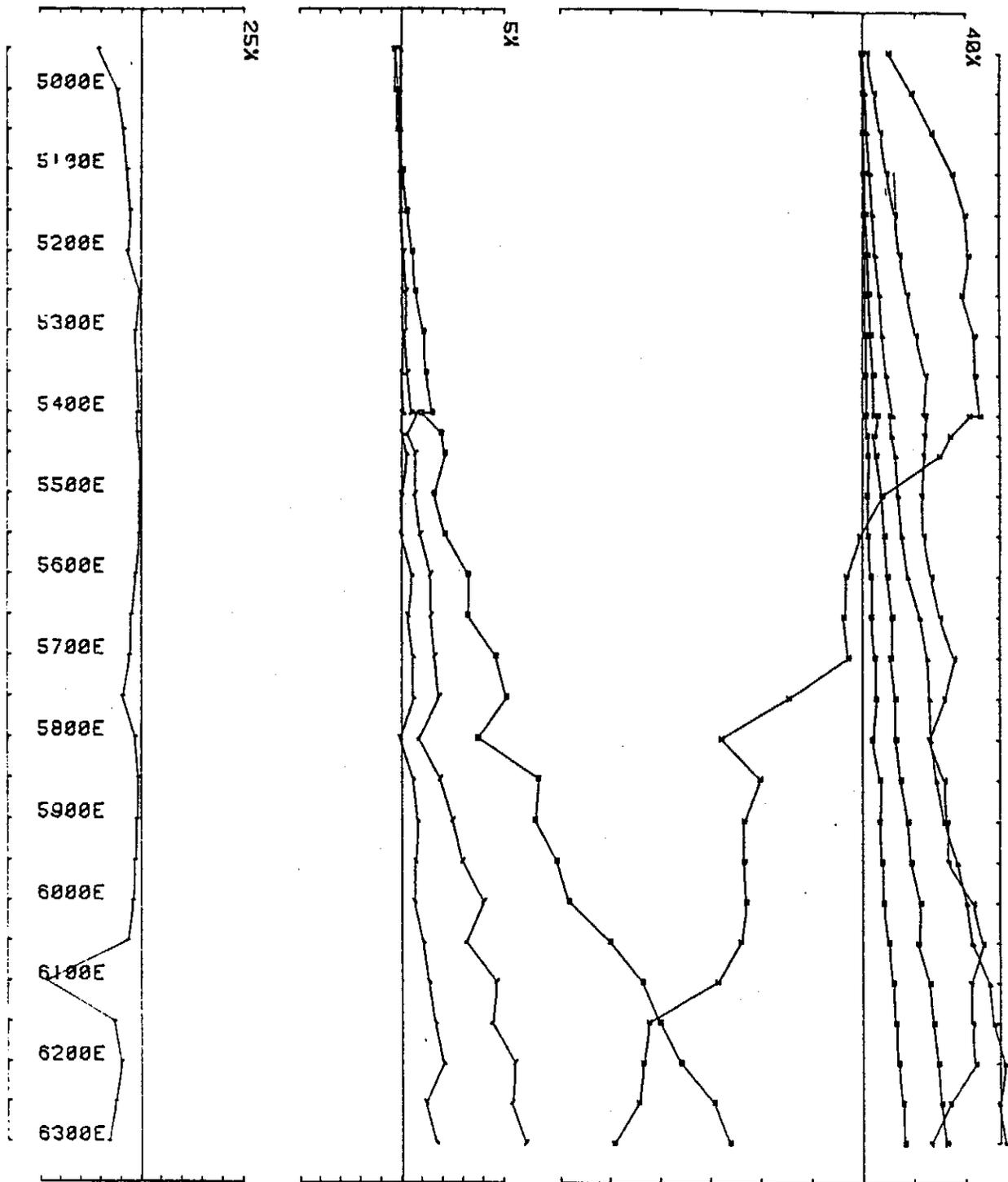


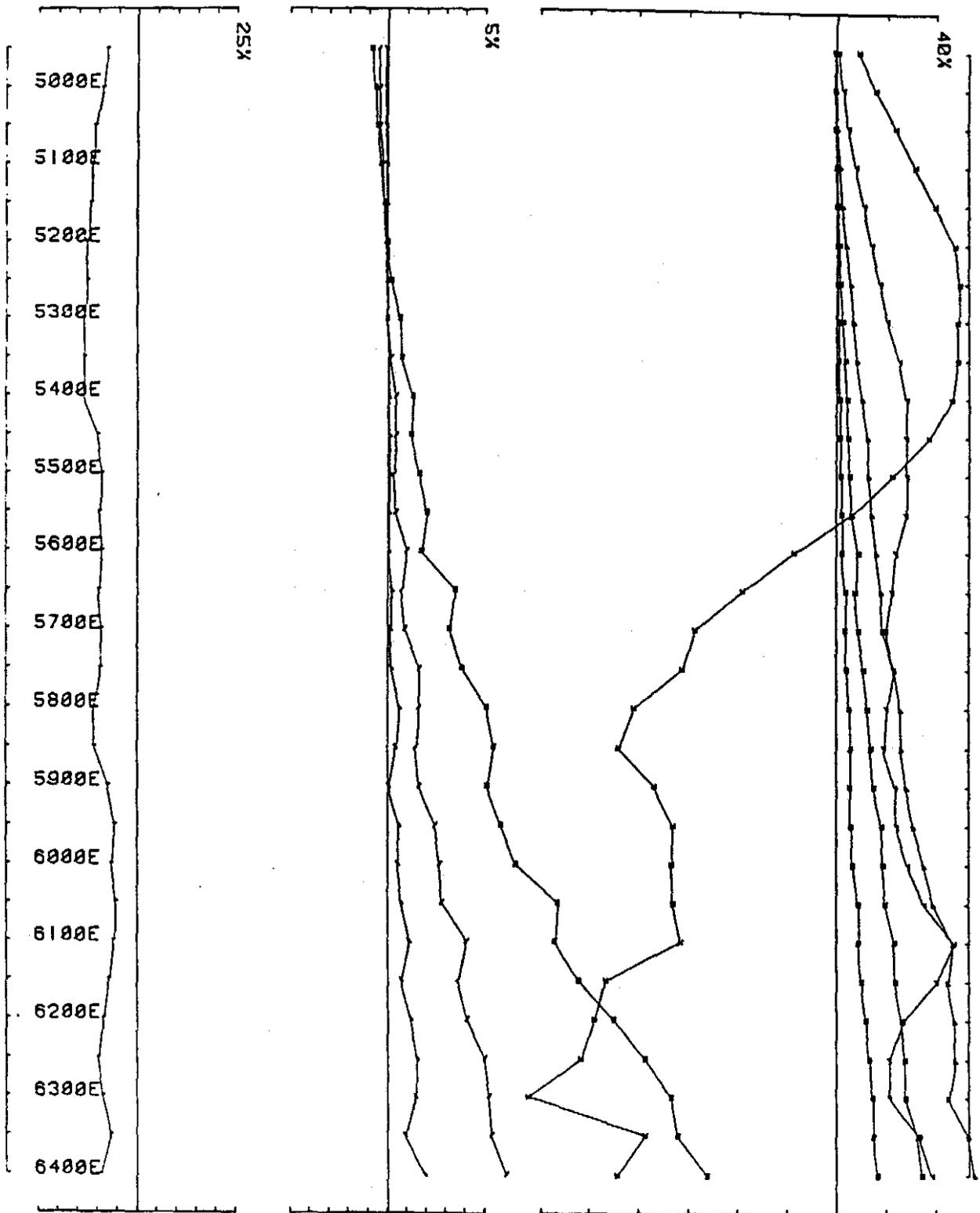
FIGURE 1: INTERPRETATION OF ZONE J1 AND J3 WITH PROPOSED DRILL HOLES

SCALE 1 : 2500

5 cm



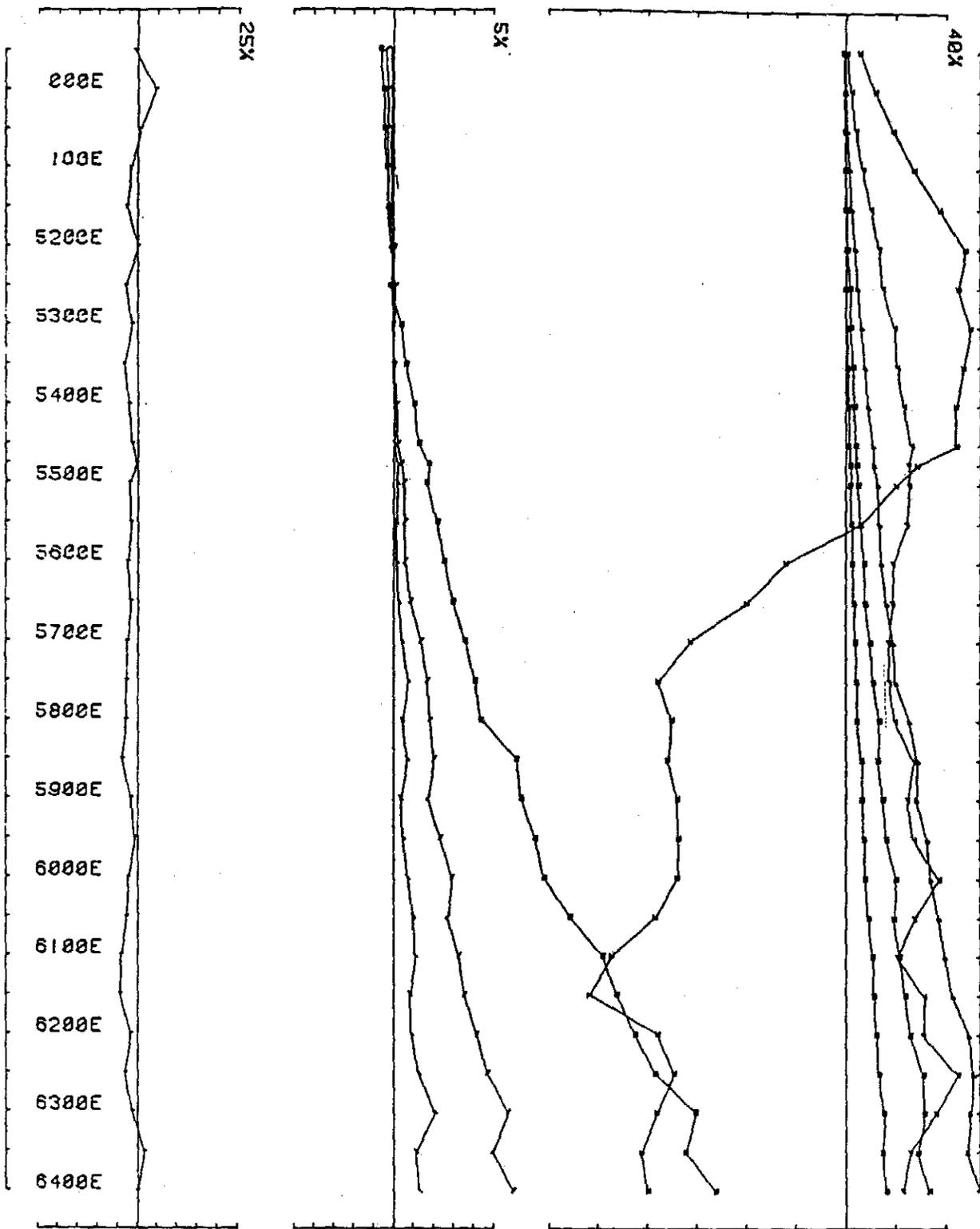
UTEM SURVEY conducted by PMM GJL Job 12
Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
Loopno 0004 Line 2800N component Hz secondary Ch 1.



UTEM SURVEY conducted by PMM GJL Job 12
 Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
 Loopno 0004 Line 3000N component Hz secondary Ch 1

353

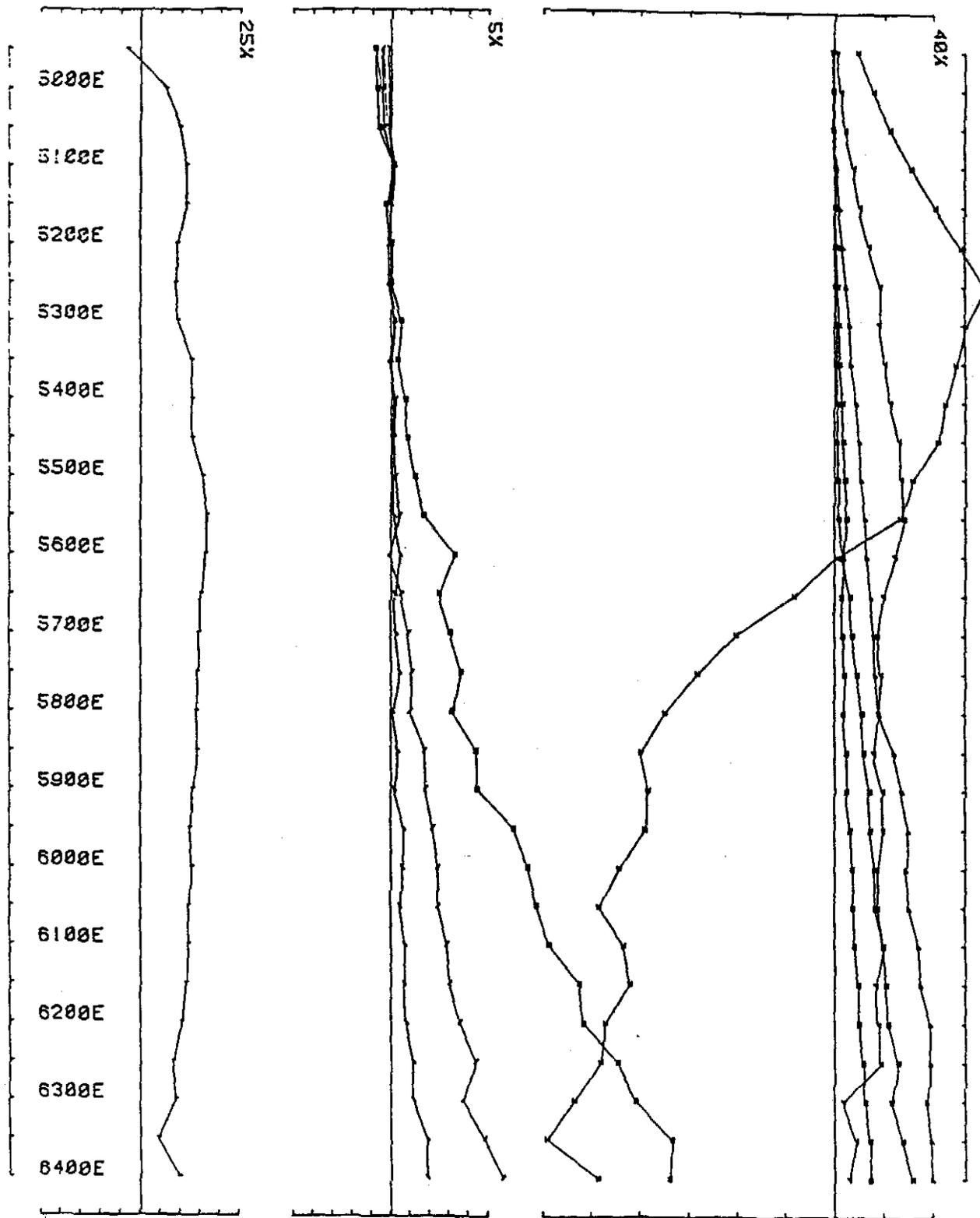
028379



UTEM SURVEY conducted by PMM GJL Job 12
Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
Loopno 0004 Line 3200N component HZ secondary Ch 1

354

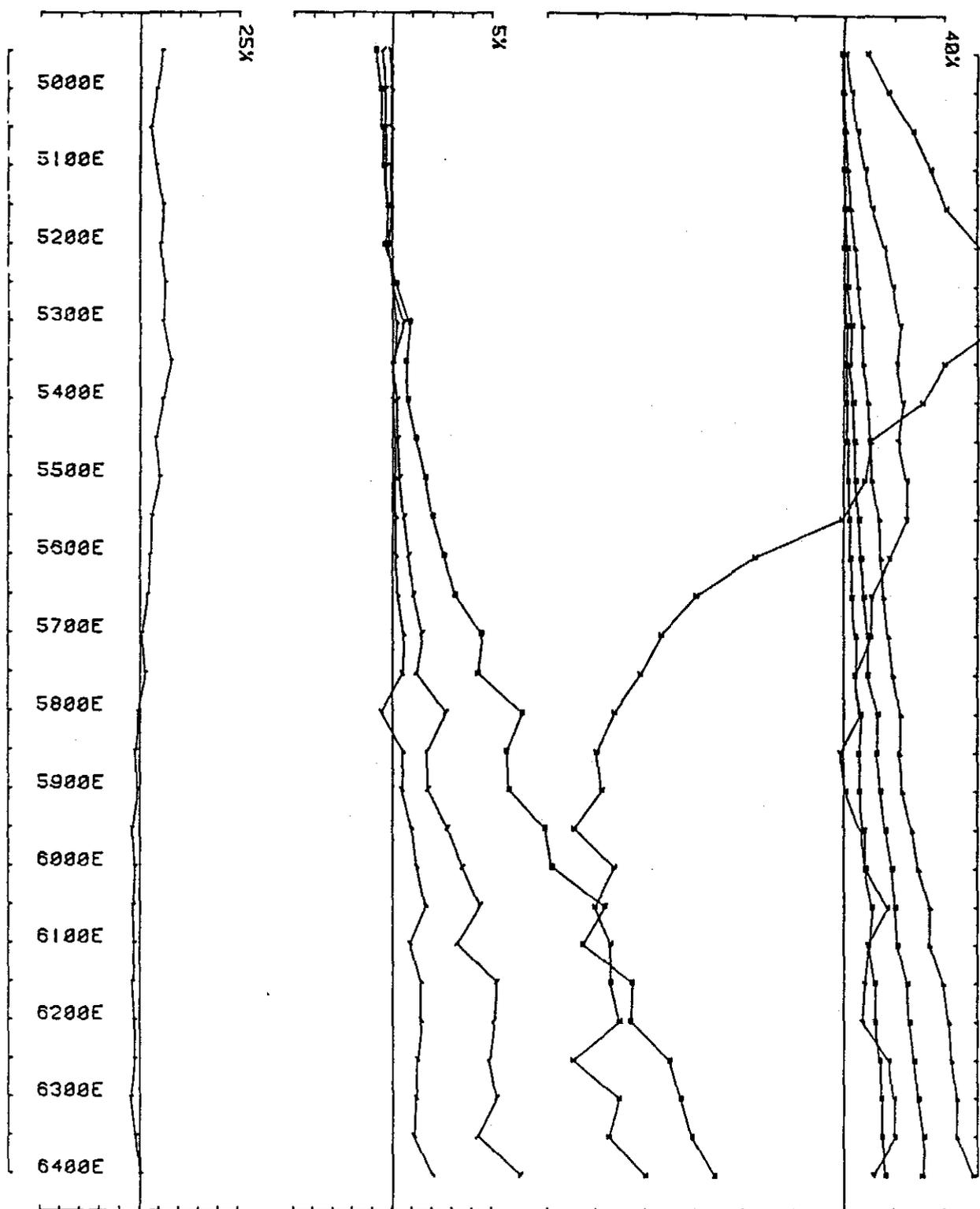
028380



UTEM SURVEY conducted by PMM GJL Job 12
Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
Loopno 0004 Line 3400N component Hz secondary Ch 1.

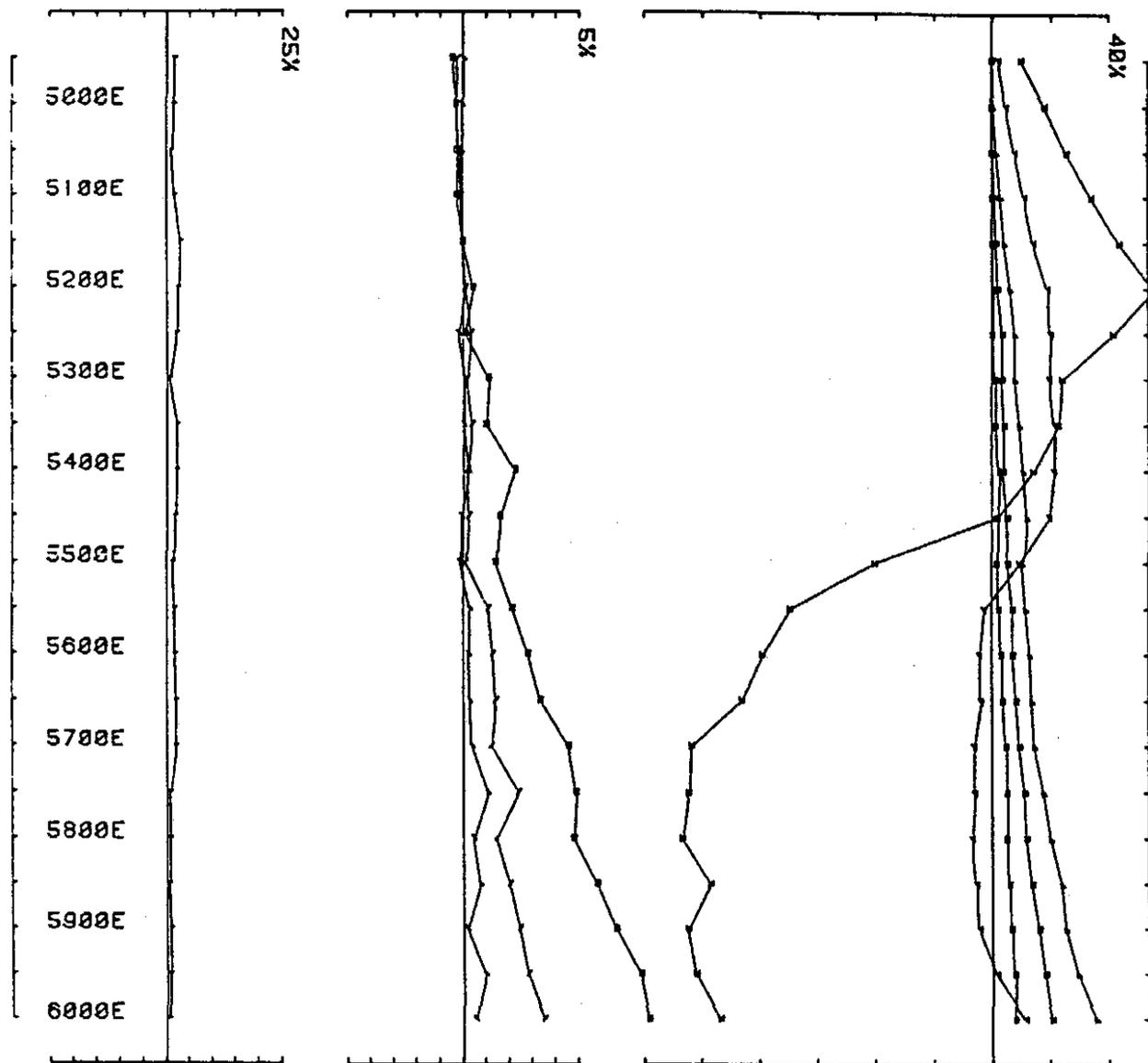
355

028381



UTEM SURVEY conducted by PMM GJL Job 12
Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
Loopno 0004 Line 3600N component HZ secondary Ch 1

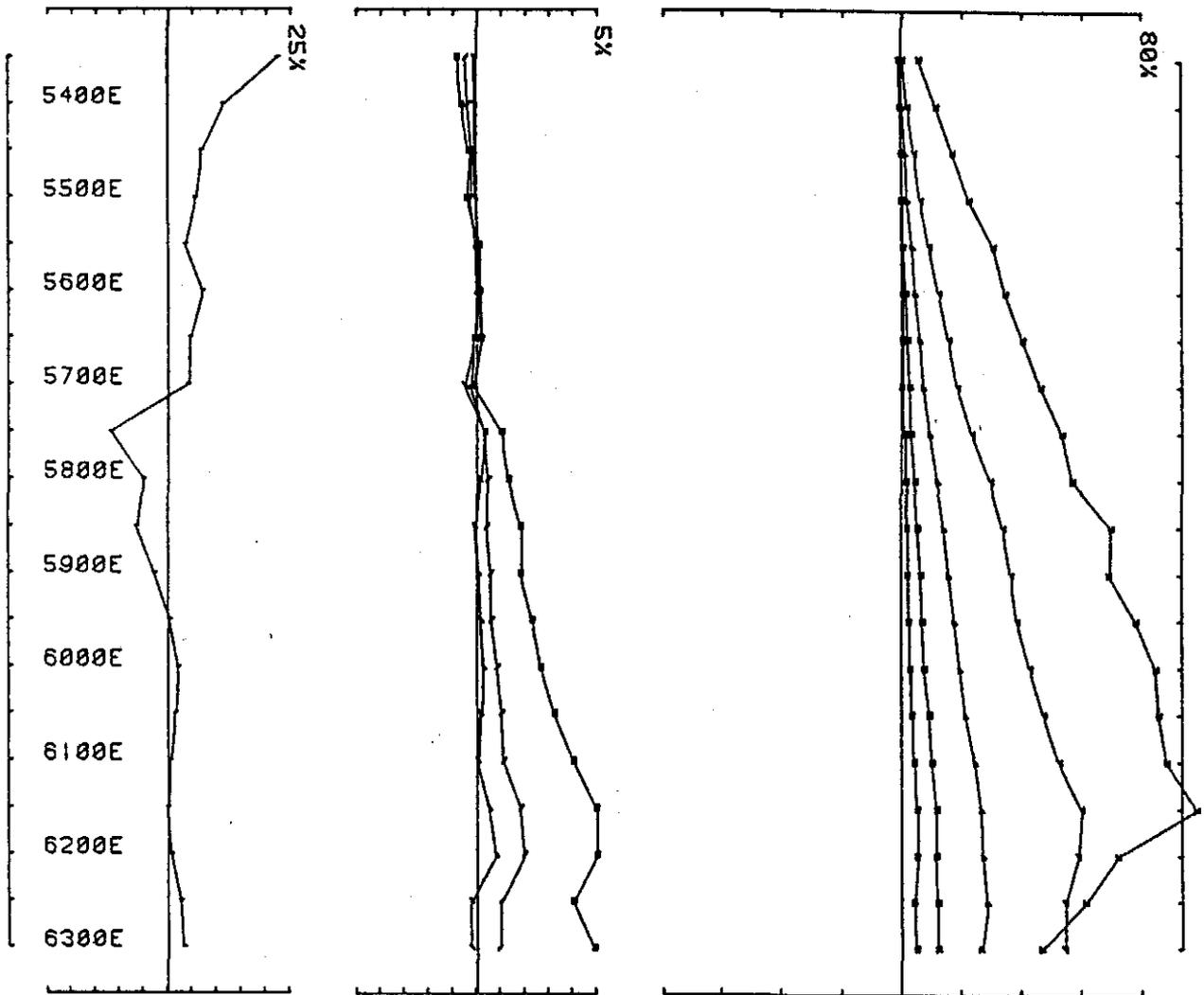
356



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357

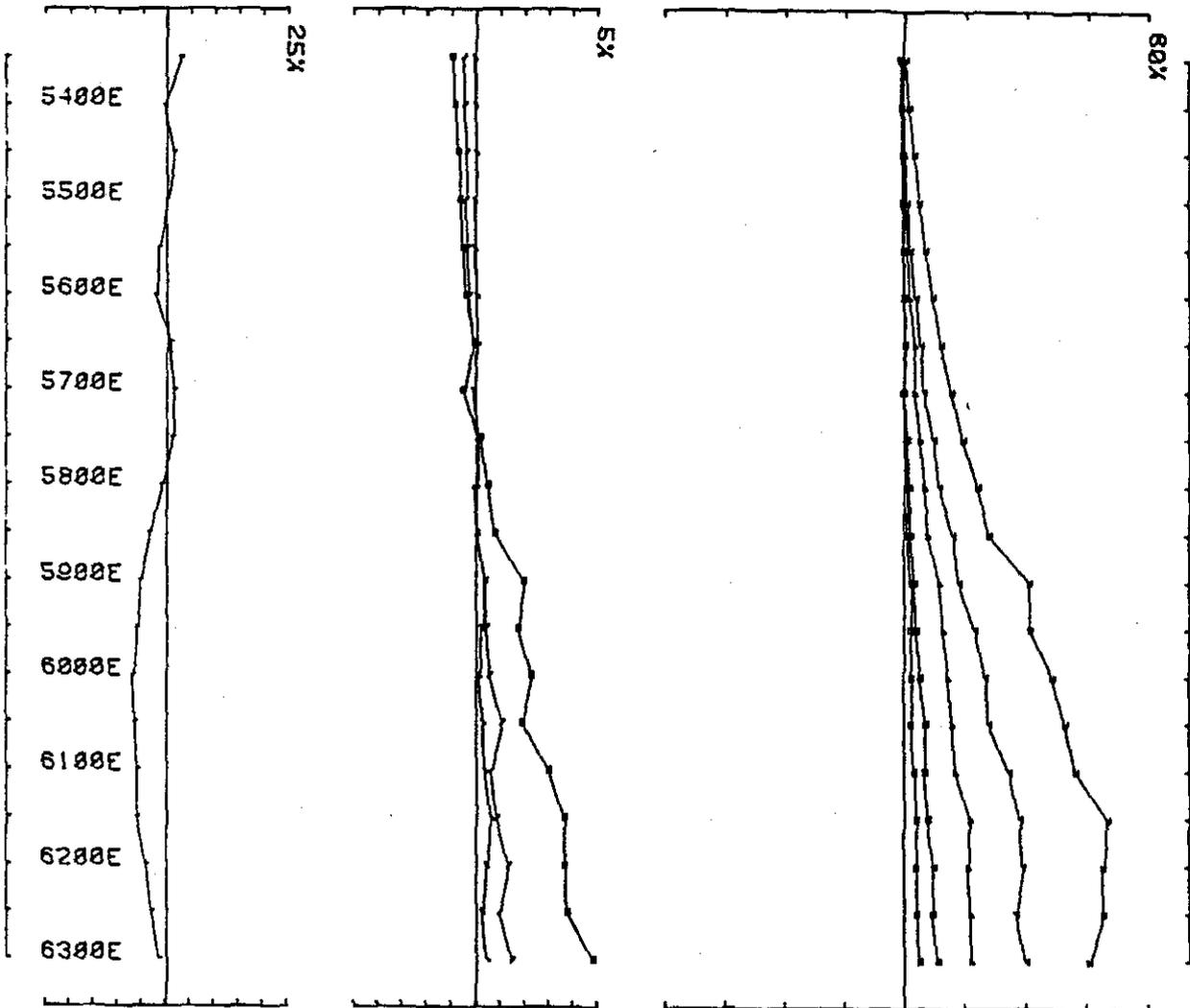
028383



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358

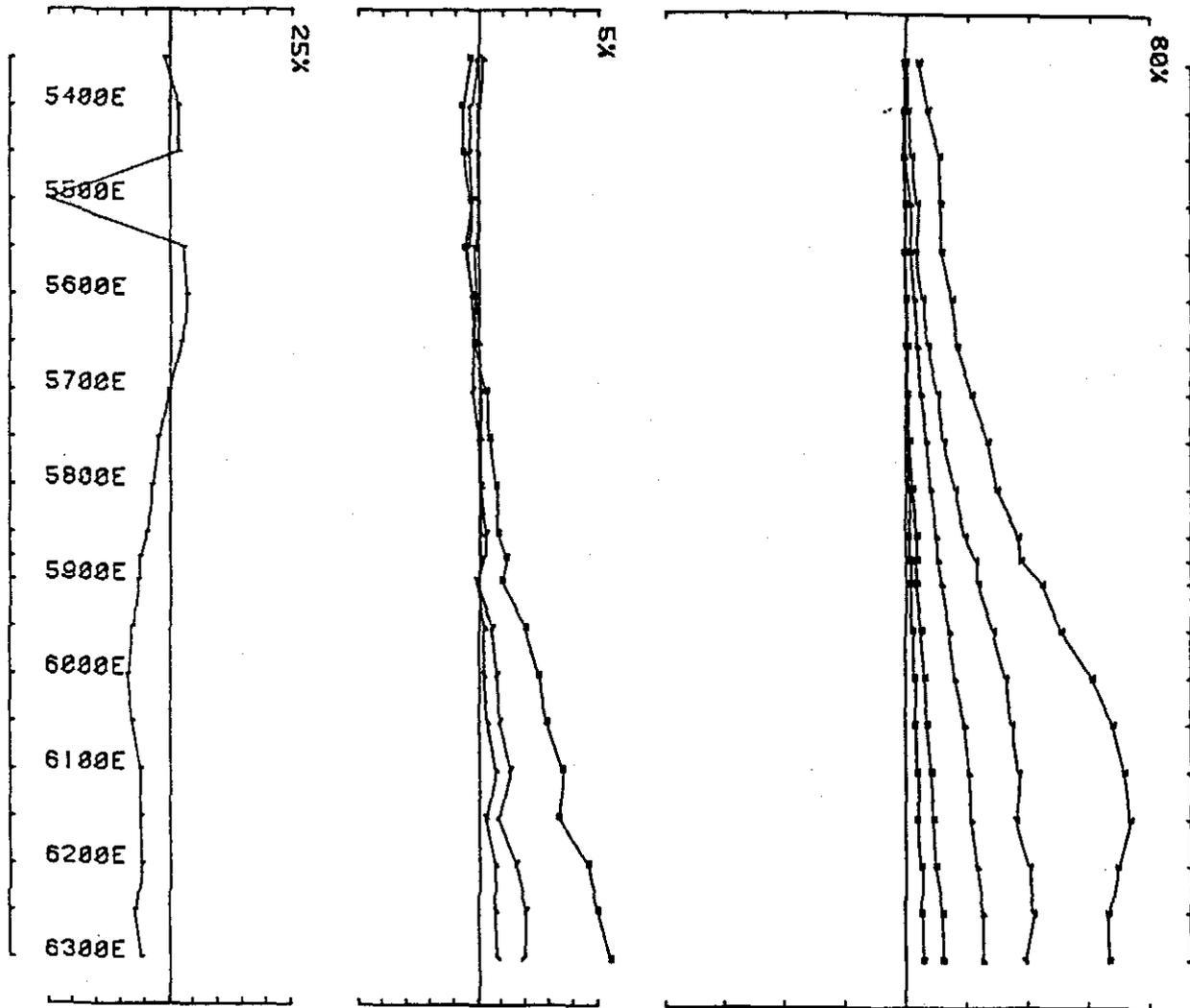
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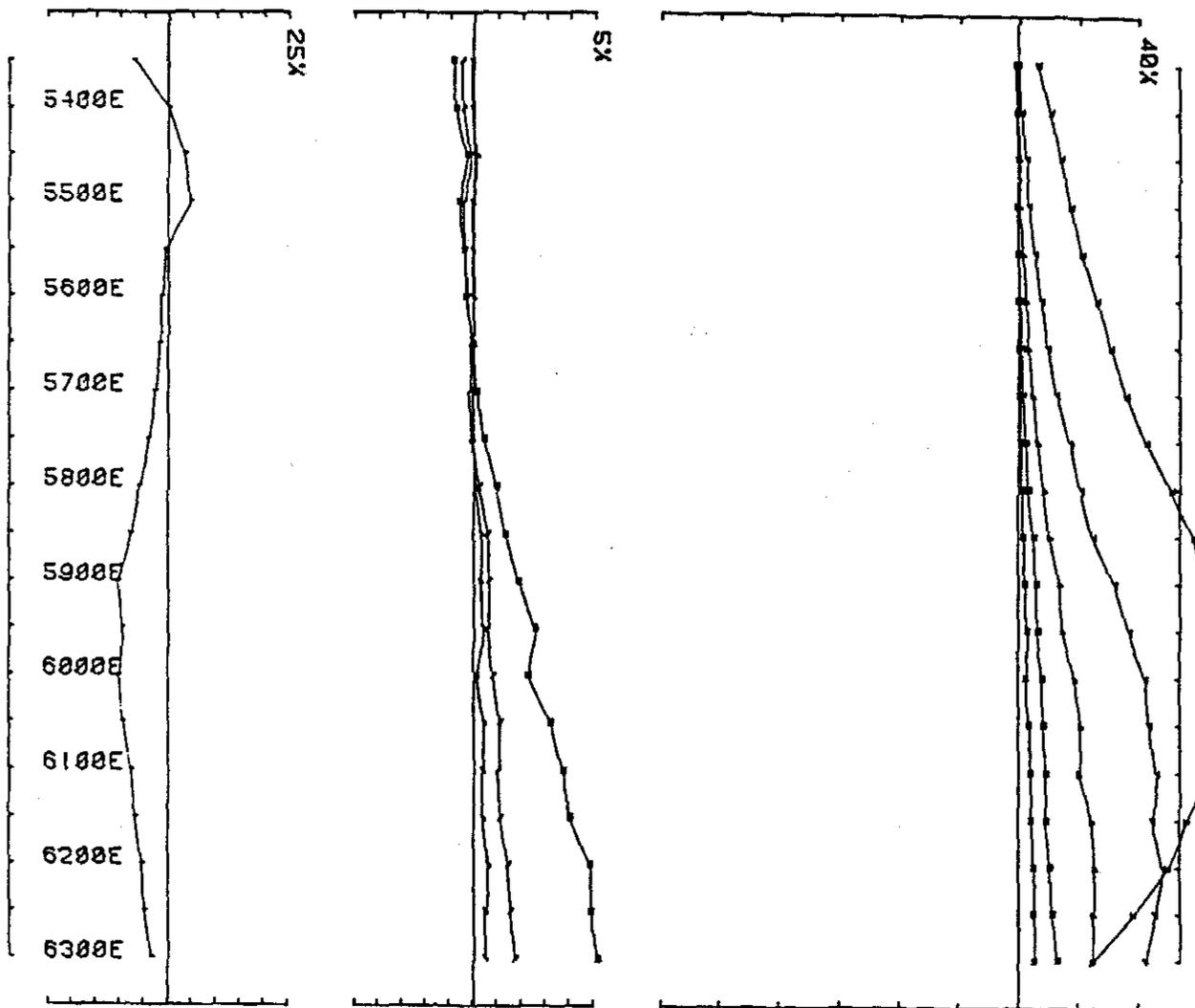
359

028385



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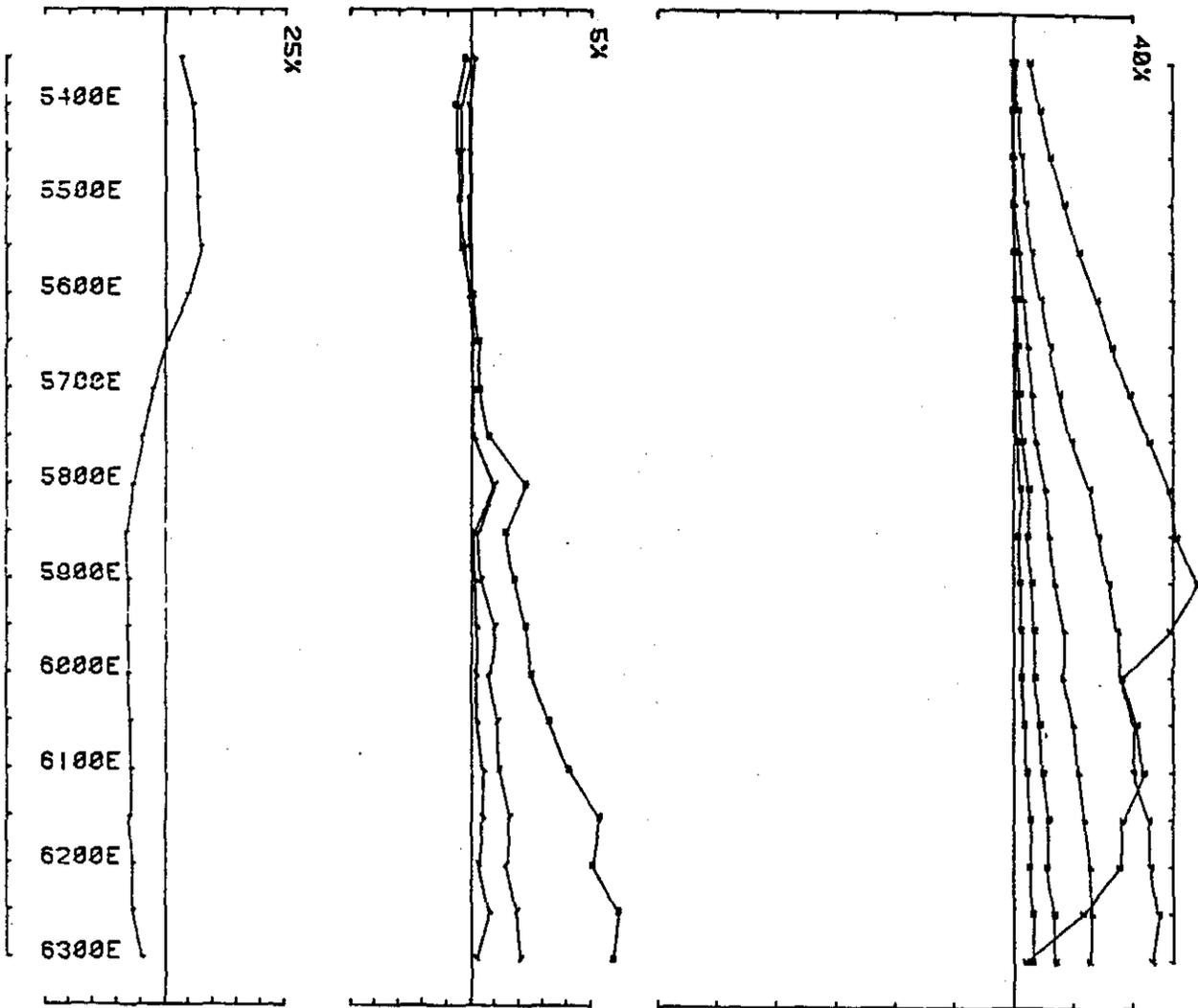
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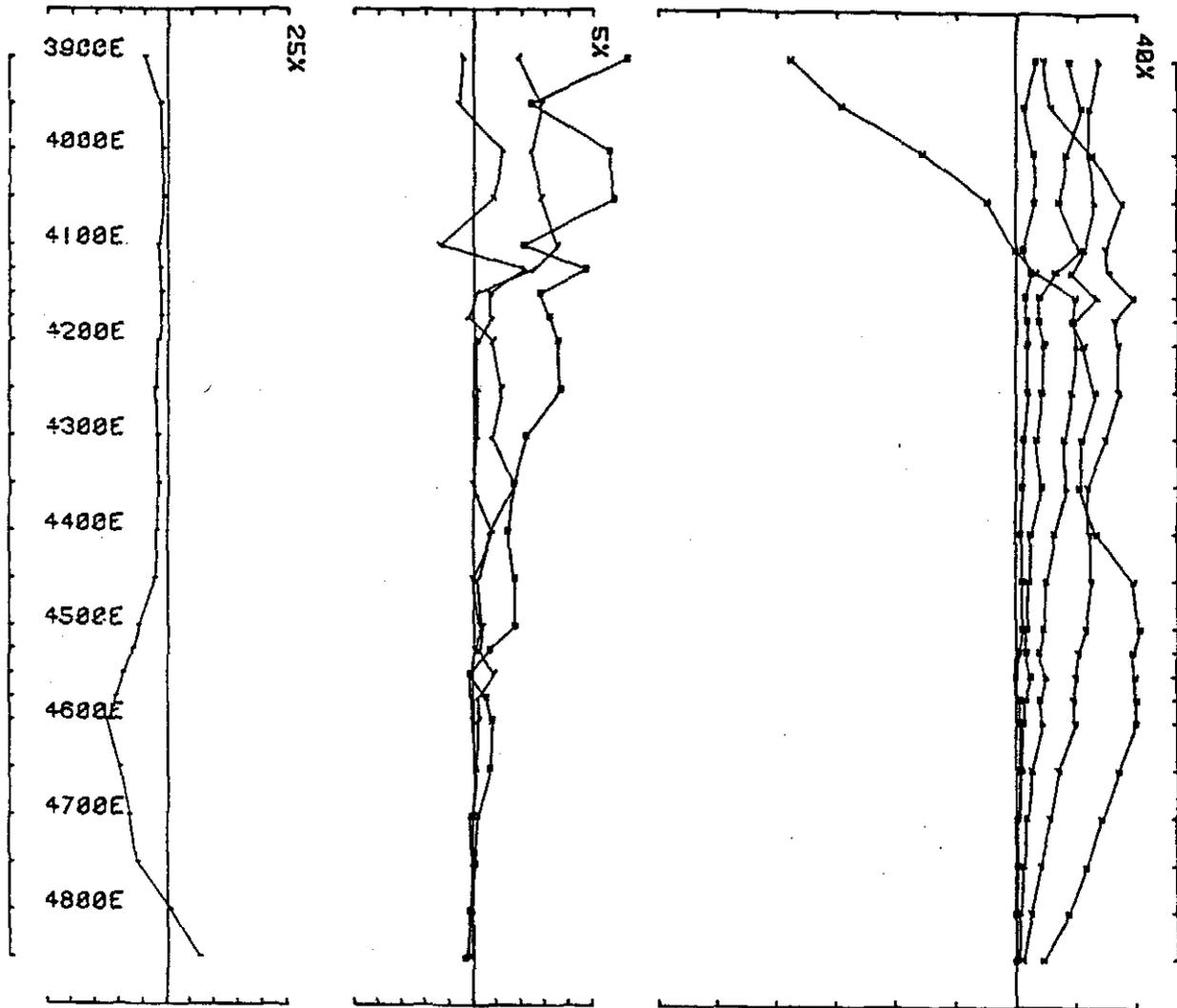
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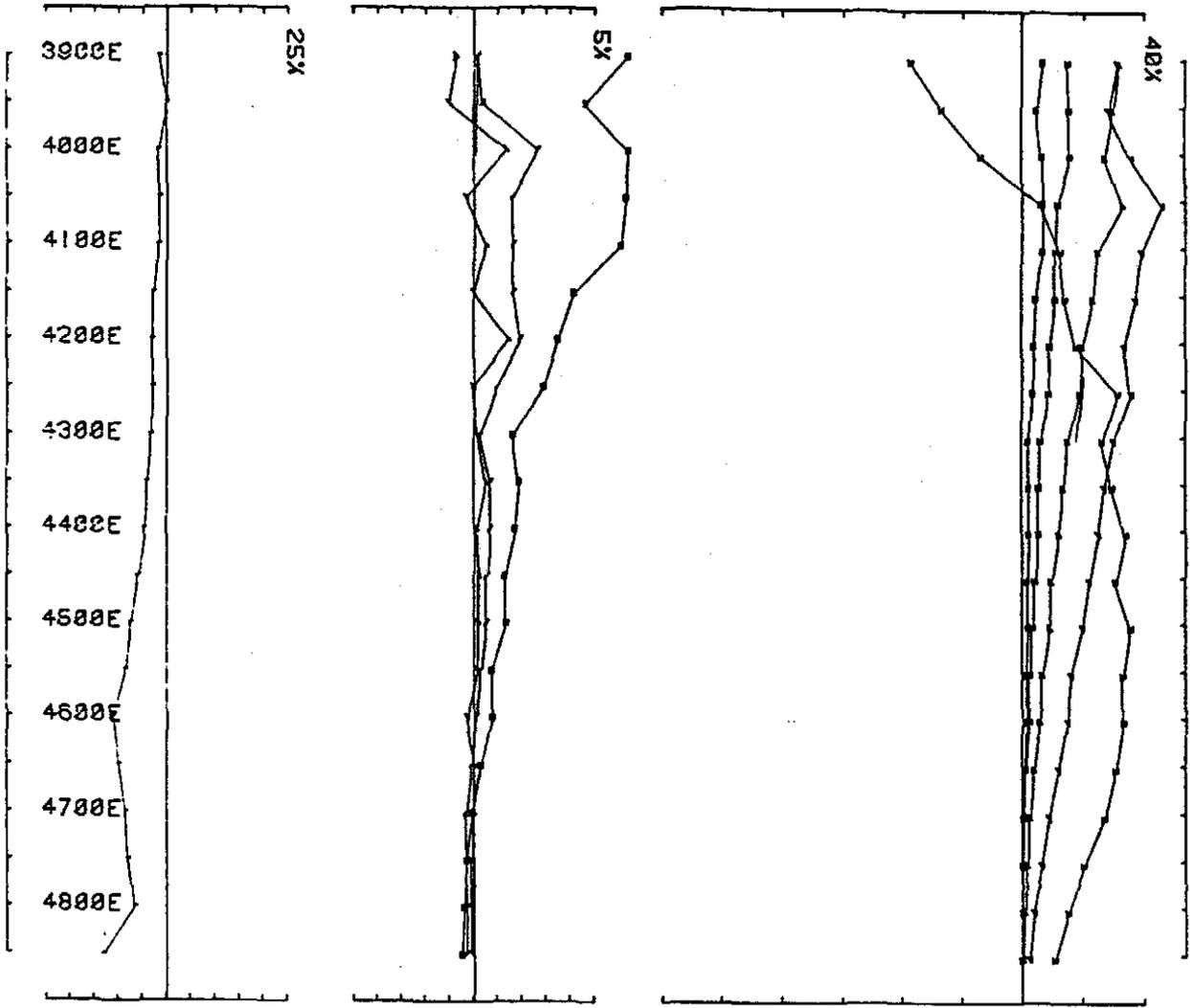
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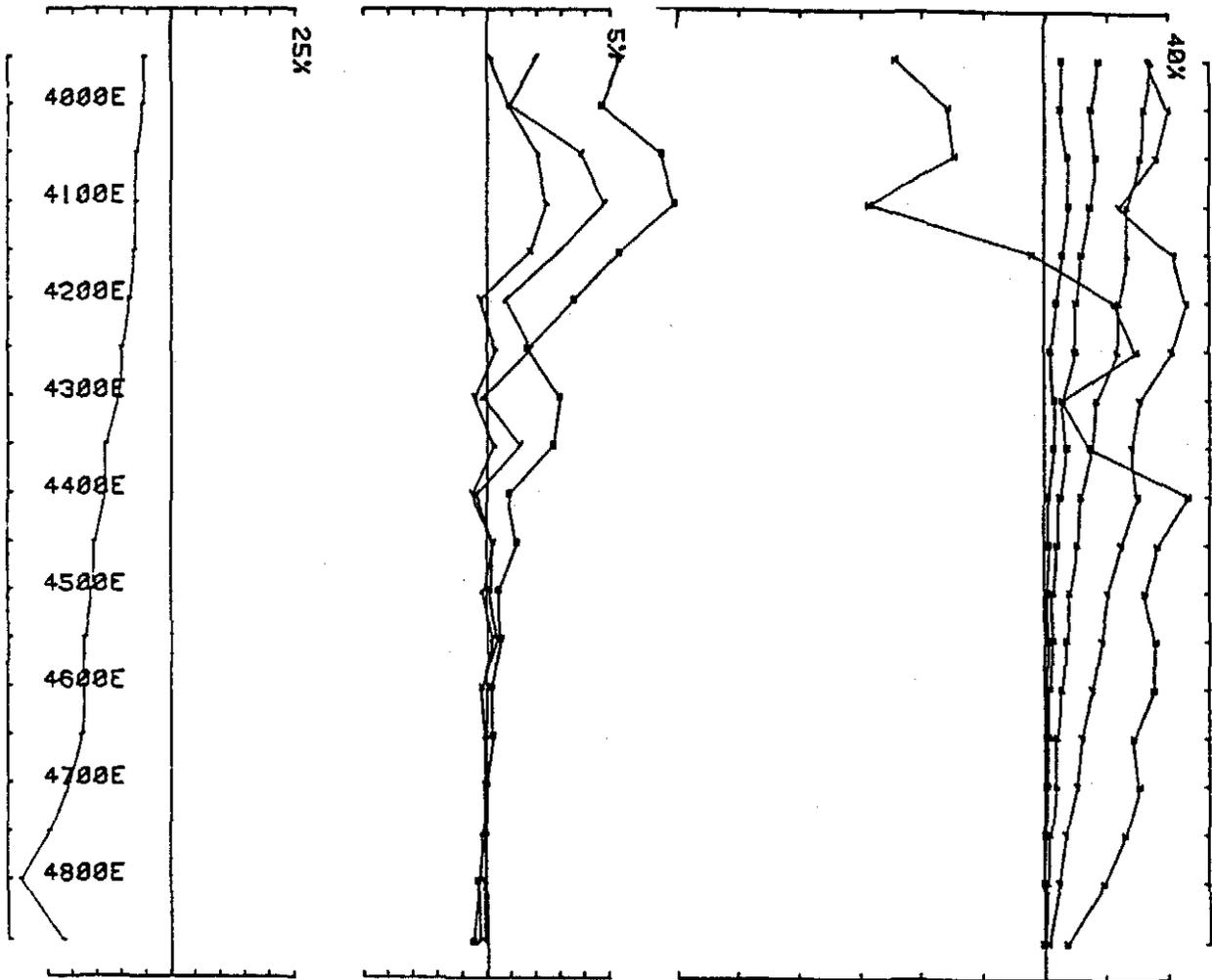
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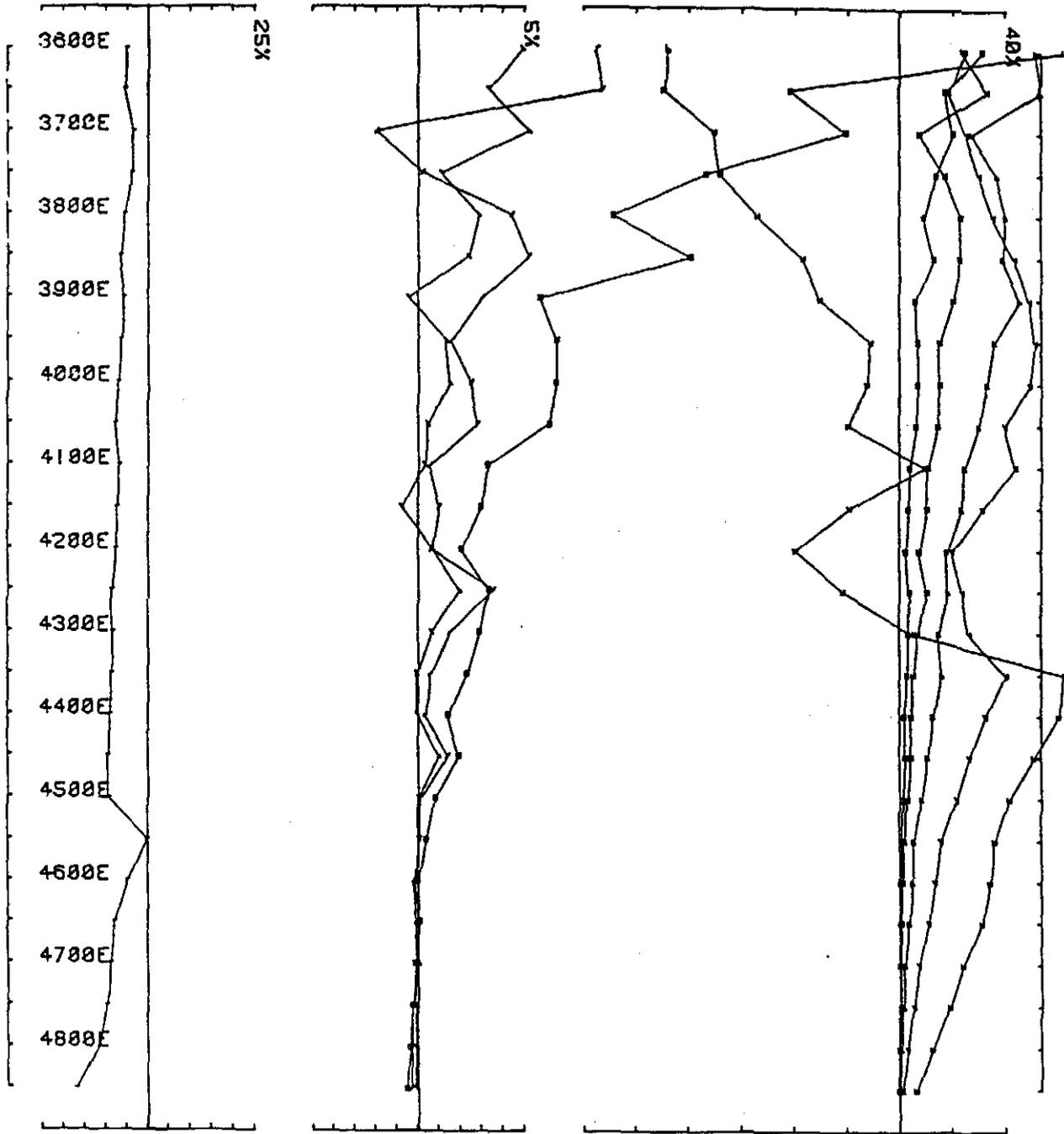
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364

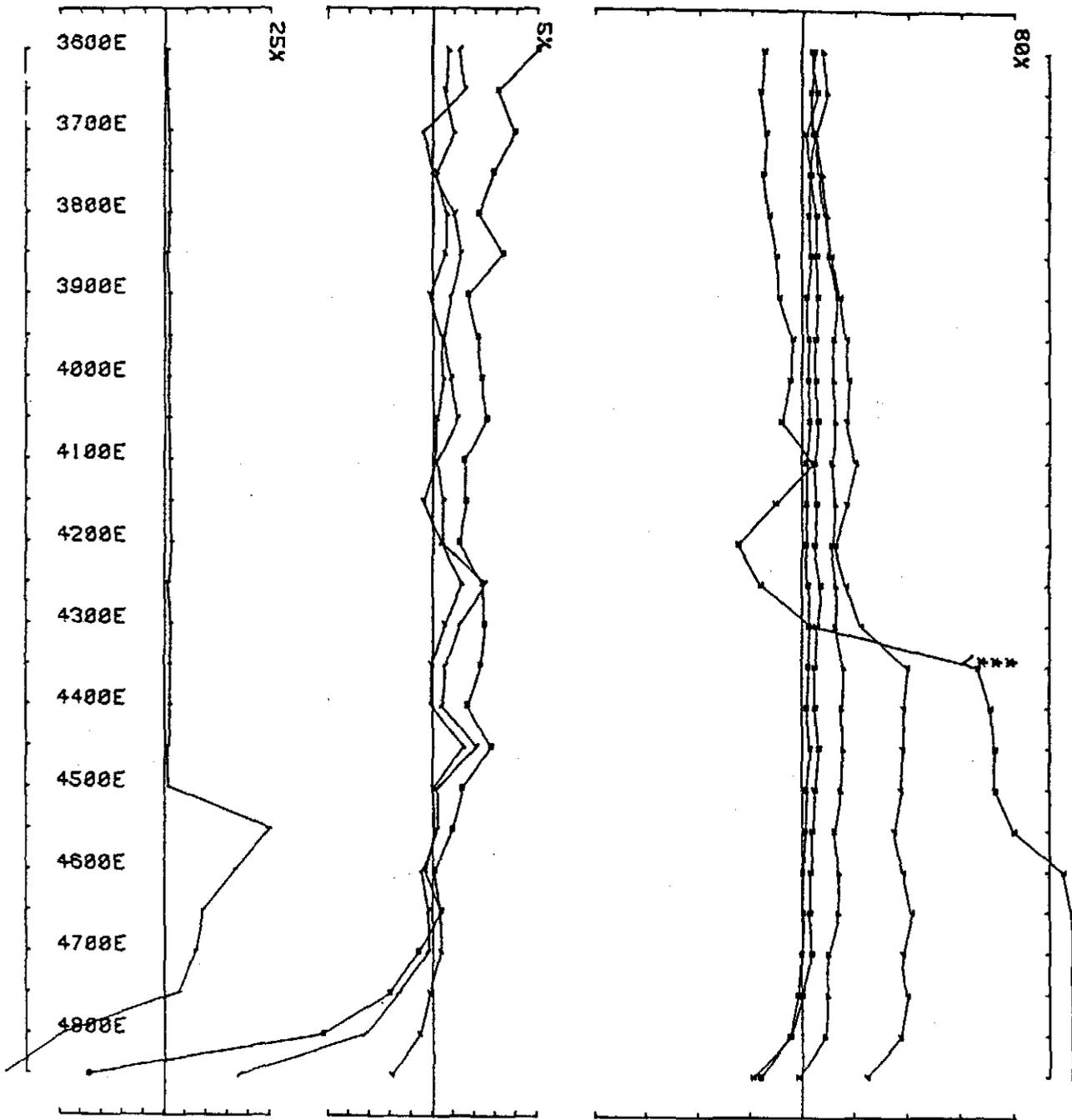
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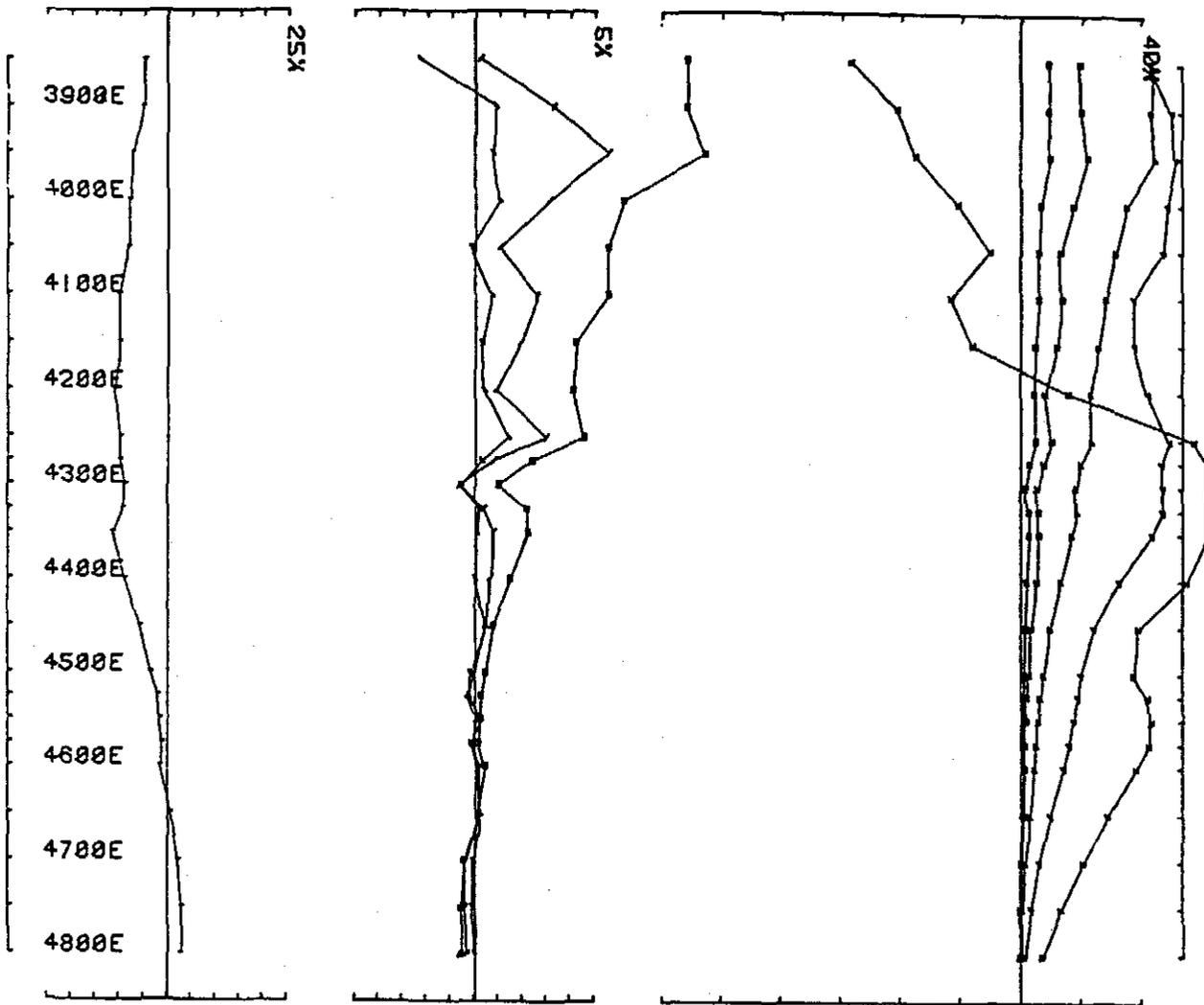
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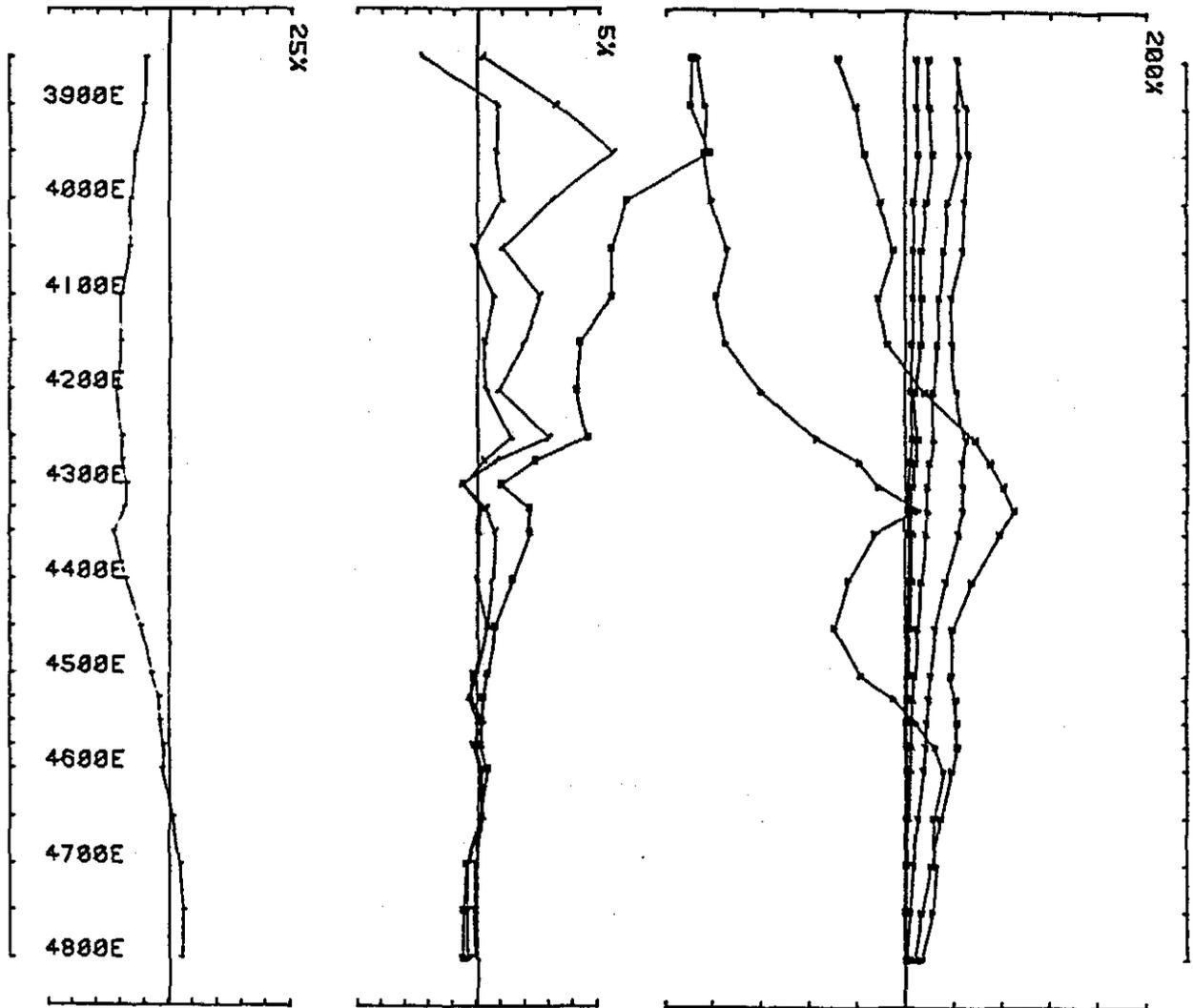
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367

028393



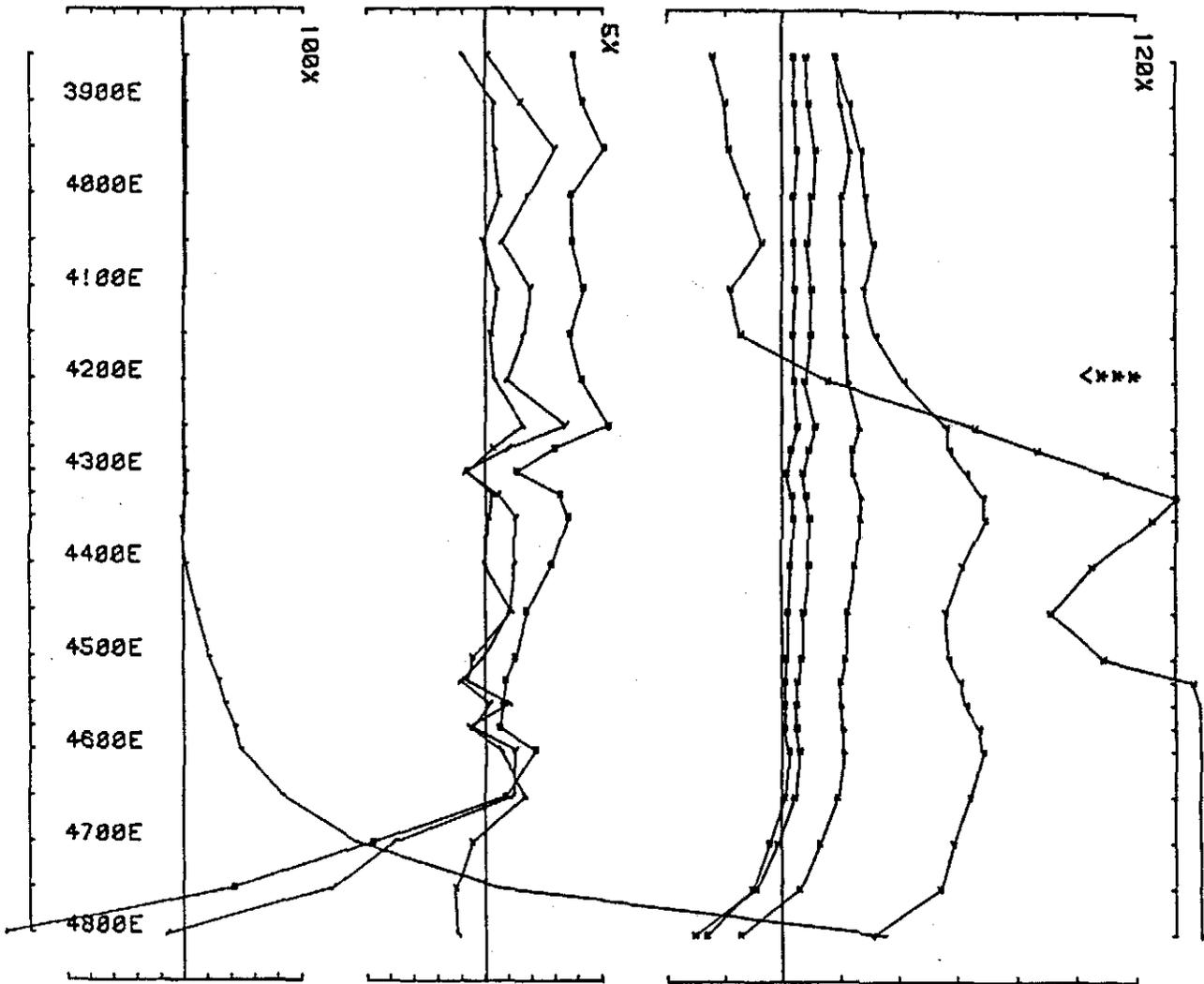
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Loopno 0014 Line 4000N component Hz secondary Ch 1.



UTEM SURVEY conducted by PMM GJE Job 1201
Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
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369

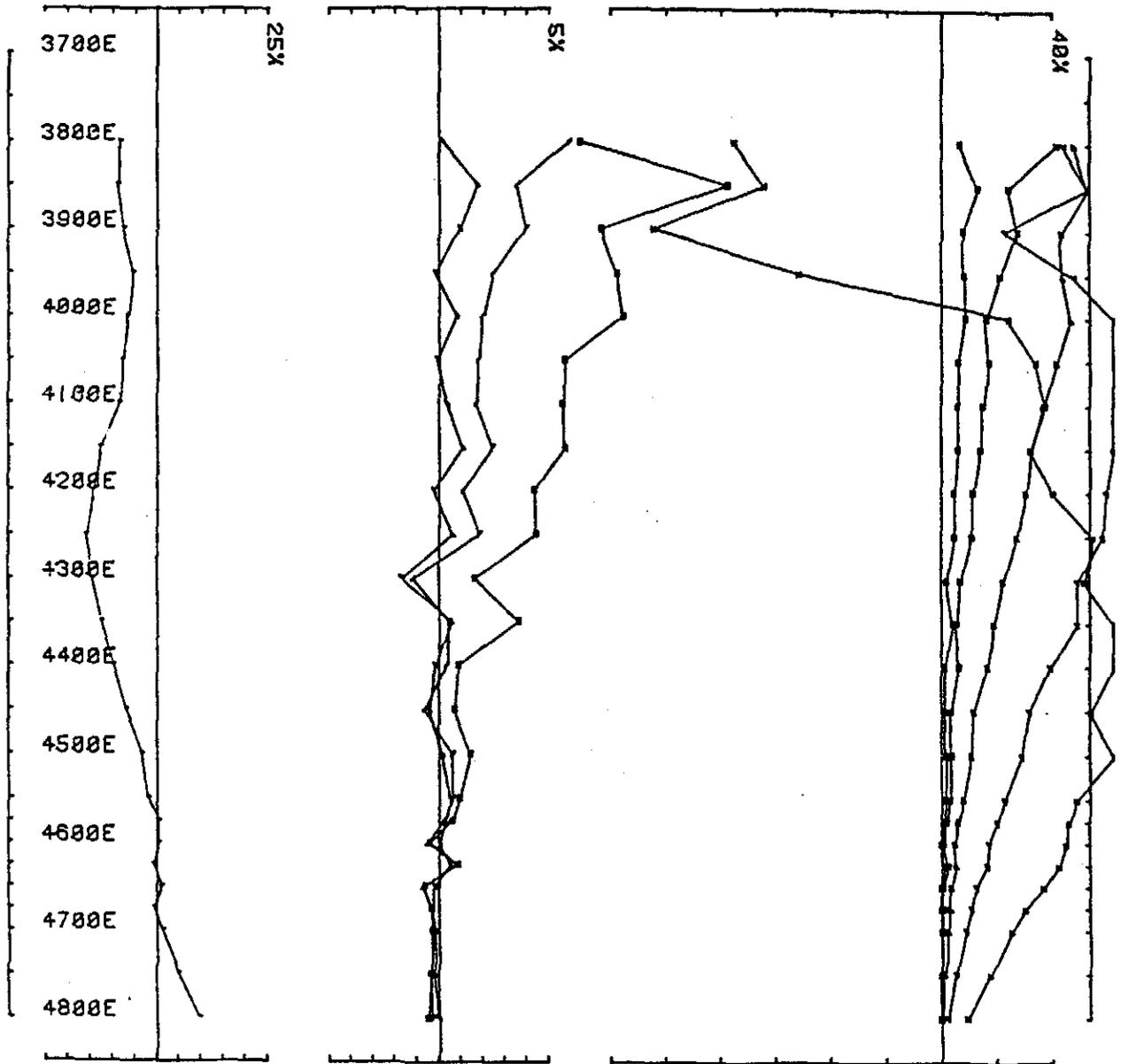
028395



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370

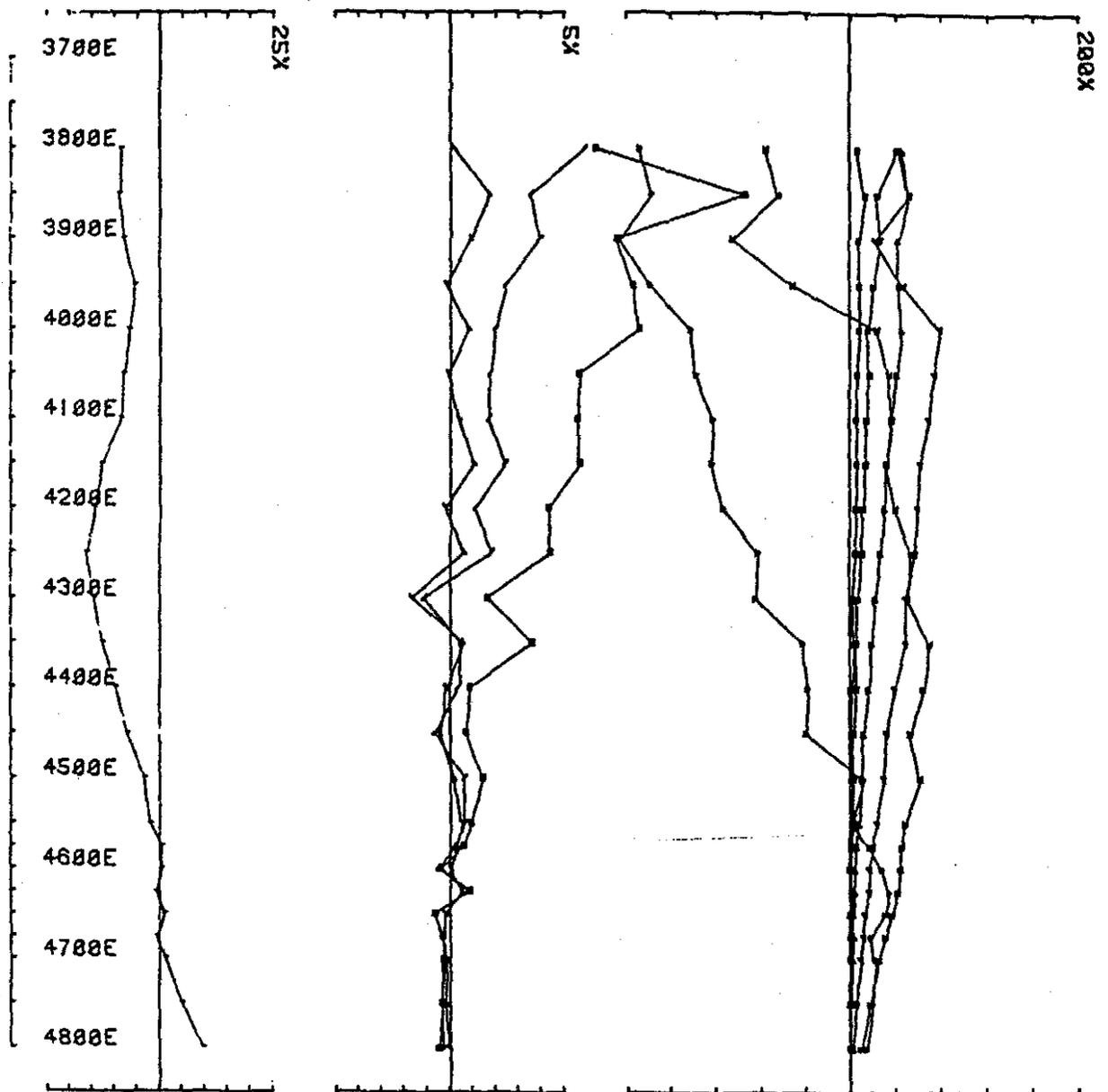
028396



UTEM SURVEY conducted by PMM GJL Job 1201
Project Area South Mt. Charter Survey for Aberfoyle freq(hz) 26.230
Loops 0014 Line 4200N component Hz secondary Ch 1

371

028397



UTEM SURVEY conducted by PMM GJL Job 1201
Project Area South Mt. Charter Survey for Aberfoyle (freq(hz) 26.238
Loopno 14 Line 4200N component Hz secondary Ch 1

372

028398

APPENDIX P

373

028399

ABERFOYLE EXPLORATION

(Internal Report)

DOWNHOLE ELECTROMAGNETICS ON THE
MACKINTOSH HATFIELD LICENCES
TO AUGUST 1985

DISTRIBUTION

Aberfoyle Hawthorn
Tom Eadie, Hawthorn
John Sise, Burnie
Dave Wallace, Que River

Tom Eadie
Geophysicist

TABLE OF CONTENTS

	<u>PAGE NO</u>
I INTRODUCTION	1
II SUMMARY	1
III INTERPRETATION	1
1. Introduction	1
2. MC10	2
3. MC11	2
4. MC12	2
5. MC13	3
6. HL2	3
7. HL80	4
8. DA4	4
9. DA5	5
10. MAC 1	6
11. MAC 2	6
12. QR 29	7
IV CONCLUSIONS	7
REFERENCES	8

APPENDIX 1 - Downhole and Surface EM Interpretation MAC 2 Area

LIST OF FIGURES

Figure 1: Summary Plan With Interpreted Geology and Transmitter Loop Positions

- " 2: DHEM Decay Curves
- " 3: MC10 Sirottem Data
- " 4: MC11 Sirottem Data
- " 5: MC12 Sirottem Data
- " 6: MC13 Sirottem Data
- " 7: HL2/LOOP 1 Sirottem Data
- " 8: HL2/LOOP 2 Sirottem Data
- " 9: HL80/LOOP 1 Sirottem Data
- " 10: HL80/LOOP 2 Sirottem Data
- " 11: DA4/LOOP 1 Sirottem Data
- " 12: DA4/LOOP 4 Sirottem Data
- " 13: DA4/LOOP 5 Sirottem Data
- " 14: DA4/LOOP 6 Sirottem Data
- " 15: DA5/LOOP 1 Sirottem Data
- " 16: DA5/LOOP 2 Sirottem Data
- " 17: MAC 1/LOOP 1 Crone PEM Data
- " 18: MAC 1/LOOP 2 Crone PEM Data
- " 19: MAC 2/LOOP 1 Sirottem Data
- " 20: MAC 2/LOOP 2 Sirottem Data
- " 21: MAC 2/LOOP 3 Sirottem Data
- " 22: MAC 2/LOOP 4 Sirottem Data
- " 23: QR29 Sirottem Data

I INTRODUCTION

Exploration and test surveys on the Hellyer ore deposit have shown that downhole electromagnetic techniques are capable of detecting deep conductive massive sulphide bodies, even if they are further than 100 metres from a drill hole. Throughout 1984 and 1985, the method has been applied to every new drill hole on the Mackintosh and Hatfield licences. Some of the results have been discussed in earlier reports (Eadie, 1984) and memos.

This report details the interpretation of the most recent downhole electromagnetic work on the licences, including data from MC10, MC11, MC12, MC13, HL2, HL80, DA4, DA5, MAC1, MAC2 and QR29.

II SUMMARY

Most of the drill holes had no anomalous response whatsoever. Some of the downhole surveys detected the Que River Shale (MC13, MAC1) and others stringer mineralization (DA4, DA5). More important was the strong off hole response measured in MAC2, which indicates that there is a strong conductor in the vicinity of this hole. The initial hole to test this anomaly, MAC3, appears to have missed the target. Further downhole work in MAC3 will undoubtedly lead to a more accurate interpretation.

III INTERPRETATION

1. Introduction

In the following section, all of the data is discussed hole by hole. The transmitter loop locations are shown in Figure 1, while the decay curves from all of the anomalies are shown in Figure 2.

377

2. MC10

There is no conductive anomaly shown in the MC10 data (Figure 3). The rapid decay of the background response shows that the host rock is very resistive.

3. MC 11

MC11 was drilled into a very subtle UTEM anomaly that was very well positioned with respect to geology, anomalous soil geochemistry and an IP anomaly. No large conductive body was intersected and the downhole Sirotem data (Figure 4) shows no conductive anomaly. One explanation for this lack of anomaly in the Sirotem data is that the UTEM feature that was interpreted to be from a deeply buried source, was actually just long wavelength noise, probably related to coming too close to the HEC transmission line, a very good conductor in itself (Eadie 1984). The reason that this was not recognised at the time, and in fact is even now just a theory, is that the anomalous readings are not exactly parallel to the power line, and do not occur elsewhere at this distance from it.

Another possible explanation is that the Sirotem unit does not measure early enough in time to detect some of the more subtle UTEM anomalies. This problem is magnified when the transmitter loop used for the UTEM is considerably larger as was the case for this survey, thereby enhancing the anomaly because of a larger amount of current channelling.

4. MC12

MC12 was drilled into the best of the Northwest Mt. Charter geochemical anomaly. There is no anomalous response in the downhole EM data (Figure 5), showing that there are no conductive massive sulphide bodies within about 100 metres of the hole.

378

5. MC13

UTEM outlined an area within the shales that was anomalously conductive. MC13 was drilled to test beneath this feature because of the geological interest of the area (nose of a syncline, on a major structure, proper Hellyer stratigraphy). The hole did not intersect any conductive massive sulphides.

The DHEM data (Figure 6) confirms that the shales are very conductive, at least to a depth of 160 metres. However there are no conductors nearby in the volcanics, which start at 250 metres. The decay curve for the MC13 shales is shown in Figure 2. The time constant of 2.3 milliseconds shows that the shales here have as much conductance as a moderately sized massive sulphide body. This is much higher than most of the shales in the area.

6. HL2

The results from HL2 are the most enigmatic of all the results (Figures 7 and 8). Judging from these curves, there is a conductor in the Upper Epiclastic sequence and an investigation of the decay curves (Figure 2), shows that the conductor is quite strong with a time constant of about 2.5ms.

The conductor could be due to a shale unit within the UES in that the shales in MC13 were as conductive as this. However there are two problems with this interpretation. The first is that the surface UTEM did not pick up a good conductor in this area, and the second is that the polarity of both of the downhole anomalies is wrong for a conductor within the Upper Epiclastics with a conformable dip. A positive anomaly would be expected from loop 1 and a negative from loop 2.

Because of these problems, no proper interpretation of this zone is yet forthcoming. Recommendations for further geophysical work on this zone will wait until the similar interpretation problems near

MAC 2 and 3 are sorted out. In the meantime, the economic potential of the Upper Epiclastic Unit in this area should be reviewed, particularly since there is a large geochemical anomaly in the vicinity.

7. HL80

HL80 was drilled to test intense alteration of the style seen in the Hellyer hanging wall. Only basalts were intersected, except from 301-305 metres where there was a laminated pyritic siltstone.

The downhole Sirotem results are shown in Figures 9 and 10. Except for a very weak early time response from about 220-240 metres (fault), there are no obvious anomalies. However a subtle elevation in values in loop 2 data in the bottom half of the hole, and a decrease in the same area in the loop 1 data, suggested that there may be a long wavelength anomaly caused by a very distant source. To investigate this possibility, data from loop 1 at 370 metres were subtracted from the corresponding loop 2 data in an attempt to remove background. (This point was chosen because the primary field is similar for both loops there). The remainder is plotted on Figure 2. It can be seen that the currents in this feature, whatever it may be, decay quickly and therefore is not conductive enough to be of economic interest.

8. DA4

The loop positions for the downhole surveys are shown in Figure 1.0. There are two anomalies in this hole and both are best shown from the loop 1 data (Figure 11). The first anomaly is a positive response from shallow in the hole to about 150 metres. The time constant of this response is quite large, about 2.4ms and is therefore very interesting. It is undoubtedly caused by the same body as the anomalies in MAC2 and therefore will be discussed in more detail in that section.

380

The second anomaly is a broad negative from about 200 metres to about 600 metres. The time constant of this anomaly is very low, suggesting that the source is the weakly pyritic stringer mineralization often found in the D zone. The response is so broad because the hole is running almost parallel to this zone of pyritization for a long distance.

The two anomalies are not as visible in the DA4 data from the other loops (Figures 12, 13 and 14). This is due to the fact that the transmitter loops are not well coupled with the conductive bodies. Loop 4 is too far north for either conductor and loop 6 is too far west plus possibly too far north. Loop 5 appears to give a very subtle negative anomaly for the shallow conductor but appears to be null-coupled with the deeper vertical body situated almost exactly beneath the loop.

9. DA5

DA5 was surveyed with two different loop positions as is shown in Figure 1. The first loop (Figure 15) shows an obvious, but weak negative anomaly, starting at about 170 metres and continuing to the end of the hole. The time constant of this anomaly, as shown in Figure 2, is very small, $\tau = 0.6\text{ms}$, and therefore the source of the anomaly is undoubtedly the stringer mineralization found in most of the D Zone holes. This is the same conductor that was seen in the initial UTEM survey and has been detected by downhole EM in most of the holes in this area.

The same anomaly can be seen in the loop 2 data, Figure 16 but is dominated by a positive host rock effect and is therefore more difficult to observe.

10. MAC 1

MAC 1 was surveyed with the Crone PEM unit for logistical reasons. This system has been proven to be just as effective as Sirotem in tests at Hellyer (Eadie, 1985). The data, in Crone units, is shown in Figure 17 from loop 1 and Figure 18 from loop 2. Loop positions are shown in Figure 1.

There is only one anomaly; it is seen in both of the holes from the top of the hole to about 100 metres. This correlates very well with the presence of the Que River Shale which is known to be conductive from surface EM work. The time constant of the anomaly as measured by the Crone unit (Figure 2) is 0.75ms which is about what is expected from shale. There is no indication of a conductive massive sulphide target either obscured by the shale, or elsewhere further down the drill hole.

11. MAC 2

An interpretation of the MAC 2 data has already been written and has been included as Appendix 1. DDH MAC 3 was drilled based on this interpretation. No massive sulphides were intersected. Drillhole and loop locations are shown in Figure 1.

Before completing the DHEM work on MAC 3, it would be a waste of time to speculate too seriously on the reasons for MAC 3 not hitting sulphides. However, as indicated in the memo in Appendix I, there is a good chance that the body lies off the section to the north of MAC 2 and MAC 3. Beside the reasons for this interpretation mentioned in the memo, this is supported by the fact that there is an anomaly in the DA4 - loop 1 data (Figure 11) that is very similar to the MAC 2 - loop 1 anomaly (Figure 19). The decay curves are very similar (Figure 2) except that the amplitude for MAC 2 is larger, suggesting that the conductor is significantly closer to this hole.

382

Subsequent to the time period covered by this report, detailed downhole work has been completed in the MAC2-MAC3 area. A report by Geoff Dickson (consultant) and Tom Eadie will be prepared shortly.

12. QR 29

QR 29 is an old exploration hole that was cleaned out and cased with PVC so that it could be read with DHEM. There is absolutely no hint of an anomaly in the hole (Figure 23). The target position was just off the end of the hole; there is no indication that a large conductor is being approached off the end of the hole, at least within 100 metres.

IV CONCLUSIONS

The large amount of downhole work done on the Mackintosh-Hatfield licences has succeeded in developing one target in the MAC 2-DA4 area, and severely downgrading several other prospects. In addition, the area around HL2 has been marked as an area of potential interest.

In general, the method has proven itself to be a very powerful component of the exploration programme for base metals in Northwestern Tasmania.

383

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- Eadie, E.T., 1984: Results of the Downhole Sirotem Survey at Mt. Charter and Zone J3, Internal Aberfoyle Exploration Report.
- Eadie, E.T., 1984: Report on the Detailed UTEM Survey on the Northwest Mt. Charter Geochemical Anomaly, Internal Aberfoyle Exploration Report.
- Eadie, E.T., 1985: Interpretation of Downhole Electromagnetic Data from the Hellyer Deposit - Part 2, Internal Aberfoyle Exploration Report.

384

APPENDIX 1

Date	18 July 1985	Ref	ETE:WB
To	Tony Hespe	From	Tom Eadie
At	Burnie	At	Hawthorn
Copies to	JRS DJJ SR ES	Keep	

Subject DOWNHOLE AND SURFACE EM INTERPRETATION - MAC2 AREA

DHEM results from DDH MAC2 were obtained from four different transmitter loop positions. In addition, the area surrounding MAC2 was covered with surface UTEM on traverses going both east-west (line spacing 200 metres) and north-south (line spacing 100 metres), Max-Min (line spacing 50 metres) and surface Sirotem (line spacing 50 metres). The results from 3 of the downhole EM traverses indicate that there is a very good conductor near the drillhole, but the fourth DHEM profile and the surface work detect very little. A further dilemma is that one of the 3 DHEM traverses that does detect the conductor, appears to have a positive response, rather than the negative response that would be expected from the position of the body interpreted with the other two loops. These apparent contradictions are discussed below. Interpretation diagrams and data sections will be included with a later report.

Downhole EM Data

There appears to be little doubt from the downhole EM data that there is a good conductor in the vicinity of the first 100 metres of MAC2. The south, centre, and east loops all give a response with a time constant of 1.9 - 2.9 milliseconds. This would suggest a body with a similar conductance to the PQ lens.

The interpretation based on the south and east loops identifies a conductor within 50 metres beneath the hole, dipping NNW and striking ENE. The conductor would project onto the drillhole at a depth of about 100 metres. The body must have a considerable thickness to explain these results. The north loop, although there is little or no response, is consistent with this interpretation in that this loop would be null-coupled with this geometry. This, plus the fact that the north loop is further from the conductor (150 m) than any of the others, could very well produce the very low response.

It is the centre loop which is the disturbing influence on this interpretation because instead of getting the predicted negative response, a positive is obtained. This can be explained in a number of ways. One is by assuming that the operator got the polarity wrong. This is probably not a good assumption in that Brian Rau is very careful these days and has not made this mistake for a long time.

MEMO TO: TONY HESPE

-2-

18 JULY 1985

Other explanations have to do with very complex conductor shapes (e.g. two limbs of a fold) and orientations. The resolution of this problem is made more complex by the azimuth of the drill hole with respect to the grid. However one possible solution is that the conductor does not pass through the plane of the section of the drillhole, and is offset to the north. There are even problems with this interpretation.

Surface EM Data

There are two different sets of UTEM data over the area. The first is from loop 10 (1983) using east-west lines with a spacing of 200 metres. It is very possible that the conductor is almost parallel to the lines, and lies totally between Lines 8900N and 9100N. There are some weak small responses at 5625E on line 8900N and 5675E on Line 9100N that may be off-line or alteration responses.

The 1985 north-south lines (loop 25) had a spacing of only 100 metres and were almost perpendicular to the target. Again there is little, if any, response due to the target conductor. One reason for this may be that the transmitter loop is very poorly coupled to a target with the interpreted dip and position. A second reason, that also applies to the first set of UTEM data, is that a small body, in this case possibly less than 1 million tonnes, may not be detectable from surface at the interpreted depth of about 100 metres using our normal UTEM survey parameters.

The Max-Min does not detect any conductors and would not be expected to, given the interpretation from DHEM.

The small amount of surface Sirotem work, 800 metres in total on Lines 8900N, 8950N, 9000N and 9050N, is difficult to explain. It seems that just about every reading is anomalous but no clear zone is outlined. The data appears to suffer from artificially elevated values near the transmitter loop, which is a great problem in this case because so great a percentage of readings are close to an edge of this very small loop. This attempt at reading inside such a small transmitter loop was a bit of an experiment; it must be judged a failure.

Conclusions

No clear interpretation has come out of all this field work, except that, if one can trust the data, there is a very good conductor within 50 metres of MAC2. The indications are that it is below the hole, and possibly (but not conclusively), off to the north. I am in total agreement with the geologists that 2 holes should be proposed for this very complex zone. The first

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MEMO TO: TONY HESPE

-2-

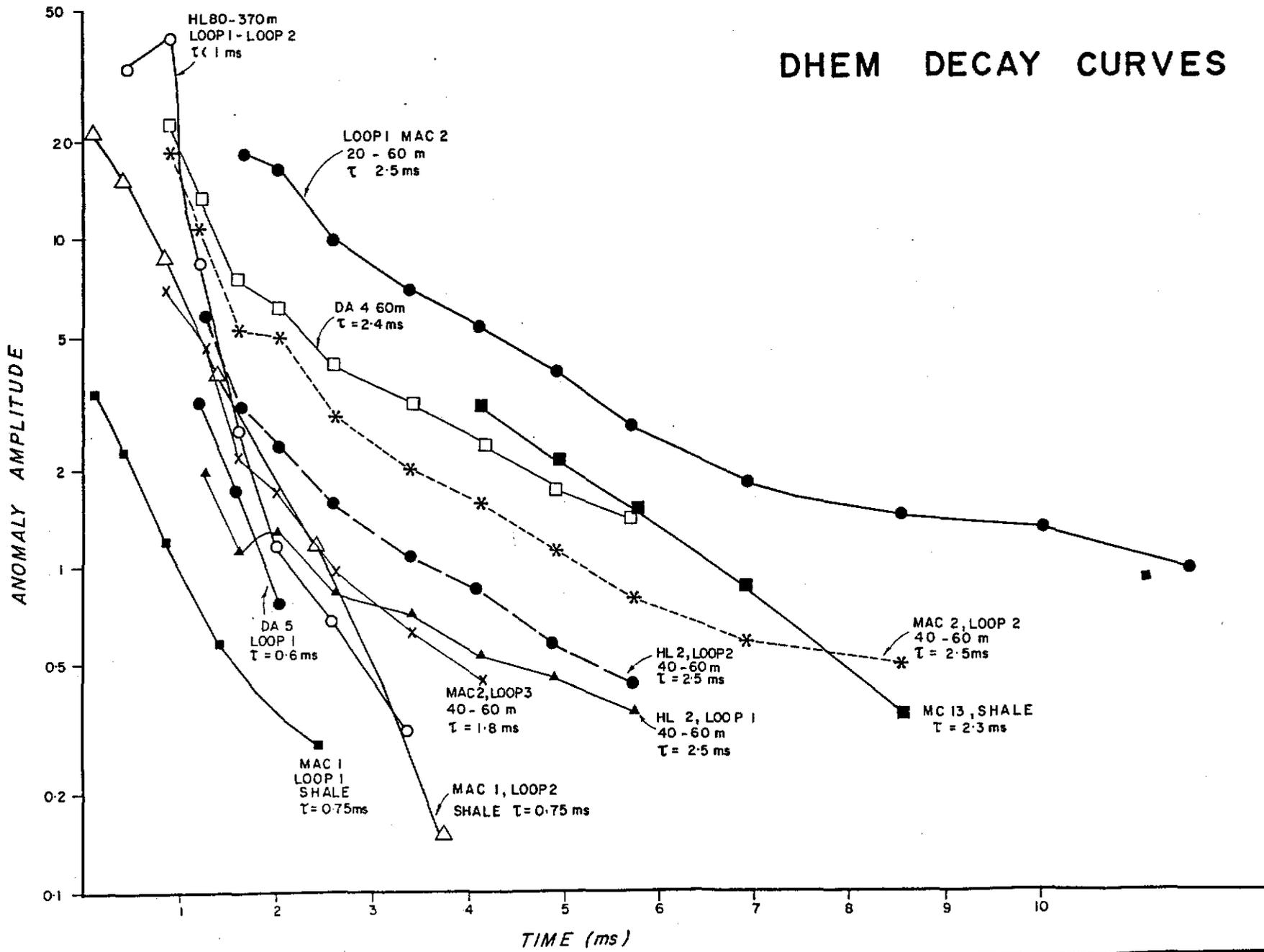
18 JULY 1985

should be drilled on section with MAC2, parallel to it and 75 metres deeper. This will probably hit the conductor and will definitely aid in geological interpretation. If no conductor is intersected, the hole should be surveyed with DHEM, prior to drilling a second hole, which will undoubtedly be to the north.



Tom Eadie

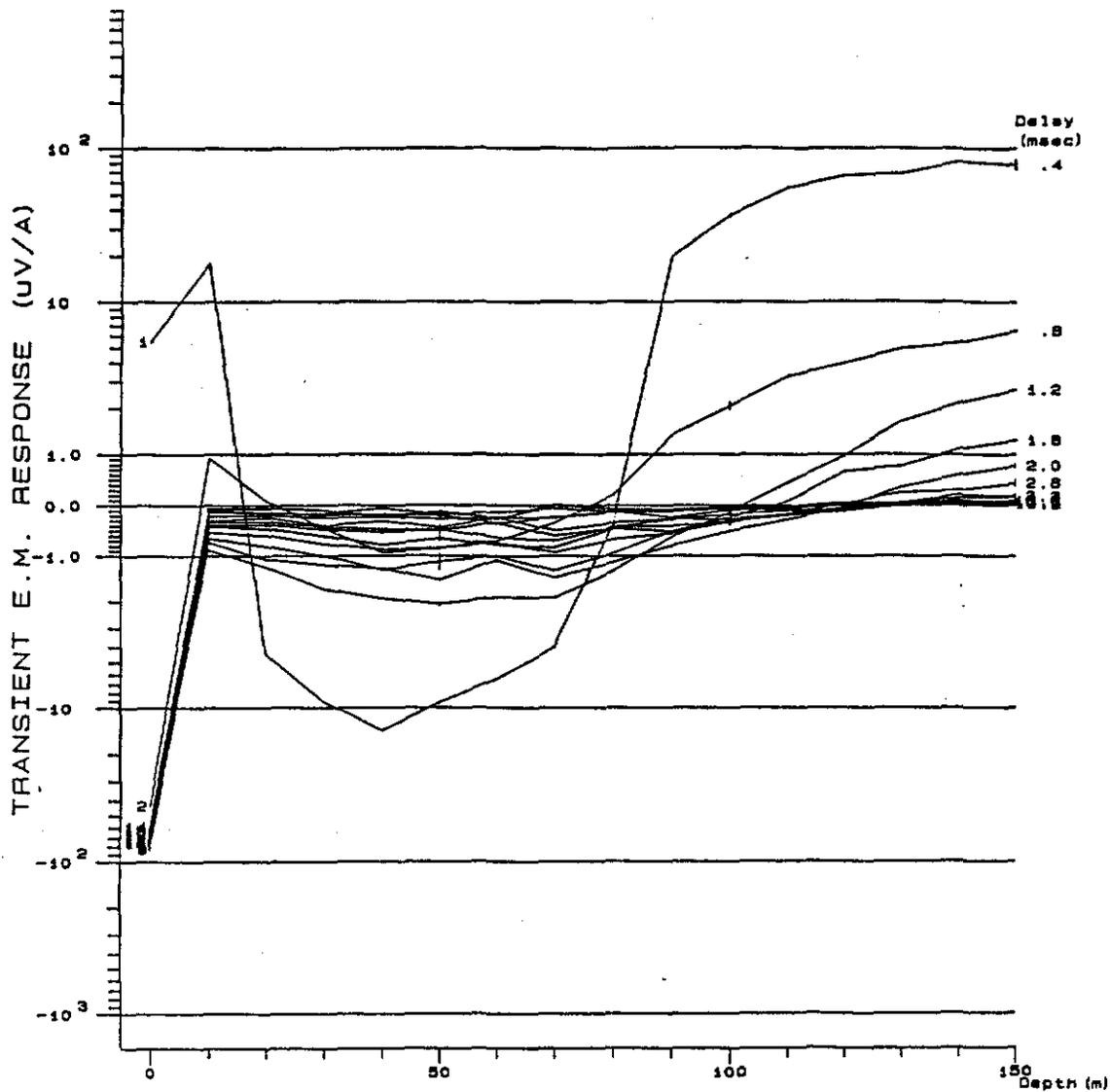
DHEM DECAY CURVES



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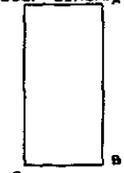
FIGURE 2



ABERFOYLE EXPLORATION PTY.LTD.
 QUE RIVER AREA, TASMANIA
 HELLYER PROSPECT (JOB NO. 570A)
 HL 2 LOOP #1

SIROTEM Survey by SOLO Geophysics & Co. 1/ 3/85
 SOLO hole ref.217 Reading interval 10.0 m
 SCALE 1 : 1000 Loop size : 200 m
 LOOP configuration : Drill hole
 Plotted : 11:38 AM 12/ 3/85

LOOP DIAGRAM



A - (10300N, 8200E)
 B - (10100N, 8200E)
 C - (10100N, 8100E)
 D - (10252N, 8205E)

FIGURE 7

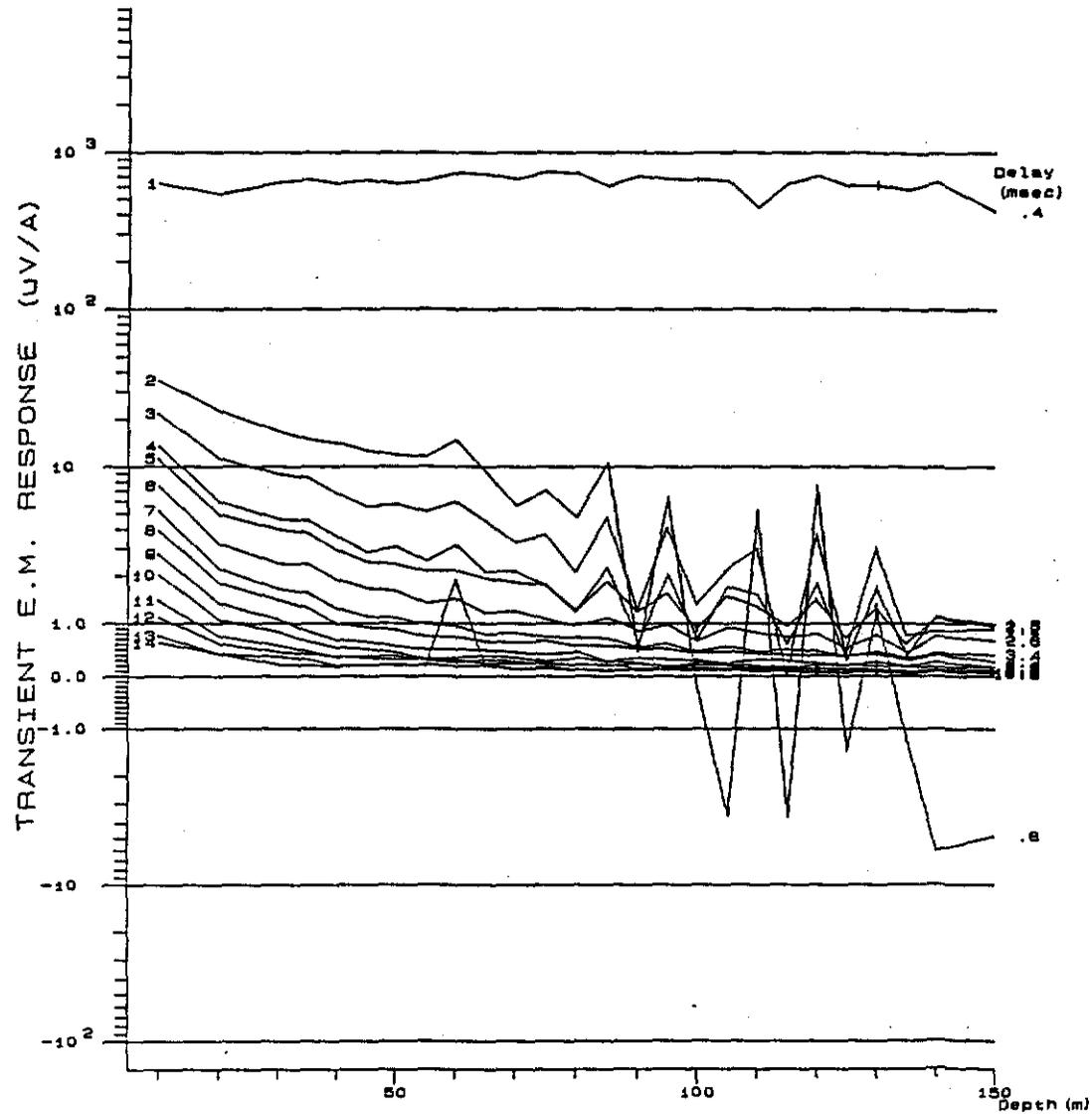
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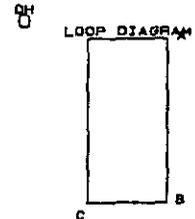
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028415

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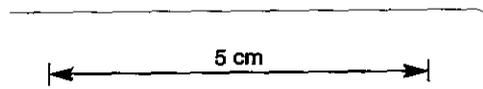
ABERFOYLE EXPLORATION PTY.LTD.
 QUE RIVER AREA, TASMANIA
 HELLYER PROSPECT (JOB NO. 570A)
 HL 2 LOOP #2
 SIROTEM Survey by SOLO Geophysics & Co. 1/ 3/85
 SOLO hole ref.218 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 m
 LOOP configuration : Drill hole
 Plotted : 11:38 AM 12/ 3/85

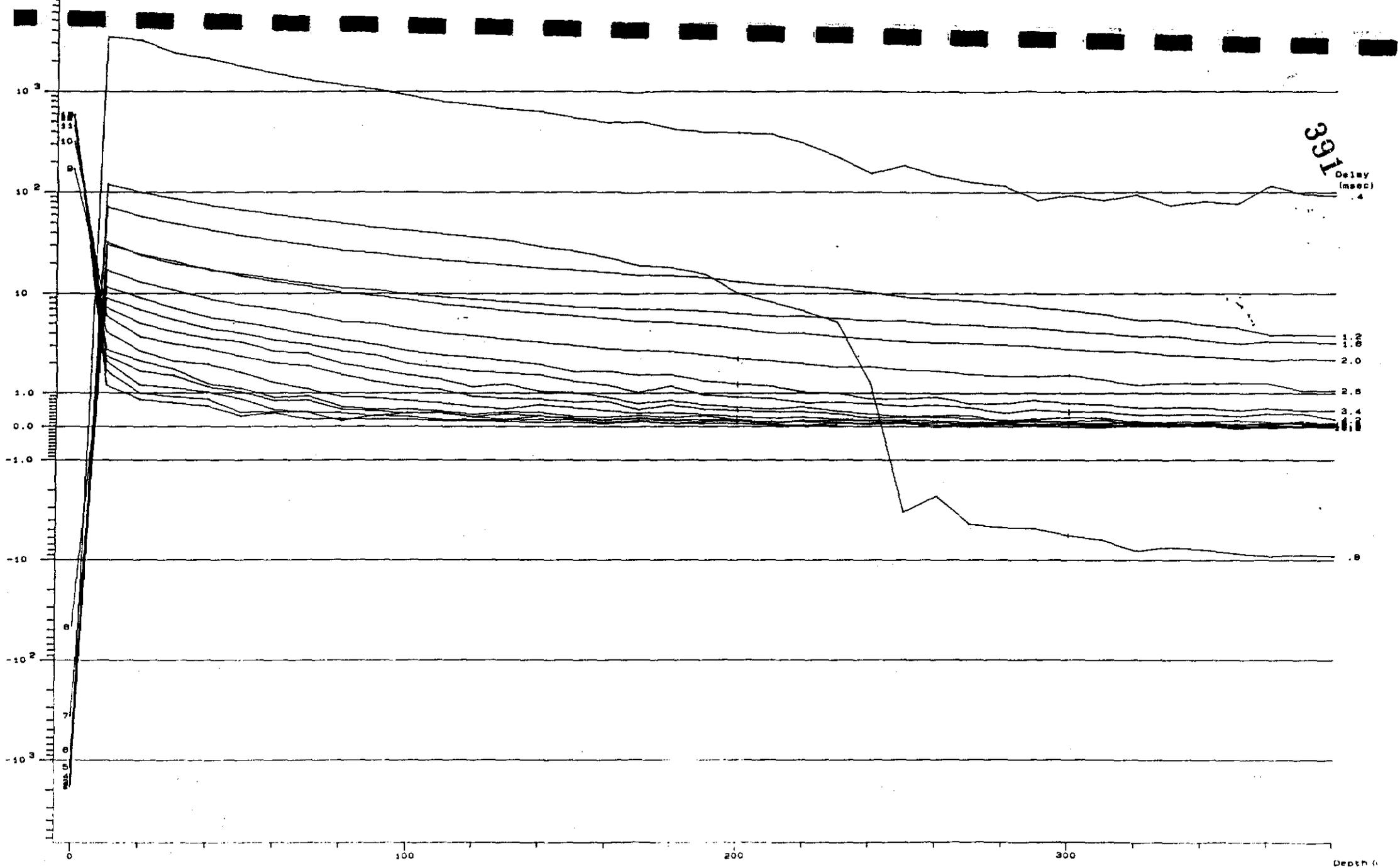


A - (10300N, 8400E)
 B - (10100N, 8400E)
 C - (10100N, 8300E)
 DH - (10252N, 8295E)

FIGURE 6

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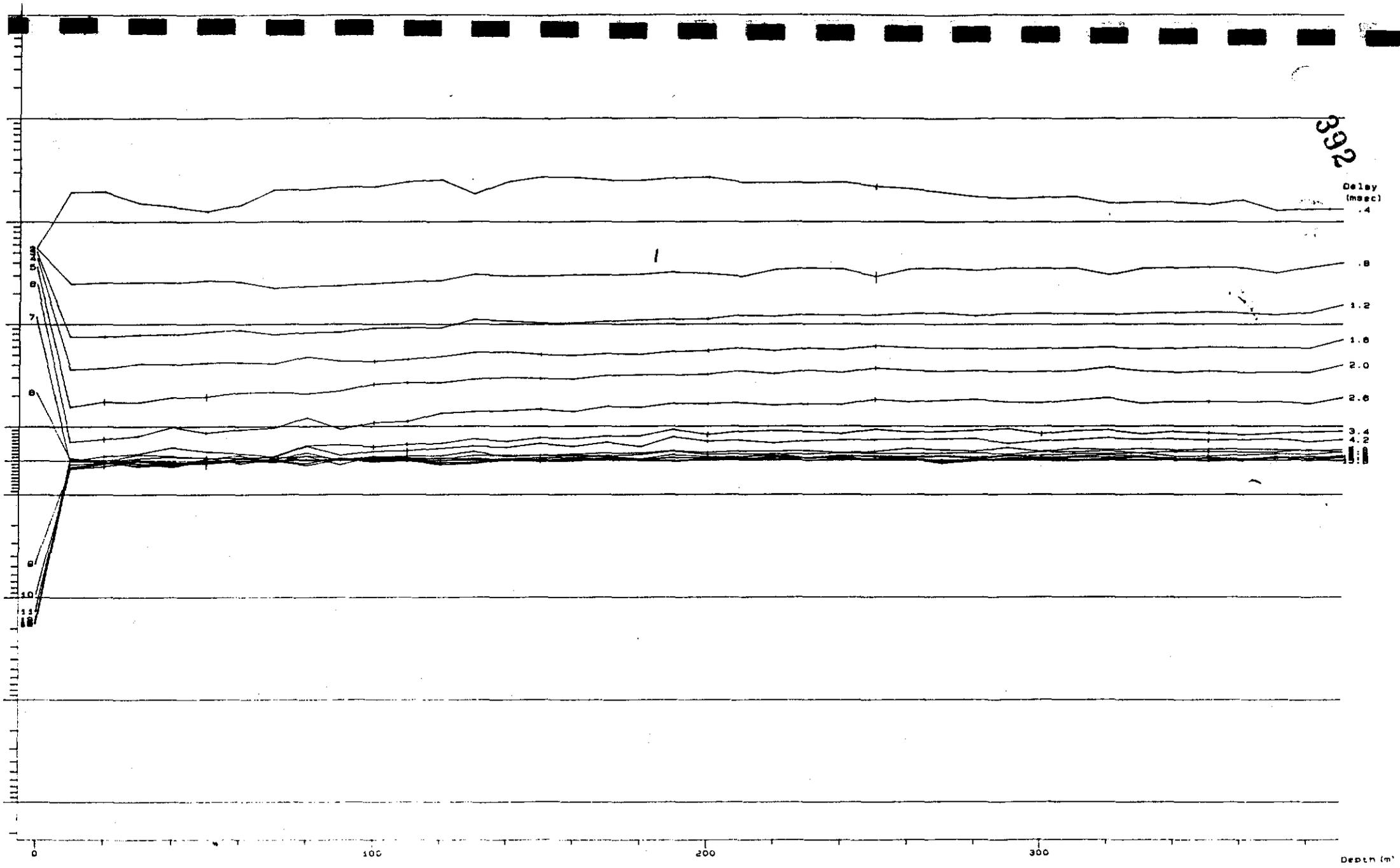
Delay (msec)

ABERFOYLE EXPLORATION PTY. LTD.
 HELLYER TASMANIA.
 HELLYER GRID (JOB NO. 590A)
 REF: ML80 LOOP 1 FIG. 9
 SIRTEM Survey by SOLC Geophysics & Co. 20/ 6/85

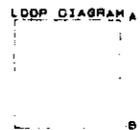
LOOP DIAGRAM
 A - (10400N, 0200E)
 B - (10200N, 0200E)
 C - (10200N, 0000E)

FIGURE 9

028417



ABERFOYLE EXPLORATION PTY. LTD.
 HELLYER TASMANIA.
 HELLYER GRID (JOB NO. 5904)
 REF: HL80 LOOP 2 FIG. 10
 SINGTEM Survey by SGLL Geophysics & Co. 20/ 6/85
 SGLL hole ref 100 Heading interval 10 C/R



A - (110400N, 8000E)
 B - (110200N, 8000E)
 C - (110200N, 5800E)

028418

FIGURE 10

Client
Aberfoyle

Site
AETHMAC10

028419

393

Grid
HELLYER

Hole
MAC1

Dr Loop
1

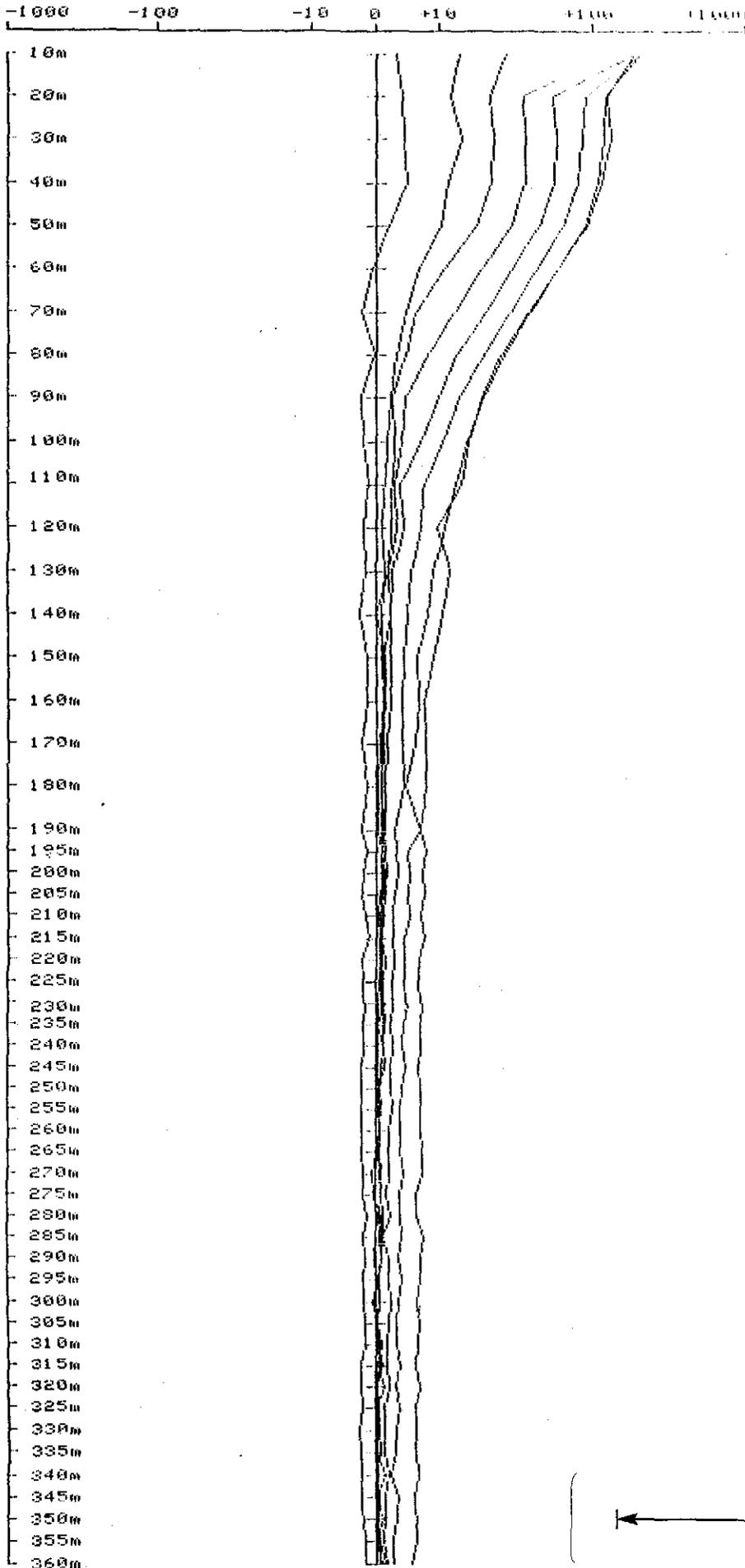
Time base: 10ms
Ramp time: 1.5ms

ZTS: 645
Gain: 600

Date: 04/04/85

Scale: 1:1000

FIGURE 17



Aberfoyle

Grid
Hellier

Hole
MAC1

Tx Loop
2

028420

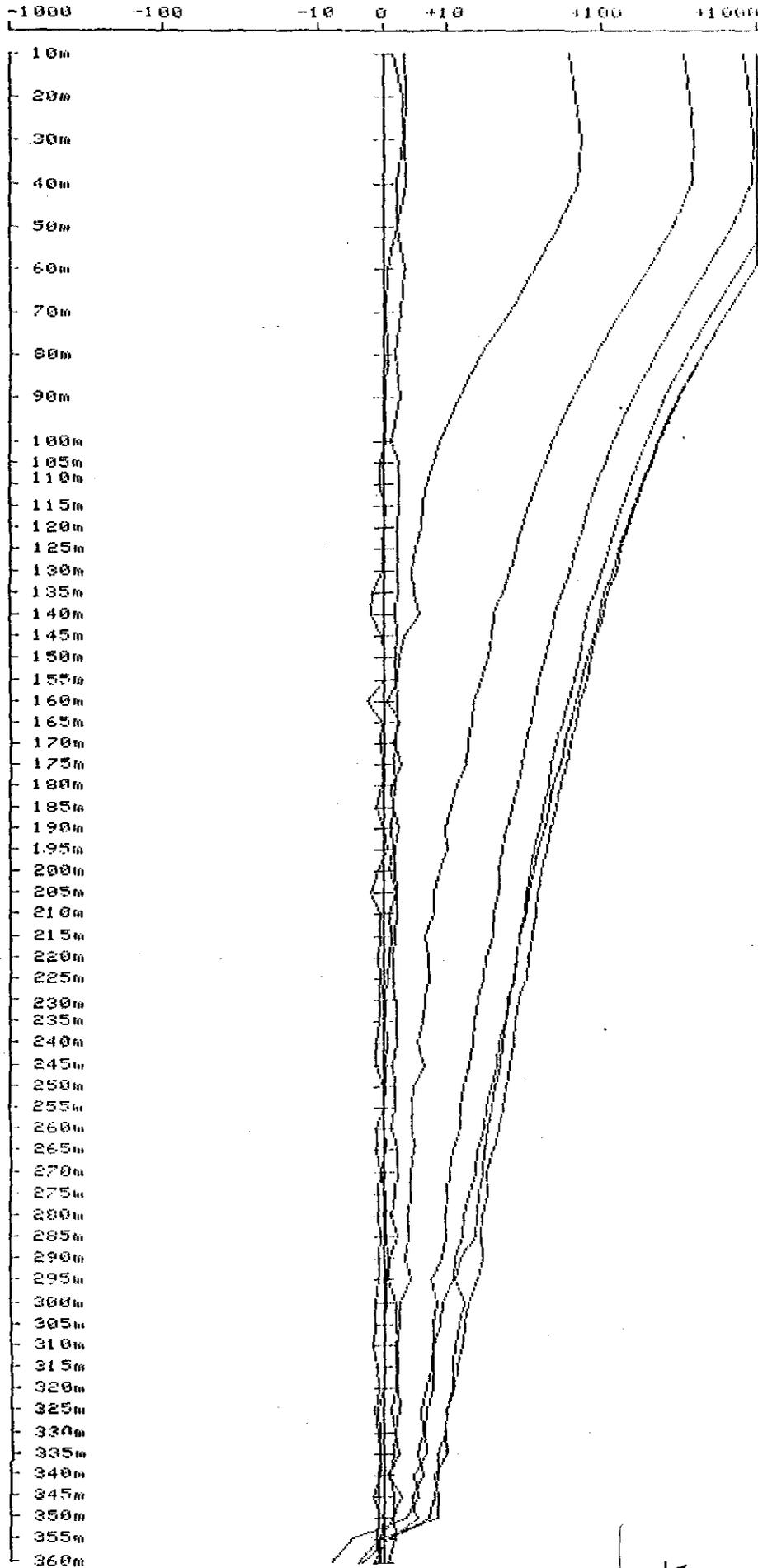
394
Time base: 10ms
Ramp time: 1.5ms

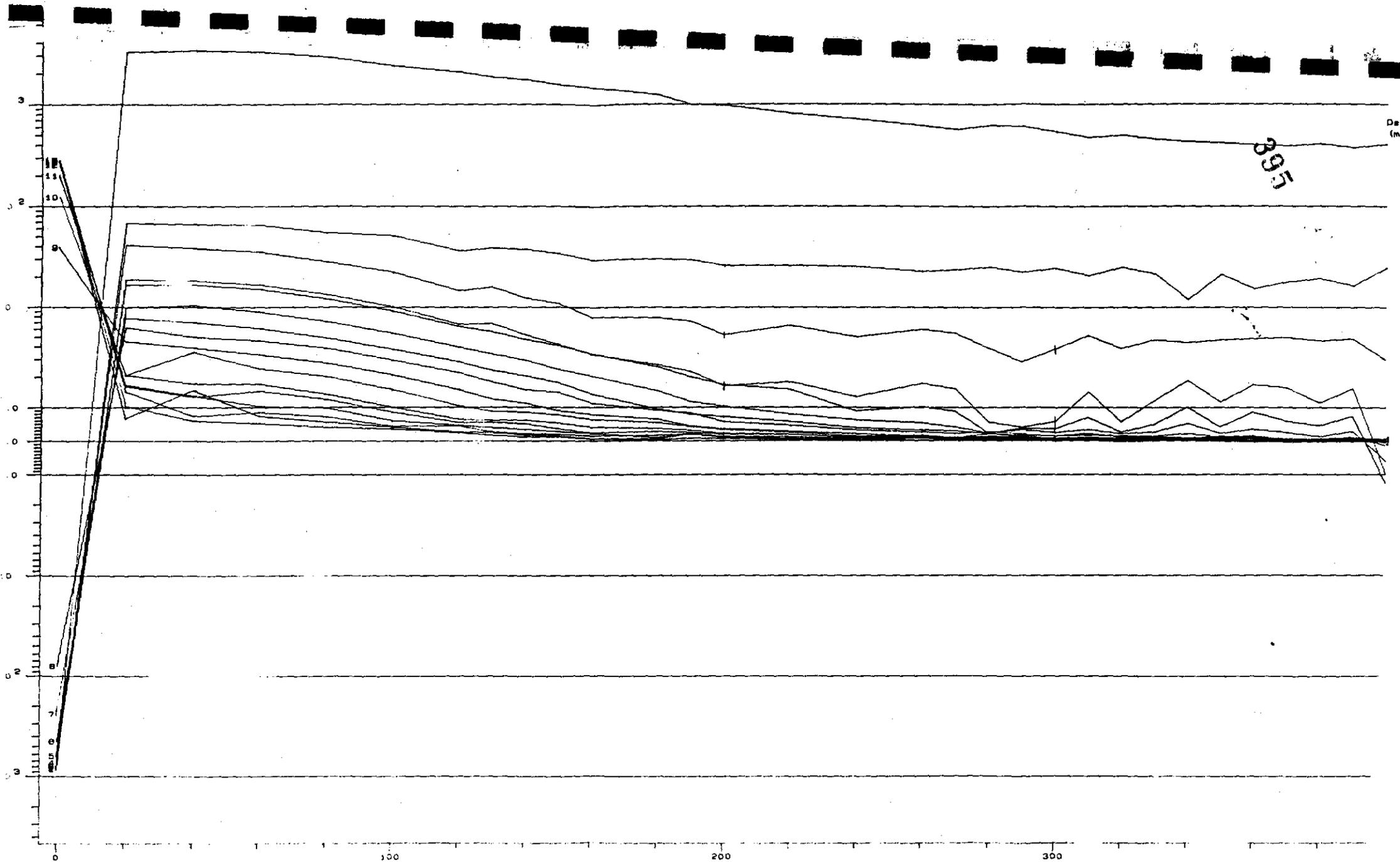
ZTS: 645
Gain: 800

Date: 04/04/85

Scale: 1:1000

FIGURE 18





ABERFOYLE EXPLORATION PTY. LTD.

HELLYER TASMANIA.

HELLYER GRID (JOB NO. 59CA)

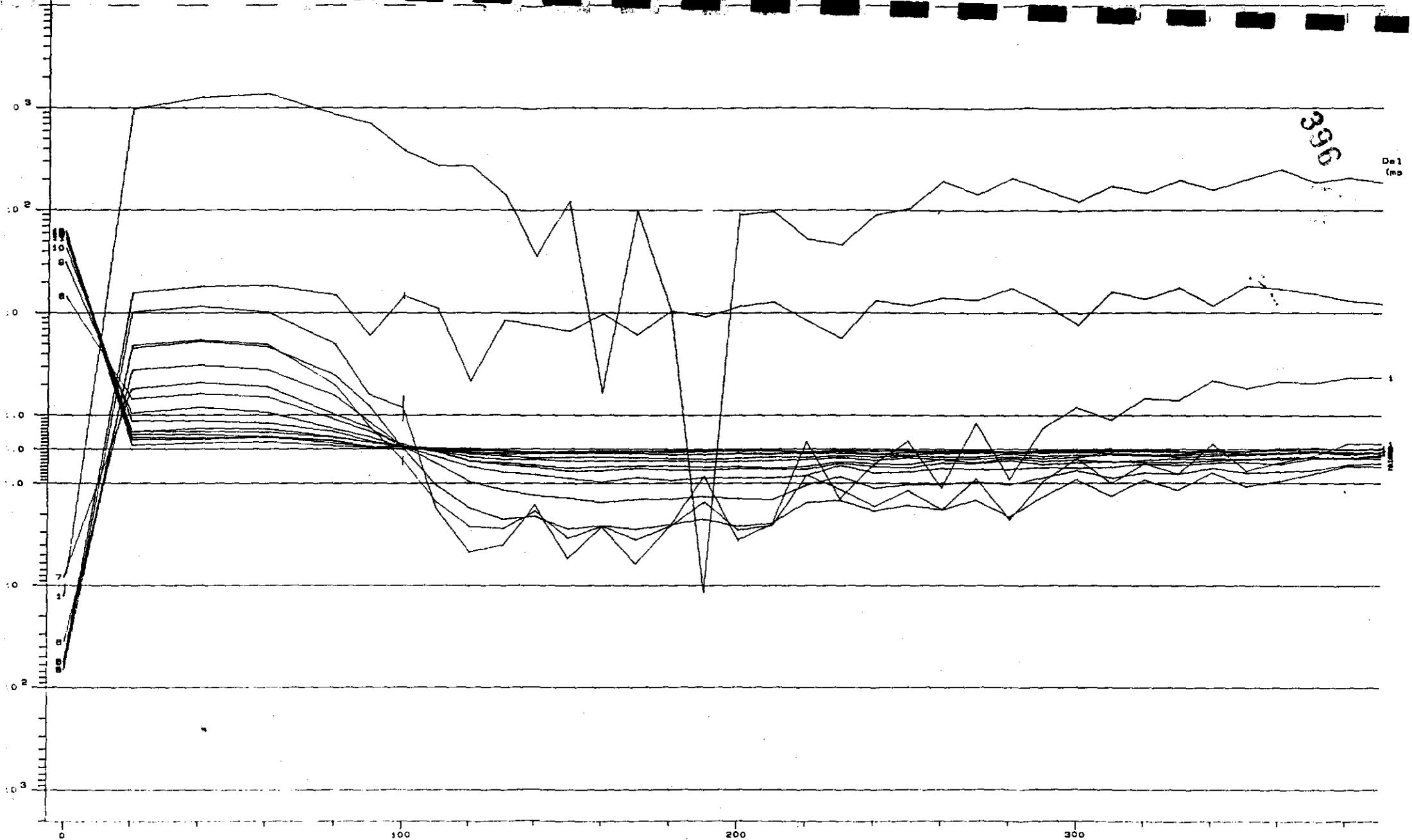
REF: MAG2 LOOP 1 FIG. 19

DATE: 24. 6. 85

LOOP DIAGRAM A

A = (8100N, 5700E)
 B = (8200N, 5700E)
 C = (8300N, 5500E)
 DM = (5580N, 6263E)

028421 FIGURE



ABERFOYLE EXPLORATION PTY. LTD.

HELLYER TASMANIA.

HELLYER GRID (JOB NO. 590A)

REF: MAC2 LOOP 2 FIG. 20

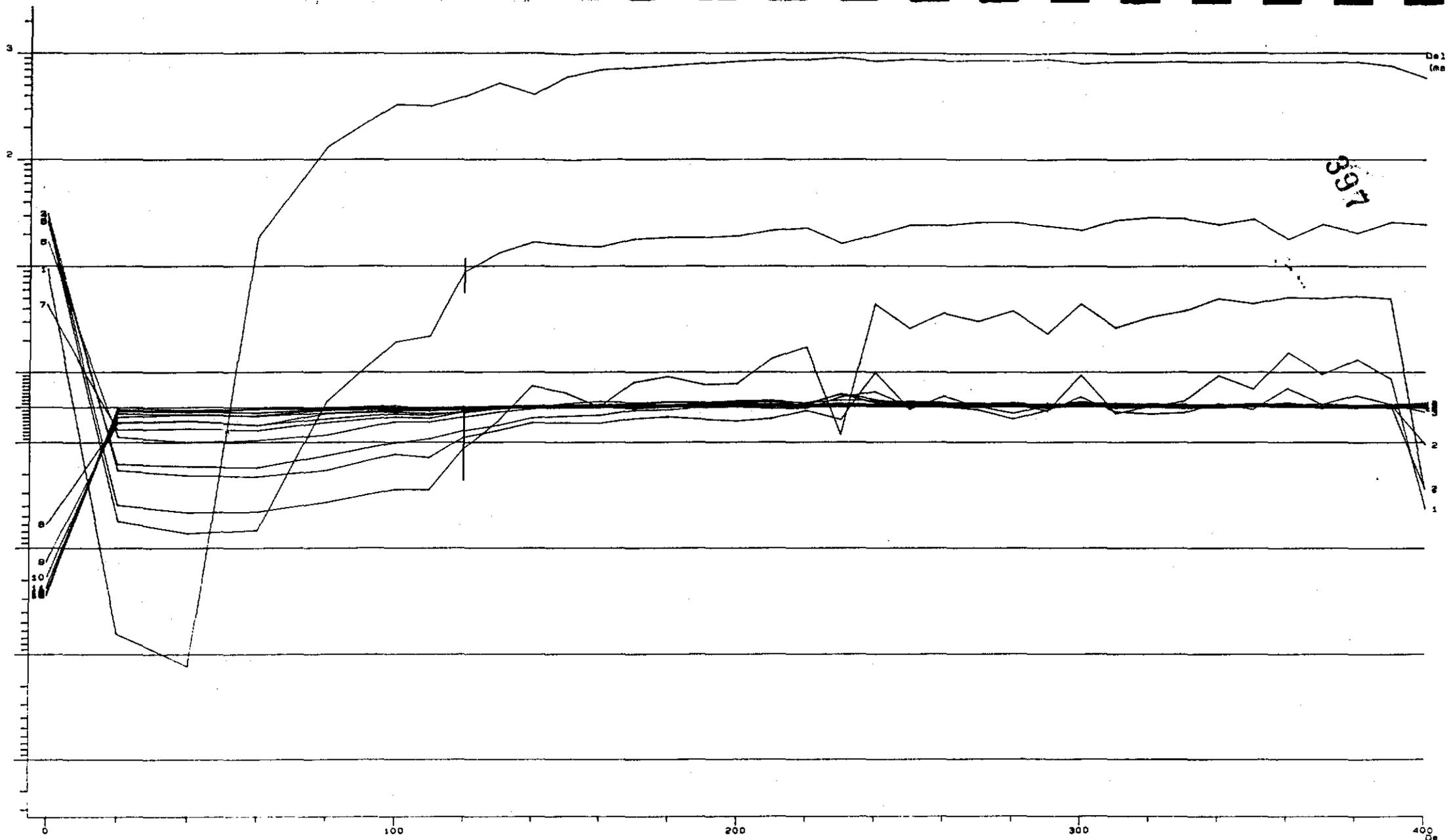
STROTEM Survey by SLOC Geophysics & Co. 24/8/85

LOOP DIAGRAM A

A = (8600N, 8700E)
 B = (8700N, 8700E)
 C = (8700N, 8800E)
 DM = (8800N, 8803E)

FIGURE 20

028422



ABERFOYLE EXPLORATION PTY. LTD.
 HELLYER TASMANIA.
 HELLYER GRID (JOB NO.590A)
 REF: MAC2 LOOP 3 FIG.21
 SIROTEM Survey by SOLO Geophysics & Co. 24/ 6/85
 SOLO hole ref.105 Heading interval 10.0 m
 SCALE 1 : 1000 Loop size 200 m

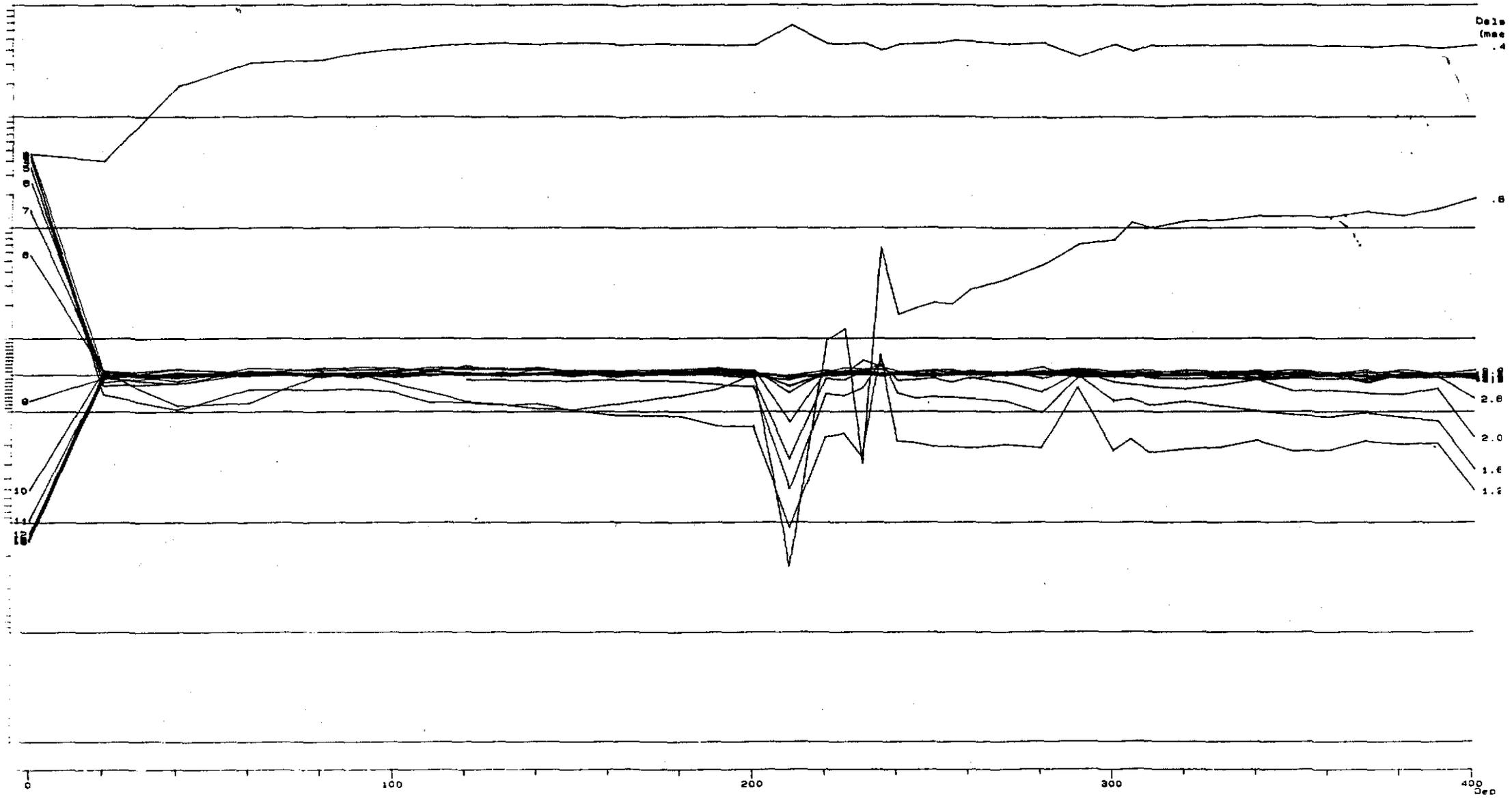


A - (8100N, 5800E)
 B - (8900N, 5800E)
 C - (8900N, 5700E)
 D - (5559N, 5804E)

FIGURE 21

028423

398



BERFOYLE EXPLORATION PTY. LTD.
 HELLER TASMANIA.
 HELLER GRID (JOB NO.590A)
 REF: MAC2 LOOP 4 FIG.22
 IROTEM Survey by SOLO Geophysics & Co. 26/ 6/85
 OLD hole ref.108 Reading interval 5.0 m
 SCALE 1 : 1000 Loop size : 200 m



A = (8100N, 5700E)
 B = (8200N, 5700E)
 C = (8200N, 5800E)
 D = (8000N, 5800E)

FIGURE 22

028424

400

320

028425

APPENDIX Q

401

028426

SIROTOPE

CSIRO

Division of Mineralogy and Geochemistry
Sydney Laboratory

Depts Road, North Ryde
P.O. Box 136, North Ryde, NSW, Australia 2113
Int. Phone: 61-2-887 8712, 61-2-887 8713
Telex: MINRE AA 25817

CONFIDENTIAL

REPORT
TO
ABERFOYLE EXPLORATION PTY LTD
ON
THE SIGNIFICANCE OF LEAD ISOTOPIC COMPOSITIONS
OF
SAMPLES FROM THE HELLYER AREA, WESTERN TASMANIA

*What was Pb
among of pyrite prod?*

GRAHAM R. CARR
BRIAN L. GULSON
28/5/85

1. AIMS OF STUDY

This Pb isotopic study was carried out to determine the association with Hellyer and Que River of samples from 1) the Switchback area, 2) a pyrite-pod from within a feldspar phyrlic lava at the Hellyer ore position and 3) stringer mineralization from southwest of Hellyer (9440N, 5440E).

2. SAMPLES

The samples were provided by Doug Jack of Aberfoyle. Three (315641, 315629 and 315660) represent sulfide mineralization from various parts of the Switchback sulfide occurrence one was taken from a pyrite pod at the interpreted Hellyer position (315659) and another from galena-rich chloritic rock considered to be stringer mineralization (315625).

3. METHODS

Galena samples were dissolved in concentrated nitric acid and Pb was electroplated onto Pt electrodes. The whole-rock samples were digested in a 7N nitric + 7N hydrochloric solution prior to ion exchange and electroplating as above. The samples were analysed on an ISOMASS 54E solid source thermal ionization mass spectrometer in fully automated mode. Precision estimates representing 2 standard deviations about the mean of over 700 analyses of standards are shown in the top left hand corner of the figures presented below.

3. RESULTS

The Pb isotopic compositions of all the Switchback samples fall within the Hellyer field as does the galena from the stringer zone. The pyrite pod contains Pb significantly more radiogenic (i.e. higher $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$)

than the Hellyer target.

4. DISCUSSION

The results confirm that the Switchback base metal sulfide and associated pyritic and disseminated mineralization is closely related to the Hellyer mineralization, both sharing a common source of Pb probably indicating they formed during the same mineralizing epoch from the same hydrothermal fluid system. They appear to have closer affinities with Hellyer rather than Que River.

The stringer mineralization (315625) cannot be distinguished from the Hellyer target based on Pb isotopes, again indicating a common source of Pb. We would thus interpret this stringer zone to be epigenetic mineralization coeval with the formation of the base metal sulfide deposits of the region. The Pb isotopic composition of this galena distinguishes it from veins related to post-Cambrian metamorphism and/plutonism which have been described from a large area of the Dundas Trough including Marionoak, Queen Hill and the East Mackintosh area.

The radiogenic composition of the pyrite pod sample probably results from the addition of Pb since the time of deposition of the rock due to the radioactive decay of U and Th. The addition of such radiogenic Pb significantly alters the isotopic ratios only if the initial Pb content is low.

5. CONCLUSIONS

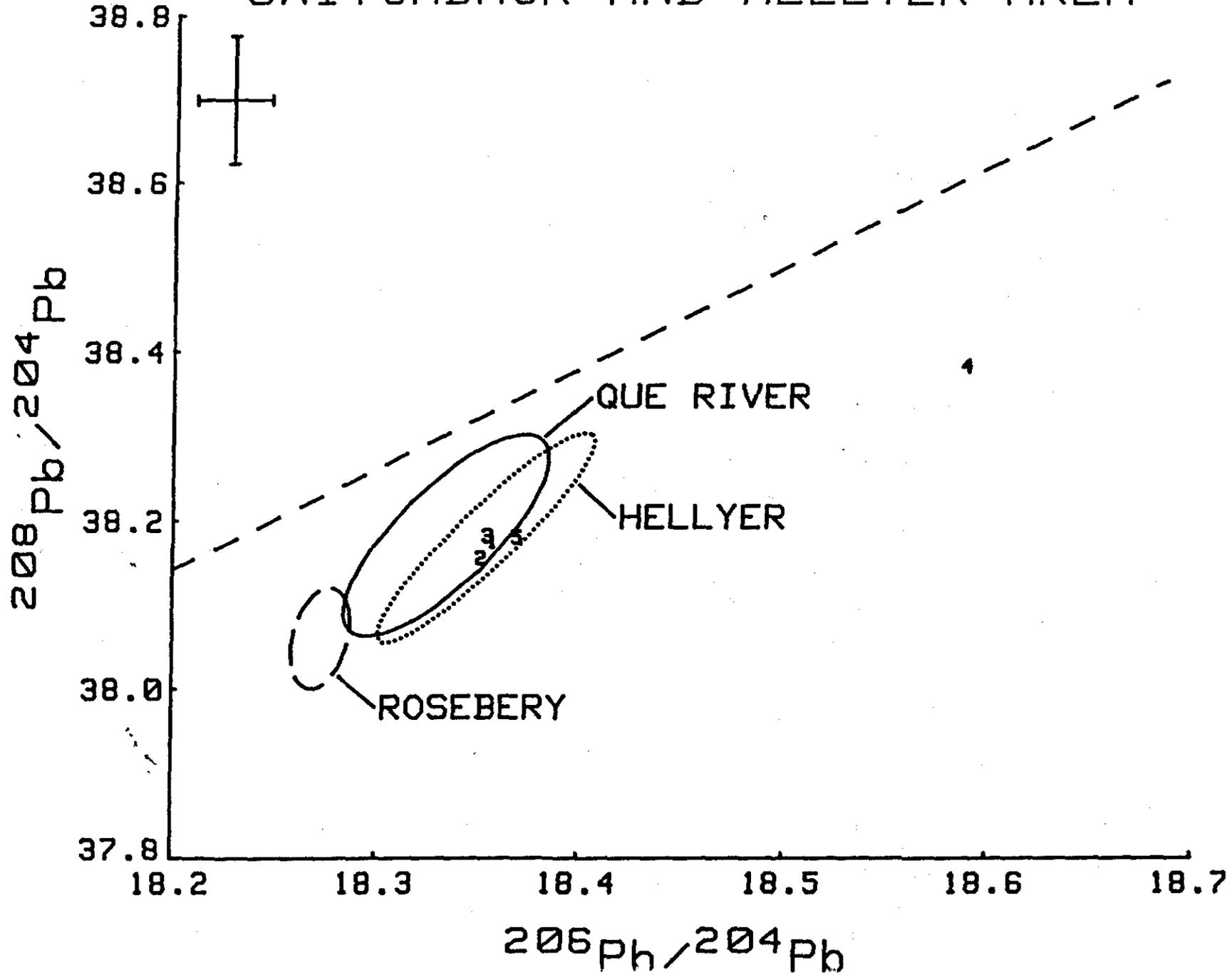
All the samples, except for the pyrite pod, have Pb isotopic compositions that indicate a close genetic relationship to the Hellyer style mineralization. The pyrite pod sample could also contain Pb of a similar origin to the Hellyer mineralization, but the probable change in Pb isotopic composition since the time of deposition has masked the relationship.

Table 1. Pb isotope compositions of samples from Switchback and Hellyer

Sample	$\frac{208 \text{ Pb}}{206 \text{ Pb}}$	$\frac{207 \text{ Pb}}{206 \text{ Pb}}$	$\frac{206 \text{ Pb}}{204 \text{ Pb}}$	$\frac{207 \text{ Pb}}{204 \text{ Pb}}$	$\frac{200 \text{ Pb}}{204 \text{ Pb}}$	Pb(ppm)
315641	2.0796	0.8505	18.357	15.614	38.176	
315629	2.0792	0.8502	18.352	15.603	38.156	
315660	2.0802	0.8506	18.355	15.613	38.182	
315659	2.0648	0.8408	18.590	15.629	38.384	
315625	2.0785	0.8494	18.369	15.602	38.180	

Figure 1

SWITCHBACK AND HELLYER AREA

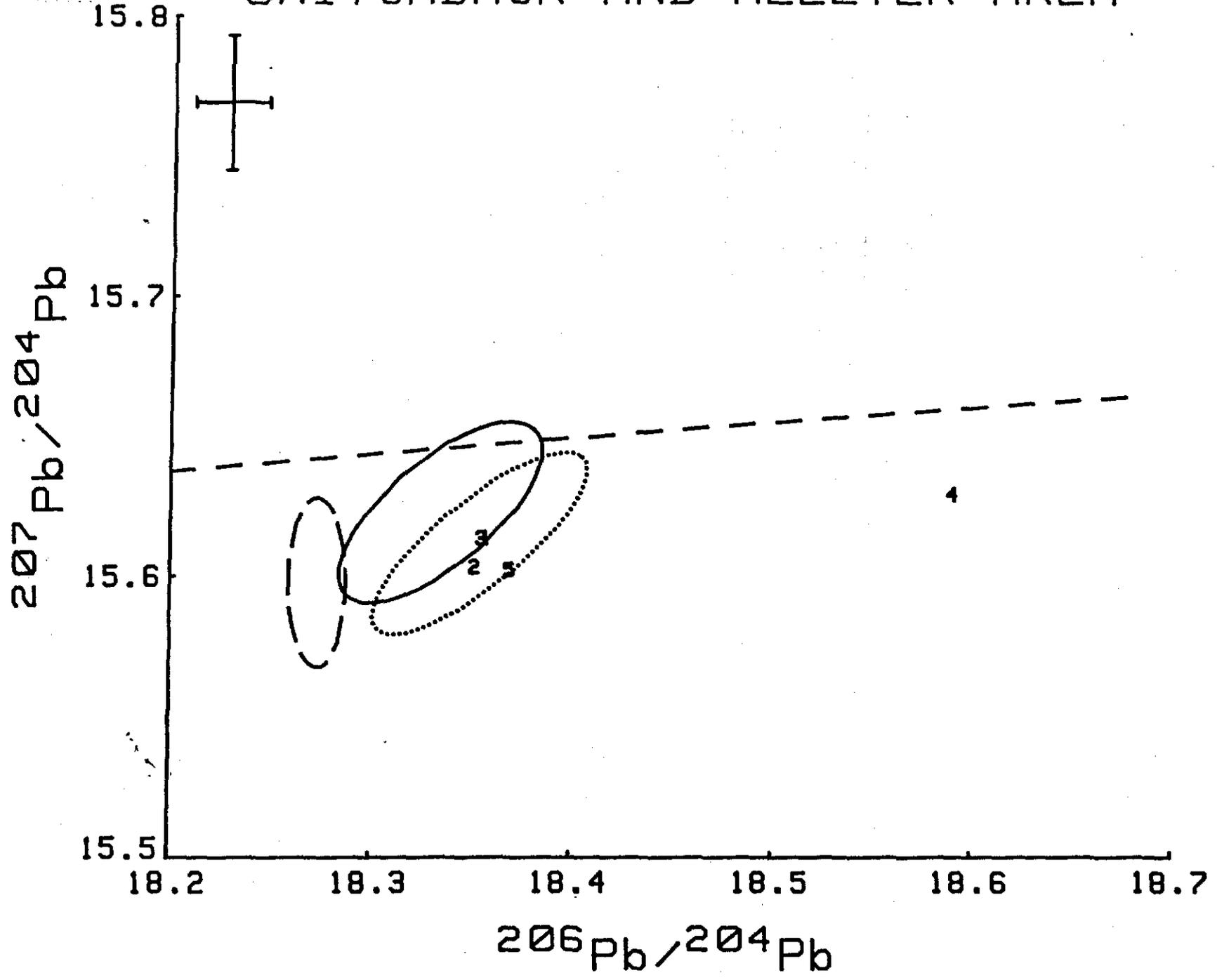


405

028430

SWITCHBACK AND HELLYER AREA

Figure 2



406

028431

407

028432

APPENDIX R

EXPENDITUREMACKINTOSH EL 2/70

The following expenditure pertains to the Aberfoyle Periods 1 May 1984 to 12 November 1985 (Period 5/84 to Period 12/85):

GEOLOGY	369,983.05
SURVEY	43014.54
GEOPHYSICS	96165.03
GEOCHEMISTRY	58976.31
TRENCHING	28056.00
DIAMOND DRILLING	1642892.26
ACCESS	55019.33
TENURE	6700.50
LEGAL	7516.95
OTHER SERVICES	125277.06
INDIRECT COSTS	268618.23
	<hr/>
TOTAL	\$2702219.26
	<hr/> <hr/>

CEH
11/4/86