

77-1222

303001

MICROFILMED

OPEN FILE

ANNUAL REPORT

EXPLORATION LICENCES 2/70 AND 15/73

MACKINTOSH AND HATFIELD

TASMANIA

For 12 months ending June 1, 1977.

Abminco Exploration Division

C.H. Young

Geologist.

2nd August, 1977.

001

TABLE OF CONTENTS

303002

	<u>PAGE</u>
SUMMARY	
INTRODUCTION	1
Tenure	1
WORK PROGRAMME	1
Review of previous exploration	1
Survey	2
Geological mapping	3
Soil geochemistry	3
Geophysics	4
Trenching	4
Diamond Drilling	5
REGIONAL GEOLOGICAL SETTING	6
GEOLOGY OF THE MACKINTOSH WEST & HATFIELD LICENCES	7
STRATIGRAPHY	7
LITHOLOGIES	9
Tertiary Basalt	9
Dolerite/Diorite	9
Ordovician Sediments	9
Rhyolitic - Dacitic Volcanics	9
Que River Beds	9
Andesite Volcanics	9
Dacitic Volcanics	11
Andesitic Dacitic Pyroclastics (ADP)	11
Dacite & Magnetic Dacite (DDM)	12
Dacitic Tuff - Lava (DTL)	12
Dacitic Pyroclastics (DP)	12
Porphyritic Dacite (PD)	12
Porphyritic Dacitic Pyroclastics (PDP)	13
Dacitic Reworked Tuffs (DRWT)	13
Dacitic Shaly Tuffs (DSHT)	13
Streaky Pyroclastics of Indeterminate Composition (SP)	13
Farrell Slates	13
STRUCTURE	14
ALTERATION	16
MINERALISATION	17
SOIL GEOCHEMISTRY	17
GEOPHYSICS	19
CONCLUSIONS & RECOMMENDATIONS	20
FINANCE	22
REFERENCES	23

LIST OF PLATES

Mac 53 (In text)	Que River Regional Geology - Summary Map (1:50,000)
DT79 (In text)	Geological Elements of North West Tasmania (1:1,000,000)
QR 96 (In text)	Que River Regional Geology - Stratigraphic Column.
QR 98 (In text)	Geophysical Summary Plan. (1:50,000)
QR 100 (In text)	Geochemical Summary Plan (1:50,000)
DT 62 (A)	Preliminary Interpretive Geology (1:10,000)
DT 62 (B)	Preliminary Interpretive Geology (1:10,000)
DT 62 (D)	Preliminary Interpretive Geology (1:10,000)
DT 78 (A)	Airborne Magnetism (1975) (1:10,000)
DT 78 (B)	Airborne Magnetism (1975) (1:10,000)
DT 78 (D)	Airborne Magnetism (1975) (1:10,000)
HT 22	Murchison Highway - Mount Charter Area (1:2,500) Hatfield EL 15/73 - Summary Plan.
HT 18	Hatfield EL 15/73, Fact Geology of the "Quarry Area". (1:250)
HT 19	Trench adjacent to Q.R. access road. (1:250)
HT 21	Trench Section 5800N (1:500)
HT 23/4000	Costean Line 4000N - Plan & Section (1:250)
HT 23/4400	Costean Line Mt.Charter (4400N) Plan & Section (1:250)
HT 23/5400 (a)	Costean Line 5400N - Plan & Section (sheet A) (1:250)
HT 23/5400 (b)	Costean Line 5400N - Plan & Section (Sheet B) (1:250)
HT 23/6400	Costean Line 6400N - Plan & Section (1:250)
HT 23/6600	Costean Line 6600N - Plan & Section (1:250)
HT 23/7200	Costean Line 7200N - Plan & Section (1:250)

003

303004

HT 17

Cross Section 6200N - 1:500

HT 20

Cross Section 5200N - 1:500

HT 1/48

Cross Section 4800N - 1:500

504

SUMMARY

303005

This report describes the exploration programme carried out over the adjoining Hatfield and Mackintosh licences during the period June 30, 1976 to June 1, 1977. Reporting for the two licence areas was combined because the boundary between the two virtually bisects a single project area.

The exploration programme included detailed and regional geological mapping, gridding, soil geochemical sampling, IP, trenching and diamond drilling. A review of the results of exploration on the licence areas was also completed.

Regional and grid mapping is substantially complete. The gross stratigraphy is now well defined, although detailed stratigraphy and structure are still obscure.

No first order soil geochemical or I.P. anomalies were delineated although improved definition of anomalies located by previous reconnaissance work was achieved.

Two trenches were cut by backhoe to expose the andesite/shale contact and six trenches were cut by bulldozer to expose bedrock underlying some of the more significant soil anomalies. Assay results for the bulldozer trench samples are not yet available.

Two diamond drill holes tested the conceptually attractive black shale - andesite contact near the Murchison Highway. Disseminated pyrite and trace base metal mineralisation was noted.

A continuing programme of exploration including detailed geological mapping, soil geochemistry and I.P. is being pursued.

005

INTRODUCTION

303006

Tenure

Hatfield River Exploration Licence 15/73 is held by Cominco Exploration Pty.Ltd, on behalf of the Abex Joint Venture. Licence expiry date is 25/6/77 and the licence may be renewed at six monthly intervals. E.L. 15/73 is partly over private land (Owner: Associated Forest Holdings Pty.Ltd.) A.F.H. have a timber concession covering E.L. 15/73.

Mackintosh River Exploration Licence 2/70 is held by Aberfoyle Tin N.L. Work is managed by Abminco N.L. Exploration Division. The licence is subject of a joint venture between Abminco N.L. and Paringa Mining and Exploration Co.Ltd. Current equities are Paringa 10% Cominco Ltd 27% and Abminco N.L. 63%. The licence expires on 30/6/77. It may be renewed at six monthly intervals.

WORK PROGRAMME

Review of previous exploration

A summary review of the results of exploration on the Mackintosh and Hatfield licence areas was completed.

The review assessed the exploration technique used over the licence areas and outlined a number of areas requiring further detailed work.

These areas are:-

1. Soil anomalies Nos. 11 and 12 (Plate QR 100 in text) overlying andesite-dacite stratigraphy in the area located approximately 1-2 km NE of the Que River ore lenses.
2. Soil anomaly No. 5 overlying andesite-dacite stratigraphy in the "Old Mill Site" area.
3. Soil anomalies Nos. 6,7,9 and 10 overlying andesitic rocks.
4. Soil anomaly No. 8 overlying andesite and altered mineralised dacitic volcanics at Mt.Charter.
5. Anomalous stream sediment values in two creeks located immediately south of the highest point on the Murchison Highway.

006

Survey

Dense rainforest vegetation in the licence areas necessitates the use of cut lines for access and routine exploration. Gridding along cut lines at 50 m intervals has thus been an on-going programme since the initial ground EM evaluation of anomaly 8 (Que River). The grid now covers an area of approximately 32.0 sq.km. and is made up as follows:-

<u>Baselines</u>	<u>Length Metres</u>
3500E	1400
3700E	2100
4000E	1400
4200E	3000
4300E	700
4500E	600
4700E	1350
5300E	4900
5500E	1400
6050E	400
6300E	200
6950E	1000
7000E	600
7300E	1150
	<hr/>
	20,200 m
Cross lines	128,400 m
	<hr/>
TOTAL	148,600 m
	<hr/>

Compass and Chain survey with clinometer control for slope corrections was used throughout to extend earlier stadia gridding.

During the past year 13,700 metres of new line was cut and pegged in the Hatfield licence. The andesite-shale contact is now covered by 200 m spaced lines, and extensions were added in the Mt.Charter south area.

In the Mackintosh licence 13,650 metres of line cutting and pegging was completed, over the andesite-shale contact north-west of the Que River Leases and extensions were added to the reconnaissance lines extending

south-east of Mt. Charter into the Southwell River valley.

Geological Mapping

Using 1:25,000 scale aerial photographs, grid lines and creek sections, field mapping was plotted at 1:2,500 scale and compiled at 1:10,000 scale (Plates QR 61, A,B,D.). Hand specimens were systematically collected and thin sections prepared as required. Geological mapping of the greater part of the Mackintosh west and Hatfield licences was completed. Approximately 26 line kilometres of grid and 6 km of creek section were mapped.

14 rock samples were thin sectioned and described by consulting petrologists with check examinations by Abminco staff. Reports are appended (B).

Soil Geochemistry

During the past year 966 "C" horizon soil samples were collected from the Hatfield Licence and 664 from the Mackintosh Licence by screw augering to depths of 150 cm, at 10 m or 20 m intervals on grid lines. After drying and sieving to minus 80 mesh, 5 gram samples were digested in perchloric acid and analysed by AAS for Cu,Pb,Zn.

Data are now being compiled for computer processing. It is expected this will allow rapid checking for compilation errors, ready geographical identification of anomalous values and improved statistical treatment of data.

For computer purposes the geochemical data is classified according to the rock groups:-

<u>Name</u>	<u>Code</u>	<u>Rock Number</u>
Andesite	AP	1
Pyritic dacitic volcanics	PDP	2
Que River Beds (Shales and Sandstones)	QRS	3
Upper Rhyolitic - Dacitic Volcanics	RDV	4
Eastern Shales and Sandstones "Farrell Slates"	FS	5
Dolerite (Jurassic?)	DOL	6
Dacitic Volcanics (Within Andesite Suite)	DV	7
Eastern Volcanics ("Farrell Slate Group")	FV	8
Ordovician Sediments and Quaternary alluvium	Qa	9

The review of the results of exploration on the licence areas has shown low order soil anomalies to overlie Cambrian acid volcanics in the Mackintosh east area. Five of the original Paringa grid lines have been resampled at 50 ft. intervals and the existing data confirmed - Skey (1974).

Geophysics

The geophysical programme was confined to the I.P. technique, both in reconnaissance and detail work. After orientation surveys with several techniques at Que River, I.P. was shown to be the only geophysical technique that could detect and delineate all the Que River ore bodies.

In the past year 3,800 m of detailed (25 metre dipole) I.P. traversing was completed, between the Murchison Highway and Mt.Charter, in the Hatfield Licence area.

In the Mackintosh Licence 950 m of 25 metre dipole, 2100m of 50 metre dipole and 1700 m of 100 metre dipole I.P. traverses were completed.

A summary plan, (Plate QR 98 in text), outlines the total area now covered by I.P. surveys.

To eliminate terrain distortions and to aid geological interpretation, the airborne magnetic data was re-compiled at 1:10,000 scale, (Plates DT 78, A,B,D.) The magnetic data show several linear trends which are useful markers in correlating geologic units between areas of observed outcrop.

In the Mackintosh East area limited I.P. was conducted by contractor Geoquest Pty.Ltd. over areas of anomalous soil geochemical response, Skey (1975). On two lines, 2100N and 7300N, deep weak frequency effect anomalies are coincident with geochemical anomalies. On 2900N a shallow very weak frequency effect anomaly is marginally offset from a geochemical anomaly.

Trenching

In the Hatfield licence two backhoe trenches were dug in 1976 to investigate the nature of the black shale-andesite contact. One trench was dug in the "Quarry" area, adjacent to the Que River access road (Plates HT 18-19). The contact was shown to be conformable.

The second trench, some 200 metres long was excavated on 5800N covering a shallow I.P. anomaly associated with the contact (Plate HT 21). Bedrock channel samples were collected over 2 metre intervals and analysed for copper, lead, zinc and iron. No base metal mineralisation was noted. Within the black shale immediately adjacent to the andesite, iron values in the rock are of the order 3.5% compared with 1.5 to 2.0% elsewhere in the shale.

In 1977 a bulldozer was used to trench some of the more significant soil anomalies in the Hatfield licence. Six trenches were completed for a total of 330 metres, Plates HT 23. In general bulldozing exposes weathered rock of the lower "C" horizon and occasionally fresh boulders.

The trenches were mapped at 1:250 scale and channel samples collected over 5 m intervals. Results are not yet available. Samples will be analysed for copper, lead and zinc.

In all cases the soil anomalies appear to be associated with massive andesites apparently containing trace disseminated base metal sulphides. Shale bands occur in the western ends of the trenches at 5400N and 6400N and some dacitic fragments were observed in the trenches at 4000N, 6400N and 6600N. A barren dacite unit some 15 metres wide, surrounded by andesite, exposed in the "Old Mill" site trench (7200N) represents an attractive rock association.

Diamond Drilling

Surface exploration, by geological mapping, soil geochemistry and I.P., of the conceptually attractive black shale - andesite contact provided two drill targets, in the vicinity of 6400N near the Murchison Highway (Plates HT17, HT 19). Hole ^{HT17}H-1 was completed in October 1976 and intersected broken pyritic black shales, and then intercalated shales and carbonated andesitic volcanics with some inclusions or veins ? of chert. Disseminated pyrite and trace base metals were noted. The second hole H-2 - 2A, intersected similar lithologies. xHATZ

Six core samples from diamond drill hole H-1 were submitted to Geoex Pty.ltd. for estimation of resistivity and "frequency effect" parameters of the black shale and andesite. These measurements were required as it was not possible to visually identify the source of geophysical anomalies, due to the fine

grained nature of the black shale. Two samples of black shale were found to be very conductive (13 ohm metres) and exhibit high "frequency effect" values (7.5% FE), whilst other samples were not significantly different from the barren andesite sample (3800 ohm metres). The two conductive samples were then examined by thin and polished section and found to contain fine pyrite in sandy laminations (with rare chalcopyrite) and variable graphite.

On the basis of geochemical (iron), geophysical and mineralogical data the target I.P. responses are attributed to variable fine (6 micron) pyrite (up to 10%) and graphite (10%).

Geochemical mapping of the drill core will be conducted to assess the base metal distribution. Continuous 3 metre ground core samples were taken from MC-1 for geochemical assessment, (Skey 1976). Plate HT 1/48. Drill logs are provided in Appendix C, the results of geophysical testing of core samples in Appendix D and appropriate petrological and polished section reports in Appendix E.

REGIONAL GEOLOGICAL SETTING

The Mackintosh and Hatfield Licences are located in the central north-west of Tasmania and overlie part of the Cambrian Mt. Read Volcanics, which occur as an arcuate belt of volcanic rocks on the eastern margin of the Dundas Trough. This trough extends for 200 km from Elliott Bay on the south-western Tasmanian coast to Deloraine in the northern central part of Tasmania (Plate DT 79 in text), and is bounded by Pre-Cambrian nuclei, the Tyennan Geanticline and the Rocky Cape Geanticline.

The western and central part of the Dundas Trough are Upper Proterozoic (?) to Upper Cambrian partly fossiliferous sediments and basic volcanics. The eastern part of the trough, adjacent to the Mt. Read Volcanic belt is less well known.

The eastern and central parts of the Mt. Read Volcanic belt are overlain by Lower Ordovician to Middle Devonian sediments. The basal Ordovician rocks, show conformable, disconformable and unconformable relations with the Cambrian. The northern part is overlain by Tertiary basalt and locally obscured by Quaternary glacial deposits.

011

303012

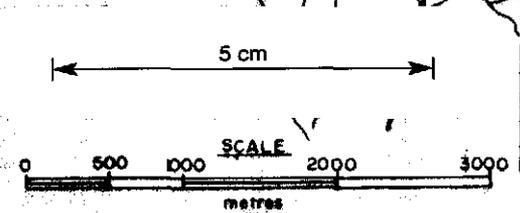
Hatfield
E.L.15/73

Mackintosh
E.L.2/70

Mayday Creek
E.L.5/74

5,380,000N

5,390,000N



- Tertiary Basalt
- Dolerite
- Ordovician quartzite/conglomerate
- Rhyolitic Dolerite Volcanics intrusions
- Black Shales
- Miocene Sandstones
- Andesitic Volcanics
- Pyritic Volcanics
- Dolerite Volcanics
- Exploration Grid
- Licence Boundaries
- Boundary of mapped area

Abminco Exploration

Drawn	C.H.Y.
Traced	R.J.E.
Checked	
Revised by	Date

NORTH WEST TASMANIA
 QUE RIVER REGIONAL GEOLOGY
 SUMMARY MAP

Location code	
Date	June, 1977
Scale	1:50,000
Plate No	Mac.53

012

The Mt. Read volcanics includes intermediate to acid intrusives, lavas and pyroclastics (Corbett et al., 1974). The volcanics are mineralised, with ore deposits at Mt. Lyell, Williamsford, Rosebery and Que River.

GEOLOGY OF THE MACKINTOSH WEST AND HATFIELD LICENCES

The licence areas cover a west facing and dipping sequence of basaltic and andesitic tuff agglomerates, lava breccias and vesicular lavas with some dacitic lavas, pyroclastics and intrusives. The Que River ore mineralisation is situated within these volcanics, 2.5 km east of the Murchison Highway and 2 km south of the Que River. The predominantly andesitic pile is conformably overlain by a fossiliferous black shale of upper middle Cambrian age (Gee 1970) located about 0.5 km east of the Murchison Highway. Drill holes and costeans confirm the shale-andesite contact to be conformable; dips and facing are to the west. Partly interbedded with, and overlying the shale is a suite of dacitic to rhyolitic pyroclastics, lavas and intrusives with quartz phenocrysts up to 5 mm in some members.

Unconformably ? underlying the andesitic volcanics and located approximately 1 km east of the Que River deposit is a greywacke- shale- volcanic sequence with steep west dips and facing. Current interpretation correlates this sequence with the Farrell Slates.

Ordovician conglomerate and quartzite, Jurassic ? dolerite, Tertiary basalt and Quaternary glacial deposits have been mapped in the licence areas (Plate MAC 53 in text).

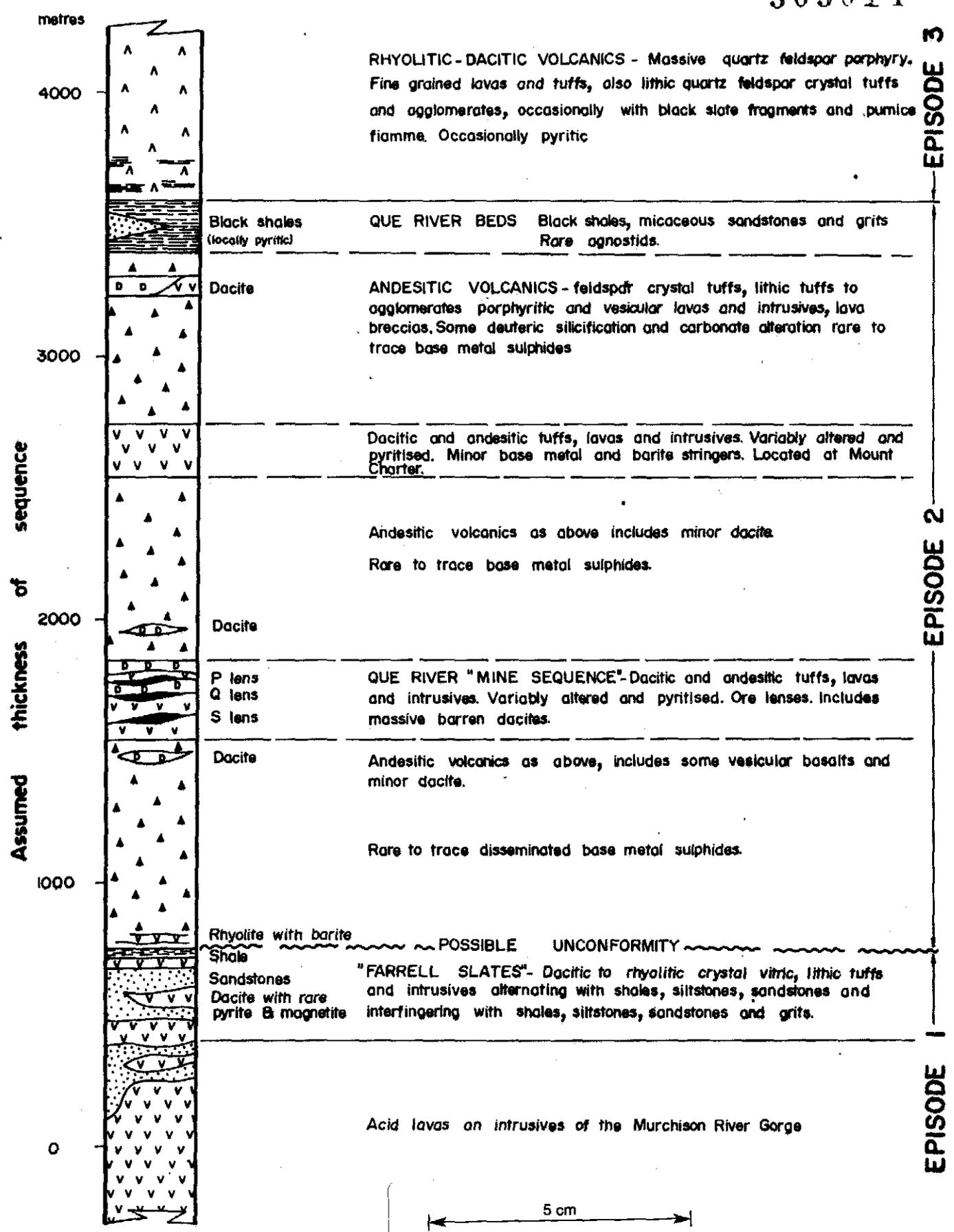
STRATIGRAPHY

A columnar section with summary description of the units is shown in Plate QR 96 in the text. The oldest rocks known consist of a series of sheared dacitic volcanics alternating with shales, siltstones, greywackes and grits believed to be the stratigraphic equivalent of the Farrell Slates exposed in the Mackintosh Dam - Sterling Valley areas.

These rocks occur in the centre of EL 2/70 and extend over 4 km from 3400N to above 7800N. There is a general regional strike of about 020° magnetic and dips are 60° - 80° west. Facings are consistently west.

013

303014



Abminco Exploration

Drawn: CHY
Traced: RKY
Checked:
Revised by: Date:

Mackintosh West / Hatfield Licence Areas
Columnar stratigraphic section of the
Mount Read Volcanics

Location code:
Date: July 1977
Scale:
Plate No. GR 96

014

The contact with the overlying andesitic pile has not been observed. Increased shearing within the "Farrell Slates" suggests the contact is unconformable.

Overlying the "Farrell Slates" is a sequence of basaltic and andesitic through dacitic and rhyolitic volcanics up to 2800 metres thick. It should be noted that significant variations in the thickness of the volcanic pile are common. This sequence is locally mineralised and contains the Que River "Mine Sequence".

Within the andesitic pile, stratigraphic sub-division on the basis of the mineralised/pale-coloured dacitic volcanics has been attempted. At least three horizons of dacite are suggested. Two of these are noteworthy; the Que River "Mine Sequence" dacites and the dacites at Mt. Charter.

The Que River " Mine Sequence" consists of up to 300 m of intermediate to acid volcanics with the pyroclastic derivative dominating. Intrusives exist in the zone along with lavas. Ore lenses appear to be generally conformable with these rock units and appear to be of distinctly proximal disposition. Tuff lavas (welded tuff) are present, indicating that parts of the volcanic pile developed under subaerial conditions, but the pyritic rocks and base metal massive sulphides were deposited in strictly submarine conditions. The regional trend of these volcanics is approximately 020° magnetic. Dips are generally vertical to 50° west, with local reversals to steeply eastward.

The dacites at Mt. Charter consist of about 300 m of altered and mineralised intrusives, lavas and fragmentals. Barren dacites appear to flank the central zone of mineralisation.

Conformably overlying and surrounding the andesitic pile on the west, north-west and north-eastern sides, is a sequence of black shales, micaceous sandstones and grits (Que River Beds). Dips are generally shallow and the beds are upright.

Partly interbedded with, and overlying the Que River beds is a suite of dacitic to rhyolitic pyroclastics, lavas and intrusives. The top of this sequence has not been observed in the Licence area. Skey (1976) proposes a summary group name of Rhyolitic-Dacitic volcanics. (RDV).

Ordovician Owen conglomerate and quartzites unconformably overly the Cambrian volcanics. Outcrop of Ordovician rocks is restricted to the eastern part of the Mackintosh west licence.

Adjacent to the Owen conglomerate, in the vicinity of 8400N, shallow dipping siliceous conglomerate and lithic tuff beds may belong to the Jukes Formation.

A Jurassic? dolerite/diorite mass outcrops between the Murchison Highway and Mt. Charter with minor occurrences elsewhere.

Tertiary flood basalts cover the northern parts of both licences.

Quaternary alluvium and glacial drift cover large tracts of the Southwell River Valley.

LITHOLOGIES

Tertiary Basalt

The basalt is dark green on fresh surfaces and has a red brown weathered surface. Crude columnar jointing is occasionally noted.

Dolerite/Diorite

Green on fresh surfaces due to chlorite, the dolerite weathers to form very hard sub-rounded blocks with a brown coloured skin.

Ordovician Sediments

Pink to white siliceous conglomerates and quartzites, (Owen Conglomerate). Fine grained detrital chromite noted in an argillaceous quartzite suggests correlation with the Pioneer Beds noted at Mt. Lyell (Corbett et al, 1974).

Rhyolitic-Dacitic Volcanics

Massive quartz feldspar porphyry. Fine grained acid intrusives, lavas and tuffs, also lithic crystal tuffs and agglomerates, occasionally with black slate fragments and pumice fiamme. Quartz phenocrysts can commonly be seen. Fresh surfaces are mid to dark grey-green and often vitreous in appearance. Weathered surfaces are distinctive light grey to cream.

Que River Beds

The shales are all black with laminar bedding apparent where cleavage is weak. They contain dispersed extremely fine pyrite and graphite (micron size).

Agnostid trilobites found near the Que River road bridge, were considered by Gee et al (1970) to demonstrate a late Middle Cambrian age.

Dark greenish brown micaceous sandstone, weathering to light grey is common south-west of Mt. Charter. Quartz grains range up to 2 mm, but are most commonly 0.5 mm in size.

Grits, located to the north-east of the Que River prospect are friable and contain sub-angular detritus to 3 mm comprising, quartz, quartzite, grey chert, black shale and muscovite.

Andesite Volcanics

This group includes the rocks termed Andesitic (A), Andesitic Pyroclastics (AP) and Andesitic Streaky Pyroclastics (ASP), (refer appendix A).

Andesite (A) is a green weakly chloritised feldspar pyroxene and/or hornblende porphyry lava, commonly vesicular with carbonate-silica infillings. The contact with the black shales can be marked by a colour change to grey and the occurrence of carbonate amygdules up to 1 cm in diameter, or the development of scoria. The dominant lithologies of the Andesitic pyroclastics (AP) are feldspar crystal lithic tuff to agglomerate and feldspar porphyry lava-breccia occasionally with fresh diopsidic augite crystals to 5 mm.

Fresh colour is green due to weak pervasive chlorite with distinctive white feldspar phenocrysts and common but less apparent chloritised pyroxene or hornblende phenocrysts. Weathered surfaces are generally grey-white and may be studded with quartz eyes due to the deuteric infilling of vesicles or matrix cavities. Composition assessed from thin section examination is in the range andesite to basalt, with deuteric silicification.

A restricted grey coloured lahar or coarse tuff occurs adjacent to the black shales. This unit contains small fragments of pyrite.

017

Irregular grey cherty inclusions, typically 1 to 5 cm, occur within the andesites. These chert inclusions are most common adjacent to the black shales.

Andesitic streaky pyroclastics (ASP) appear to be a facies equivalent of the andesitic pyroclastics and represent the occurrence of pumice. Green coloured, weakly sheared, lithic crystal vitric tuffs, possibly ash flow tuffs predominate. Eutaxitic micro textures have been noted and aligned "streaky" porphyritic fragments (fiamme) of collapsed pumice are characteristic.

Dacitic Volcanics

A suite of intrusives, lavas, pyroclastics and reworked tuffs include the host rocks of the Que River ore lenses. The currently accepted rock units and symbols used are listed below and a more detailed legend is appended (Appendix A).

Andesitic-Dacitic Pyroclastics	ADP
Dacite, Magnetic Dacite	D,DM
Dacitic Tuff Lava	DTL
Dacitic Pyroclastics	DP
Porphyritic Dacite	PD
Porphyritic Dacitic Pyroclastics	PDP
Dacitic Reworked tuffs	DRWT
Dacitic Shaly tuffs	DSht
Streaky pyroclastics of indeterminate composition	SP

Andesitic Dacitic Pyroclastics (ADP)

Pyritic pyroclastic beds located within the "mine sequence". Characterised by heavily chloritised fragments of porphyritic andesite (average 2 cm) in an otherwise dacitic fragmental matrix. The rock exhibits pyrite - quartz - sericite - carbonate - chlorite alteration and is grey to dark grey in colour.

A unique member of this group is grey to green in colour with conspicuous amygdaloidal andesite lava clasts. When in close proximity to massive sulphides there is an abundance of "chrome" green illite-hydromuscovite aggregates.

018

Dacite and Magnetic Dacite (D,DM)

Members of these units are lavas and intrusives, commonly buff to pink in colour, fine grained homogeneous, slightly porphyritic for feldspar, occasionally vesicular or flow banded. Often intercalated with the pyritic pyroclastic rocks of the "mine sequence" the dacites are relatively barren evidently being impervious to mineralising fluids.

They are often wedge shaped, widest near surface, thinning rapidly with depth.

Dacitic Tuff-Lava (DTL)

Exists in localised settings, indicative of subaerial volcanism. Texturally and compositionally similar to the dacite, this rock has both extrusive and pyroclastic features. Angular fragments of slightly porphyritic dacite, occasionally flow-banded, are incorporated in a lava matrix of similar composition.

The rock is considered to be a flow brecciated lava and/or a lava contaminated by fragments of tuffaceous origin.

Dacitic Pyroclastics (DP)

Generally marginal or facies equivalent to dacite with a limited distribution. Characterised by fragments of buff to green coloured dacite, occasionally flow-banded, in a grey coloured tuffaceous pyritic - quartz - sericite rich dacitic matrix.

Porphyritic Dacite (PD)

Interpreted to have both intrusive and flow characteristics. Porphyritic dacite is a massive rock porphyritic in feldspar. It is buff to light grey in colour and has been altered by carbonate, sericite and silica. The rock consists of sericite-pseudomorphed, flow-oriented feldspar phenocrysts (to 3 mm average 0.5 mm), often euhedral and a few anhedral quartz phenocrysts in a devitrified siliceous groundmass of quartz - feldspar composition. Fractures filled with disseminated and stringer mineralisation are common. The rock hosts much of the S lens copper mineralisation at Que River and is of widespread distribution being one of the main units at Mt.Charter.

Porphyritic Dacitic Pyroclastics (PDP)

Fragments of porphyritic dacite are ubiquitous, sizes vary from microscopic grains to over 20 cm. Fragments range from unsorted to fairly well-sorted and from angular to sub-rounded. There is a tendency to cyclicity from agglomerate to tuff.

The rock is pale grey to blue grey in colour, due to pyrite-quartz-sericite-carbonate alteration.

Dacitic Reworked Tuffs (DRWT)

Subrounded polymictic lithic fragments (from 0.5mm to 50mm, average 5 mm) are indicative of reworking. Fragments consist of altered porphyritic dacite, sericitised trachyte and recrystallised chert. Irregular quartz aggregates may represent devitrified glass.

The matrix consists essentially of introduced secondary quartz, carbonate and pyrite. The rock is grey to blue grey in colour due to pyrite-quartz-sericite alteration.

Dacitic Shaly Tuffs (DShT)

Pyritic shaly tuff appears to be the immediate host rock for massive sulphides. Beds to 5 m thick are located as selvage (generally beneath) and lateral to ore. The rock is a very fine tuff, highly argillaceous and completely sericitised.

Streaky Pyroclastics of Indeterminate Composition (SP)

Grey, weakly sheared, sericitised and pyritised, lithic vitric crystal tuff, often with a close spatial relationship to dacitic shaly tuff although with a greater lateral extent. Pale grey-white porphyritic fragments are typically "streaky" in appearance. The richly sericitic matrix carries fine feldspar crystals and devitrified shards. This rock appears to reflect occurrence of pumice, giving rise to streaky *fiamme* textures.

"Farrell Slates"

Exposure of the rocks assigned to this formation, is restricted to the eastern part of the Mackintosh west licence and limited by a cover of Ordovician sediment-

The main rock units are grey to black shales, siltstones with local current bedding and micaceous sandstones (greywackes). There is an indicated thickness of over 700 metres. Medium grained grit beds up to 15 cm thick have been noted. Dacitic tuffs and lavas are subordinate.

The volcanics are sheared with the development of a phyllitic cleavage, they include dacitic lithic vitric crystal tuff and dacitic feldspar porphyry lava, often containing primary magnetite.

STRUCTURE

West dips and facing, common through the whole volcanic sequence covered by the Mackintosh west and Hatfield Licence areas, allow an interpretation to be suggested whereby the volcanics are all part of the same west-facing limb of a major NNE trending late Cambrian fold.

Tabberabberan (Devonian) folding appears to have developed simple fold structures. Main axes trend to the NNE with cross-fold axes to the WNW.

The most reliable indication of Tabberabberan fold structures is given by the dips and facings measured in the Que River shale-sandstone units that surround the andesitic volcanics on the west, north-west and north-eastern sides.

South-west of Mt. Charter the apparently complex minor folding in the shales and acid volcanics may result from WNW trending cross-folding.

To the west, in the vicinity of the Murchison Highway and Mt. Charter a conformable andesite-black shale-sandstone contact dipping west at 25° to 50° is indicated.

In the vicinity of 6400N there is a small lobe-like structure, located by mapping and confirmed by I.P. It is not known if this feature is a fold or fault phenomenon. Dips are considered too steep for this feature to be a topographic effect.

A synclinal structure in the shales and overlying acid volcanics is located in the north-west (8000N). This syncline trends NNE but is terminated to the north by apparent WNW anticlinal cross-folding demonstrated by deformation

021

in the shales exposed in the Que River tributaries.

Located in the vicinity of 9400N, approximately 2 km north-east from the Que River prospect, steep dips (50° to 80°) and facing to the north-east define the east limb of a north-plunging asymmetric anticline (Plate MAC53 in text). It is not clear what effect this structure has on the Que River "Mine sequence".

The marked thinning of the andesite pile between the NNE trending, west dipping and facing "Farrell Slates" and the east dipping and facing Que River beds is poorly understood, but may be attributed to faulting, variations in the thickness of the volcanic pile, cross-folding and later ? intrusion of a quartz feldspar porphyry located in the vicinity of 8400N.

Fault structures indicated by photo, geophysical and geochemical linears and mapping of underground development may be resolved into two main sets, trending 035° to 050° (A) and 315° to 335° (B) magnetic. An example of set (A) is located in the vicinity of the Que River exploration decline portal. This is a major fault trending at 060° magnetic which dips to the SE at approximately 45° and displaces the "mine sequence" some 500 metres to the SW i.e. dextral movement. A NW-SE trending set of faults measured in the andesite at the portal which strike 120° magnetic and dip at approximately 45° NE, provide an example of set (B). Air photo interpretation indicates that a fault with this orientation is likely to be present in the mine area north of the portal.

Shearing might be one expression of faulting. Some shearing, for instance, at the massive sulphide - pyroclastic contact most probably is differential slip along the contact during folding, particularly where two physically dissimilar rocks like massive sulphide and dacite are adjacent. Strike slip shearing has most likely occurred within the highly argillaceous shaly tuff, host for the massive sulphides.

In the vicinity of the andesite-black shale contact, low grade regional metamorphism has produced a common conformable cleavage. Strong platy cleavage is common in the Que River shales with local graphite. Within the andesitic pile regional cleavage is most apparent within the pyritic sericitised "mine sequence" pyroclastics. The cleavage strikes approximately

30° magnetic with subvertical dip. The more competent rock groups (AP,D) show a foliation of similar attitude which in many instances may be bedding or flow banding.

Shearing within the "Farrell Slates" appears to be far more strongly developed than in the other volcanics. The shearing has produced a shaley/slatey character in the sediments and a phyllitic cleavage in the tuffs.

ALTERATION

Weak chlorite development is ubiquitous in the andesites and is ascribed to deuteritic alteration and low grade regional metamorphism of pyroxenes and amphiboles. Deuteritic chloritisation, carbonation and silicification of the andesites culminates in the formation of sericite adjacent to the contact with the Que River Beds. Silicification of the andesites is quite common. Quartz (particularly chalcedony) filled vesicles, tension gashes and pervasive silicification of matrix material are commonly observed.

Within the Que River "Mine sequence" and the porphyritic dacite of Mt. Charter the effects of hydrothermal alteration associated with sulphide mineralisation are widespread. As well as pyritisation, the most marked effects are those of silicification, sericitisation and carbonation. Chloritisation is restricted and argillisation has been noted. Most quartz is inferred to be derived from devitrification although common and abundant pervasive silicification is locally developed to an impressive degree. The term sericite is used in a general sense to denote fine white mica, typically as illite grading to chrome green illite-hydromuscovite. Carbonate probably ankerite, occurs as veinlets, matrix permeations and as an alternate to sericite in the replacement of feldspar phenocrysts. Massive chlorite zones are restricted, occasionally up to 5 metres in width as selvages to ore.

Weaker carbonate veining and patchy pervasive carbonate - silica alteration occurs in the area 7000N to 7500N near 4700E (old mill site area) and in massive andesitic fragmentals on the southern slopes of Mt. Charter.

Shales of the Que River Beds contain up to 5% ultrafine graphite and minor recrystallised pyrite. They are locally indurated adjacent to the andesites.

023

Alteration within the "Farrell Slates" is well developed. Both the sediments and volcanics exhibit sericite, locally illite-hydromuscovite, and minor carbonate. Minor pyrite and chlorite are common although not ubiquitous.

MINERALISATION

Minor stringers and disseminations of pyrite, sphalerite, galena and rare chalcopryrite occur within silicified, sericitised and carbonated intrusives, lavas and pyroclastics, located both north and south of the Que River ore lenses, at Mt.Charter and near the Murchison Highway(6400N, 3150E.)

On the east slope of Mt.Charter, several small pits and trenches and a larger cut, approximately 4 metres deep, are the result of early prospecting activities, circa 1930. A barite vein approximately 70 cm thick occurs, with widespread float on both sides of the watershed. Barite and minor base metal veining is common in drill core from MC 1 and MC 2, though no zones greater than 10 cm of massive barite were found.

Disseminated and minor vein pyrite and base metal sulphides were reported in some of the andesites. Quartz - carbonate veining appears to bear a close relationship to this type of mineralisation. Two areas are noteworthy; the old mill site (7200N 4300E) and Mt.Charter south (4200N 4200E). Speculation as to the proximity of massive base metal sulphides is warranted.

Disseminated to laminar bedding of locally recrystallised pyrite occurs in shales of the Que River Beds.

Within the "Farrell Slates" minor disseminated pyrite and rare base metal sulphides were noted.

SOIL GEOCHEMISTRY

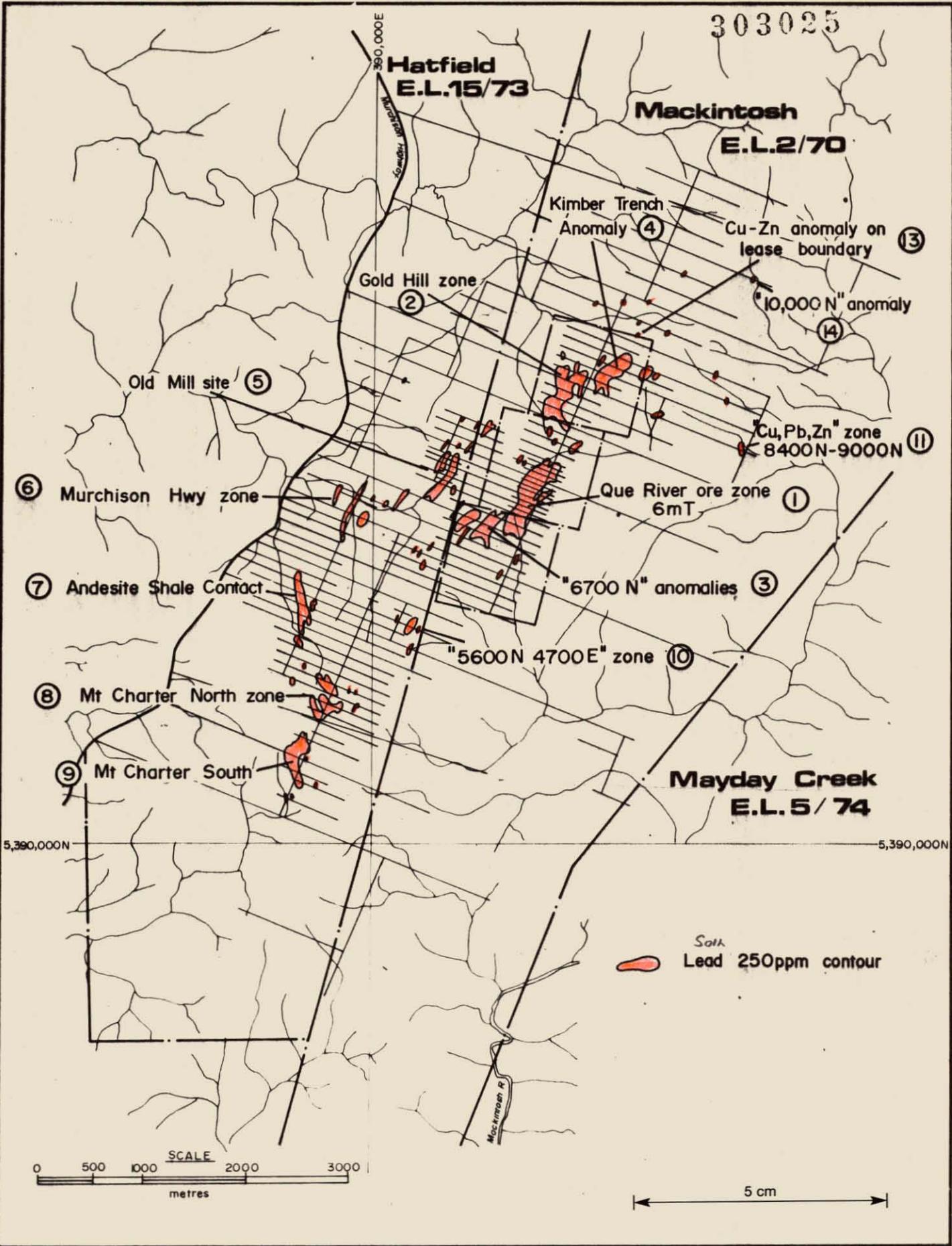
Contour levels for all data determined by inspections are as follows:-

Copper	100 ppm	200 ppm		
Lead	250 ppm	500 ppm	1000 ppm	2000 ppm
Zinc	200 ppm	400 ppm		

The relative immobility, and hence discrimination of lead with respect to

024

303025



Abminco Exploration

Drawn	CHY	Mackintosh West / Hatfield Licence Areas GEOCHEMICAL SUMMARY PLAN	Location code
Traced	RKY		Date June 1977
Checked			Scale 1:50,000
Revised by	Date		Plate No QR 100

zinc and copper, is well illustrated over the Que River ore zone. A summary plan showing lead geochemistry outlined by the 250 ppm contour illustrates fourteen anomalies or anomalous zones, (Plate QR 100 in text).

Within the Que River Mineral Leases, four anomalous zones are outlined by the 250 ppm lead contour, anomalies Nos. 1 - 4 (Plate QR 100).

Ten anomalies or zones of interest lying outside the Que River Mineral Leases warrant mention (Plate QR 100).

Anomaly No. 5 "Old Mill Site" Zone

Anomalous values of copper, lead and zinc with lead values to 3,750 ppm. The geology, from both mapping and drilling appears to be carbonated andesite with disseminated galena and sphalerite. Trenching has recently exposed a barren dacite unit in the southern part of the grid.

Anomaly No. 6 "Murchison Highway" Zone

The occurrence of pyritic chert and disseminated base metal sulphides in vesicular andesites, near the shale-andesite contact, was followed-up by a detailed soil sampling programme. Two separate anomalies were distinguished; lead-zinc values related to the chert and andesites and copper-zinc to the shales.

Anomaly No. 7 Andesite-Shale contact towards Mt. Charter

Lead values of up to 3,000 ppm, with supporting zinc, form a distinct anomaly of some 400 metres strike length. Spot values occur to the south-east and merge with the "Mt. Charter North" zone. The strong trend apparent in this anomaly parallels the shale contact but the anomaly is within the andesites.

Anomaly No. 8 "Mt. Charter North" Zone

A bifurcating anomaly of large areal extent with lead values commonly exceeding 500 ppm appears transgressive to the geology but shows similarities to the contoured I.P. data (Plate HT 22). Drilling has confirmed altered dacitic volcanics with disseminations and stringers of base metal sulphides and barite.

026.

Anomaly No. 9 "Mt.Charter South"

Dominated by zinc values in the range 500 to 2,300 ppm. Disseminations and aggregates of galena and sphalerite were observed associated with carbonate veining in massive andesites. Lead soil values attain 1,000 ppm.

Anomaly No. 10 "5600N 4700E" Zone

A two line lead anomaly, maximum 1,400 ppm has a much greater breadth (200m) and strike (600m) in terms of zinc values. The anomaly appears related to disseminated lead and zinc sulphide mineralisation in andesites.

Anomaly No. 11 Cu,Pb,Zn Zone 8400N-9000N

A zone of 100-200 ppm lead values, in the vicinity of 6500E to 7100E, with spot values of 2320 ppm and 750 ppm, enhances the marked copper anomaly (maximum 700 ppm) on line 8400N. The underlying lithologies are andesites with some dacites and pyritic chert.

Anomaly No. 12 Pb,Zn Zone 8000N - 8800N

Three single line lead-zinc anomalies occur immediately east of the mineral leases on lines 8000N, 8400N and 8800N. All appear to be in andesitic to dacitic volcanics.

Anomaly No. 13 Cu,Zn Anomaly on ML 2M/75 Lease Boundary

A small copper-zinc anomaly straddling the northern boundary of ML 2M/75 has associated spot values of anomalous lead. A linear trend apparent in the copper anomaly is in line with the Kimber trench anomaly.

Anomaly No. 14 10,000N Lead Anomaly

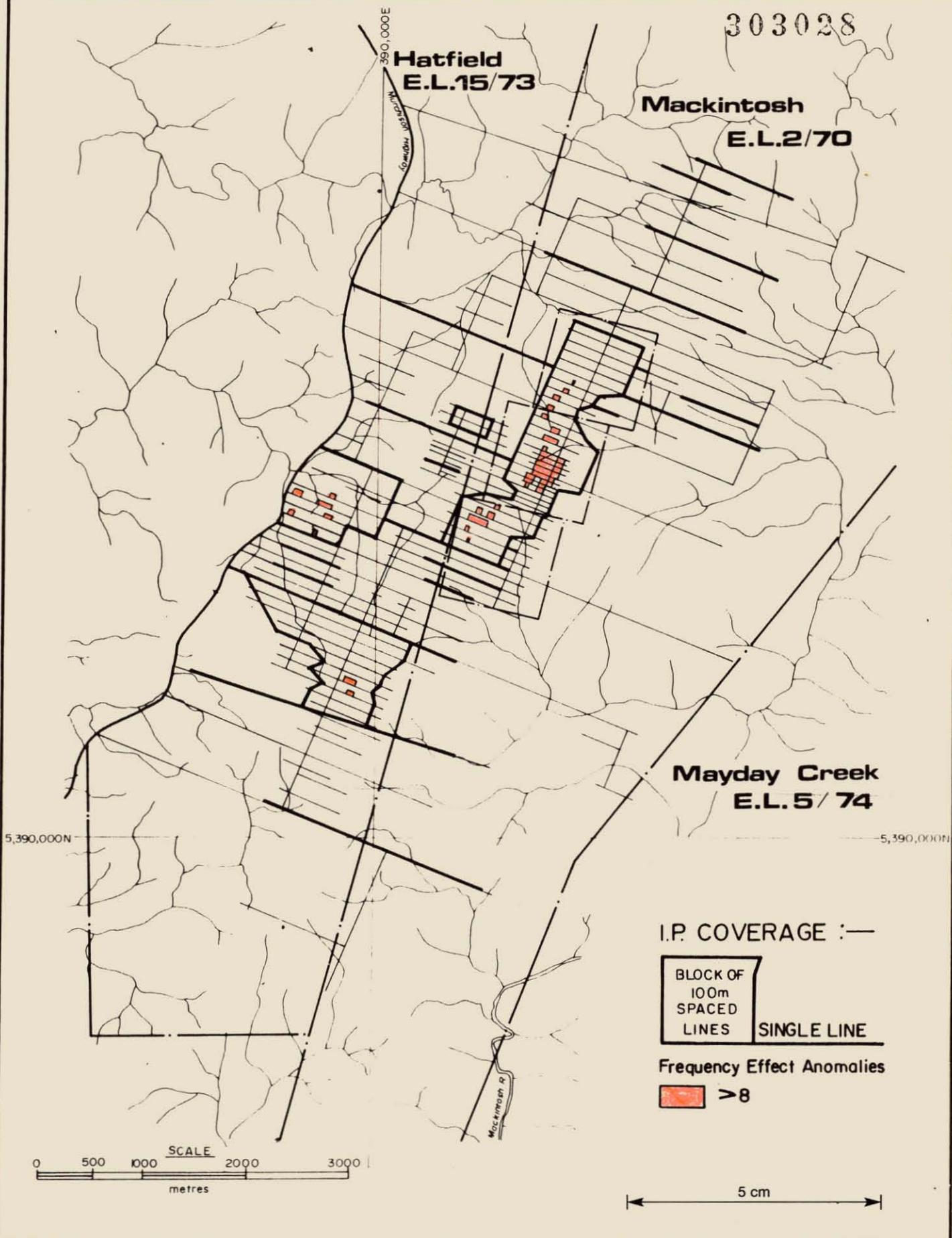
A reconnaissance line lead anomaly with values to 900 ppm. Follow up gridding and soil sampling is in progress.

GEOPHYSICS

A summary plan, Plate QR 98 in text, outlines the total area now covered by I.P. traverses.

027

303028



 **Abminco Exploration**

Drawn CHY Traced J D Checked Revised by JJB Date 11/7/77	Mackintosh West / Hatfield Licence Areas GEOPHYSICAL SUMMARY PLAN	Location code Date June 1977 Scale 1:50,000 Plate N ^o QR 98
---	---	---

In the past year 3800m of detailed (25 metre dipole) I.P. traversing was completed, between the Murchison Highway and Mt.Charter, in the Hatfield licence. No significant anomalies were obtained. Summary plan, plate HT 22 shows frequency effect contours illustrating the I.P. coverage of the above area.

In the Mackintosh licence four areas were tested by either detailed or reconnaissance I.P.traverses:-

1. As follow-up to a coincident lead-zinc anomaly at 10,000N, 25 metre dipole I.P. was conducted from 6300E to 6500E, a weak anomaly was obtained. Additional gridding, mapping and soil geochemistry was completed. Sporadic disseminated base metal mineralisation in the upper Rhyolitic-Dacitic volcanic sequence is indicated.
2. On line 8600N, 25 metre dipole I.P. was conducted from 6250E to 7000E as follow-up of a geochemical anomaly. Only weak frequency effects were recorded.
3. 50m dipole I.P. was conducted on lines 10,600N, 10,800N and the H.E.C. survey line near 10,600N in an attempt to more clearly define the shale-andesite contact.
4. 100 metre dipole I.P. was conducted on reconnaissance line 7400N from 5300E to 7000E without defining any new anomalies. I.P. Profiles are appended (F).

CONCLUSION AND RECOMMENDATIONS

A review of the results of all exploration on the licence areas was completed. Subsequent to airborne EM surveys, stream sediment sampling and a variety of orientation geochemical and geophysical surveys conducted at Que River, geological mapping, soil sampling and I.P. have featured as prime techniques in the exploration of the Mackintosh West and Hatfield licence areas. At this stage in the exploration programme it is considered the above techniques should have delineated any near surface ore deposit.

The Que River ore deposit is located in dacitic volcanic rocks which are part

029.

of an essentially andesitic pile. Apart from S lens, where the nature of the mineralisation is seen to be essentially of stringer type, situated in altered porphyritic dacite, all other ore horizons consist of massive sulphides situated within fine grained argillaceous (shaly) tuffs. As well, all ore horizons are located close to, or at least no further than 50 metres from, massive barren dacite and in many instances near andesites. It is considered that further exploration effort be directed towards identifying the stratigraphic continuation or repetition of argillaceous (shaly) tuffs in proximity to massive dacites or, when dealing with the rocks most likely to be found by surface mapping, the contact between andesite and massive dacite. In view of the masking effect massive dacite may have on the geophysical and geochemical response from deeply buried ore bodies, the lack of significant I.P. and soil anomalies should not be considered definitive.

Recent geological mapping has shown soil anomaly zones Nos. 5,11 and 12 (Plate QR 100) to be related to dacite-andesite stratigraphy. Although, in part, downgraded by 25 metre dipole I.P. these zones represent, possibly, the most attractive targets in the licence areas. Further detailed exploration will be conducted.

The presence of disseminations and aggregates of galena and sphalerite within andesitic rocks represents a style of mineralisation different to that at Que River and not directly related to intense alteration and pyritisation. Soil anomalies Nos, 6,7,9 and 10 are believed related to this style of mineralisation.

As massive sulphide ores may be located flanking altered porphyritic dacite (similar to the S lens host rock), the presence of mineralised andesitic pyroclastics overlying the large altered porphyritic dacite at Mt.Charter (soil anomaly No. 8) takes on greater significance.

Further consideration of these anomalies is warranted and testing by trenching is in progress.

Creek mapping of the area, approximately mid-way between reconnaissance lines 4400N and 5400N has found sheared and altered rhyolites which contain pyrite and barite. Closer spaced soil sampling, mapping and possibly I.P. will be conducted.

030

A programme of rock geochemistry (Cu,Pb,Zn,Hg,Ag,Ba) is recommended to test its potential for defining geochemical characteristics of the stratigraphy. Hopefully, rock geochemistry might provide a means for evaluating relatively weak I.P. and soil geochemical anomalies.

Improved methods of geochemical data assessment by computer processing will allow rapid checking of compilation errors, rapid geographical identification of anomalous values and improved statistical treatment of data.

In the Mackintosh East area coincident soil geochemical and weak I.P. anomalies, apparently within Cambrian acid volcanics, require follow up.

FINANCE

EL 15/73 HATFIELD

Expenditure for the twelve months ending June 7, 1977 is as follows:

Geology	16,271
Survey	9,901
Geophysics	8,578
Geochemistry	6,804
Diamond Drilling	31,114
Tenure	307
Miscellaneous	2,449
	<hr/>
	75,424
	<hr/>

EL 2/70 MACKINTOSH

Expenditure for the twelve months ending June 7, 1977 is as follows:-

Geology	15,143
Survey	9,424
Geophysics	5,921
Geochemistry	4,579
Tenure	1,103
Miscellaneous	2,702
	<hr/>
	38,872
	<hr/>

Signed C.H. YOUNG
C.H. Young
Geologist

Endorsed K.R. Yates
K.R. Yates
Chief Geologist

REFERENCES (* Classified report)

C.E.P.L. Staff (1974) Progress Report on E.L. 2/70 Mackintosh River Tasmania, Que River Prospect.

Corbett, K.D., Reid, K.; Corbett, E.B; Green, G.R; Wells, K and Sheppard, N.W. (1974) The Mount Read Volcanics and Cambro-Ordovician Relationships at Queenstown, Tasmania, J. Geol. Soc. Aust. 21 (2), 173-186.

Gee, C.E; Jago, J.B. and Quilty, P.G. (1970), The Age of the Mount Read Volcanics in the Que River Area, Western Tasmania. J.Geol. Soc. Aust. 16 (2), 761-763.

Skey, E.H. (1973) Progress Report - EL 2/70 Mackintosh River Area, Tasmania, January-February 1973.

Skey, E.H. (1973) Progress Report - EL 2/70 Mackintosh River Area, February - May 1973.

Skey, E.H. (1974) Report on Surface Activities on Mackintosh EL 2/70 and Hatfield River EL 15/73.

Skey, E.H. (1975) Progress Report - Hatfield River Exploration Licence 15/73, 12 months ending June 25, 1975.

Skey, E.H. (1975) Progress Report Mackintosh River Exploration Licence 2/70 for 12 months ended June 30, 1975.

Skey, E.H; Young, C.H. and Webster, S.S. (1975) Progress Report Que River Prospect Exploration Licence 2/70 (Mineral Leases 2M, 3M, 4M/75).

Skey, E.H. and Webster, S.S. (1976) Annual Progress Report Mackintosh River Exploration Licence 2/70. (Licence holder Aberfoyle Tin N.L.) for 12 months ended June 30, 1976.

Skey, E.H. and Webster, S.S. (1976) Annual Progress Report Exploration Licence 15/73, Hatfield River for 12 months ending June 25, 1976.

*Young, C.H. (1977) Geology of the Que River Lead-Zinc Deposit.

*Young, C.H. (1977) Summary Review of the results of exploration on Exploration Licences 2/70 Mackintosh River and 15/73 Hatfield River.

031

032.

LIST OF APPENDICES

APPENDIX A

Plate QR 84, Que River Prospect Geological Legend and Colour Code.

APPENDIX B

Petrological Reports for Rock Samples, Mackintosh and Hatfield Licence areas.

APPENDIX C

Diamond Drill Logs H 1 and H 2 - 2A.

APPENDIX D

Geophysical Testing of Core Samples.

APPENDIX E

Petrological Reports on samples from Diamond Drill Holes, H1, H2, MC1 and MC2.

APPENDIX F

I.P. Profiles Mackintosh Licence area.

7400N	-	25 metres	} MISSING NOT RECIEVED WITH REPORT.
7400N	-	100 "	
10000N	-	25 "	
8600N	-	25 "	
10800N	-	50 "	
10600N	-	50 "	

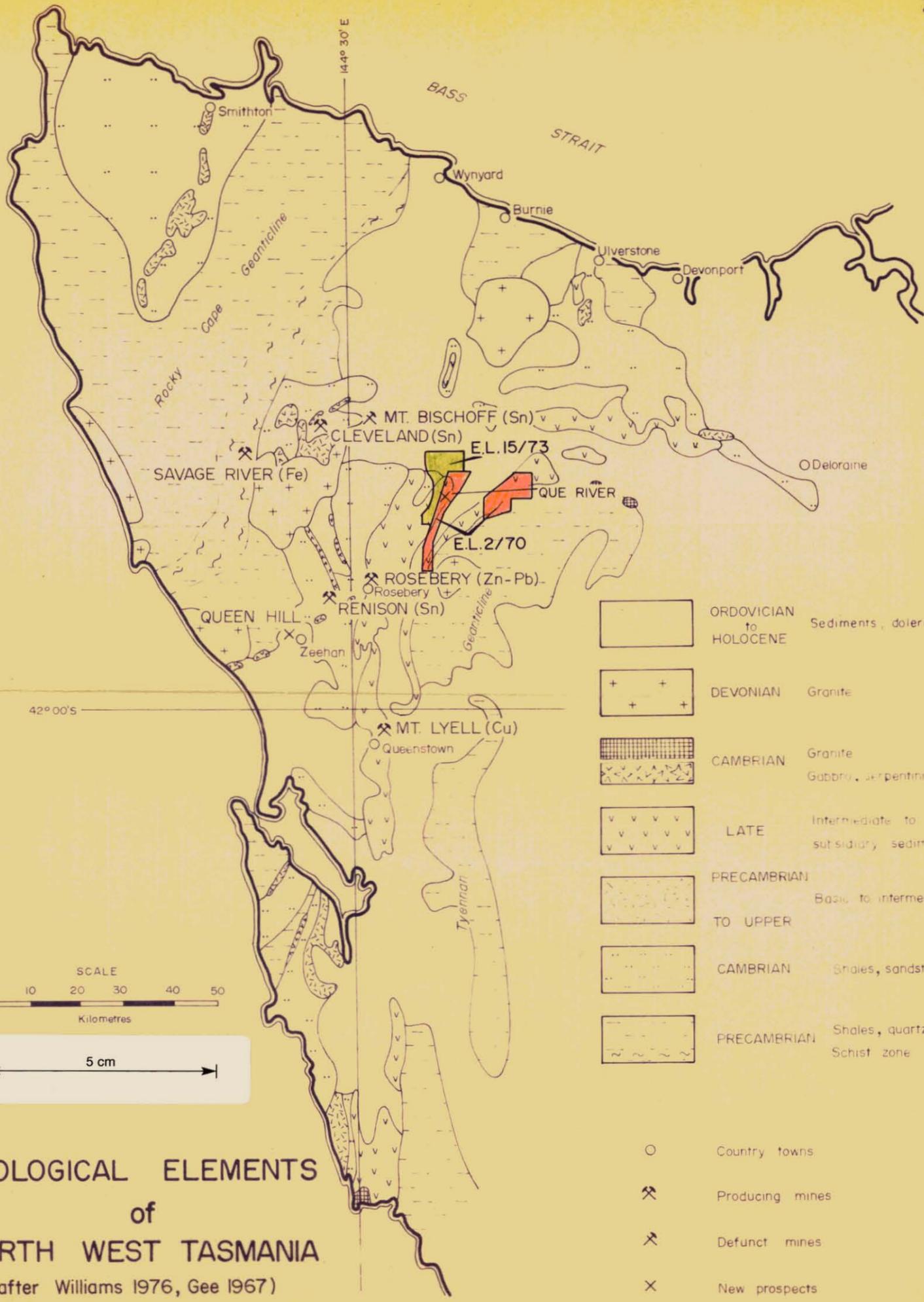
033

303034

APPENDIX A

Plate QR 84, Que River Prospect Geological
Legend and Colour Code.

034



	ORDOVICIAN to HOLOCENE	Sediments, dolerite, plateau basalts
	DEVONIAN	Granite
	CAMBRIAN	Granite Gabbro, serpentinite
	LATE	Intermediate to acid volcanics, subsidiary sediments
	PRECAMBRIAN TO UPPER	Basic to intermediate
	CAMBRIAN	Shales, sandstones, conglomerate
	PRECAMBRIAN	Shales, quartzites Schist zone
	Country towns	
	Producing mines	
	Defunct mines	
	New prospects	

GEOLOGICAL ELEMENTS
of
NORTH WEST TASMANIA
(after Williams 1976, Gee 1967)

035

Nº	NAME / COMPOSITION	CODE	OCCURRENCE	TEXTURE	ROCK COLOUR	COMMON ALTERATION TYPE	COMMON SULPHIDE CONTENT
48	ANDESITE	A	Flow and intrusive	Por, Vesic, massive - fine grained	Green	Carbonate, chlorite	Py ≤ 1% rare base metal sulphides
49	ANDESITIC PYROCLASTICS	AP	Pyroclastic	Variouly lfdpxhbxt, ta, some amygdaloidal fragments	Green	Carbonate, chlorite	Py ≤ 1% rare base metal sulphides
46	ANDESITIC STREAKY PYROCLASTICS	ASP	Pyroclastic	lt, lta streaky porphyritic	Pale green	Carbonate, chlorite	Py ≤ 1% rare base metal sulphides
44	ANDESITIC - DACITIC PYROCLASTICS	ADP	Pyroclastic green andesitic fragments in an otherwise dacitic pyroclastic	lt, lta	Grey, dark green (grey matrix)	Carbonate, chlorite sericite, silica	Py ≤ 10% stringer Sph Gn Cpy
63	DACITE MAGNETIC DACITE	D MD	Flow and intrusive	Fine grained, occasionally Por, vesicular	Buff, pink, green brown	Carbonate (sericite chlorite)	Py ≤ 1%
59	DACITIC TUFF LAVA	DTL	Pyroclastic (welded, may be in part sub-aerial)	t, lt, lta, a, fragments similar to matrix	Buff - pink green	Carbonate, sericite	Py ≤ 1%
64	DACITIC PYROCLASTIC	DP	Pyroclastic fragments typically dacite in grey matrix	t, lt, lta, a	Buff - pink and green fragments	Carbonate (silica, sericite chlorite)	Py ≤ 3%
18	PORPHYRITIC DACITE	PD	Flow and intrusive (auto brecciated, fractured)	Porphyry	Buff - grey, yellow green (mottled)	Carbonate, sericite (silica, chlorite)	Py ≤ 10% including stringer mineralisation
6	PORPHYRITIC DACITIC PYROCLASTICS	PDP	Pyroclastic. Fragments typically porphyritic dacite	t, lt, coarse lt, lta	Blue - grey, grey	Carbonate, sericite silica (chlorite)	Py ≤ 10% also stringer Sph Gn, Cpy
70	DACITIC REWORKED TUFFS	DRWT	Reworked pyroclastics	t, lt, coarse lt, lta	Blue - grey, grey	Carbonate, sericite	Py ≤ 10% also minor Sph, Gn, Cpy
68	DACITIC SHALY TUFFS	DShT	Pyroclastic argillaceous	Fine t, t, lt	Grey	Sericite	Py ≤ 20% also Sph, Gn, Cpy
INDETERMINATE COMPOSITION							
	FLAWS AND INTRUSIVES	L	Flow and intrusive	Por. vesic. massive - fine grained	Green, buff	Carbonate, chlorite	Py ≤ 10%
	PYROCLASTICS	P	Pyroclastic	t, lt, lta	Green, grey - buff	Carbonate, sericite chlorite	Py ≤ 10%
27	STREAKY PYROCLASTICS	SP	Pyroclastic	lt, lta, streaky porphyritic	Green, grey, off-white	Carbonate, sericite	Py ≤ 10%

REFERENCE

SECTION

Sericite rich, locally sericitic ser, (ser)

Chlorite rich, locally chloritic chlor, (chlor)

Carbonate rich, locally carbonated carb, (carb)

Silicified, locally silicified silic, (silic)

Vesicular, amygdaloidal vesic

Probable original character siliceous

Foliation, probable bedding/flow bedding

Cleavage

Fault unmeasured orientation F

Fault measured " F

Fault zone unmeasured orientation FAULT ZONE

Fault zone measured FAULT ZONE

Petrological sample 141090 *

DRILL HOLE TRACE

Py 5 (50) Pyrite 5%, locally 50%

Py 5-10 Pyrite 5-10%

Gn 2 Galena 2%

Sph 5 Sphalerite 5%

Cpy 15 Chalcopyrite 15%

Ba 5 Barite 5%

q vein quartz vein

c vein carbonate vein

PLAN

Bedding with dip/vertical 60°

Cleavage with dip/vertical 80°

Fault with dip/vertical/wet 60°

Joint with dip/vertical/horizontal 30°

Lineation, direction and plunge 30°

SULPHIDES

- 21/12 Massive sphalerite - galena Greater than 5% combined Cu, Pb, Zn
- 29 Massive Pyrite ≥ 60%
- Pyrite ≥ 10% Pyritic rocks

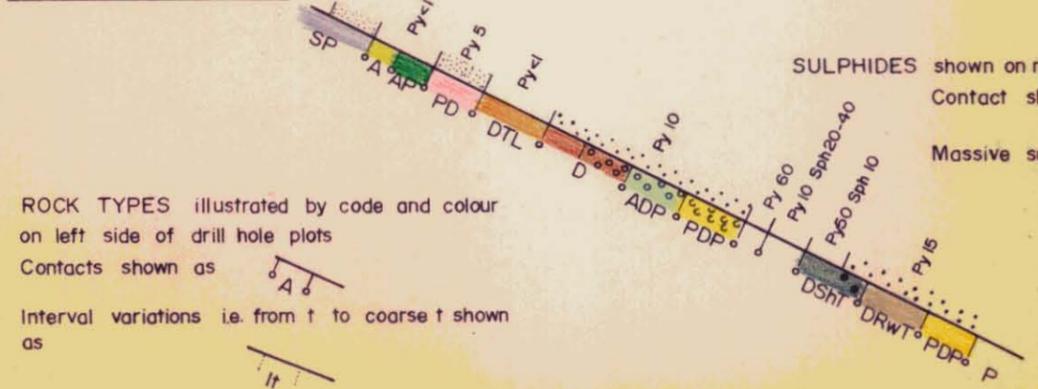
DOMINANT ALTERATION TYPES

- Carbonate (ankerite)
- Silica
- Chlorite massive / Chlorite disseminated
- Illite hydromuscovite

Alteration illustrated as overprint on same side as rock type.

Contacts shown as

DRILL HOLE TRACE



ROCK TYPES illustrated by code and colour on left side of drill hole plots

Contacts shown as

Interval variations i.e. from t to coarse t shown as

SULPHIDES shown on right side of drill hole plot as overprint

Contact shown as

Massive sulphide shown as both sulphide and rock type

ABMINCO N.L.		Location code:
Drawn: E.H.S C.H.Y.	QUE RIVER PROSPECT	
Traced: R.K.Y.	Geological Legend and Colour Code	
Checked:	Date:	Scale:
Revised:	Date:	Date:
		Plate N°: QR 84

APPENDIX B

Petrological Reports for Rock Samples,
Mackintosh and Hatfield Licence Areas.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/3/18 Date Received: 28.3.77

Reference Order No. 7/22

Sample No. 206135

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 20888

a. Hand Specimen:

Grey green microgabbro, K stain virtually negative.

b. Microscopic:

This is a weakly altered microgabbro.

The rock is porphyritic towards frequent subhedral grains (to 1.5mm, mean 750 μ) of labradorite. These are enclosed in a medium grained groundmass of random labradorite laths (500-200 μ) with disseminated granules and crudely subophitic patches (to 500 μ) of pyroxene and a semi-pervasive poorly crystalline montmorillonite-stained feldspathic mesostasis. Accessory magnetite is present and there are minor traces of Fe-sulphide as ultrafine particles in the mesostasis.

Two clinopyroxene phases are present with a pale brown pigeonite accompanied by subordinate colorless augite. The two are generally discrete but locally intergrown and overall show identical textural relationships. The rock is thus unusual in that pigeonite occurs as a phenocrystal phase. Additionally rare patches of bastite-like montmorillonite (after orthopyroxene) are seen as inclusions in clinopyroxene.

The rock is essentially fresh although feldspar is marginally corroded by the mesostasis. Thin veins (to 350 μ) of fibrous semi-radiating scolecite occur sporadically and show semi-continuous selvages (to 500 μ) of zeolitised feldspar. Pyroxenes are often microfractured and weakly stained with Fe-oxide but are essentially unaltered.

D. Cowan, B.Sc.

IDENTIFICATION
206135
WEAKLY ALTERED MICROGABBRO MACKINTOSH HBC LINE 11425N 6000E

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/3/18 Date Received: 28.3.77

Reference Order No. 7/22

Sample No. 206136

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 20889

a. Hand Specimen:

Grey fine-grained microgabbro, K stain very weakly positive.

b. Microscopic:

This is an essentially unaltered hypersthene microgabbro. The rock is similar and no doubt closely related to 206135 but is of slightly different composition and fabric.

This rock is weakly porphyritic towards pyroxene subhedra (to 1mm) and clusters but overall is relatively fine and even-grained. It consists of labradorite and pyroxene in roughly equal proportions with accessory ilmenite, hematite, traces of magnetite and a sparse variably montmorillonite-stained cryptopegmatitic feldspathic mesostasis. The fabric is slightly ophitic ("doleritic") and the main contrast here is the finer modal grain size.

The pyroxenes are variably diallaged diopsidic augite, pigeonite and virtually colorless weakly schillerised hypersthene in order of abundance. All three are discrete to mutually intergrown. Presence of hypersthene tends to confirm the former presence of orthopyroxene in 206135 as a minor accessory phase.

As previously the rock is essentially fresh. Incipient montmorillonite replacement of pyroxene is evident. No sulphides were detected.

D. Cowan, B.Sc.

IDENTIFICATION
206136
HYPERSTHENE MICROGABBRO MACKINTOSH HBC LINE 11425N 6000E

U39

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 1st April 1977

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
206337
ALTERED, SHEARED ?LITHIC-VITRIC- CRYSTAL TUFF MACKINTOSH 7700N 6920E

Job No. REPORT CMS 77/3/18 Date Received: 28.3.77

Reference Order No. 7/22

Sample No. 206337

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 20891

a. Hand Specimen:

Grey green chloritic sheared ?fragmental, K stain weakly positive (clays).

b. Microscopic:

This is an extensively altered and sheared tuff of dacitic affinities.

Recognisable clastic material comprises 30 to 50% of the rock and is very poorly sorted in the silt to coarse sand range, (50µ-2mm) with no real evidence of bedding. Angular to subangular lava clasts predominate. These consist typically of sparse sericitised feldspar and rare partly recrystallised quartz microphenocrysts in a chlorite- and sericite-stained microfelsitic groundmass with trace-accessory apatite and leucoxenised opaques. Some of the finer lithic clasts are completely altered to secondary microgranular quartz. Accompanying these are cloudy quartz semi-pseudomorphs of feldspar crystals (to 1mm) and crystal fragments and rare similarly altered shards (max. 50µ).

Probably shards were more abundant than is now evident (hence ?lithic-vitric-crystal tuff). The clastic material is embedded in microschistose chlorite and green sericitic illite-hydromuscovite which are weakly stained with discontinuous microscopic films of leucoxenic TiO₂. No sulphide was detected.

D. Cowan, B.Sc.

040

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 1st April 1977 J U J U 4 1

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/3/18 Date Received: 28.3.77

Reference Order No. 7/22

Sample No. 206338

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 20892

a. Hand Specimen:

Grey brown altered sheared ?fragmental rock, K stain negative, weakly magnetic.

b. Microscopic:

This is a devitrified altered and sheared porphyritic pitchstone of inferred dacitic primary composition.

Frequent irregular to semi-regular aggregates (mean 500 μ , max. 2mm) of sericite are present and on the basis of form the majority of these features represent altered single and sporadically clustered feldspar phenocrysts. A few sericite aggregates are stained with very fine opaques and these represent altered ferromag phenocrysts (?amphibole, shapes are non-diagnostic). There is no evidence of phenocrystal quartz.

The remainder of the rock consists essentially of thoroughly sericite-stained felsitic material. A relict perlitic structure persists in the form of micro-scale sericite veinlets outlining the devitrification cracks. Relict primary magnetite is abundant and traces of apatite are present.

Shearing is reflected in partial orientation of sericite and a flattening of the coarse perlitic structure. Sheared discontinuous chlorite veinlets occur sporadically. There is no evidence of sulphides. Fe-staining results from partial degradation of magnetite which is extensively martitised.

D. Cowan, B.Sc.

IDENTIFICATION
206338
DEVITRIFIED ALTERED SHEARED PORPHYRITIC PITCHSTONE MACKINTOSH 7730N 6925E

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/3/18 Date Received: 28.3.77

Reference Order No. 7/22

Sample No. 206350

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 20893

IDENTIFICATION
206350
DEVITRIFIED ALTERED PORPHYRITIC DACITE MACKINTOSH 7400N 6400E

a. Hand Specimen:

Grey green altered ?dacite, K stain negative.

b. Microscopic:

This is a devitrified, altered and incipiently sheared porphyritic dacite.

Frequent chlorite-sericite semi-pseudomorphs of single (to 1mm) and clustered (to 2mm) prismatic phenocrysts are present. On the basis of shape the majority of these features were feldspar but there are a few definite pyroxene-derived shapes. Rare partly recrystallised quartz microphenocrysts are present and the paucity of these features confirms the intermediate nature of the rock.

The altered groundmass consists largely of heavily sericite-stained anhedral quartz with relict felsitic to crudely spherulitic microtextures. Subordinate similarly textured feldspar is closely intergrown. Accessory leucoxenised opaques are present. A poorly defined flow fabric is outlined in a dimensional preferred orientation of the altered phenocrysts.

Stressed/weakly crenulated quartz veinlets occur sporadically. Minor traces of partly oxidised ultrafine pyrite occur associated with the altered phenocrysts. This rock is a little unusual in carrying (altered) pyroxene phenocrysts but in other respects is typical of the Mount Read Volcanics.

D. Cowan, B.Sc.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/3/18 Date Received: 28.3.77

Reference Order No. 7/22

Sample No. 206351

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 20894

a. Hand Specimen:

Grey green altered sheared porphyritic andesite, K stain negative.

b. Microscopic:

This is a devitrified, altered and weakly sheared porphyritic lava of andesitic-quartz andesitic ("dacitic") composition.

Texturally the rock is rather similar to 206338 and it appears as a strongly porphyritic perlitic pitchstone. The phenocrysts are completely chloritised-sericitised and these semi-pseudomorphous aggregates (50 μ - 1.5mm) are somewhat flattened by shearing. The majority were feldspar but accompanying these were relatively frequent phenocrysts of both amphibole and pyroxene with, probably, accessory amounts of olivine and rare biotite flakes.

The groundmass consists of strongly sericite-stained felsitic/anedral quartzofeldspathic material with relict perlitic cracks outlined by discontinuous films of chlorite and sericite - leucoxenised accessory opaques are relatively abundant. There are occasional patches of stressed granular secondary quartz and weakly stressed quartz veins (to 3mm) with traces of chlorite sporadically. There is no evidence of sulphides.

This rock, on the basis of inferred mineralogy, is of relatively basic character when compared to the associated specimens. However, in common with them it has a rather felsic (siliceous) groundmass. Conceivably some of the "ferromags" (eg. olivine) were xenocrystal.

D. Cowan, B.Sc.

IDENTIFICATION
206351
DEVITRIFIED, ALTERED, WEAKLY SHEARED PORPHYRITIC "DACITE" MACKINTOSH 6600E 7400N

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/4/18 Date Received: 28.4.77

Reference Order No. 7129

Sample No. 206349

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 21058

a. Hand Specimen:

Grey white/dark grey fragmental rock, K stain positive.

b. Microscopic:

This is a devitrified and weakly altered flow- or autobrecciated ignimbrite of potash dacitic (ie. trend rhyodacitic) composition.

The grey angular clasts (to 1cm+) seen in hand specimen have the general appearance of porphyritic dacite lava in thin section with fairly frequent single and clustered plagioclase phenocrysts (now weakly saussurite-stained albite) enclosed in a weakly flow-textured pervasively chlorite-montmorillonite-stained groundmass. These clasts are weakly amygdaloidal with disseminated cusped quartz-clay infilled vesicles (to 1mm). Very fine cryptocrystalline K-feldspar (?adularia) semi-pseudomorphs of alkali feldspar microlaths occur in some areas of the groundmass. Some areas of these clasts are clearly tuffaceous with recognisable flow lined microshards (rarely > 20 μ) which are locally restricted to discrete elongate/ovoid clasts (to 1mm). Elsewhere there are recognisable lava clasts (to 3.5mm). These clasts can then be classified as tuff lava with a certain pyroclastic component.

The enclosing matrix (grey-white, hand specimen) consists essentially of micro-felsitic quartzofeldspathic material enclosing disseminated feldspar crystals/crystal fragments (albitised, mean 250-300 μ) and sporadic lava clasts (< 1mm) similar to those described above. Vague but nonetheless definite relict microshard textures are semi-pervasive throughout. Accessory traces of K-feldspar are present but quartz crystals/crystal fragments are completely absent (hence potash dacite). Weak but semi-pervasive montmorillonite staining occurs and minor chlorite occurs in discontinuous microveinlets.

The fabric, overall, is typical of flow-breccias and with the composite of lava, clastic lava and tuffaceous lava clasts in a tuffaceous matrix is most likely a flow-top breccia. Minor oxidised fine grained an- to subhedral pyrite is present and incipient shearing (greenschist metamorphism) is evident.

IDENTIFICATION

206349

WEAKLY ALTERED
IGNIMBRITIC FLOW
BRECCIA
MACKINTOSH 3600N 4520E

044

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/4/18 Date Received: 28.4.77

Reference Order No. 7129

Sample No. 206348

Nature of Sample: Hand Specimen

DESCRIPTION SECTION No. 21059

a. Hand Specimen:

Grey white argillaceous quartzite, non-magnetic.

b. Microscopic:

This specimen was examined briefly in thin section and subsequently in polished section and by determination of Vickers Microhardness of the opaque phase appearing as minute black specks in hand specimen.

The rock is a poorly sorted weakly argillaceous orthoquartzite consisting of quartz-cemented fine to coarse sand sized single and composite quartz grains with sporadic (quartzite, chert, and argillite) lithic fragments. Traces of kaolin are included in the quartz cement and the rock is quite markedly stressed.

The opaque phase is an accessory detrital constituent as fairly evenly sized angular to rounded grains (mean about 100µ) comprising 0.2 - 0.5% of the rock. Optical features (opaque to incipiently translucent in dark red brown at thin edges, isotropic, unzoned, grey, low reflectivity) indicate that this is a spinel and one of the more chemically complex varieties most likely a picotite. This could be confirmed by spectography but a larger specimen would be required for initial heavy liquid separation/concentration.

Minor traces of detrital zircon and partly leucoxenised brown rutile are also present.

D. Cowan, B.Sc.

IDENTIFICATION
206348
DETRITAL ? PICOTITE
MACKINTOSH
6400N 7430E

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/5/21 Date Received: 17.5.77
Reference Order No. 7137
Sample No. 206392
Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 21200

a. Hand Specimen:

Very pale, fine-grained volcanic rock; abundant fine pyrite. K-stain test negative.

b. Microscopic:

This is believed to be a rhyolitic tuff, probably welded, and thoroughly silicified and sericitised.

Small rounded grains of quartz (possibly pyroclastic) and poorly-defined "felsitic" patches of devitrified and altered glass are interspersed with wispy subparallel streaks of sericite-illite. Relict fine textures are vague but suggest shards and other vitric fragments. Ultrafine leucoxene is characteristic throughout and is relatively abundant, occasionally forming thin streaks and small lenses.

Euhedral pyrite is very common, and is associated with minor, pale chlorite. There are veins and lenses of fairly coarse quartz, carrying larger pyrite crystals and goethite patches possibly representing oxidised chalcopyrite.

The general petrography of this rock would not be out of place in the Mt. Lyell sequence.

H.W. Fander, M.Sc.

IDENTIFICATION
206392
ALTERED RHYOLITIC TUFF MACKINTOSH 5930B 4950N

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/5/21 Date Received: 17.5.77

Reference Order No. 7137

Sample No. 206376

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 21199

a. Hand Specimen:

Pale, fine-grained volcanic rock. Weak K-stain reaction.

b. Microscopic:

As far as can be determined, this is a sodic trachyte; as is often the case, the groundmass is very fine and indeterminate, and the rock may range into a felsic trachyandesite on the one hand or into a sodic rhyolite on the other. However, the term sodic trachyte ('keratophyre') is probably a reasonable compromise without resorting to a whole-rock analysis.

Small phenocrysts of albite, chlorite pseudomorphs after ?hornblende, and very occasional small quartz crystals, show subparallel flow-alignment and are set in a groundmass of sericitised feldspar laths, chlorite, ultrafine ?epidote and secondary quartz. Judging from the K-stain reaction the groundmass feldspar is probably a k-Na variety (perhaps originally sanidine). Accessory leucoxene occurs throughout and is pseudomorphous after ?ilmenite.

Apart from chlorite pseudomorphs, there are other chlorite patches, with different texture, which may be vesicle-fillings. Patches of granular epidote represent deuteric alteration.

The fabric of the rock is fairly homogeneous, and it is possible that it is intrusive, not extrusive.

IDENTIFICATION	
206376	
SODIC TRACHYTE	
MACKINTOSH	5970B
	4980H

047
CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th May 1977

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/5/21 Date Received: 17.5.77

Reference Order No. 7137

Sample No. 206375

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 21198

a. Hand Specimen:

Pale, fine-grained, sheared volcanic rock. K stain test positive.

b. Microscopic:

This is a sheared rhyolite; it was probably microporphyritic and glassy, and has a fairly complex history. It contains barite and there is evidence of sulphides.

Numerous small, rounded patches of quartz occur throughout the rock; these could be small phenocrysts or perhaps spherulitic bodies; they are more abundant in some bands and are sparse elsewhere. The bulk of the rock consists of typical devitrified glass, evidently potassic (positive K-stain test), of brownish color, with intergrown fine quartz and secondary sericite and very pale chlorite.

It would appear that at this stage the rock was mineralised, with the development of pyrite, ?chalcopyrite, and associated barite as lenses and clusters of small crystals. This phase may have been accompanied by some shearing and chloritisation, and was followed by further shearing, which affected all the earlier minerals including the sulphides and barite.

This rock (and its history) would fit in quite well with the Mt. Lyell situation.

H.W. Fander, M.Sc.

IDENTIFICATION
206375
SHEARED RHYOLITE (WITH BARITE) MACKINTOSH.
5977B 5110N

048

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th May 1977

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/5/21 Date Received: 17.5.77

Reference Order No. 7137

Sample No. 206373

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 21197

a. Hand Specimen:

Pale, fine-grained featureless rock. K stain test negative.

b. Microscopic:

This is a sheared, altered rhyolite or perhaps welded rhyolitic tuff, and is also reminiscent of some of the rocks at Mt. Lyell. Whilst broadly similar to 206006, it differs in some details, especially of texture.

There are quite abundant small, rounded patches of quartz which are assumed to be phenocrysts; many are stressed, fractured and partly recrystallised. They are set in a groundmass of fine quartz and sericite; this has a lensoid fabric, believed to be partly due to flow-banding and partly to subsequent shearing. Some flow-brecciation very probably also took place.

Sericite is abundant in some bands, as relatively coarse interleaved flakes with strong preferred orientation; minor streaks of degraded chlorite are also present (cp. mineralised rocks at Mt. Lyell), generally with associated goethite patches. The goethite is pseudomorphous after small, euhedral pyrite crystals; there is no evidence of other sulphides. Small, irregular aggregates of white, opaque, leucoxene are common.

As in 206006, the term "rhyolite" is used in a broad sense to denote an acid volcanic type; it is not known whether the rock was potassic or sodic or even perhaps dacitic.

IDENTIFICATION
206373
SHEARED, ALTERED RHYOLITE MACKINTOSH.
6045B 5270W

H.W. Fander, M.Sc.

040
CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th May 1977

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 77/5/21 Date Received: 17.5.77

Reference Order No. 7137

Sample No. 206006

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 21196

IDENTIFICATION
206006
PORPHYRITIC RHYOLITE MACKINTOSH. Mt. Charter Line 3800E

a. Hand Specimen:

Pale volcanic rock with fine pyrite. K-feldspar stain test negative.

b. Microscopic:

Fairly severely altered and thus not as clearly defined in some details as would be needed for an accurate classification, this rock is thought to be a porphyritic rhyolite (in a broad sense) or rhyolitic tuff-lava. It is strongly reminiscent of the host rocks at Mt. Lyell.

Phenocrysts and fragmented phenocrysts of embayed, corroded quartz are fairly common but feldspar phenocrysts are scarce and are completely sericitised. The groundmass now consists of microcrystalline quartz and wisps and streaks of sericite. There are minor textural variations in the groundmass which suggest some tuffaceous components (of the same composition), and clear indications of minor brecciation, very probably flow-brecciation.

Pyrite, and possible other sulphides (positive evidence is lacking), was introduced at a subsequent stage pre-dating a younger phase of mild shearing. The pyrite is now largely oxidised, and fine goethite pervades the rock. It also forms patches with poorly defined cellular textures.

The rock has been termed a rhyolite but since the feldspar cannot now be determined, the term "acid Volcanic" would perhaps be more appropriate.

H.W. Fander, M.Sc.

050

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 27th September 1976

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 76/9/22 Date Received: 16.9.76

Reference Purchase Order No. 7308

Sample No. 183190

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. **19611**

IDENTIFICATION
183190
SHEARED, INDURATED LITHIC GREYWACKE MACKINTOSH Creek adjacent to 2010N 5300E

a. Hand Specimen:

Dark, medium-grained indurated clastic sediment.

b. Microscopic:

This is a mildly sheared, indurated lithic greywacke, perhaps incipiently metamorphosed.

The framework consists mainly of slightly stressed, angular to subangular, irregularly shaped quartz grains with an average size of 0.2 - 0.3mm; there is some preferred, subparallel orientation of their long axes. Shreds and larger flakes of muscovite are fairly common, also with preferred orientation. The lithic fragments range in size from 0.3mm to 3mm, with occasional larger particles which are generally flat or platy; types include micaceous siltstones, metaquartzite, muscovite-quartz schist, fine mica schists/phyllites, and very occasional ?microdiorites (rather decomposed). Thus the lithic grains are predominantly low-grade metasediments.

Heavy minerals are interesting, the main species being dark brown "chromite" (probably a chromiferous spinel) and leucoxene aggregates representing altered ilmenite; others include apatite and well-rounded zircon, and tourmaline (schorl).

The matrix/cement is mostly pale-green chlorite, with some sericite and quartz, recrystallised and stressed. Quartz veins cut the rock, and there are quartz-chlorite filled shears or fractures.

The components had several sources. The tourmaline and some quartz and coarse muscovite were most likely from an "acid" igneous source. The chromite and ilmenite had an ultramafic(-mafic) provenance, and the chromite occurs as irregular, angular grains suggesting a reasonably close source. The matrix chlorite (a pale Mg-rich variety) could be from the same source. The microdiorite was from an intermediate, ?minor intrusive. The low-grade metasediments are from a regionally metamorphosed sedimentary sequence.

H.M.J. 69052

H.W. Fander, M.Sc.

APPENDIX C

DIAMOND DRILL LOGS H1 & H2-2A

MC-1, MC-2

053

DIAMOND DRILL LOG

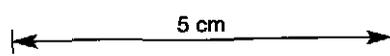
Feature :

- Bedding 
- Foliation 
- Fragment - size & shape 
- Shearing 
- Fault 
- Vein 
- carbonate 
- quartz 

Mineralization : Trace 1.5%
 Common 5.15%
 Abundant 15.14%
 Massive >60%

303054

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	3.00	PyP1 Mid to light grey, locally bleached (weathered) fine grained dacite or rhyolite lava. Flow banding is wavy, typically 30° to subparallel to the core axis. Intermittent fragmental texture is interpreted as <u>lava-breccia</u> (e.g. 5.30 to 6.40)							Pyrite 507% as veinlet and occasional irregular clots of massive fine aggregates.
	1.55	5 Foliation is typically 30° to core axis is weak and is dominated by irregular fracturing marked by quartz veining (<3mm) and pyrite veinlets. Possibly silicified and sericitised.							
	2.95								
	0.65								
	2.30	10							
	1.00								
	2.00	12.60 Sheared grey <u>lithic tuff</u> with sericitised (pale green), blue grey, and pyritic fragments.							Note pyrite rich fragments
	2.40	15 15.17 ?DTL >PyP1 Light grey to buff locally greenish grey, <u>feldspar porphyry</u> lava. Pale green sericitised phenocrysts to 1mm occur densely in a sericite-carbonate rich matrix. A strong foliation (streaking of feldspar) is developed at 30-40° to the core axis. The unit is very massive (forms a marked topographic ridge), and is the typical Mt. Charter rhyolite as dacite feldspar porphyry lava.						4.96 5.36	Massive vein pyrite 7%
	1.65								Veinlets and disseminations of pyrite occur throughout averaging 5% possibly 7% locally.
	1.70								
	2.50								
	3.10								
	25								



055



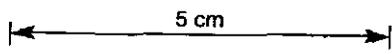
DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment - size & shape Vein carbonate quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-40%
 Massive >60%

303056

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	3.00	Zones may be matrix silification coincident with lava solidification, as previously rare breccia and agglomerate zones may be flow tops.							Veinlets and rare massive veins of pyrit
	3.00	Bleaching and oxidation has occurred adjacent to some fractures.							
	55	This lava is massive and is only along irregular fractures.							Pyrite 5%
	2.75								
	60								
	3.05								
	3.10								
	65								
	3.00	Irregular quartz veining is present throughout, traces of barite become apparent below 65m.							Pyrite 5%
	3.05	The unit continues as massive feldspar porphyry lava, with occasional narrow, (10-20cm) zones of breccia (agglomerate).							
	70								
	1.00								
	2.00								
	75								



056



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein
 c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-40%
 Massive >60%
 303057

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	3.00								
	77.00								
	3.00	Lithologically identical with above but more heavily veined with quartz and barite, the latter locally 10%. Base metals are also evident.							Pyrite 5-7%, trace disseminated galena and sphalerite, particular with barite veining.
	80								
	3.00								
	84-85m	84-85m, distinct banding (<1mm) which may be bedding. This unit may in part be a bedded fine tuff. Barite layers or veins occur parallel to this foliation; pyrite silica and barite veins also occur at all angles and cross cut each other.							
	3.00	Barite veining is possibly later than sulphide and silica, but this may be a post depositional remobilisation.							
	3.00								
	90	Lithology is <u>feldspar porphyry lava</u> , possibly <u>crystal and fine tuff</u> locally. Foliation now 60° to core axis.							Traces of sphalerite and galena with pyrite veinlets, also with barite veins.
	3.00								
	3.00								
	95								
	97.55								
	97.85	Finely bedded barite 70° to core axis							Fine pyrite with barite
	0.60	Major quartz vein 40 cms —							
	1.95	Pale grey to cream, sericitised carbonated (?) <u>feldspar porphyry lava</u> .							
	100								



057

DIAMOND DRILL LOG

11010 10

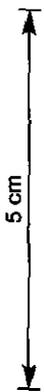
Feature : Bedding 
 Foliation 
 Fragment-size & shape 

Shearing 
 Fault 
 Vein  c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-40%
 Massive >60%

303058

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
		Rare barite-carbonate(?) veining. Foliation is 50° to core axis.							Traces of galena sphalerite in barite veins.
	3.00								
	103	Zone of intense (25%) barite veining(?) lithology as above, feldspar porphyry lava or tuff.							Disseminated pyrite, galena, sphalerite (locally 2-3%, combined sph. galena)
	104								
	105	As above, less intensely veined with barite (5-10% of total), the lava is locally brecciated (probably tectonic deformation? rather than autobrecciation?).							
	3.05								
	3.00	Foliation, vein orientation and fracturing tends to be 50-60° to core axis.							
	110								
	2.90								Disseminated sphalerite and galena throughout, with pyrite veining 5-7% locally 10%.
	112.60								
		Lithic tuff becoming agglomerate below 117.50m approx. Texture locally destroyed by sericite alteration, and quartz-carbonate veining.							
	115								
	3.00								
	3.20	Foliation locally strong at 40-45° to core axis.						116	Pyrite 3-5%, no apparent sphalerite or galena, except with barite at 119m. (10cm zone)
	120								
	3.00	Barite veining is common to 114m, then more rarely and with quartz-(carbonate?) below approx. 116.80m. Massive 10cm barite band (foliated or bedded at 119m).							
	123.06								
	3.00	Fine grained feldspar porphyry lava(?) veined by barite and pyrite.							
	125								



58



DIAMOND DRILL LOG

Hole No [MC 1] Page No 0

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein carbonate quartz

Mineralization : Trace 1.5%
 Common 5.15%
 Abundant 15.41%
 Massive >60%

303059

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	3.00	Barite veining common towards end of unit.						127.35	Pyrite 10% as massive irregular veins, common with massive barite. Disseminated sphalerite and galena occur, particularly with barite quartz veins.
	128	Lithic tuff; green to cream sericite-carbonate(?) rich fragments, occur in a grey matrix. Scattered fragments of light grey lava.							
	3.05	130 Foliation (cleavage) is 45° to core axis, the sericitic fragments have a characteristic shredded appearance.							Sulphide contact declines to 5-7% (pyrite).
	2.85	Barite veins and bands are present throughout. Zones up to 10cm of massive barite with foliation (?bedding or recrystallisation) parallel to the cleavage.							
	135	3.00 Later quartz-carbonate veins up to 10cm are typically perpendicular to the cleavage?. These massive veins are concentrated between 133m and 137.20m						135.20	Pyrite 3-5% as veins and disseminated quartz.
	3.00								
	139.30	140 Pale blue-grey agglomerate of fine-grained dacitic(?) feldspar porphyry lava. Sericitisation of feldspar is apparent, but the bulk of the rock has a siliceous aspect. The fragments are generally light grey, the matrix dark blue grey. There are rare quartz veinlets only.							
	3.00								
	143.85	145 Sheared, yellow cream to light grey lithic tuff-agglomerate to agglomerate mixture of yellowish and light grey fragments occur in a grey matrix, much veined by quartz and variable quantities of barite.							Pyrite continues 3-5% fine stringers and disseminated euhedral sub-hedral crystal (< in the rock matrix.
	1.60								
	1.30	Alteration is sericite-carbonate(?) - silica(?) Cleavage is 55 to 60° to core axis. Shearing is most intense between 146.68							Rare disseminated sphalerite and galen.
	150								



U59



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein
 carbonate quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303060

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	2.55	and 152m with much broken core and probable faulted zones.							
	3.05	Between 152m and 161.08, the rock is competent, with yellow sericite-carbonate rich fragments after feldspar porphyry (to 5cm) and a mid to dark grey matrix. Foliation (cleavage) continues at 60° to core axis but is not as marked a parting as previously.							Pyrite increase to 7-10% as narrow veinlets (<5mm), as halos to rock fragments and as disseminated crystals.
	155	There are occasional barite veins parallel to the foliation.							
	3.00								
	3.00								
	160								
	161.08	DTL/PyP1 Pale grey fine grained lava or tuff. Feldspar phenocrysts (sericitised) and faint crudely lenticular forms (<2mm) visible at x 10 suggest this rock may be an ash flow tuff or tuff-lava. — <u>Dacitic feldspar porphyry (vitric?) tuff-lava.</u> Petrological specimen collected at 187.50m (No. 183301)							
	3.00								
	165								
	2.95								
	1.80	Zones of foliated uniformly macro-textured rock alternate with zones where close packed fragments are apparent. These are typically <2cms but some are up to 10cm.							Pyrite 5-10%, as veins parallel to the foliation commonly bifurcating. Veins vary from < 1mm to 2-5 cms.
	170	Shapes have been modified by shearing at 70° to the core axis, pyrite veining is quite common.							Pyrite is 40% from 168 to 168.90 with barite veins, similarly from 175.29 to 175.92. Elsewhere, vein pyrite without barite locally attains 30%.
	3.00								
	2.85	Barite veins occur sparsely throughout, but locally attains 5-10% of the total rock, viz 168.40 to 171.40m, and 175.50 to 176m.							
	175								





DIAMOND DRILL LOG

Feature :

Bedding 
 Foliation 
 Fragment-size & shape 

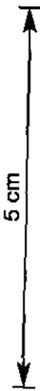
Shearing 
 Fault 
 Vein  c carbonate
 q quartz

Mineralization :

Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303061

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
								175.29	
								175.92	
								176.00	
	3.00	Patchy sericitisation of some fragments occurs below 178.50, imparting a greenish colour to the unit, shearing is more apparent at 60° to core axis.							Pyrite circa 5% as vesicles and disseminated crystals, rare veins 1 cm below 180m.
	2.90							180	
	2.95	181.85 Greenish yellow to grey sheared sericite <u>tuff-agglomerate</u> . Cleavage is 65° to core axis. Probably an altered variant of the adjacent rock type.							PyP1
	3.00							185	
	2.80	187.04 Light grey <u>feldspar porphyry (vitre?) tuff-lava, brecciated, with dark grey colouration along pyritised fractures. Foliation, possibly sheared out flow-banding or tuffaceous bedding is 45° to core axis.</u> Some narrow sericitised zones occur. Petrological specimen at 187.60 (No. 183301)							DTL>PyP1
	3.05							187	Pyrite occurs as vein as rare disseminated crystal aggregates (<1mm) typical 3-5%, patchily to 7-10%.
	1.55							190	
								195	
								195.5	
		END OF HOLE							



202



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment size & shape Vein
 c carbonate
 q quartz

Mineralization : Trace 1.5%
 Common 5.15%
 Abundant 15.14%
 Massive > 50%

303063

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	2.00	AP Oxidised orange, <u>feldspar porphyry agglomerate</u> ; original weak chlorite colouration patchily visible. Very broken, rubbly core.							Oxidised
	5								
	10								
	15	Orange brown feldspathic sand.							
	20								
	2.40	Pale grey-green <u>feldspar porphyry agglomerate</u>							
	23.0	As above but fresher, <u>feldspar porphyry agglomerate</u> . Partly altered andesite, very broken and locally pug. Note substantial core losses.						23	Pyrite visible 3-5%
	1.75								
	25								

SAND COLLECTED

NO CORE.



063



DIAMOND DRILL LOG

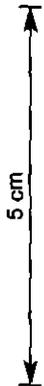
HOLES NO. []

Feature : Bedding Shearing
 Foliation Fault
 Fragment - size & shape Vein
 c carbonate
 q quartz

Mineralization : Trace 1.5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303064

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRIM	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION				
	25.40	FAULT ZONE. Lithology as above, rubbly core with pug. Locally cleaved at 40° to core axis. Alteration is sericite, so that the typical AP character veers towards PyP1.	BROKEN CORE										
	0.90												
	2.50												
	3.00	NQ reduced to BQ at 33.37m. Alteration increases below 34m.						31.35	Pyrite increases to (locally) 10% as disseminated crystal and crystal aggregat.				
	34.75	Gradational contact, to <u>PyP1 (>AP)</u> sheared sericite rich <u>lithic tuff to agglomerate</u> . Fragmented texture only locally distinct due to cleavage at 25-35° to core axis. Patchy penetrative weathering is indicated by brown and light cream zones adjacent to fractures. Occasionally relict features typical of AP group rocks can be seen (feldspar phenocrysts to 2mm, off white in colour) - Particularly 44.10 to 54.10 - with large fragments (to 5 cms)											
	2.00												
	1.05												
	0.90												
	1.20												
	2.30												
	1.60												
	2.80							44.90	Pyrite 15-20%, network of veins and string Pyrite 10%, locally as disseminated cry stringers and veinl				
	4.10												
	48.50	Texture as above (agglomerate) but colour is distinctly yellow-green, (due to sulphide?)											
	50												



U64

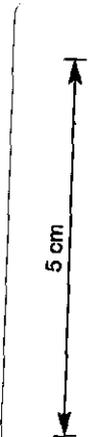
DIAMOND DRILL LOG

Feature : Bedding  Shearing 
 Foliation  Fault 
 Fragment-size & shape  Vein  c carbonate
 q quartz

Mineralization : Trace 1.5%
 Common 5.15%
 Abundant 15.61%
 Massive >60%

303065

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	1.75								
	0.60								
	2.45								
	55								
	3.05								
	58.40								
	2.95	Gradational colour change to light mottled grey, sericite-carbonate altered, sheared <u>agglomerate</u> , with occasional carbonate veins. Cleavage is 30° to core axis.						60.60	Pyrite 5%, disseminated crystals and aggregates.
	62.84								
	2.95	<u>Agglomerate</u> , - yellow-green fragments in a carbonate-barite(?) bearing matrix; a minor grey chert. Cleavage is 35° to core axis. Fragments display 'spotting' of sericitised feldspars and pyrite crystals.							
	65								
	3.00								
	65.70								
	2.95	Light grey mottled <u>feldspar porphyry agglomerate</u> , rich in carbonate, with sericite and some silica. The fragmental texture is only just apparent. The spotting, due to feldspar phenocrysts (to 2mm) is quite marked.							
	70								
	71.40	Light grey fine grained <u>feldspar porphyry lava</u> DTL?							
	72.30	Light to mid grey carbonated <u>lithic tuff to tuff-agglomerate</u> , becoming heavily sericitised downwards, particularly below 73.70. PyPI							
	73.50							73.50	Increase in pyrite to 7%
	74.70							74.70	Pyrite 15% as veins
	75								



065



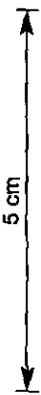
DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment - size & shape Vein carbonate quartz

Mineralization : Trace 1.5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303066

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	3.00	Colour changes to dark grey. Fragments become close packed suggestive of lava-breccia; internally some are light grey, indicating an original DTL character.							and stringers in the (rather limited) groundmass. The sulph contact is patchily up 30% and down to 7%.
	1.60	Some bleaching(?) occurs adjacent to and within the Fault zone (below) within the light grey fragments sericite feldspar phenocrysts can						79.94	Trace pyrite only with leached, bleached fault zone.
	1.15	FAULTED ZONE, bleached, broken core, intermittently sheared and puggy.							
	0.60								
	2.75	be seen. Below the fault zone there is limited sericitisation and chloritisation(?) of a massive nature, succeeded by altered lithic tuff.						84.36	Pyrite 3-5% as veinlet (<1mm to 5mm)
	3.15	Light grey feldspar porphyry PyP1/DTL lava to lava-breccia (locally), with variable carbonation and sericitisation.							
	2.85	Pyrite veining gives rise to PyP characteristics (blue-grey to white mottling). Bleaching and iron staining is common marginal to fractions.							
	1.25	Foliation, indicated by alignment of sheared feldspar and by cleavage (locally) is 30-35° to core axis.							
	3.05	Fracturing and carbonate veining appears random. There is minor barite veining.							
	2.70	Yellow-grey sheared agglomerate PyP1 or lava-breccia. Schistosity is 45° to core axis. Alteration is sericite rich. Fragments have grey margins, yellow centres. PyPi/DTL						97.65	Pyrite 7% as matrix stringers.
	1.00							99.63	Pyrite 5% as veins ar



U66

Feature :

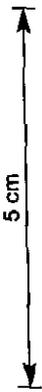
Bedding 
 Foliation 
 Fragment - size & shape 

Shearing 
 Fault 
 Vein  c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303067

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
		Pale grey, weakly sericitic, siliceous dacitic(?) lava, and lava-breccia, of close-packed fragments. The matrix is veined with pyrite and white carbonate-barite.							Pyrite continues 3-5% locally 7%.
	3.10								
	105								
	3.00								
	0.85								
	2.05								
	109.28								
	110	Zone of barite-carbonate veining, with traces of sulphide and digested rock.							Trace galena with barite zone.
	110.35	Sericitised, sheared, siliceous, lithic tuff, much veined with carbonate and barite. Cleavage is 40° to core axis.							
	1.70								
	112.40								
	0.50	Yellow-green to grey feldspar porphyry agglomerate, sheared at 35-30° to core axis.							
	1.70								
	115								
	115.30	FAULT ZONE, minor pug, broken core, rock type change to mottled grey sheared, sericitised, carbonated agglomerate, probably altered variant of adjacent rocks. Patchy carbonate veining is present.							Pyrite 3-5% locally 7% as stringers and veinlets.
	2.30								
	118								
	2.95								
	120								
	2.50	Colour varies from grey to yellow-grey, locally orange. Altered (carbonate?) feldspar phenocrysts (to 2mm) occasionally visible, with some fragments of agglomerates. Core is sheared, rubble between 123.11m and 126.84m.						122.55	Pyrite 2%, disseminated crystals.
	1.60								
	125								



067



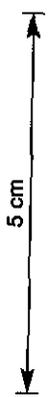
DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein
 carbonate quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303068

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	1.63								
	27.93								
	3.00	Lithic-tuff agglomerate PyP1>AP of dark grey-green feldspar porphyry in a light-grey carbonate rich matrix. Fragments (up to 10cm) are 50% of the rock.						122.95	Pyrite 5%? with traces of galena.
	3.00	Greenish grey, strongly deformed (sheared) lithic tuff or agglomerate of sericitised feldspar porphyry with narrow barite-carbonate veins. Cleavage is 50° to core axis.						132.40	Pyrite 7-10% as veins and stringers, massive where shown.
	133.20								
	2.80	Cream lava-breccia? lithic tuff of carbonated feldspar porphyry, with blue-grey colouration developing along pyritised fractions.							
	136.60								
	1.20	Sheared sericitic lithic tuff, varying to agglomerate. Locally**							
	2.00	Zone of FAULTING AND SHEARING. Much cleaved core with some narrow pug zones at 50° to core axis. Refolded cleavage discernable at 144.80.							Pyrite 65-70%.
	1.10	** bleached within the faulted zone, with carbonate-barite?? veining irregularly.							
	1.40							141.40	Pyrite 2-5%
	0.30								
	0.50	143.20 Agglomerate - as above, but fragments are green (sheared chlorite) in a gray matrix, which is variably++							
	0.75	144.80 End of faulted zone at 144.80.							
	1.20	145 ++sheared and sericitised. Yellow narrow carbonate veins are common. Green fragments least sheared show carbonated(?) feldspar relicts.							
	2.20								
	3.00	Foliation is 60-65° to core axis.							
	150								



068



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment size & shape Vein c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303069

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
		150.00 to 152.00m intense carbonate veining.							Pyrite 2%
2.97	152.00	Mid grey strongly sheared, PyP1 lithic tuff to agglomerate. Shredded sericite fragments at 75-80° to core axis occur in a light grey matrix. The fragments are pale cream to greenish.							
1.35	154.60 155	Dark green agglomerate of PyP1/AP patchy leached, carbonated vesicular(?) andesite, with sericitised feldspars. Foliation is 45° to core axis.							Pyrite 2%, patchily 10%
3.05	158.50	Sericitic fragments in a blue-grey matrix - lithic tuff. Fragments are 25% of total. PyP1/DTL?							
3.10	160	Agglomerate. Pale cream fragments of sericitised, carbonated feldspar porphyry are set in a blue grey matrix of sericitised carbonate. Fragments range from <2mm to 10cms.							
3.04	165	Foliation (alignment of small fragments, and feldspars in large fragments) is 45° to core axis. Specimen at 161m (183302).							
2.98	165.16	Texture as above, agglomerate, however fragments are dirty-yellow green, and show both green (sericite) and white (carbonate) flecking; and alteration variety of the above unit? Specimen at 167.70m (183303)							
2.97	168.88 170	Identical with penultimate unit. Agglomerate of pale cream seritic-carbonated feldspar porphyry fragments in a blue grey matrix; less matrix than in previous unit. Pervasive pyritisation along planes parallel to foliation (45° to core axis) gives rise to blue-grey and cream wavy striping of large fragments. Rare barite veins.							Pyrite 10% as matrix veins and stringers.
3.02	174.65	AP?							Pyrite not apparen



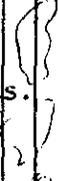
069

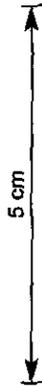
Feature: Bedding 
 Foliation 
 Fragment-size & shape 

Shearing 
 Fault 
 Vein 
 c carbonate
 q quartz

Mineralization: Trace 1.5%
 Common 5.15%
 Abundant 15.61%
 Massive >60%

303070

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	3.00	Agglomerate, of pale yellow-green carbonated sericitised feldspar-porphry. Foliation is 45° to core axis, indicated by elongation of fragments and streaking of sericitised feldspars.							
	3.00	180 There is a progressive increase in the number of dark green fragments with white and off white feldspar phenocrysts. These fragments show brown-yellow alteration rims and completely altered ghosts of smaller fragments are visible between the larger fragments. The rock would appear to be an andesite feldspar-porphry agglomerate showing progressively less carbonation down hole.							
	3.00								
	3.00	185 Specimen at 175m (183304). Specimen at 182.75m (183305) The fragments have smoothed out lines.							
	187.40	END OF HOLE							
		Note: The petrological problem presented by this hole is the difference (if any) between the cream sericitised carbonate rich feldspar porphyry agglomerates and the carbonated andesite feldspar porphyry agglomerates. Specimens sent for thin section 183302 - 183305.							



070

303071



DRILL HOLE RECORD

Location Hatfield R.
 Commenced 20.10.1976
 Objective Target was an IP anomaly located at the contact of vesicular andesites and black carbonaceous shales (Que River Slate).

Property E.L. 15/73
 Completed 27.10.1976

District Tasmania, Australia.
 Core size NQ to 68.50 m
BQ to 160 m

Alt./R.L. -
 Co-ordinate 6200N 3450E
 Bearing (M) 099° m.
 Grid bearing (M) 8° 45'

HAT1
 Hole No H.1
 Date November 1976
 Logged E.H. SKBY
 Dip -50°

SURVEY DATA			
DEPTH	DIP	BEARING(M)	INSTRUMENT TYPE
0	50°	099	Theodolite and Brunton
-	-	-	Surveyors pick up
30 m	51.0°	105.5°	Que River Eastman
60	51.5°	104	"
90	50.0	105.5	"
120	47.0	106.5	"
140	47.0	107.5	"
159	46.5	110.0	"

GRAPH DERIVED DATA					
DEPTH	DIP	BEARING(M)	NORTHING	EASTING	ALTITUDE
0	50	099	6200.00	3450.00	0.00
25	50.5	100.5	6199.72	3465.98	-19.22
50	51	99.5	6199.44	3481.80	-38.58
75	51	100.0	6199.24	3497.53	-58.01
100	49	100.8	6198.78	3513.59	-77.16
125	47	101.8	6198.05	3530.30	-95.73
150	47	104.0	6196.82	3547.30	-114.02
160	46	105.5	6192.10	3554.14	-121.27

REMARKS
End of Hole.



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment - size & shape Vein
 c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303072

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	210	Massive black (carbonaceous) slate. Fine (<1 mm) laminar bedding uniformly at 55° to core axis to 30 m then 60°.							Slight brown discolouration may be due to fine pyrite (<1%)
	.95	Below 25 m the rock is less weathered and beds up to 1 cm thick are discernible due to a slight variation in grain size (mud to fine silt) fine mica is present throughout.							
	5	There is no cleavage but several joint planes are evident at both low and high angles to C.A. with several strike orientations.							Disseminated pyrite on joint surfaces.
	290								
	285								
	10								
	285								
	295								
	15								
	275								
	20								
	240	22.00 - 24.00 m Zone of jointing parallel to core axis, with fine (2 mm) quartz vein swarm.							Pyrite on joint surfaces
	250								24.25 Elongate pellet of massive pyrite parallel to



SPALIN RUBBLE



DIAMOND DRILL LOG

Feature : Bedding Shearing Foliation Fault Vein Fragment-size & shape carbonate quartz

Mineralization : Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive >60%

303073

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
		Sample at 26.5 m for conductivity testing.						25.65 - 2 cm massive pyrite band parallel to bedding.	
260									
275	30							28.50 - 1 cm band massive pyrite parallel to bedding.	
250									
255	35	34.25 - 46.00 Zone of very broken core and slicken-sided fragments, some fine quartz veining.						34.10 - 5 mm 'bed' of massive pyrite, but terminated, occupies only 1/3 core. Appears to have slumped into place, and been surrounded by fresh deposits of shale.	
285	40	Bedding locally 60 - 65° to core axis. Sample at 39 m for conductivity testing.							
270									
245	45								
	46.5	Silty zone, faulted at 46.55, 5 cm pug.							
285	46.9	<u>Black shale</u> . Fainter bedding than previously, colour uniformly black. Bedding 50° to C.A. Sample at 49 m for conductivity testing.						Pyrite on joint surface also rare lenticles (to 3 mm) parallel to the bedding.	

5 cm

VERY BROKEN

072

073



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment - size & shape Vein carbonate quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303074

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	245								
	265	Very broken at 54.00 m.							
	55	Sample at 54.5 m for conductivity testing.							
	285								
	275	Very broken at 58.50.							
	60								59.10 m Flattened ball structures in pyrite with black shale centres
	90	Sample at 61 m for conductivity testing.							59.9 - 61.5 m Coarse aggregates of pyrite to 5 mm. Also some dendritic pyrite aggregates.
	15								61.5 - 64.85 m Pyrite 2% as disseminations.
	64.65	Light grey chert, gradational contact with shale.							
	64.85	Conformable contact gradational over 1 cm to vesicular andesite. Colour is green with white spotting due to carbonate alteration. Irregular veining of carbonate occurs throughout. Minor grey quartz veins have been noted. Vein margins are occasionally pyritic.							
	290	Some carbonate zones e.g. 65.9 maybe flow tops. Fragmental andesite is immediately adjacent.							64.85 Pyrite 3-5% as disseminations and aggregates to 1 mm.
	30	Sample at 67 m for conductivity testing.							
	170								
	70								
	300								
	73.60	Sharp contact at 30° to C.A.							
	74.00	Fine grey pyritic chert, fragmental at base.							
	250	Fine grained variably vesicular andesite							





DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303075

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	MINERALIZATION
	75.74	Sedimentary breccia of pyritic chert.		75.74 Pyrite 5%+, bedded
30	76.14	Carbonated amygdaloidal andesite. Weak foliation at 45° to core axis.		76.14 sulphide in chert fragments.
	77.16	Pyritic grey chert, fragmental below 76.14		
295	77.19	Carbonated amygdaloidal andesite. Weakly foliated at 40° to C.A. Occasional cherty inclusions, also irregular masses (xenoliths). Fine carbonate veining is common.		Pyrite 3% veinlets parallel to foliation, also associated with carbonate vesicles.
	79.99	Zone of deformed (breccia) chert. Upper 5 cm is sedimentary breccia of pyritic		
265	81.22	chert. 81.5 m Fault breccia of chert and andesite healed with carbonate. Below 81.22 m sub-ophitic amygdaloidal andesite-basalt. Amygdules are not common every 5-10 cm and average 1-2 mm in size. The rock is dark green in colour with a foliation at 40° to C.A. Dark grey chert bands or inclusions have been noted, at 30° - 60° to C.A. They show a relict foliation. They appear to occupy the sites of primary joints and fractures.		Disseminated pyrite typically less than 1%.
	85			
290				
	300			
	40			
	250			
	90			
	70			
	10	92.25 Cherty shale and chert. Mostly dark grey in colour, some pale greenish, cream beds (5 mm), discontinuous pyritic beds (1-2 mm) and pyritic mud balls to 1 cm have been noted. Bedding is 60° to C.A. and is laminar.		92.25 Pyrite up to 2% local beds and mud balls.
	70			
140				
	94.86	Andesitic-dacitic feldspar porphyry agglomerate (lava breccia) with a cherty matrix. Fragments are green (chloritic) and light grey. There are minor quartz veins throughout.		94.86 Disseminated pyrite, pyrite in quartz veins
300				
	98.62 - 98.85	Laminated shale with dropped boulders of andesite at upper contact.		Pyrite lenticles in shale.
	98.62	15 cm quartz vein at base.		98.8 Galena and pyrite in quartz vein.
250	98.85	Altered andesite agglomerate and coarse lithic tuff. Fragments are typically		Pyrite 1-5% as disseminated

5 cm

074

U76



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein carbonate quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303077

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
300	125.95	Mid grey weakly sericitic, carbonated porphyritic dacite. Sparse carbonate and quartz veins.							Trace pyrite throughout
	126.65	Mottled green-grey siliceous dacite feldspar porphyry weakly foliated at 45° to core axis. Patchy carbonate alteration imparts a mottled texture.							
300		There are areas andesitic in appearance with white feldspar phenocrysts to 2 mm in a green lava matrix.							
	130	Narrow carbonate veinlets are present throughout typically at 70° - 80° to C.A.							
	180	Thin section specimen 126.5 m No. 179620.							
	130	Thin section specimen 135.8 m No. 179621.							
	135								
	165								
	300								
	30	140 Broken zone, possible Fault.							
	120	Thin section specimen 142.7 m No. 179622.							
	120	142.00 Scoriaceous andesite. Numerous closely packed silica filled vesicles have been noted.							
	143.00	Mottled andesite lava as above.							
300	143.63	Midgrey vesicular porphyritic andesite lava. Feldspars and carbonate filled vesicles define a foliation at 50° to C.A. The rock is scoriaceous towards the base of the unit.							Pyrite 1 - 3%.
	145								
	146.10	Mottled porphyritic andesite as above. Distinctly fragmented (lava breccia)? in part.							
300	148.85	Massive fine grained grey porphyritic andesite often vesicular, similar to							



077



DIAMOND DRILL LOG

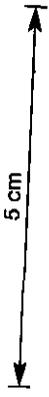
Feature : Bedding 
 Foliation 
 Fragment - size & shape 

Shearing 
 Fault 
 Vein  c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303078

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	150.05	<p>Altered agglomerate of <u>andesitic to dacitic</u> composition, with dark green porphyritic and mid-pale green sericite-carbonate-epidote(?) rich fragments. Fragments vary up to 5 cm in size. The matrix is both carbonated and silicified. Rare quartz veins of 2 cm are present.</p> <p>There is no distinctive foliation, fracturing is rare.</p>						150.05	Pyrite is rare.
	300								
	155								
	300								
	230								
	160	END OF HOLE.							



079



DIAMOND DRILL LOG

Hole No H.2

Page No 1.

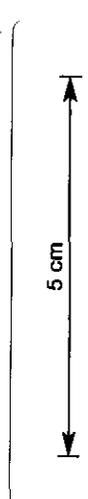
Feature : Bedding
 Foliation
 Fragment - size & shape

Shearing
 Fault
 Vein
 carbonate
 quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303080

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
		No Core before 3 metres.							
.05	5	Thoroughly weathered (brown) <u>dolerite</u> . Very broken, possibly densely packed scree, but more likely sub-crop. Fractures are lined with black to dark brown manganese oxide. Rare kernels of fresh dark grey-blue dolerite. Texture is subophitic, but appears to be altered. Note core loss.							No sulphide.
.25									
.10	10								
.15									
.10	15								
.35									
.45	20								
.75									
	25								





DIAMOND DRILL LOG

Feature : Bedding 
 Foliation 
 Fragment-size & shape 

Shearing 
 Fault 
 Vein  c carbonate
 q quartz

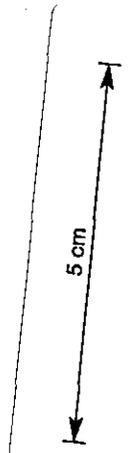
Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303081

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TEXTURE	MINERALIZATION
		Dolerite as above.			
	.60				
	28.10	Weathered micaceous fine siltstone.			
	28.75	Bedding 40° to core axis.			
	28.75	Weathered dolerite.			
	170	Micaceous siltstone, becomes fine carbonaceous shale after 25 cm.			
	30	Siltstone contains small (less than 0.5 mm) feldspars. Bedding is 70° to C.A.			
	40	The shale shows beds of less carbonaceous material up to 0.5 cm at 75° to C.A. Bedding is markedly disrupted by minor movement on joint surfaces.			
	70	Intermittant development of strong cleavage is at approx. 30° to C.A. and is rotated 20° in strike relative to bedding. This relationship varies between 10° and 30°.			
	70	35			
	210	With regional cleavage assumed sub-vertical then steep west dips are implied for the black shale.			
	210	The shale does not preferentially break along one plane but varies between bedding, cleavage and joint surfaces.			
	100	40			
	100	Weathering to a pale grey colour with orange iron staining on fractures persists to 56 m, however the bulk of the rock is substantially fresh below 45 m.			
	260				
	200				
	200	45			
	245				
	50				

Disseminated, trace pyrite apparent on cleavage surfaces from 50 m.

BRACKEN CORE



030

081



DIAMOND DRILL LOG

Feature: Bedding Shearing
 Foliation Fault
 Fragment - size & shape Vein
 carbonate
 quartz

Mineralization: Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303082

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
260		Massive black shale with laminar bedding at 70° to C.A. continues to 67 m. Beyond this, bedding is not visible, the rock being rich in carbonaceous material.							Rare pyrite on cleavage surfaces.
230		Minor erratic carbonate veining occurs between 56.5 and 58 m, and infrequently thereafter.							
55		Cleavage is 35° - 50° to C.A. but is not well developed. Core also breaks along joints at 60° - 80° to C.A.							
270		Fracture surfaces are occasionally carbonate lined (less than 1 mm wide) fresh pyrite may occur on cleavage surfaces.							
280	60								
295									
65									
295									64.8 Large ellipsoidal kernel of massive pyrite 5 cm, parallel to bedding.
300									
70									69.6 Deformed massive pyrite layer (1 cm) in carbonate occurs as a circular feature in core surround by shale.
285		Thin section at 73.05 m, Number 179617.							
72.50		Vesicular, carbonated dolerite or andesite dike. Carbonate filled vesicles parallel shale foliation.							
73.85		Massive carbonate vein (calcite).							
300	74.50	Dike as above.							



U32



DIAMOND DRILL LOG

Hole No H.2

Page No 4.

Feature : Bedding
 Foliation
 Fragment-size & shape

Shearing
 Fault
 Vein
 carbonate
 quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303083

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	75.45	Irregular contact with xenoliths of shale within dike. <u>Massive black shale</u> with carbonate veinlets, broken below 78.5 m, with some slickensides. Thin section at 80.9 m, No. 179618.							Rare 1 mm lenticles of pyrite.
	79.60	Strongly sheared, carbonate rich dike of volcanic with partly hornfelsed shale xenoliths to 10 cm, lower contact shows chilled margin merging with shale.							Disseminated pyrite 1 - 2%.
	80.90	<u>Massive black shale</u> , uniform colour and texture, cleavage foliation is 60° to C.A., with thin (1-2 mm) carbonate veins and fracture fillings, especially at 87.1 - 88.4 m and 94.7 - 97.2 m.							81.1 Two clasts of massive pyrite sub ellipsoidal to 10 cm parallel to foliation. Otherwise pyrite is rare.
	85								
	280								
	285								
	295								
	290								
	290								
	100								

BROKEN CORE



084



DIAMOND DRILL LOG

Feature : Bedding Foliation Fragment - size & shape Shearing Fault Vein carbonate quartz

Mineralization : Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive >60%

303085

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	FRAGMENT SIZE	MINERALIZATION
	300				
	129.0	Massive fine grained black shale, with an almost irridescent appearance on broken surfaces.			Rare pyrite.
	133.45	Sheared <u>agglomerate</u> of feldspar porphyry. Colour is orange-brown to light grey, contains chert clasts around which foliation diverges. Similar to SP units at Que River. (Sericite alteration).			Pyrite 5-7%, stringers, clots, disseminations.
	135.35	Massive black shale with occasional thin 1-2 cm bands of wispy tuff with quartz phenocrysts, fine carbonate veining and fracture filling throughout.			No pyrite.
	137.05	Sheared <u>feldspar porphyry agglomerate</u> . Fault zone, sheared and broken core.			Pyrite 3-5%, as clasts, veinlets and disseminated crystals.
	139.75	Sheared pale grey carbonate-sericite rich feldspar porphyry agglomerate.SP. With wispy pumice (fiamme) and subangular clasts of porphyritic dacite. Fragment size is typically 0.5 - 5.0 cm to 140 m then increasing to 2-7 cm. Carbonate is common with veins between 139.75 and 139.9 m.			Trace pyrite.
	145.10	Gradational contact to less altered <u>agglomerate of feldspar porphyry of andesite</u> . (Lava breccia). Fragments are angular to subangular all sizes up to 7 cm, dark grey-green in colour becoming greener with depth. The matrix is light grey in colour with white carbonate and minor quartz veinlets. Foliation (schistosity) is 45° to C.A. White feldspar (altered to carbonate) become very prominent (to 1 mm) down			

5 cm

085.



DIAMOND DRILL LOG

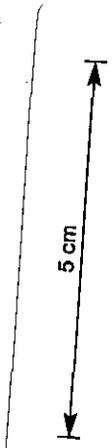
Hole No **H.2** Page No **7.**

Feature : Bedding Foliation Fragment-size & shape Shearing Fault Vein
 c carbonate
 q quartz

Mineralization : Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive >60%

303086

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
		Both green andesitic and grey dacitic fragments occur.							
300									
	155								
300									
	160								
140	161.50	Hole ends.							Traces to 5% sphalerite in last 50 cm of core.



086



DIAMOND DRILL LOG

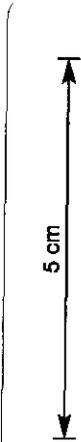
Hole No **H.2A** Page No 1.

Feature : Bedding Shearing Foliation Fault Fragment-size & shape Vein carbonate quartz

Mineralization : Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive >60%

303087

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	130	New hole commenced from same collar and drilled adjacent to H.2. Tricone used to 147.7 m.							
	135								
	140								
	145								
330	147.70	Massive <u>feldspar porphyry agglomerate</u> of andesite but with grey fragments of possibly dacitic composition.							Trace sphalerite and galena.



Handwritten notes:
B
x
2/27

087



DIAMOND DRILL LOG

Hole No **H.2A**

Page No **2**

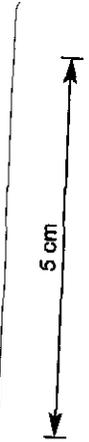
Feature :
 Bedding
 Foliation
 Fragment - size & shape

Shearing
 Fault
 Vein carbonate
 quartz

Mineralization :
 Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303088

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	300	Rock colour is dominantly dark green with carbonate-silica alteration of matrix, also minor carbonate veining. Fragments vary in size up to 7 cm average 3-4 cm.						157.0	Disseminated sphalerite 1% as small grain aggregates, also rare galena and trace sphalerite.
	155								
	255								
	290								
	160	Fragmental texture becomes diffuse due to deuteric alteration of the matrix by carbonate and silica.							
	300								
	295							164.0	Sphalerite averages less than 1% with rare galena.
	165								
	300								
	170								
	280								
	300								



U88



DIAMOND DRILL LOG

Feature : Bedding Shearing
 Foliation Fault
 Fragment-size & shape Vein c carbonate
 q quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303089

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	MINERALIZATION	
	300	Altered carbonate-silica andesitic agglomerate continues.			
	280				
	300				
	180				
	185				
	300				
	270	Fractures sub-parallel to core axis.			
	190				
	190.78	Massive quartz vein.			No sulphide associated with vein.
	191.50	Massive silicified andesitic agglomerate or lava breccia. Colour is dominantly green, with white feldspar phenocrysts to 1 mm. The colour varies locally to pale fawn and pink due to carbonate alteration. Rare carbonate veins are present.			Disseminated rare sphalerite and galena.
	100				
	300				
	195				
	300				
	200				



089.



DIAMOND DRILL LOG

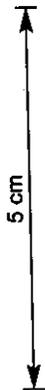
Feature : Bedding
 Foliation
 Fragment - size & shape

Shearing
 Fault
 Vein carbonate
 quartz

Mineralization : Trace 1-5%
 Common 5-15%
 Abundant 15-60%
 Massive >60%

303090

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	295								
	175	Fragment boundaries often corroded.							Trace sphalerite and galena, associated with quartz veinlets.
	300	205							
	95								
	300	210							
	300	Rare massive chlorite veins 1 - 2 cm minor epidote with some veins of carbonate.							
	215								
	300	217.0 End of Hole.							



090

303091

APPENDIX D

Geophysical Testing of Core Samples

APPENDIX E

Petrological Reports on samples from Diamond
Drill Holes H1 & H2, MC1 & MC2.

093

H1 - 39m: black shale; evenly dispersed extremely fine pyrite (5-7%) and ultrafine graphite (5%)

Macroscopically, and as viewed in thin section this is a laminated black shale. Individual laminae and/or thin beds consist of variable concentrations of clays, ultrafine sericite, opaque grains and relatively minor quartz and feldspar silt and some chlorite. Variation in composition and grain size between laminations is very minor, certainly less than in sample H1-54m.

In polished section fine pyrite is seen quite evenly dispersed throughout the rock, forming an estimated 5-7% of it. These grains range in size from 0.002 mm to 0.04 mm, average about 0.006 mm, (i.e. 6 microns). One exception to this is a single irregular segregation of chalcopryite which has a maximum dimension of 0.4 mm.

This is mainly framboidal and spheroidal pyrite, with subordinate generally coarser subhedral to euhedral crystals.

Trace chalcopryite very rarely occurs as inclusions in this pyrite, and even more rarely occurs as single grains.

.../

U94

H1-39m contd. :

Ultrafine graphite is ubiquitous throughout the clay fraction of the rock. It occurs essentially as a finely divided "dust" with individual flakes rarely greater than 0.01 mm although several, extremely thin, variably continuous laminae occur sporadically along the bedding. Some of this finest "dust" may not be truly crystalline carbon, i.e. not genuinely graphite.

The fine size and diffuse, dispersed distribution of the graphite makes it difficult to ascertain its abundance, but it is estimated at about 5%.

If the exact quantity of C becomes important in resolving the geophysical problem, then a chemical analysis for this element is recommended.

Likewise, if the exact quantity of pyrite becomes important for the same reason, then an analysis for total sulphur is recommended (since this resides almost exclusively in pyrite.) An Fe analysis may also be considered, however this may be not as diagnostic due to probable Fe in minor chlorite through the rock.

095

H1 - 54m: black shale; dispersed and minor locally aggregated pyrite (up to 10%) and extremely fine graphite (7-10%)

This is also a laminated black shale. In thin section it is seen to be somewhat more sericitic than at 35m and slightly more silty. The quartz (and feldspar) silt has a consistent average size in a given lamination, which is generally very slightly coarser than at 39m, and layers up to very fine sand size occur at irregular intervals through the sequence.

The opaque material is slightly less dense than at 39m, apparently due to a slightly greater average size.

Fine grains of framboidal and spheroidal pyrite, and subordinate subhedral to euhedral pyrite are also dispersed throughout this core. Generally the size of these is about the same as at 39m, but the abundance of this pyrite appears to be marginally more than at 39m, possibly up to 10%, as a result the individual grains are slightly more closely packed.

In addition to being dispersed, minute spheroids of pyrite form clusters up to 0.1 mm across, and these, and trace, single euhedral crystals up to 0.05 mm are scattered along fine sandy layers. These account for about one quarter of the total pyrite.

.../

096

H1-54m contd. :

Ultrafine graphite is ubiquitous throughout the clays and fine micas which form a large proportion of this rock. The graphite is marginally more distinct as micron-size flakes, rather than the dominant finely divided "dust" at 39m. Maximum size of the graphite however is also about 0.01 mm, and several thin foliae of graphite are present as at 39m.

The graphite appears to be slightly more abundant than at 39m (7-10%).

179617 (DH, H2 at 73.05m)

amygdaloidal andesitic glassy lava;
complete pervasive replacement by deuteric
carbonate, subordinate silica and minor
associated chloritisation

Field comment: amygdaloidal andesite dyke,
carbonate filled vesicles

Most of this rock consists of a fairly homogeneous groundmass in which the primary minerals are completely replaced by carbonate and subordinate silica.

Primary textures are preserved and consist of a combination of: fine-scale (0.3 mm) spherulitic textures characteristic of glass; fine laths which are locally similarly flow-oriented; more or less interstitial bleb-like vesicle fillings average size 0.15 mm; larger randomly scattered amygdules (or vesicles) greater than 1 mm in diameter.

Most individual crystals have been completely pseudomorphically replaced by microcrystalline carbonate. Some crystals are replaced by chlorite. Interstitial areas within, or forming the glassy textures are represented by fine chlorite and/or diffuse, cryptocrystalline quartz (?devitrified glass).

...../

179617 contd. :

The small bleb-like vesicles consist of chalcedonic gradational to microcrystalline silica of deuteritic origin.

The amygdules are filled by extremely fine carbonate commonly mixed with cryptocrystalline varying to fibrous chalcedonic silica. These represent concentrations of deuteritic carbonate and silica, inherent to this host rock. Accessory very fine oxidised magnetite is disseminated.

The textural characteristics indicate that this is most likely an extrusive lava (rather than the suggested dyke, which implies an intrusive genesis.)

The primary composition is almost certainly andesitic but possibly basaltic. It is difficult to determine which, due to complete pervasive replacement by carbonate, and related silicic-chloritic alteration.

039

17961B (DH, H2 at 80.90 m) :

fine tuff grading to laminated shale,
against a very fine andesitic lava, or tuff
lava; the volcanic is later and imposes
localised silicification and sericitisation
at the contact

Field comment: andesite dyke against hornfelsed black shale;
cherty inclusions in andesite

Both facies in this sample are dark grey and extremely fine grained, one is a "sediment", the other is a "volcanic". The sediment is composed of ultrafine quartz, clouded with clays, chlorite and minor sericite; it is microscopically "tough" and conceivably, incipiently silicified. These materials are too fine to differentiate between, or to meaningfully estimate their abundance.

Irregular, roughly lath-shaped and some rhomb-shaped "porphyroblasts" of clouded carbonate (0.1 x 0.3 mm) are scattered through part of the shale away from the contact forming 20% of it. These are similarly aligned, conformable to the contact, and thus apparently bedded. A cleavage occurs in the same plane.

The sediment 7-10 mm in from the contact is devoid of carbonate and relatively enriched in silica and sericite. Several veinlets of quartz and/or carbonate, rarely plus trace pyrite are oblique to the cleavage.

.../

100
179618 contd. :

Minor ultrafine opaque material suggests that the field term "black shale" is an appropriate classification for this rock. However it does appear to be very finely tuffaceous, at least in the layers containing "porphyroblasts", grading to a laminated, sericitised and silicified shale at the contact.

The "volcanic" is dominated by extremely fine and somewhat wavy cleavage planes, conformable to the contact; very closely spaced adjacent to the contact, but widening further away from it. It consists of a felted mass of completely argillised and chloritised primary flow-oriented microlites, with coarser (1 mm) lath-form crystals and apparent, elongate glass fragments evenly distributed in the same plane. These crystals and fragments are completely replaced by chlorite and clay-sericite. Accessory minute grains of pyrite and trace magnetite are scattered, rarely in clumps.

The volcanic is identified as an andesitic lava, possibly tuffaceous. It appears to have generally indurated the adjacent tuffaceous-shale and selectively sericitised and silicified the immediate contact zone. Thus it is later than the shale, conceivably a flow, or an extremely shallow small tongue-like dyke into it. Both facies have suffered the same low grade regional metamorphism to produce a common, conformable cleavage.

101

179619 (DH, H2 at 106.55 m):

carbonate-rich, graphitic and pyritic black shale; bedding laminations of fine pyrite vaguely cyclical

Field comment: black shale, cyclic bedding due to fine pyrite

This is indeed a black shale, much blacker and less indurated than in 179618. The laminations seen in hand specimen are in fact bedding. A poorly defined cleavage (slaty cleavage) cuts across this bedding and vaguely forms axial planes to microscopically kinked sericite.

The rock consists of ultrafine quartz (silt) intimately mixed with subordinate sericite and carbonate, clouded by extremely fine opaque material. Minor small patches of carbonate and fine quartz sand grains are scattered.

In polished section the opaque material is identified as mainly pyrite. This occurs as generally spheroidal, less commonly framboidal, and rarely subhedral grains ranging in size from 0.001 to 0.1 mm, average about 0.02 mm.

As suggested in your covering notes, the pyrite does form laminations in which the concentration of the pyrite gradually increases over a sequence of laminae totalling about 10 mm thick to a layer composed of about 50% pyrite. Successive layers contain only 1-2% disseminated pyrite but these grade into layers carrying 5-10% disseminated pyrite, also localised patches up to 0.1 mm of ultrafine spheroidal pyrite.

..../

179619 contd. :

Examined in oil immersion at magnifications of x1200, submicron-size graphite and possible amorphous carbon is seen to have an even distribution through intergranular areas of the shale. It forms an estimated maximum of 5% of the rock.

Certainly it is the vaguely cyclical layered concentration of fine pyrite which gives rise to the bedding laminations, rather than variations in graphite distribution.

179620 (DM, H1 at 126.50 m):

slightly vesicular glassy andesite;
groundmass shows complete alteration to (and
consequent enrichment in) silica, minor chlorite
and potash feldspar; phenocrysts sericitised,
disseminated pyrite

Field comment: altered andesite (carbonated)

Euhedral to subhedral crystals of plagioclase (30%)
and several amygdules (3-5%), average size about 0.8 mm, are
generally randomly disposed through an altered microcrystalline
groundmass. These crystals are very extensively replaced by
sericite and minor, clouded saussurite, rare chlorite and carbonate.

The groundmass consists of diffuse patches of extremely
fine rather feathery quartz, intimately mixed with chlorite and
minor extremely fine granular carbonate and potash feldspar. (The
potash feldspar is highlighted on the slide offcut stained with
sodium cobaltinitrite.) These components outline poorly defined
spherulitic textures and minor, localised microlites, indicating
a primary groundmass composed largely of glass, partly of
microcrystalline lava.

The amygdules are filled by deuteric quartz, minor
irregular patches of brown clouded baryte, carbonate and chlorite.
Carbonate forms an estimated maximum of 5-7% of the rock.

Fine pyrite (5-7%) commonly in clusters, is scattered
throughout.

The mode of occurrence of plagioclase phenocrysts, and
lack of primary quartz phenocrysts or potash feldspar indicates that

.../

179620 contd. :

this rock has an original andesitic composition. However it has been extensively altered, involving extensive enrichment of quartz, minor potash felspar and chlorite in the groundmass.

The gross rock chemistry thus now approaches a rhyolitic composition.

179621 (DH, H1 at 135.80 m) :

slightly porphyritic perlitic glass of
andesitic composition, with adsorbed relatively
potassic xenoliths also of perlitic glass;
completely altered

Field comment: mottled andesite felspar porphyry, lithic tuff,
carbonatised and silicified

Most of this rock consists of an extremely fine,
clouded and rather diffuse matrix of ultrafine quartz, subordinate
chlorite and minor potash alteration products after glass. Primary
perlitic and spherulitic textures of this primary glass are
ubiquitous.

Small irregular amygdules (10-15%) up to 2.5 mm across
are randomly scattered, and filled by deuteric quartz \pm minor
carbonate sericite chlorite and low temperature felspar or zeolite.
Minor small plagioclase phenocrysts are completely replaced by
sericite, carbonate, quartz \pm chlorite and epidote.

Accessory fine pyrite is disseminated, also pyrite
occurs in some veinlets of quartz carbonate \pm ?zeolite.

Irregular patches up to 1.5 mm across, with gradational
boundaries into the glassy matrix described, give the rock a
pseudo-fragmental texture. These patches have a similar
composition, and the same spherulitic-perlitic textures as the
majority of the rock, although staining of the outcrop indicates
that they are more potassic. These are interpreted as more or
less in-situ xenoliths of the glassy lava partly adsorbed by the
larger volume of glassy lava host.

.../

179621 contd. :

The abundant, well-preserved glass textures and dominance of siliceous and local potassic material indicates that it is largely a silicified perlitic glass, however the mode of occurrence of the altered plagioclase phenocrysts indicates a primary andesitic component.

107
179622 (DH, H1 at 142.70 m):

amygdaloidal and porphyritic glassy lava
of trachy-andesite composition; amygdules
enriched in deuteric quartz

Field comment: siliceous amygdaloidal (?) andesite

The fine mottled texture of this rock, on a scale of about 2 mm is due to the primary, largely glassy nature of the groundmass, forming a 'fuzzy' reaction rim around the numerous amygdules incorporated in this glass, and around the evenly scattered phenocrysts. This texture considered together with the fine microlite mat indicates quick cooling.

Euhedral phenocrysts of plagioclase (25%), average size about 0.6 mm, and smaller primary bleb-like segregations of quartz (5-7%), are scattered and rarely clumped together (glomeroporphyritic). Also, larger (2 mm) amygdules (20-25%), filled with zoned spherulitic quartz, are all evenly distributed with similar orientation.

They occur in a matrix composed of flow oriented minute microlites of potash feldspar, with minor wavy networks and interstitial largely siliceous glass. The abundance of potash feldspar is highlighted on the stained offcut.

.../

179622 contd. :

This groundmass has an essentially glassy trachytic composition. The mode of occurrence of the plagioclase phenocrysts, and lack of genuine quartz phenocrysts, is characteristic of an andesite. Thus the rock is interpreted as a glassy trachy-andesite, rapidly cooled, and vesicular and quite extensively enriched in deuteric quartz, i.e. silicified. As a result of this silica enrichment, and the primary potassic (trachytic) groundmass, a total rock analysis of this rock, would no\ doubt indicate a rhyolite composition.

APPENDIX F

I.P. Profiles Mackintosh Licence Area.



- Main road
- - - Secondary road
- Track
- Railway
- - - Abandoned railway
- Power transmission line
- - - Fence
- ✕ Mine

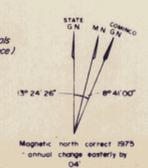
- △ Quarry or pit
- △ Trig station
- River, creek
- Survey line
- - - Tenure boundary
- - - Walking Track

- Quaternary Qa Alluvium
- Tertiary T3 Basalt
- Jurassic J3 Dalrymple - Diorite
- Ordovician O1 Conglomerate, grit sandstone

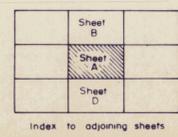
- Cambrian C1 Dalrymple - Rhyolite lavas and gneissites with visible quartz (commonly) light grey cream or orange colouration. Intrusions shown (+) overprint.
- C2 Mica sandstones, grits. Dark greenish brown when fresh, light grey to white.
- C3 Shales (black, grey)
- C4 Breccia (sedimentary)
- C5 Cherts (blue grey, white, black)

- A1 Andesite - Basalt (lavas, lithic tuff, agglomerates, lava breccias) typically green. Intrusions shown (+) overprint. Blue grey colour when fresh.
- A2 Scoriaeous and coarsely vesicular (>3mm) andesite - basalt lavas
- A3 Intermediate to acid (dacite-ryholite) lavas and gneissites within andesite sequence and felsic siltstones (includes DTL and MTL mine groups. Typically white, pink, light red brown to brown colouration.

- 6 Altered (sericite-carbonate chlorite) and pyritic fragmentals and lavas (P/P of mine sequence) Blue grey colour when fresh.
- 7 Dip B strike of bedding
- 8 Dip B strike of cleavage
- L Linament
- F Fault (Interpreted)
- Barite occurrence
- Magnetite occurrence



5 cm



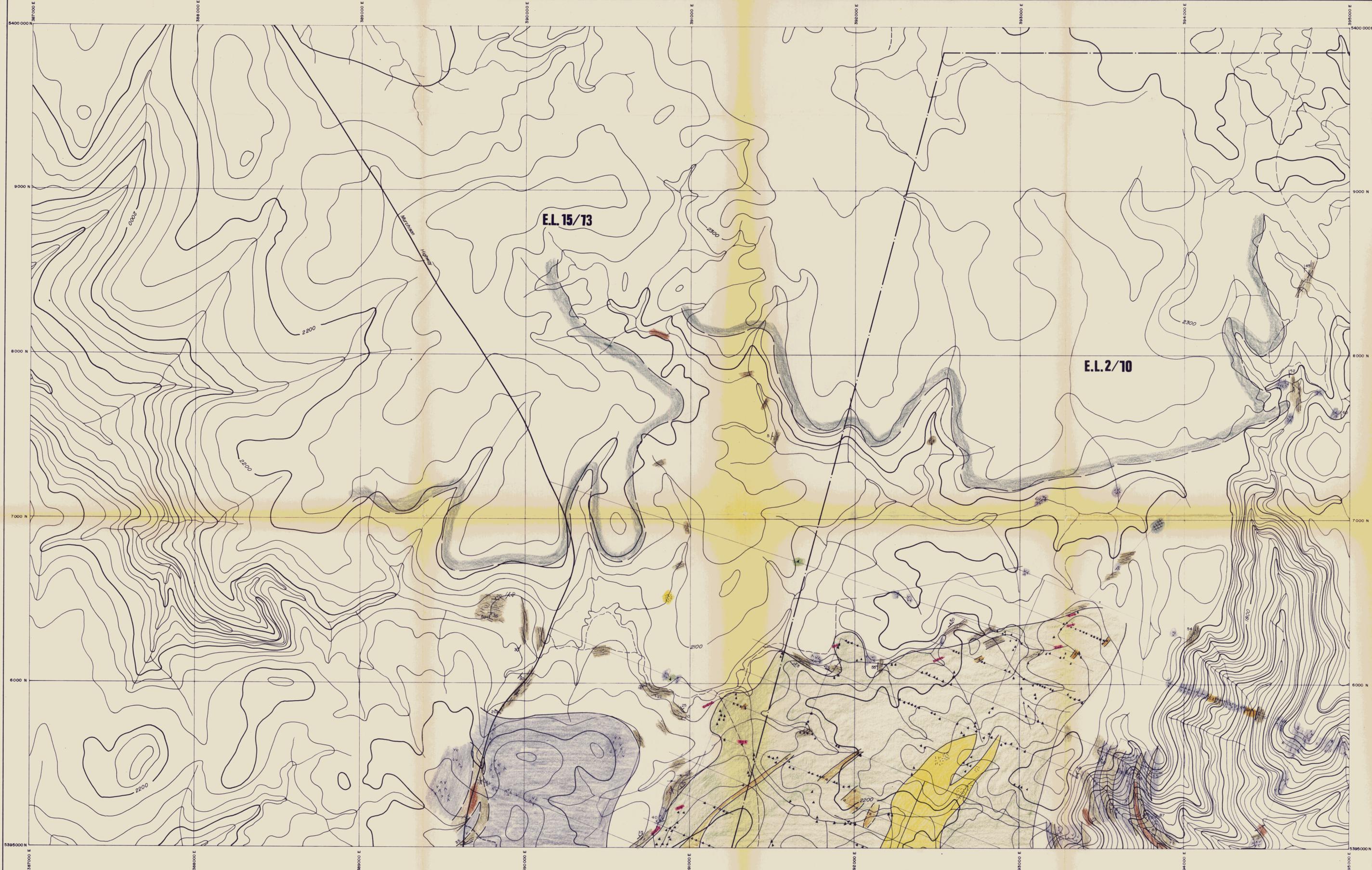
Base sheet and contours enlarged from 1:31,680 Tasmanian Lands Dept. Topo. Contour interval 50 feet.

303111

Compiled from field geology (1971-77 mapping) soil geochemistry and induced Polarisation data.

COMINCO EXPLORATION PTY. LTD.		NORTH WEST TASMANIA DUNDAS TROUGH		001
Drawn by E.H.S.	Traced by R.J.E.	Preliminary Interpretive Geology		
Checked by		Contour interval 50 feet		
Location code	K55/6/44	Scale	1:10000	Date
			July, 1977	Plate
				DT 62 A

77-1222



E.L. 15/13

E.L. 2/10

Murchison Highway

Base sheet and contours enlarged from 1:31,680 Tasmanian Lands Dept. Topo. Contour interval 50 feet

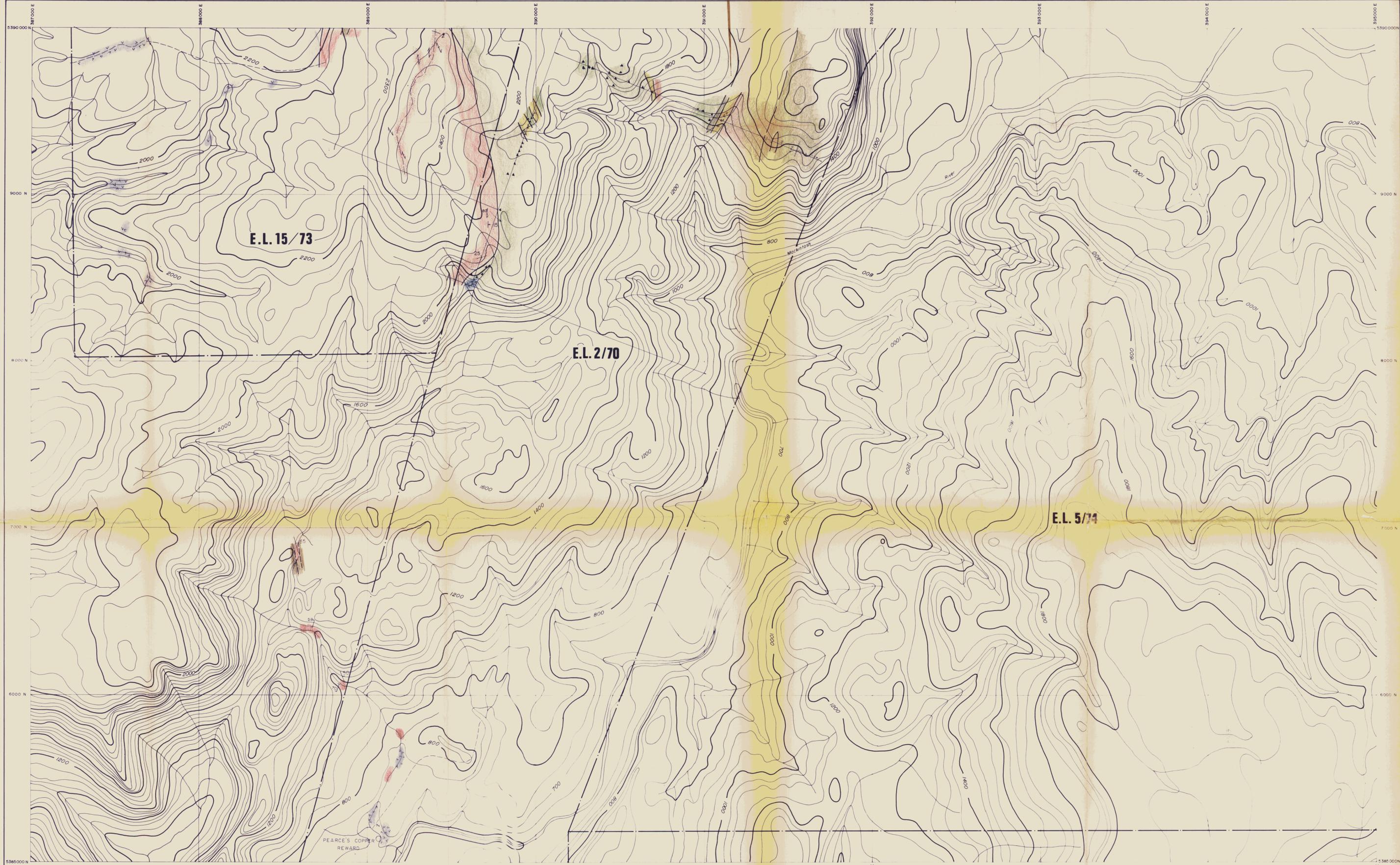
NOTE: See Sheet 'A' for Legend



Sheet C	
Sheet B	Sheet F
Sheet A	

Index to adjoining sheets

COMINCO EXPLORATION PTY. LTD.		303112	
Drawn by E.H.S.	Traced by A.E.R.	NORTH WEST TASMANIA 01 002	
Checked by G.O.B.C.H.Y. May 77		DUNDAS TROUGH	
		Preliminary Interpretive Geology	
		Contour interval 50 feet	
Location code K55/6/44	Scale 1:10,000	Date	Plate 57-1222

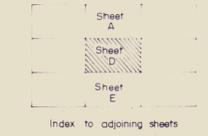


5385000 E 5390000 E 5395000 E 5400000 E 5405000 E 5410000 E 5415000 E 5420000 E 5425000 E 5430000 E 5435000 E 5440000 E 5445000 E 5450000 E

5385000 N 6000 N 7000 N 8000 N 9000 N

Base sheet and contours enlarged from
1:31,680 Tasmanian Lands Dept Topo
Contour interval 50 feet

NOTE
See Sheet 'A' for Legend

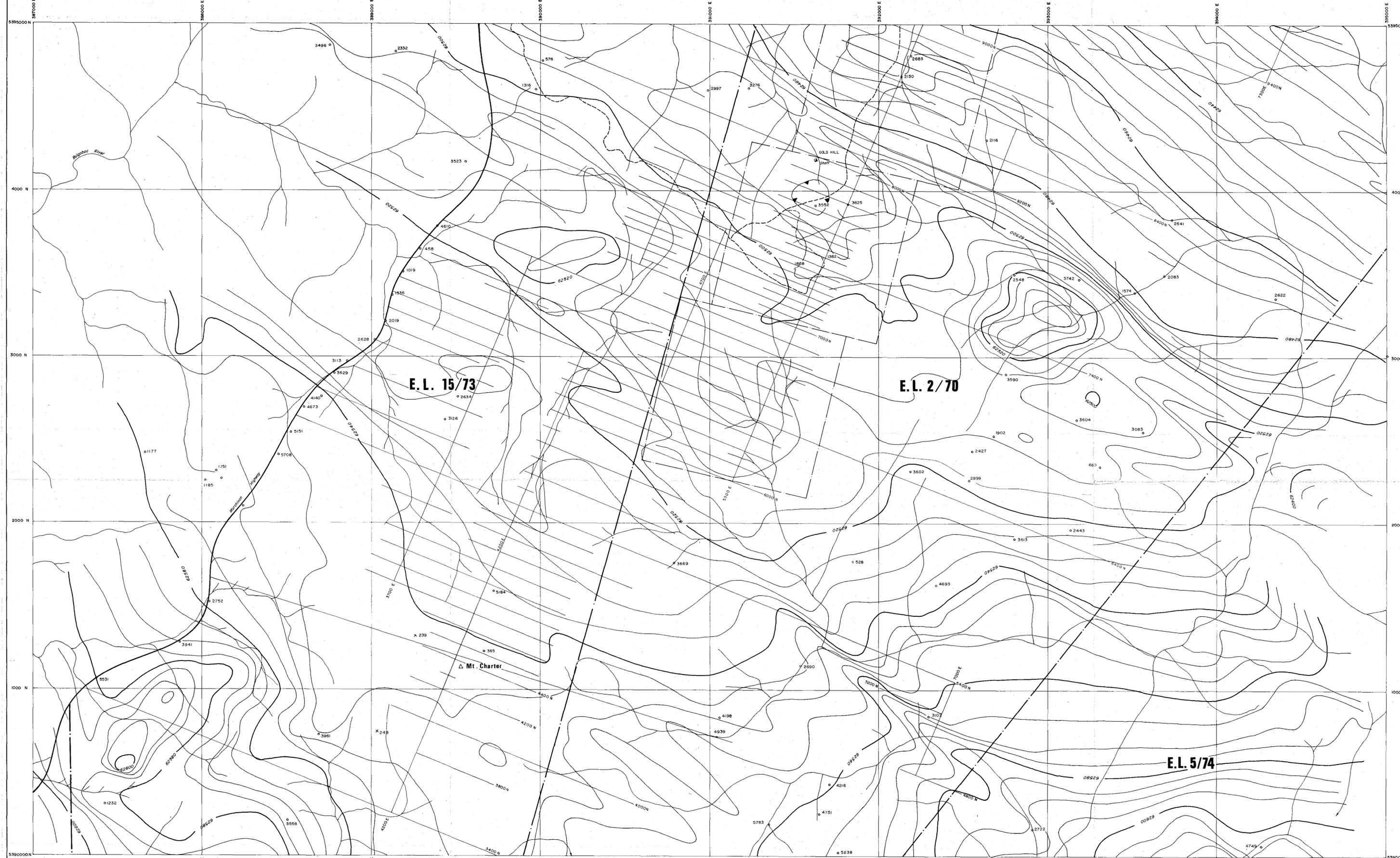


303113 77-1238

COMINCO EXPLORATION PTY. LTD.

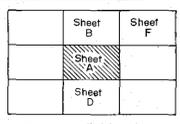
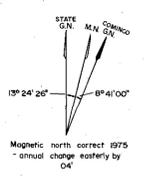
NORTH WEST TASMANIA 003
DUNDAS TROUGH
Preliminary Interpretive Geology
Contour interval 50 feet

Drawn by EHS	Traced by AER
Checked by SOB_CMY May 1977	
Location code K55/6/44	Scale 1:10,000
Date July 1977	Plate DT 620



- Main road
- - - Secondary road
- - - Track
- +— Railway
- - - Abandoned railway
- - - Power transmission line
- - - Fence
- ⚡ Mine
- Quarry or pit
- △ Trig. station
- River, creek
- Survey line
- - - Tenure boundary

○ 1878 Photo-identified point used for correction of flight line and photo distortions.

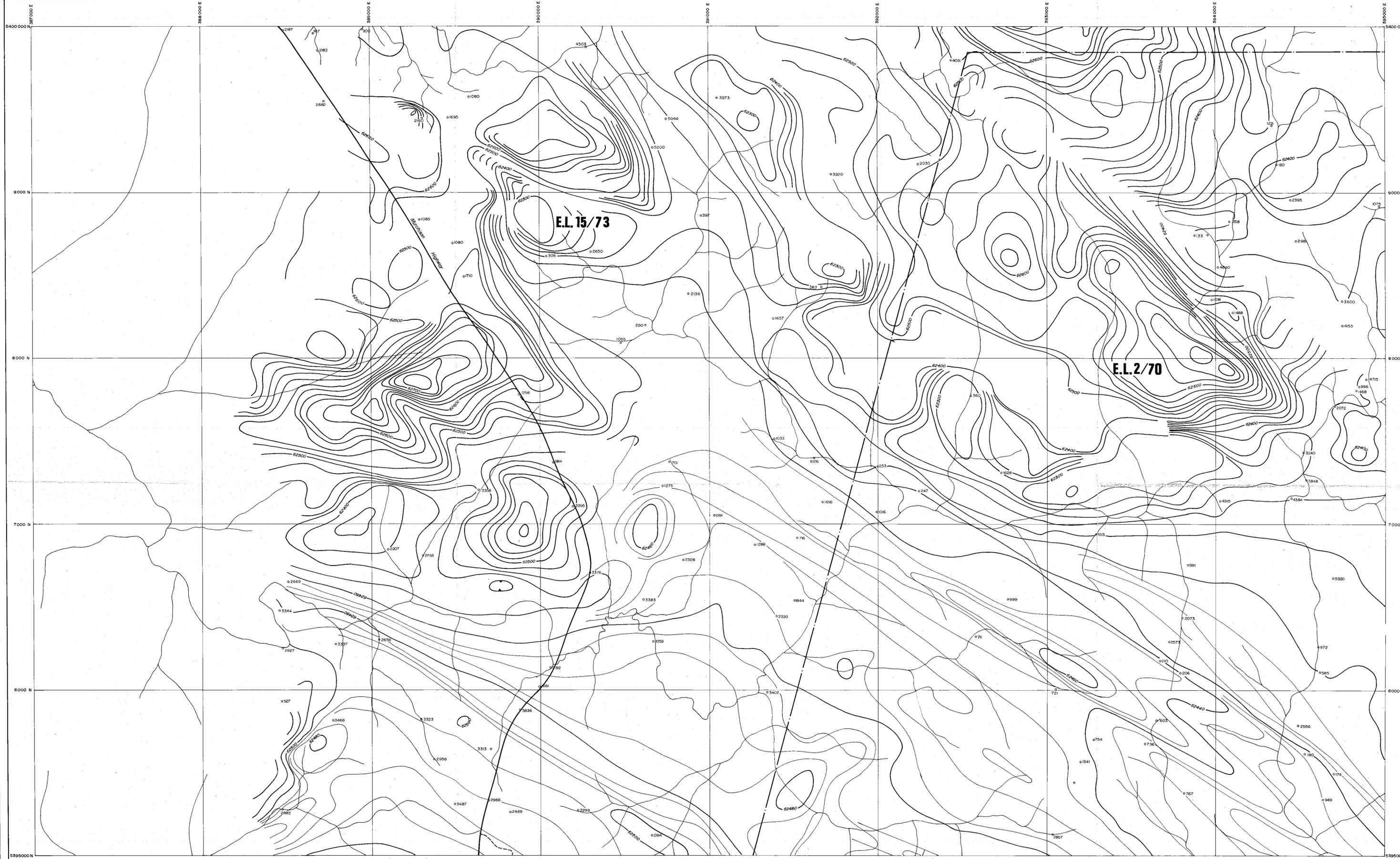


303114 77-1222

COMINCO EXPLORATION PTY. LTD.

Drawn by E.H.S.	Traced by JJB
Checked by	
Location code K55/6/44	Scale 1:10000
Date June 1977	Plate DT 78 A

NORTH WEST TASMANIA 004
DUNDAS TROUGH
AIRBORNE MAGNETICS (1975)
Contour interval 5 & 20 gammas



E.L. 15/73

E.L. 2/70

*878 Photo-identified point used for correction of flight line and photo distortions.



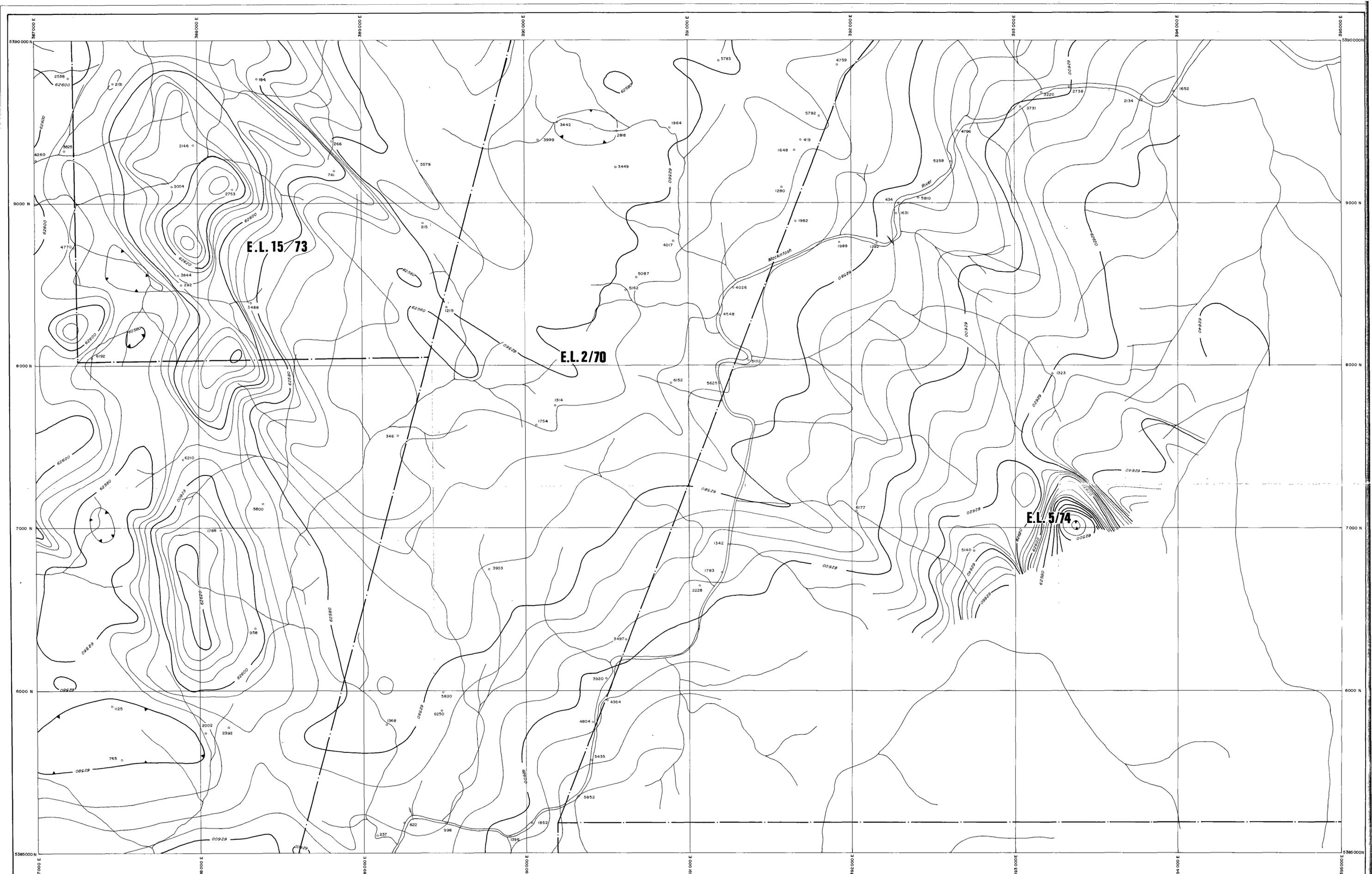
Sheet C	
Sheet B	
Sheet A	

Index to adjoining sheets

303115 77-1222

COMINCO EXPLORATION PTY. LTD.

Drawn by E.H.S.	Traced by R.K.Y.	NORTH WEST TASMANIA DUNDAS TROUGH AIRBORNE MAGNETICS (1975) Contour interval 5 & 20 gamma	005
Checked by			
Location code K55/6/44	Scale 1:10,000	Date June 1977	Plate D7 78 B



E.L. 15/73

E.L. 2/70

E.L. 5/74

01878 Photo-identified point used for correction of flight line and photo distortions



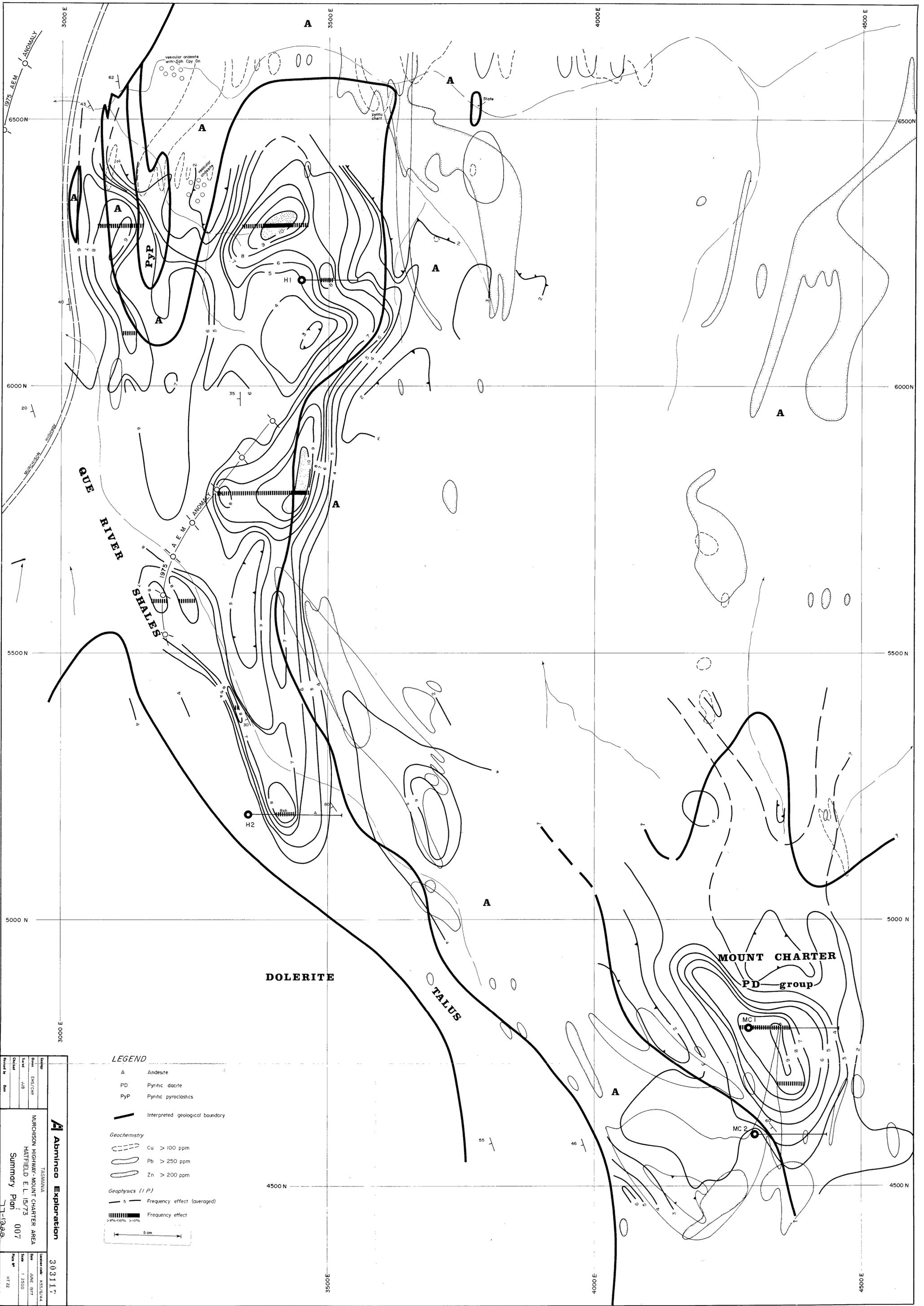
Sheet A	
Sheet B	
Sheet C	
Sheet D	
Sheet E	

Index to adjoining sheets

303116 77-1222

COMINCO EXPLORATION PTY. LTD.

Drawn by EHS	Traced by JJB	NORTH WEST TASMANIA DUNDAS TROUGH C 006 AIRBORNE MAGNETICS (1975) Contour interval 5 & 20 gammas
Checked by		
Location code K55/G/44		Scale 1:10,000
		Date June 1977
		Plate DT 78 D



Abnino Exploration	
Geophysicist	CHD/GW
Supervisor	JJB
Geologist	JJB
Checked by	
Drawn by	
TASMANIA	
MURCHISON HIGHWAY-MOUNT CHARTER AREA	
HAIFIELD E.L. 15/7/73	
Summary Plan 007	
11-1999	
30317	30317
Issue date	15/5/74
Date	JUNE 1977
Scale	1:2500
File no.	1472

LEGEND

A Andesite
 PD Pyritic dacite
 PyP Pyritic pyroclastics

Interpreted geological boundary

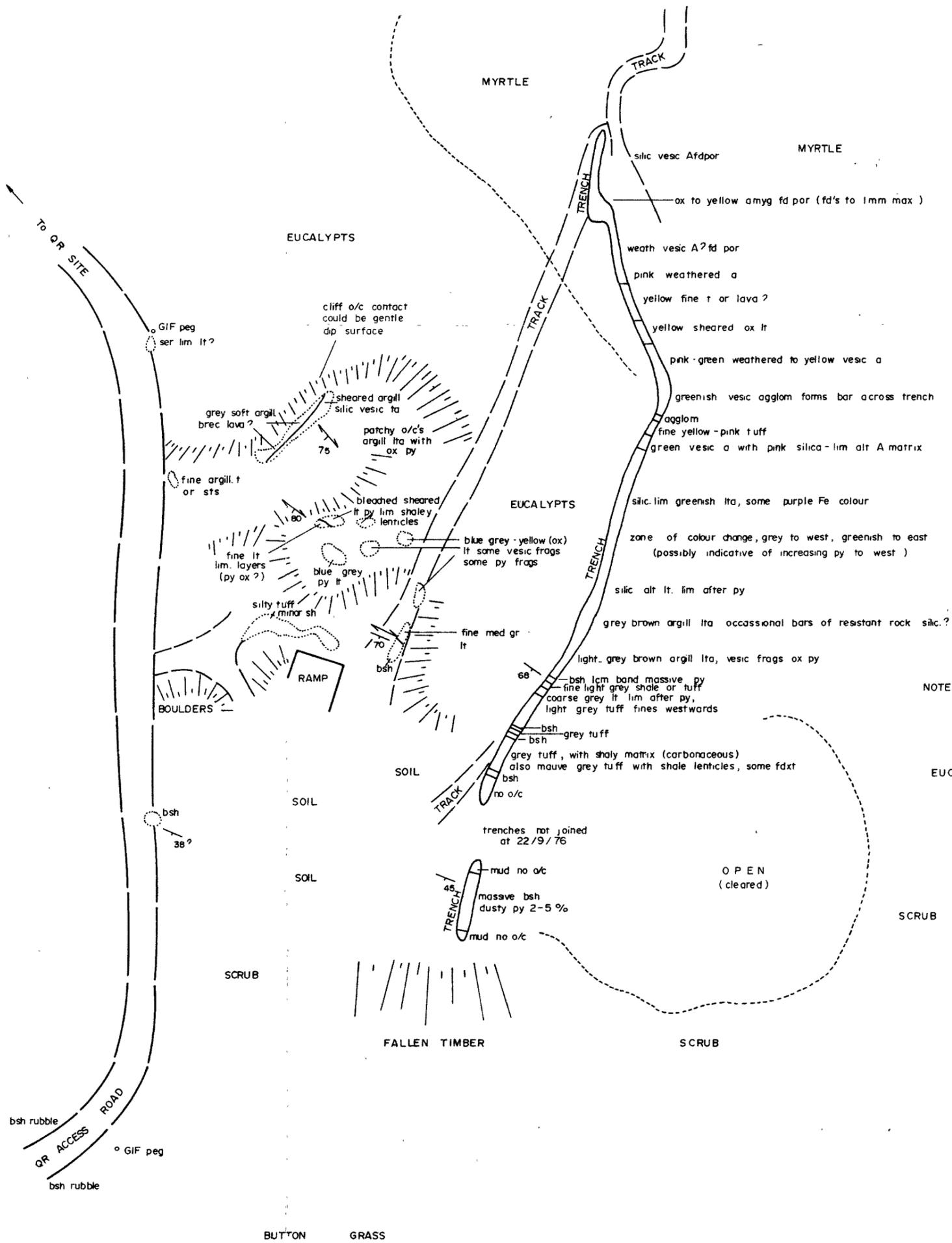
Geochemistry

Cu > 100 ppm
 Pb > 250 ppm
 Zn > 200 ppm

Geophysics (IP)

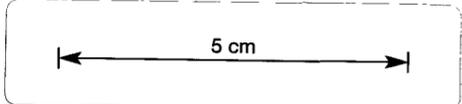
5 Frequency effect (averaged)
 Frequency effect
 > 8% < 20% > 10%

50m



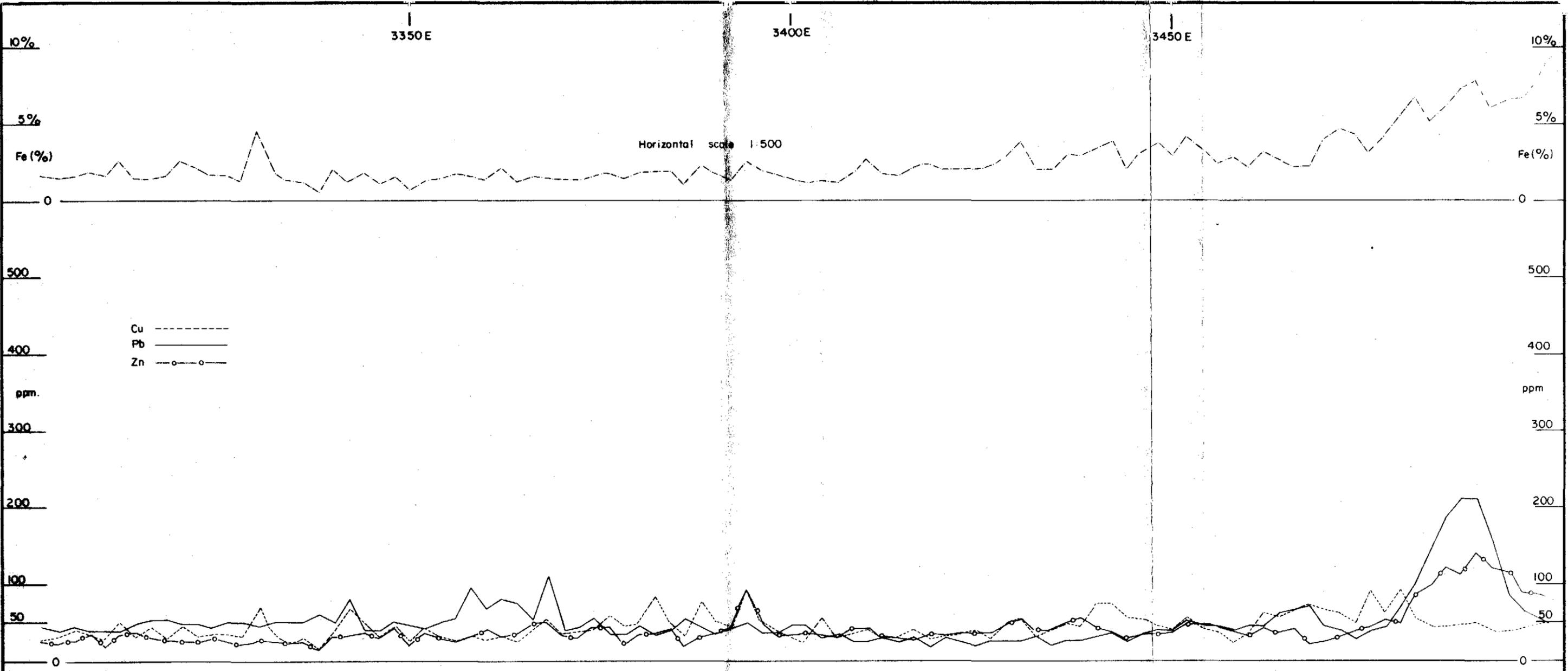
NOTE No faulting observed at any contact

303118



77-1222 008

ABMINCO N.L.		
NORTH WEST TASMANIA HATFIELD E.L.15/73		Location code : K55/6/44
Drawn by : E.H.S.		Scale : 1:500
Traced by : R.J.E.		Date : December, 1976
Checked by :		Plate : HT 18
Revised : _____	Date : _____	
Fact Geology of the "Quarry Area"		



Sample bag No.

182852 182850 182845 182840 182835 182830 182825 182820 182800 182795 182790 182785 182780 182775 182770 182765 182760 182755 182753

Sample Length (every 2m)

rubby black shale

fractured, faulted black slate

bedding strike 035°
dip 45° W
cleavage 035-035°
dip vertical

black shale, massive
cleavage 015°/ vertical

black slate
cleaved contact

orange-red weathered andesitic(?) agglomerate
white feldspar phenocrysts
part vesicular (no fresh rock seen)

3450E 3500E

303120 77-1222

3300E 5 cm 3350E

3400E

Abminco Exploration		NORTH WEST TASMANIA HATFIELD E.L.15/73 Trench 5800 N 010		Location code:
Drawn by: E.H.S.				Scale: 1:500
Traced by: R.J.E.				Date: January, 1977
Checked by:				Plate: HT 21
Revised:	Date:			

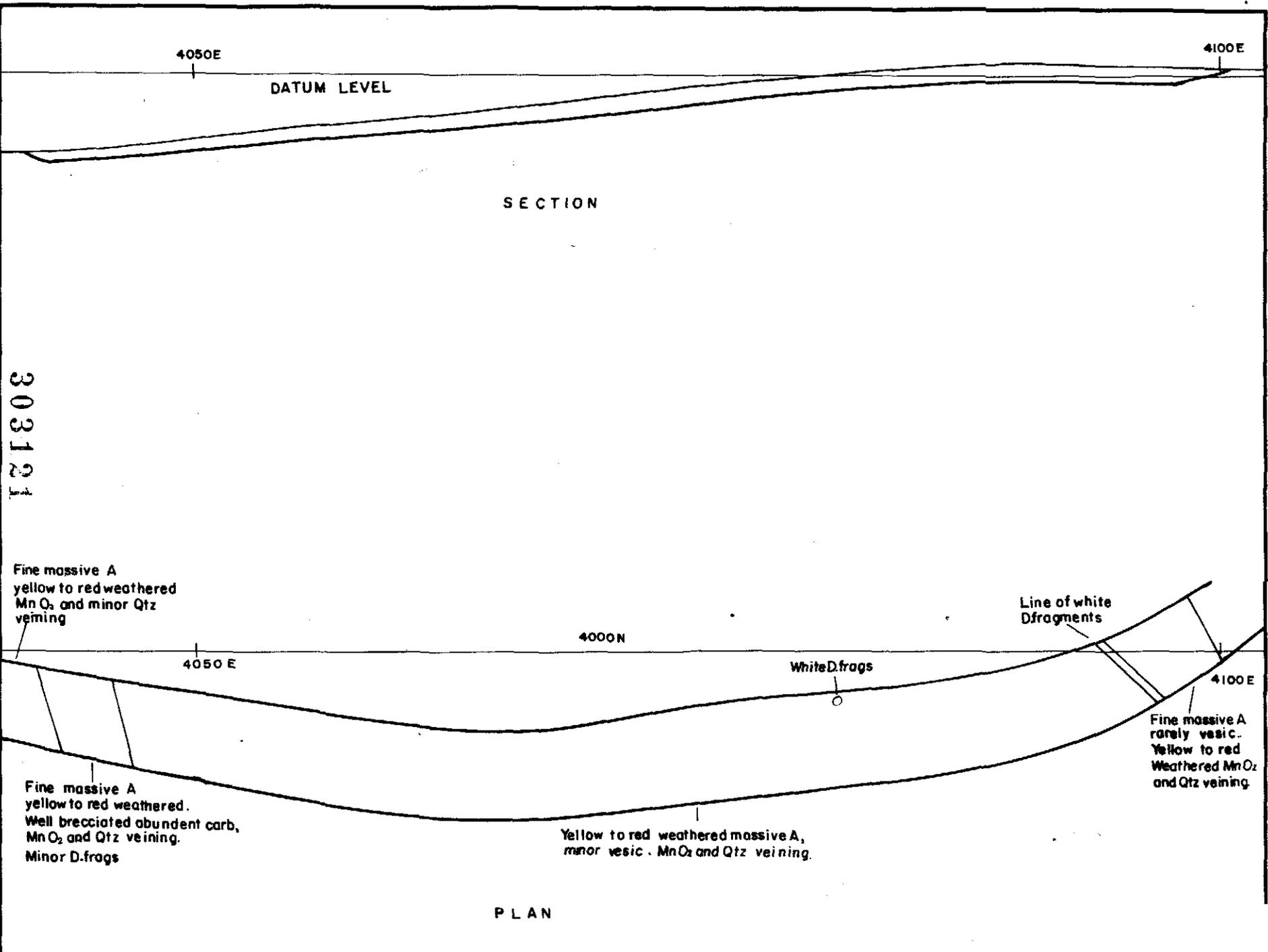
5 cm

Drawn: GOB
 Traced: JD
 Checked:
 Revised by: Date:

Abminco Exploration

NORTH WEST TASMANIA
 HATFIELD E.L.15/73
 Costean Line 4000N
 PLAN and SECTION

Location code: 77-1222
 Date: JULY 1977
 Scale: 1:250
 Plate No HT 23/4000



PLAN

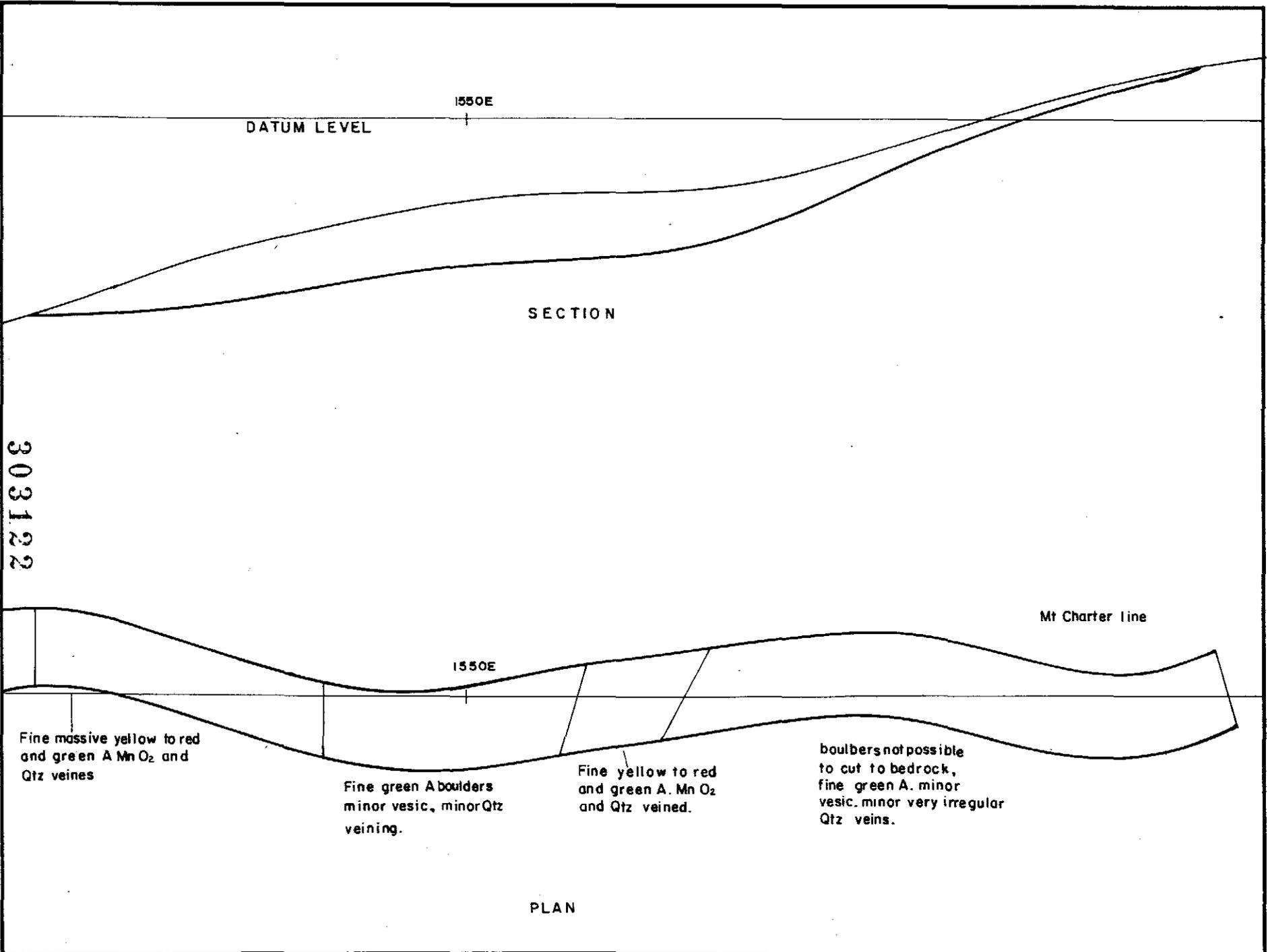
SECTION

5 cm

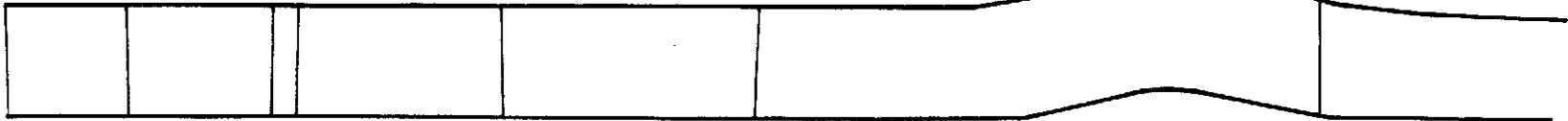
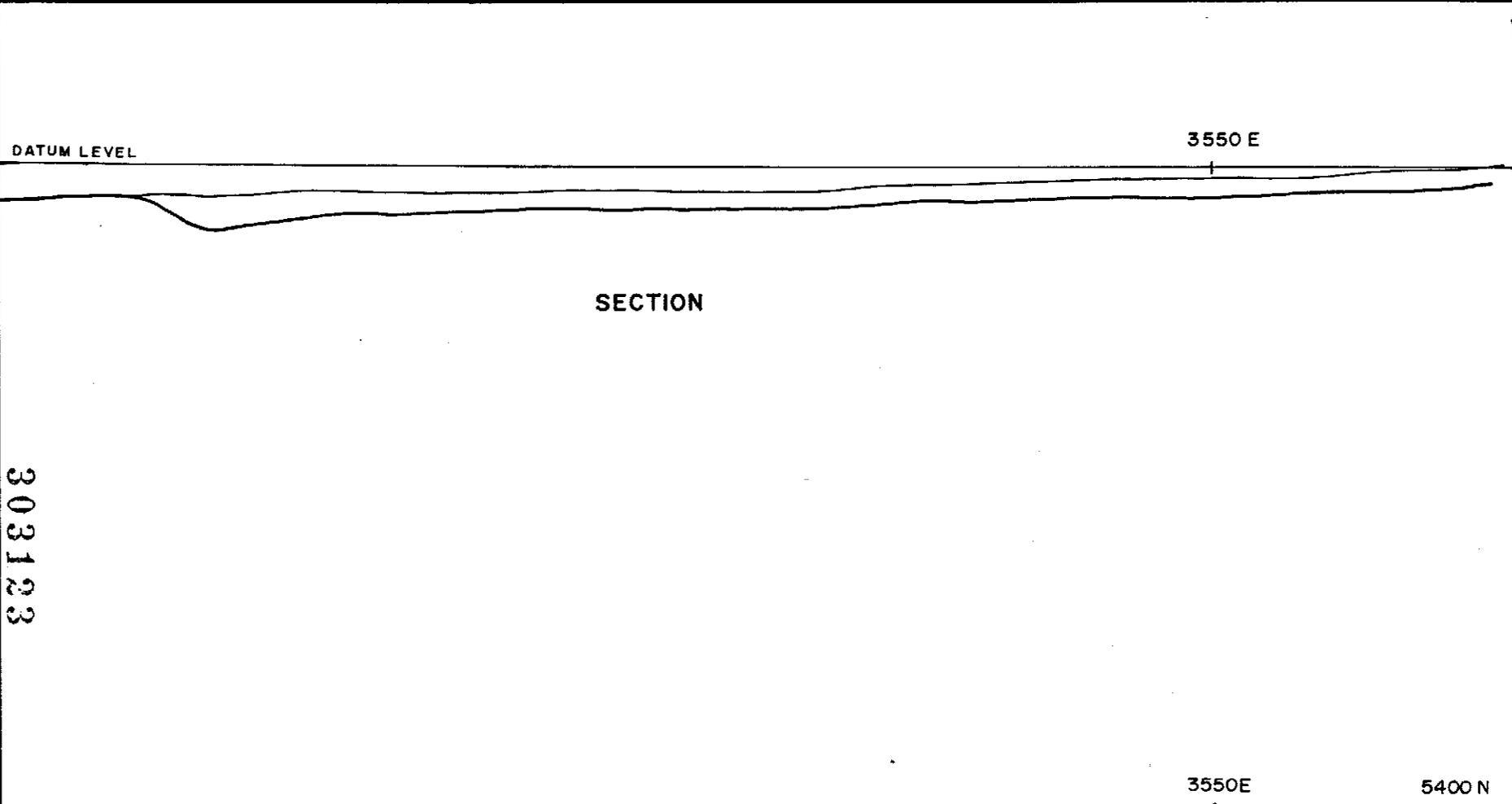
Drawn: GOB
 Traced: JD
 Checked:
 Revised by: Date:

Abminco Exploration
 NORTH WEST TASMANIA
 HATFIELD E.L.15/73
 Costean Line Mt Charter (4400N)
 PLAN and SECTION

Location code: 77-1002
 Date: JULY 1977
 Scale: 1:250
 Plate No: H T 23/4400



5 cm



soil	white, heavily iron oxide veined. sh.	iron oxide	yellow to green Afdxit, moderate to heavy carb. veining.	yellow to green Afdxit, minor carb. veining.	fine, yellow Afdxit, minor carbonate veining.
------	---------------------------------------	------------	--	--	---

Abminco Exploration

Drawn: G.O.B.
 Traced: A.E.R.
 Checked:
 Revised by: Date:

NORTH WESTERN TASMANIA
 HATFIELD E.L.15/73
 Costean Line 5400 N
 PLAN and SECTION

Location code: *77-122a*
 Date: July 1977
 Scale: 1 : 250
 Plate No: Hat 23/5400a

112

5 cm

3600E

3550 E

DATUM LEVEL

SECTION

3600E

3550

5400 N

PLAN

green Ardsh, light to heavy carb. veining

303124



Abminco Exploration

77-1222

Drawn: G.O.B.
Traced: A.E.R.
Checked:
Revised by: Date:

NORTH WESTERN TASMANIA
HATFIELD E.L.15/73
Costean Line 5400 N
PLAN and SECTION

Location code:
Date: July 1977
Scale: 1:250
Plate No Hat 23/5400b

5 cm

Abminco Exploration

77-1222

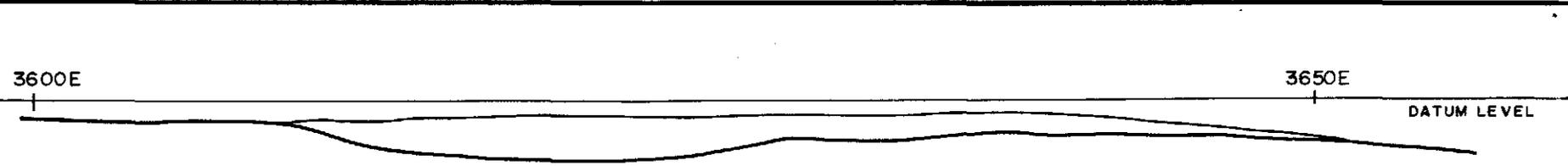
Abminco Exploration

GOB
A.E.R.

GOB
A.E.R.

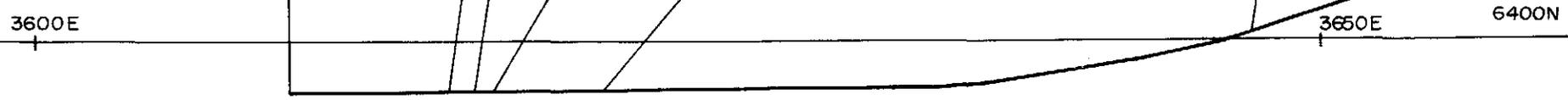
NORTH WESTERN TASMANIA
HATFIELD E.L.15/73
Costean Line 6400 N
PLAN and SECTION

Location code:
Date: July 1977
Scale: 1 : 250
Plate No Hat 23/6400



SECTION

303123



PLAN

white clay with green A frags. possibly A/sh breccia

yellow, Afdxt, brecciated carb, MnO₂ veined

yellow clay rare Afdxt boulders

white clay

fine massive black sh. some bleached white or weathered to white clay and iron oxide.

fine A, weathered yellow, possibly, brecciated. white D frags. up to 10cm, locally to 5% Light to moderate carb. and MnO₂ veining

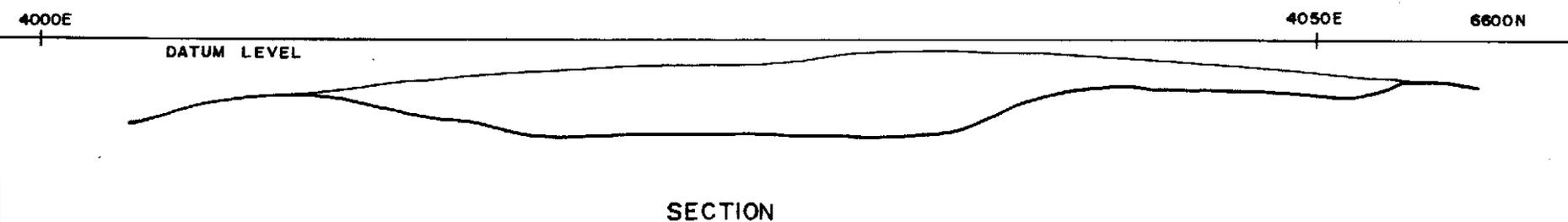
5 cm

Drawn: G.O.B
 Traced: A.E.R
 Checked:
 Revised by: Date

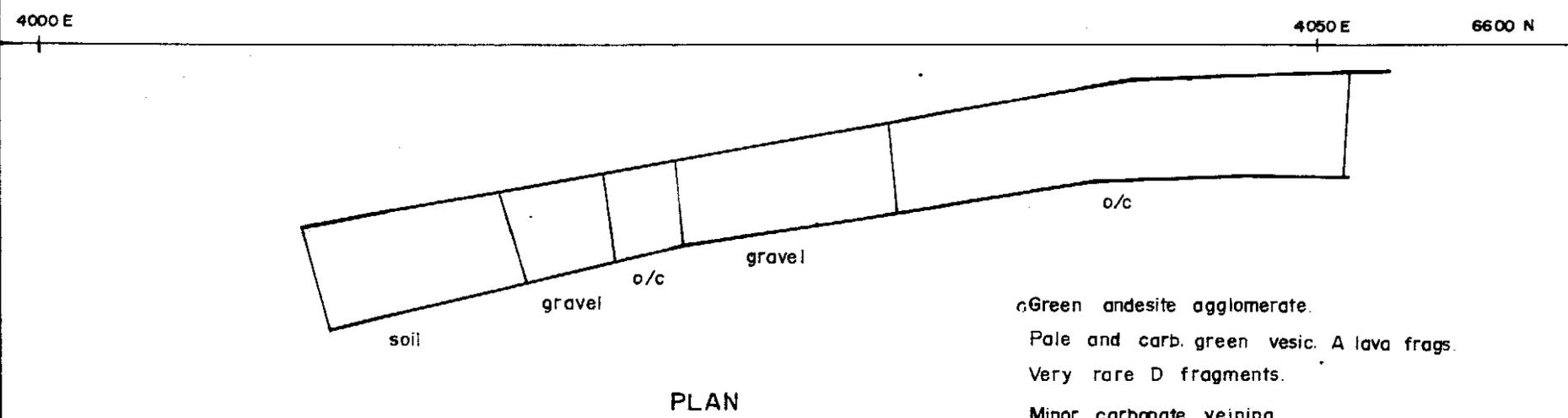
Abminco Exploration

NORTH WESTERN TASMANIA
HATFIELD E.L.15/73
 Costean Line 6600 N
 PLAN and SECTION

Location code: 77-1222
 Date: July 1977
 Scale: 1 : 250
 Plate No Hat 23/6600



303126



oGreen andesite agglomerate.
 Pale and carb. green vesic. A lava frags.
 Very rare D fragments.
 Minor carbonate veining.

5 cm

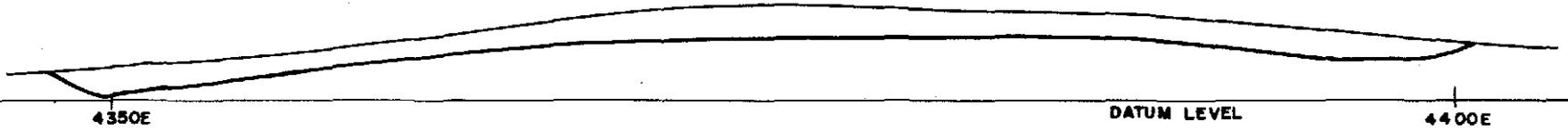
Drawn: GOB
 Traced: JD
 Checked:
 Revised by:
 Date:

Abminco Exploration

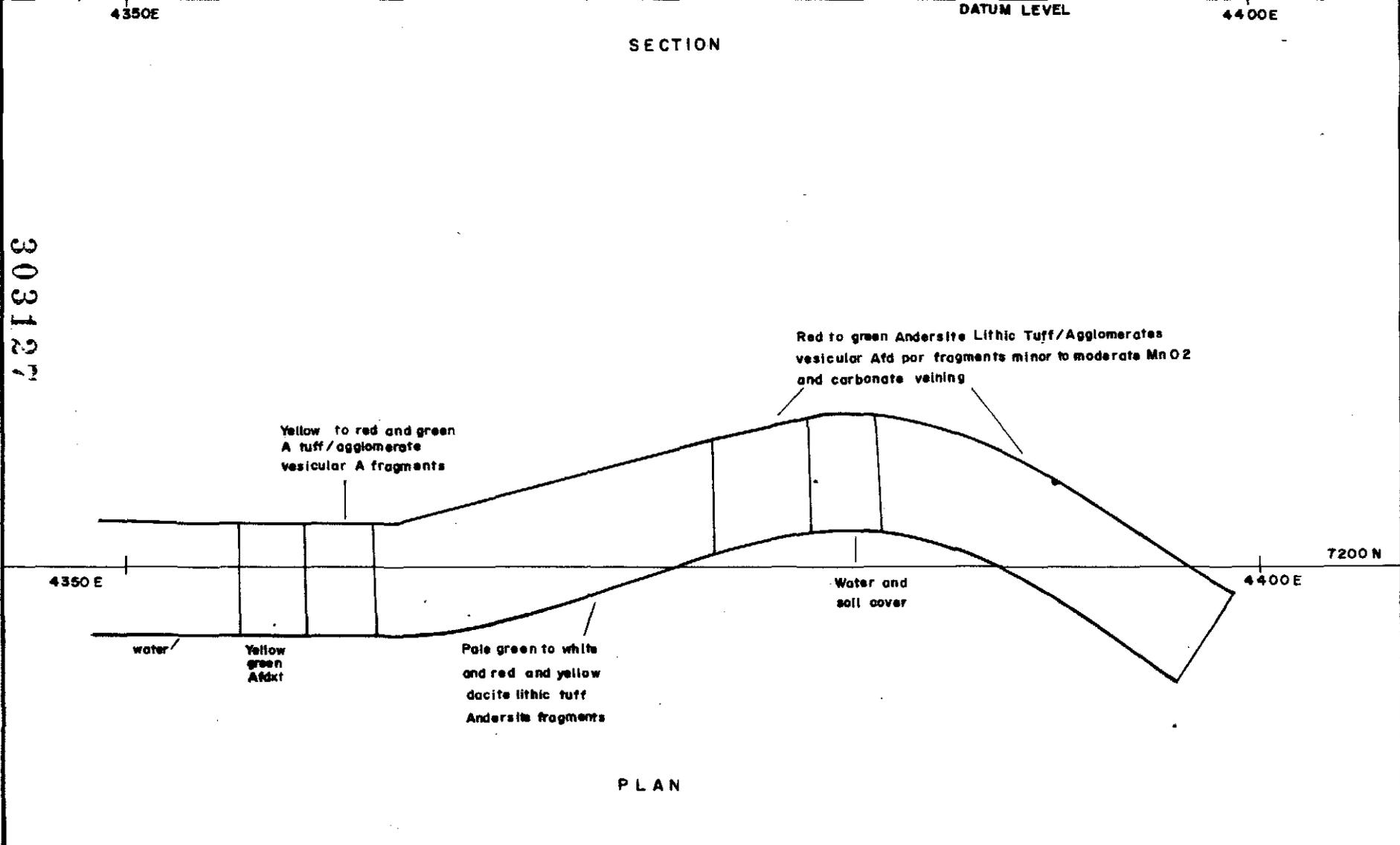
NORTH WEST TASMANIA
 HATFIELD E.L.15/73
 Costean Line 7200 N
 PLAN and SECTION

Location code:
 Date: JULY 1977
 Scale: 1:250
 Plate No HT 23 / 7200 N

303127



SECTION



PLAN

77-1222

3300E

3350E

3400E

3450E

3500E

3550E

3600E

0

0

50m

50m

100m

100m

150m

150m

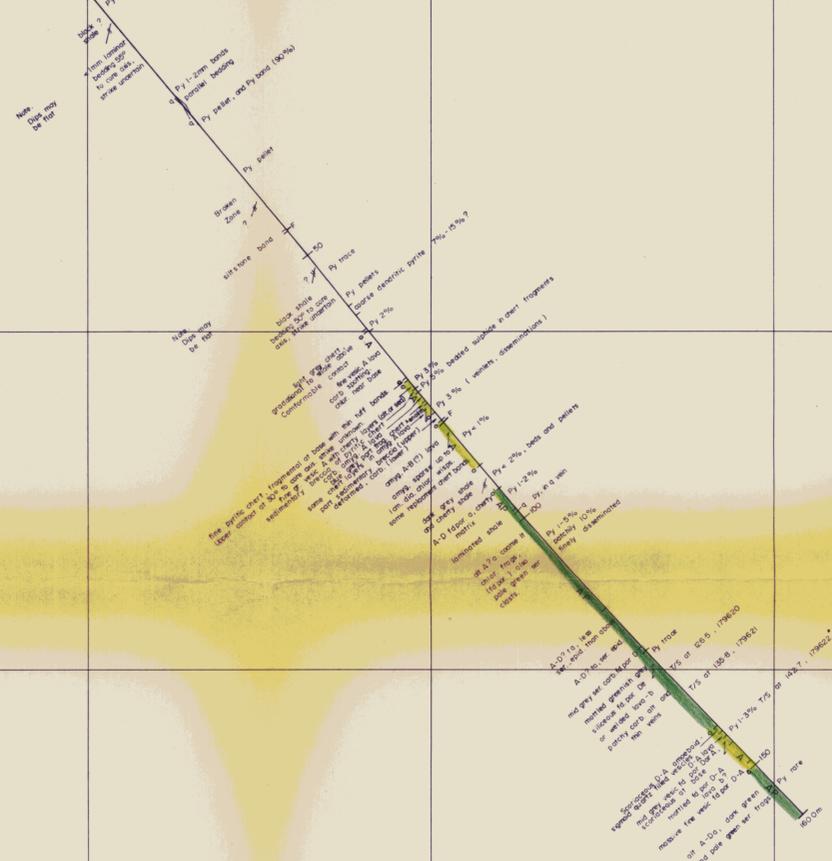
200m

200m

No outcrop at surface

No outcrop at surface

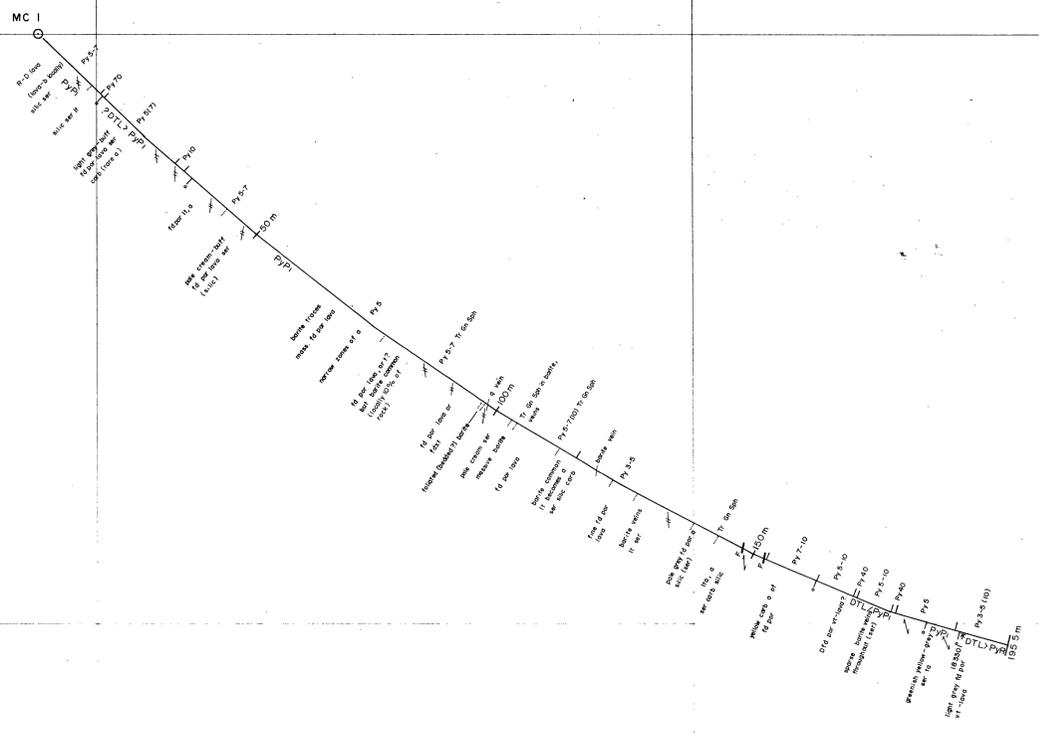
H



303128



Drawn by E.H.S.		Traced by R.J.E.		ABMINCO N.L. 77-1222	
Checked by CHY/JD MAY 77				NORTH WEST TASMANIA	
				HATFIELD E.L.15/73	
				SECTION 6200N 011	
Location code: K55/6/44		Scale: 1:500		Date: November, 1976	
				Plate: HT 17	



NB Colar elevation above Sea Level not available.



303130

COMINCO EXPLORATION PTY. LTD.

Drawn by: E.H.S.	Traced by: J.I.H.	NORTH WEST TASMANIA HATFIELD RIVER EL 15/73 MT. CHARTER AREA SECTION 4800N	013
Checked by:			
Location code: K55/6/44	Scale: 1:500	Date: MAY 1976	Plate: MT 1/48

SOLO GEOPHYSICS AND CO.

INDUCED POLARIZATION & RESISTIVITY SURVEY

CLIENT ABMINCO N.L.
 AREA QUE RIVER
 GRID
 LINE 7400 N
 ARRAY DIPOLE - DIPOLE
 DIPOLE SPREAD 25 METRES
 FREQUENCIES 0.3 + 2.5 HZ
 TRANSMITTER TYPE McPHAR P660
 RECEIVER TYPE McPHAR P660
 ELECTRODE TYPE SINGLE FOIL

SURVEYOR STEVE BRONSKILL
 DATE OF SURVEY 19.1.76
 PLOTTED BY NIC LIMB

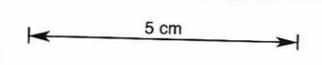
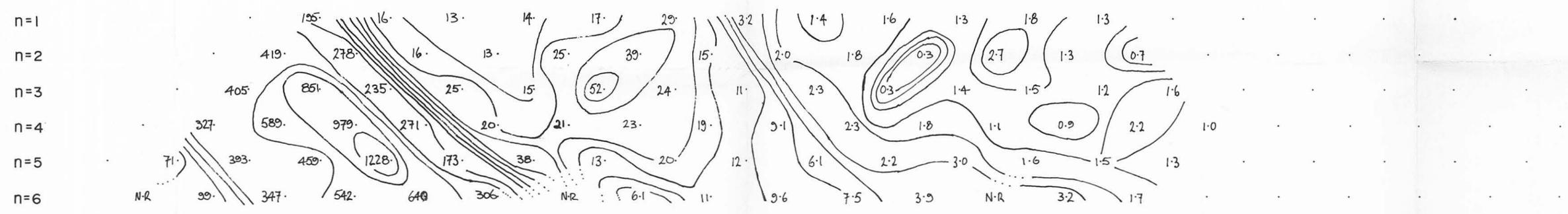
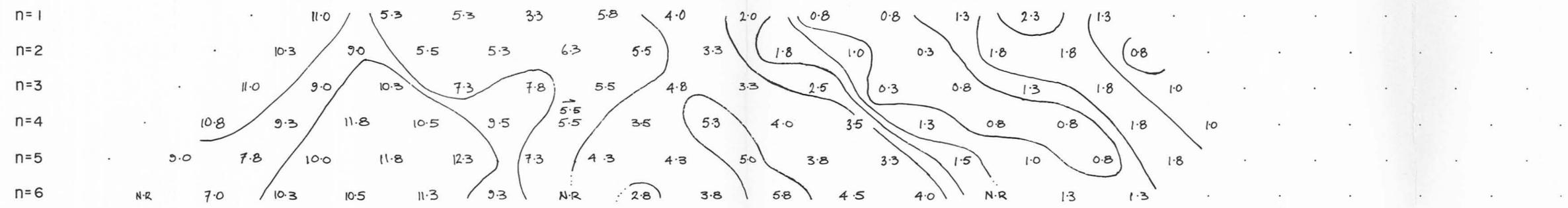
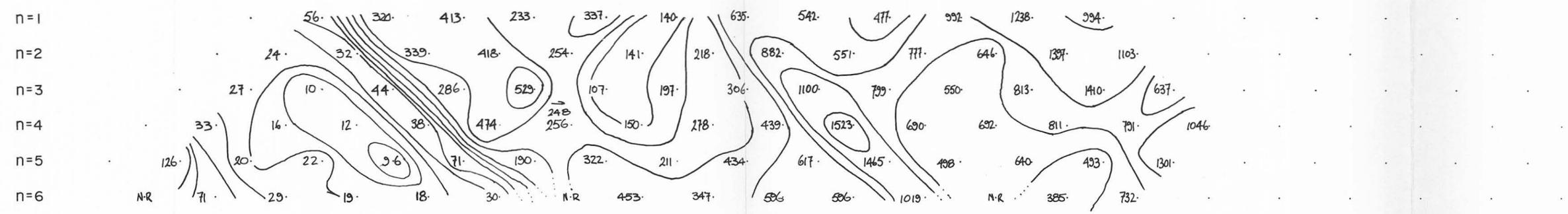
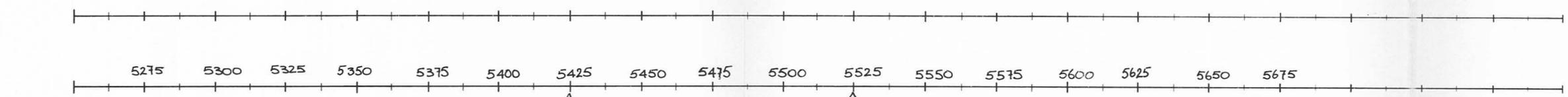
COMMENTS

Culture Plan

Apparent Resistivity (ohm-m)

Percentage Frequency Effect

Metal Factor



SOLO GEOPHYSICS AND CO.

INDUCED POLARIZATION & RESISTIVITY SURVEY

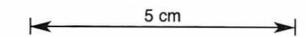
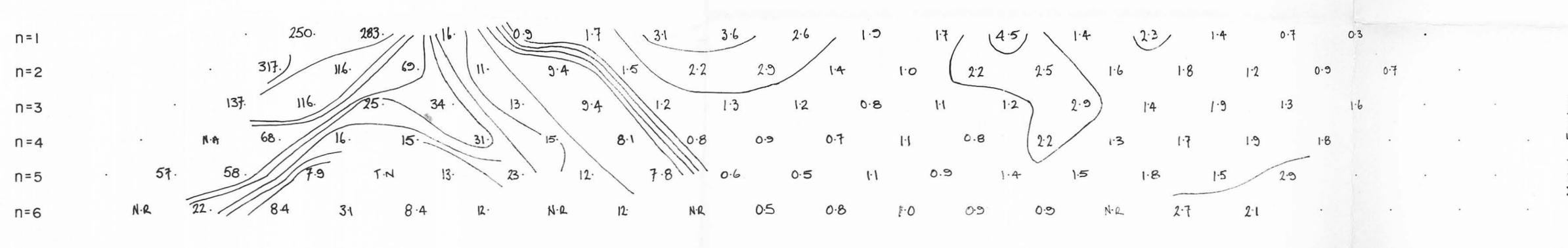
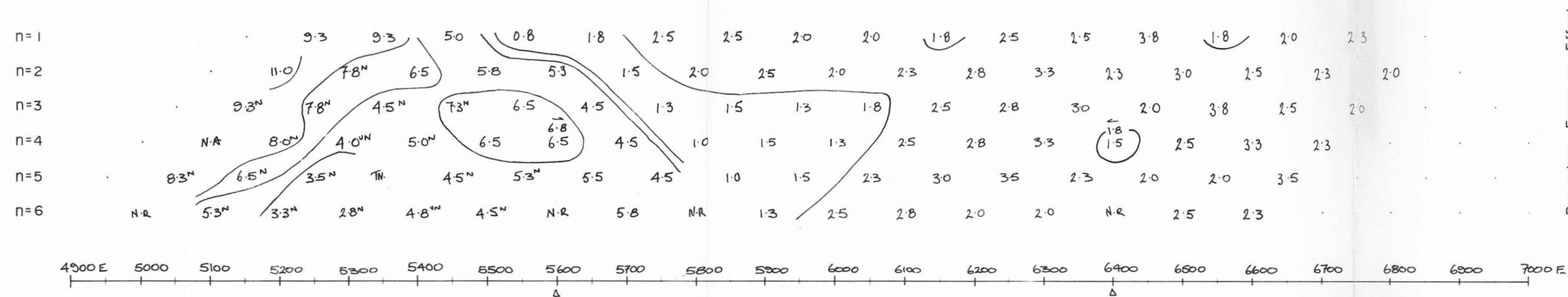
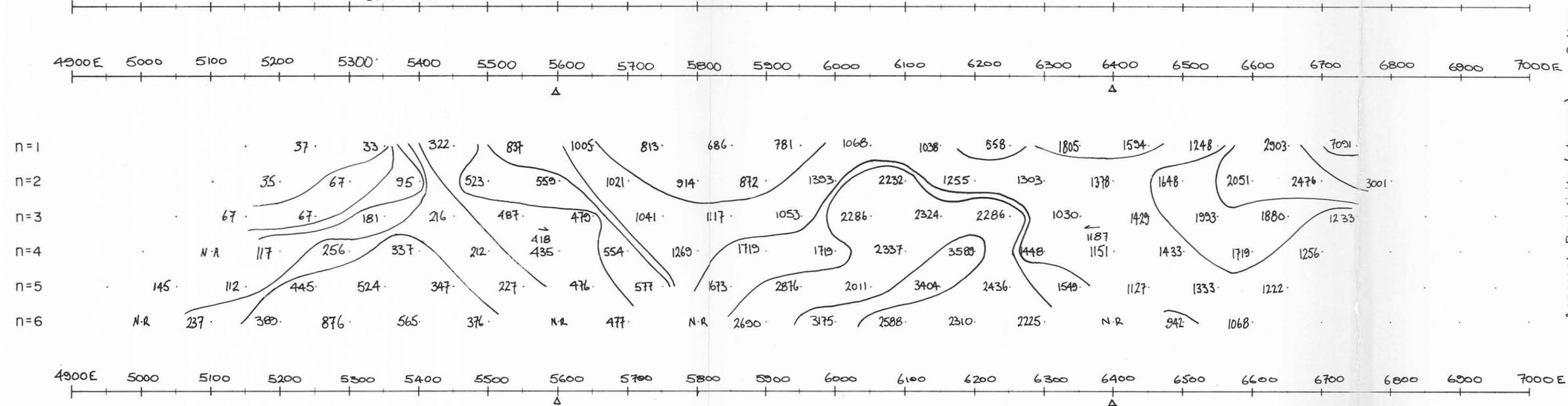
CLIENT ABMINCO N.L.
 AREA QUE RIVER
 GRID
 LINE 7400 N
 ARRAY DIPOLE - DIPOLE
 DIPOLE SPREAD 100 METRES
 FREQUENCIES 0.3 + 2.5 Hz
 TRANSMITTER TYPE McPHAR P660
 RECEIVER TYPE McPHAR P660
 ELECTRODE TYPE SINGLE FOIL

SURVEYOR STEVE BRONSKILL
 DATE OF SURVEY 9+10.2.77.
 PLOTTED BY Nic LIMB

COMMENTS

Culture Plan
 Apparent Resistivity (ohm-m)
 Percentage Frequency Effect
 Metal Factor

DRILL HOLES COMMON IN THIS AREA



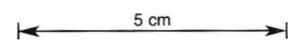
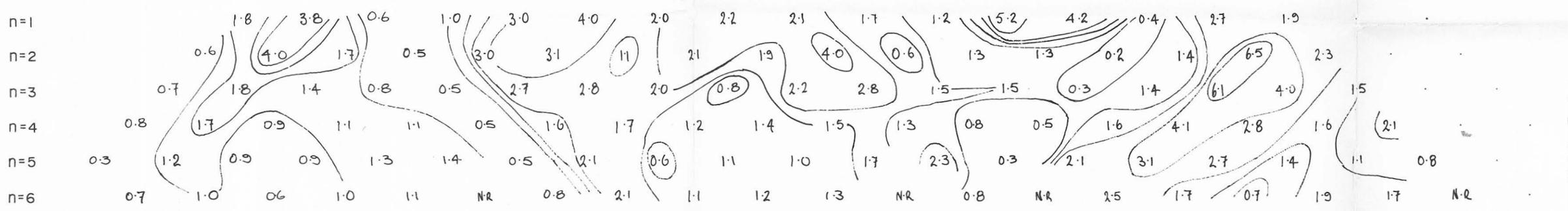
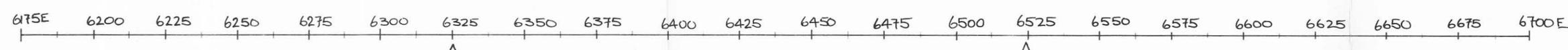
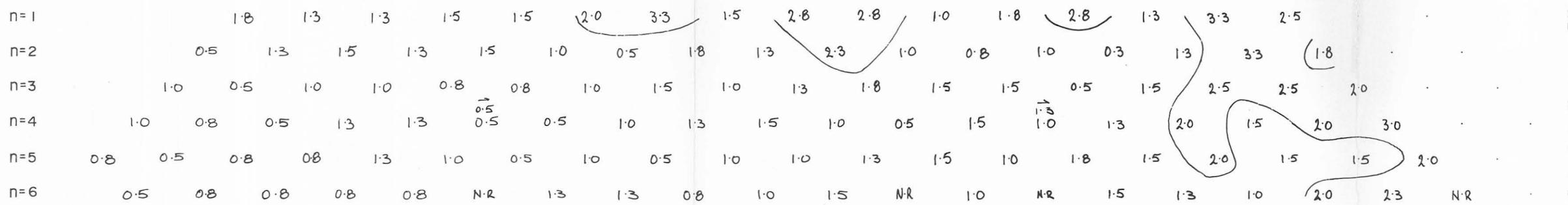
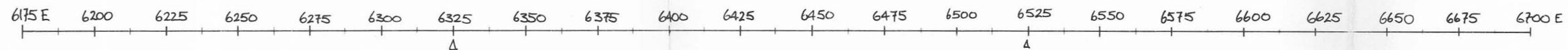
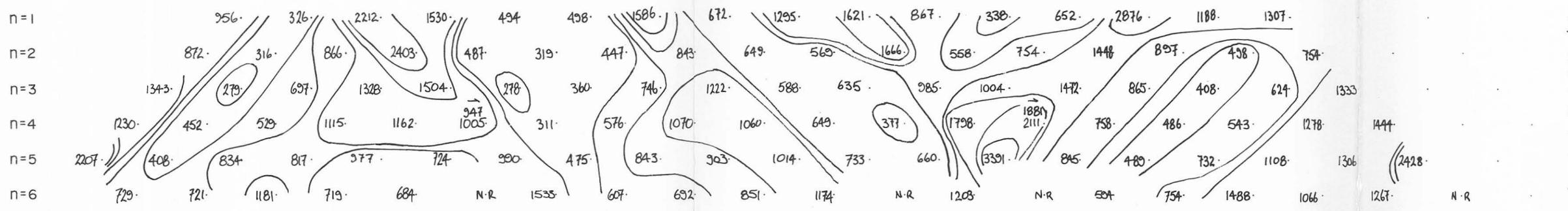
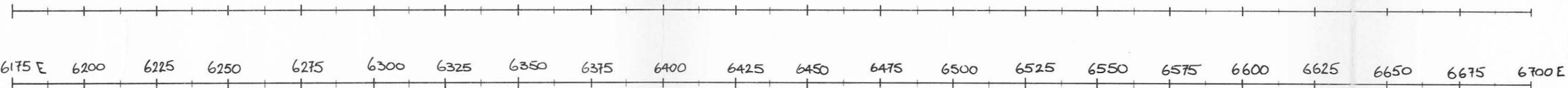
SOLO GEOPHYSICS AND CO.

INDUCED POLARIZATION & RESISTIVITY SURVEY

CLIENT ABMINCO N.L.
 AREA QUE RIVER
 GRID
 LINE 8600 N
 ARRAY DIPOLE DIPOLE
 DIPOLE SPREAD 25 METRES
 FREQUENCIES 0.3 + 2.5 Hz
 TRANSMITTER TYPE McPHAR P660
 RECEIVER TYPE McPHAR P660
 ELECTRODE TYPE SINGLE FOIL

SURVEYOR STEVE BRONSKILL
 DATE OF SURVEY 1/2 + 2/2/77
 PLOTTED BY NIC LIMB

COMMENTS



Culture Plan

Apparent Resistivity (ohm-m)

Percentage Frequency Effect

Metal Factor

SOLO GEOPHYSICS AND CO.

INDUCED POLARIZATION & RESISTIVITY SURVEY

Culture Plan

Apparent Resistivity (ohm-m)

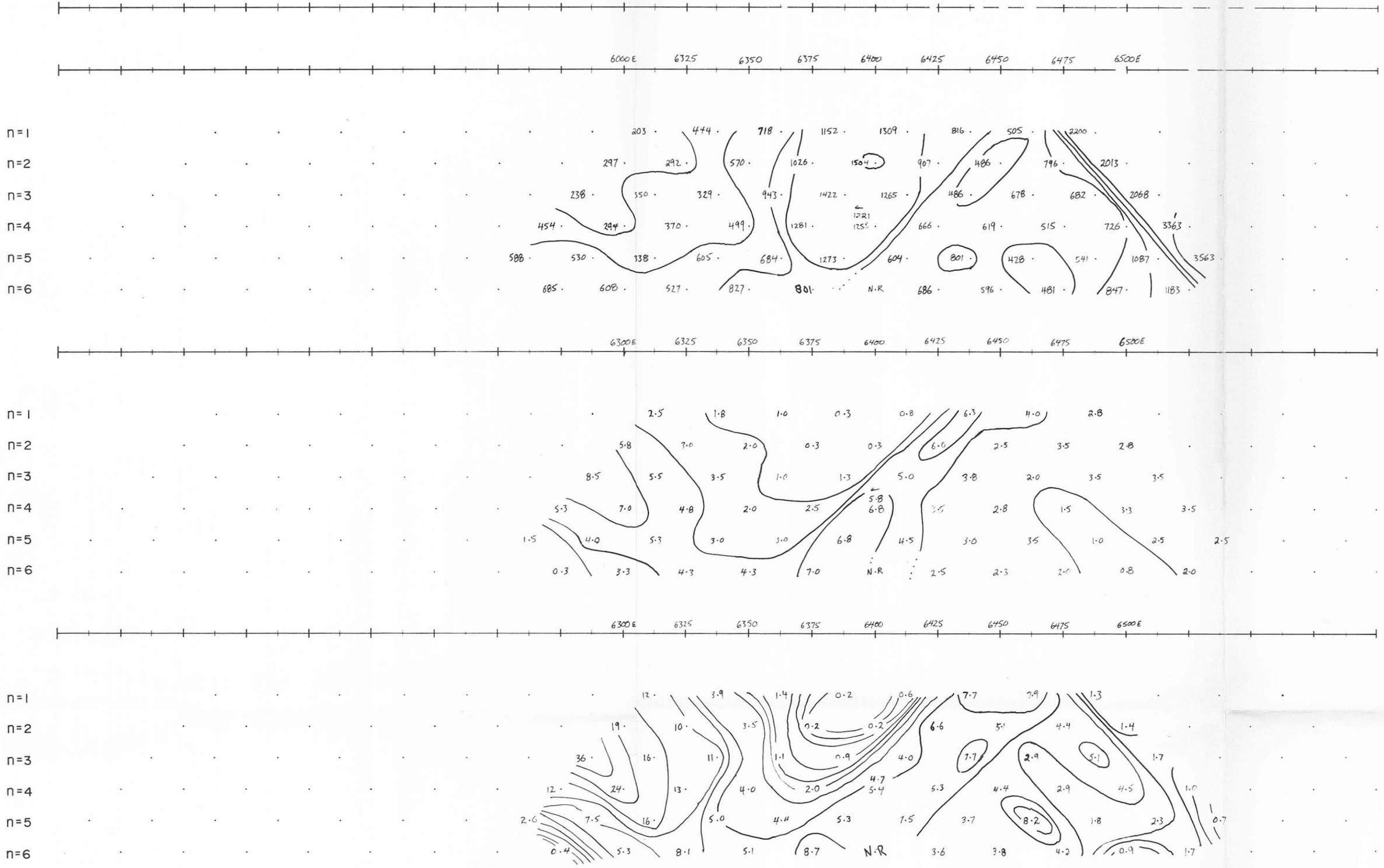
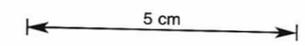
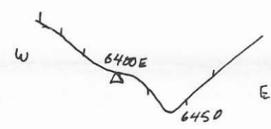
Percentage Frequency Effect

Metal Factor

CLIENT ABMINCO N.L.
 AREA QUE RIVER
 GRID
 LINE 10,000 N
 ARRAY DIPOLE-DIPOLE
 DIPOLE SPREAD 25 m
 FREQUENCIES 0.3 / 2.5 Hz
 TRANSMITTER TYPE M'Phar P660
 RECEIVER TYPE M'Phar P660
 ELECTRODE TYPE Alfoil

SURVEYOR S. BRONSKILL
 DATE OF SURVEY 3/2/77
 PLOTTED BY S.B.

COMMENTS



SOLO GEOPHYSICS AND CO.

INDUCED POLARIZATION & RESISTIVITY SURVEY

CLIENT ABMINCO N.L.
 AREA QUE RIVER
 GRID
 LINE 10600N
 ARRAY DIPOLE - DIPOLE
 DIPOLE SPREAD 50 METRES
 FREQUENCIES 0.3 + 2.5 Hz
 TRANSMITTER TYPE M^c PHAR P660
 RECEIVER TYPE M^c PHAR P660
 ELECTRODE TYPE SINGLE FOIL

SURVEYOR STEVE BRONSKILL
 DATE OF SURVEY 12.2.77
 PLOTTED BY NIK LIMB

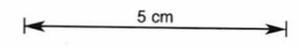
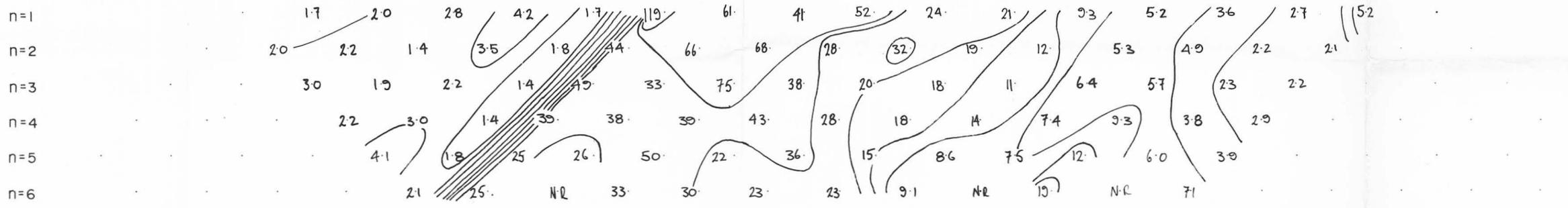
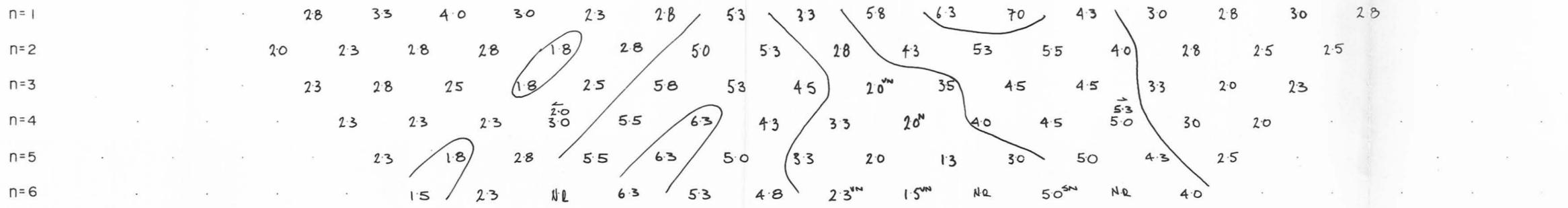
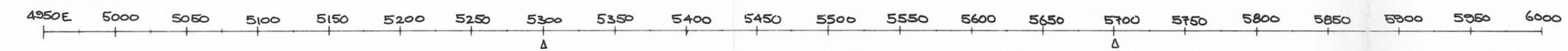
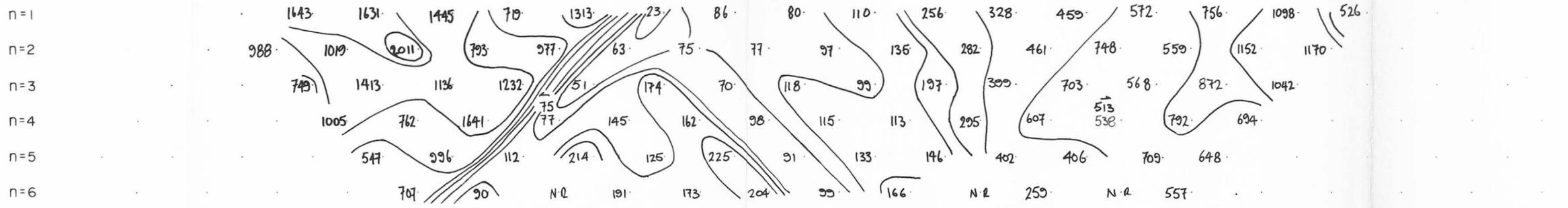
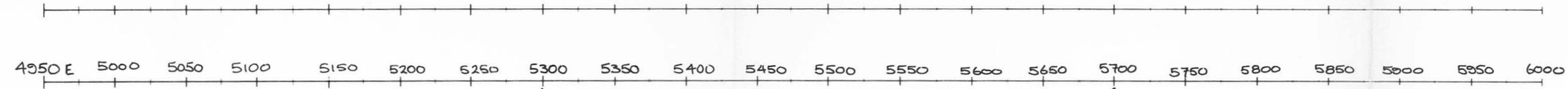
COMMENTS

Culture Plan

Apparent Resistivity (ohm-m)

Percentage Frequency Effect

Metal Factor



SOLO GEOPHYSICS AND CO.

INDUCED POLARIZATION & RESISTIVITY SURVEY

CLIENT *ABMINCO N.L.*

AREA *QUE RIVER.*

GRID

LINE *10,800 N*

ARRAY *DIPOLE-DIPOLE*

DIPOLE SPREAD *50 m*

FREQUENCIES *0.3/2.5 Hz*

TRANSMITTER TYPE *M'Phar P660*

RECEIVER TYPE *M'Phar P660*

ELECTRODE TYPE *Alfoi*

SURVEYOR *S. BRONSKILL*

DATE OF SURVEY *12/2/77*

PLOTTED BY *S.B.*

COMMENTS

Culture Plan

Apparent Resistivity (ohm-m)

Percentage Frequency Effect

Metal Factor

