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PASMINCO EXPLORATION

TULLAH EL 22/90 & STERLING RIVER EL 24/91 ANNUAL REPORT

OCTOBER 1992 - SEPTEMBER 1993
volume 1 of 2

TRANSPARENCIES HELD

93-3504.

LOCATED DATA TAPES HELD

AUTHOR: JG Purvis
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DATE: September 1993

REPORT No.: T93-12

SUBMITTED TO: Regional Exploration Manager - Tasmania

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- Melbourne
- Rosebery

Department of Mineral Resources- Tasmania

MINES EL22/90
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SUBMITTED BY: J.G. Purvis

ACCEPTED BY: Kerry Fitzgerald

Burnie
September 1993

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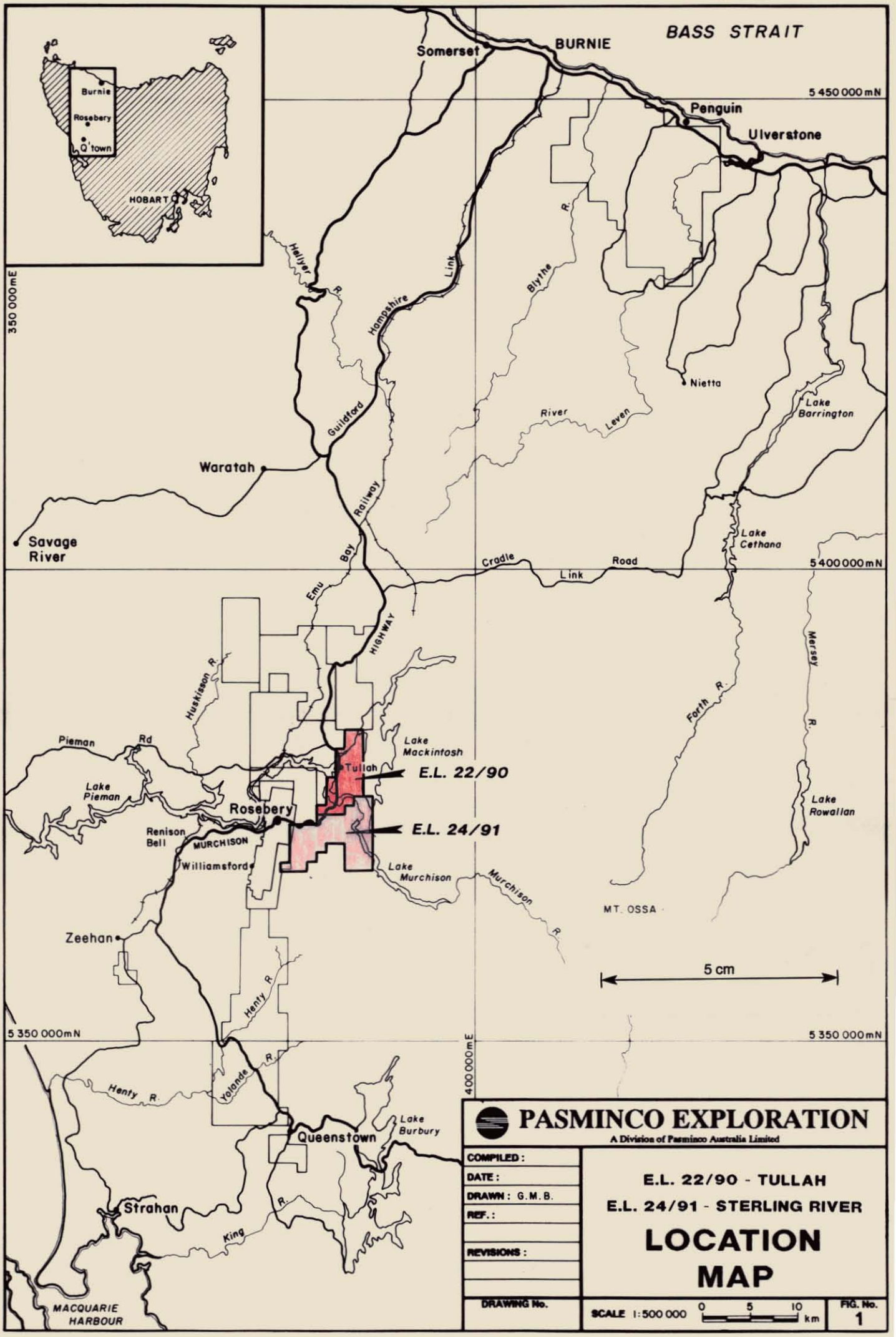
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COMPILED:
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E.L. 22/90 - TULLAH
E.L. 24/91 - STERLING RIVER

LOCATION MAP

SCALE 1:500 000 0 5 10 km

FIG. No. 1

1 SUMMARY

Highlights of the 1992–93 exploration programme on Tullah / Sterling River included the discovery of small basemetal massive sulphide boudins assaying 15.7% Zn, in the Farrell Slates near Mackintosh Dam. Drilling of this occurrence is recommended.

The evaluation of the old Murchison Mine was completed, and included the drilling of hole MM1a to 400.7m beneath the lode and the dewatering of the workings below 3 Level by Mancala P/L.

Results were disappointing in that MM1a was barren and a large unrecorded stope was found under 3 Level, but the indicated remaining resource is at least 12,000t grading around 15% Zn, 10% Pb, 350g/t Ag and 2g/t Au. Past production is estimated at about 25,000t.

Potentially, the Murchison Mine resource could be much larger than 12,000t, and the 400t/vertical metre ore capacity in the known lode augmented by the possibility of major new adjacent lodes. Attempts should be made to interest another small mining group in the resource with a view to providing additional ore feed to Pasminco's Rosebery Mine.

A downhole EM anomaly detected in MM1a appears due to a previously–drilled sulphide zone in the Farrell Slates 150m west of the hole collar. Further EM surveying is required to confirm this interpretation.

Hole MM1a confirmed the stratigraphic basis for targeting the Farrell Slates / Murchison Volcanics contact zone, but intersected a major unmapped fault in this position, which has as yet unknown implications for the perceived prospectivity of this zone.

Large aeromagnetic and gravity surveys were carried out on the EL's during the year. The former involved complete coverage of the Sterling River EL and in–fill on the Tullah EL, with low–level, high–resolution, helicopter–borne aeromagnetics and radiometrics. The gravity survey involved measuring 537 stations at a nominal spacing of 500m x 200m. Results from both these surveys are currently being processed and assessed.

Compilation of old drillhole data continued, with survey details for 67 out of 100 holes, and geochemical data for 55 holes, entered in the computer database. In 1993–94 it is recommended this compilation be given priority so that geological interpretations based on it are available to be integrated with the gravity and magnetic results. It is anticipated this work will provide targets for drilling in the second half of 1993–94.

2 INTRODUCTION

This report details the results of exploration on the 27 km^2 Tullah EL 22/90 and the contiguous 48 km^2 Sterling River EL 24/91, in the year to September 1993. Recommendations are made for the future direction of the programme.

The two licences cover units of the Cambrian Mt Read Volcanics along the Henty Fault in Western Tasmania (see Figure 3). The Henty Fault is considered to be highly prospective as most of the extensive known mineralization on the EL areas is spatially related to it. Because of their geological similarity, exploration on both EL's is conducted as one project with the principal objective of finding auriferous basemetal deposits.

The Tullah-Sterling River area has a long history of previous mining (mainly for Pb-Ag), and is one of the most heavily explored parts of the Mt Read Volcanics (see Lorrigan, 1991). There is an enormous amount of old data, particularly from the 178 identified diamond drillholes (100 surface, 78 underground), and the extensive geophysical surveys.

Much of the Tullah EL has good access apart from the rugged Farrell Range which occupies the eastern 40% of this EL. The Sterling River EL is very rugged, largely forested and has difficult access, except for the HEC's Anthony Road and associated works areas in the eastern part of the EL.

Work carried out in 1992-93 included:

* Drilling of hole MMIa (400.7m) under the old Murchison Mine.
* Downhole DHEM survey of MM1a.
* Evaluation of Murchison Mine, including relogging of old drill core, mapping / sampling of surface and underground workings, and dewatering below 3 Level (by Mancala Pty Ltd).
* Gravity survey of both EL's (537 stations, 500x200m nominal spacing).
* Helicopter-borne low-level high-resolution aeromagnetic/radiometric survey over Sterling River EL and in-fill aeromagnetics/radiometrics over Tullah EL.
* Geological mapping and rock chip sampling in selected areas.
* Continued evaluation and computer processing of old exploration data, particularly that from previous drilling.
* Colour aerial photography and compilation of computer-generated detailed topographic base plans, over the Sterling River EL.

3 TENURE

Tenure details for the Tullah and Sterling River licences are shown in Figure 2.

The Tullah EL 22/90 covers 27 km^2, extending along 10km of the Henty Fault to the NNE and SSW of Tullah Township in Western Tasmania. A total area of 5.15 km^2 has been excluded from the EL, including 3.4 km^2 of land vested in the HEC and 1.45 km^2 of Mine Leases held by Pasminco Mining (the old Farrell mines).

The original Tullah EL application was made in August 1990 by Peko Exploration Limited – a subsidiary of North Broken Hill Limited. In September 1990 Pasminco Australia Limited (of which NBH then owned 45%), came to an agreement with Peko whereby the licence application was transferred to Pasminco. The EL was granted on 20th October 1990.

The Tullah EL comprises:

58% Crown Land
40% Land vested in the HEC
2% Private Property

About 5% of the EL area is covered by the Mt Murchison RAP (Recommended Area For Protection).

In November 1992, Mancala Pty Ltd (F.W.Lannen & Associates), applied for a depth-limited Mineral Lease covering 17.5 ha over the old Murchison Mine. The application, which had the approval of Pasminco Exploration, was withdrawn in January 1993 following negative results from Mancala's examination of the old workings.

The Sterling River EL 24/91 (100% Pasminco Exploration), covers 48 km^2 to the west, north and east of Mt Murchison, extending 7km along the Henty Fault from the southern boundary of the Tullah EL. Sterling River was originally applied for as 42 km^2 in August 1991, but a further 6 km^2 to the southeast of Mt Murchison was added to the original application in October 1991. The EL was granted on 10th January 1992.

A total of 6.9 km^2 has been excluded from the Sterling River EL, comprising 2.6 km^2 of land vested in the HEC, 3.5 km^2 of Mine Leases held by Pasminco Mining. These areas are shown on Figure 2.

Sterling River largely comprises Crown Land. Just over 75% is covered by the Mt Murchison RAP.

In May 1992, the Division of Mines approved the rationalisation of the reporting and renewal dates for both the Tullah and Sterling River licences. The annual renewal date for both EL's is now 19th October.

KEY

- HEC Vested Land – excluded from E.L.
- HEC Vested Land – included in E.L.
- RAP – Recommended Area for Protection
- Private Freehold Land
- Crown Reserve
- Deferred Forest
- Multiple Use Forest
- Mine Lease
- Nomination for National Estate
- Unallocated Crown Land (within EL only)

NOMINATION FOR NATIONAL ESTATE

MT. MURCHISON RAP

E.L. 22/90

E.L. 12/88

E.L. 37/89

E.L. 24/91

ROSEBERY MINE LEASE

MINE LEASE EXT.

5 380 000mN

5 375 000mN

5 370 000mN

5 365 000mN

380 000mE

385 000mE

ROSEBERY MINE

HERCULES MINE

TULLAH

ROSEBERY

LAKE

LAKE MACKINTOSH

MT. SALE

MT. BLACK

MT. FARRELL

MT. MURCHISON

MT. READ

New North Mt. Farrell 1106SM

North Mt. Farrell

Murchison Mine

63M/80

1M/55

2M/55

74/M16

Rosebery Lodes

Koonya

Dalmeny

Lake Bull

Emu Bay Railway

HEC Transmission Lines

MURCHISON HIGHWAY

Farm Ck

Pieman Road

Mackintosh Dam Road

Murchison Road

Anthony Road

Sterling River

Stitt River

Ring River

Williamsford Road

Mt. Read Road

5 cm

NOTE – The Land Tenure is only shown within E.L. 22/90 and E.L. 24/91

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COMPILED : G.M.B.	E.L. 22/90 – TULLAH
DATE : Sept., 1993	E.L. 24/91 – STERLING RIVER
DRAWN :	**LAND TENURE**
REFERENCE :	
REVISIONS :	
DRAWING No. TSRLTEN	SCALE 1:50,000 (500 0 500 m)
	FIG. No. 2

971011

4 EXPENDITURE

Expenditure on **Tullah EL 22/90** in the 12 months from 1st September 1992 to 31st August 1993, was **$165 765.** Total expenditure on the EL since its granting in October 1990 is **$265 137.**

Expenditure on the **Sterling River EL 24/91** from 1st September 1992 to 31st August 1993, was **$156 790.** Total expenditure on the EL since initial granting in January 1992 is **$195 126.**

Details of the 1992–93 expenditure on both EL's is as follows:

	Tullah EL	**Sterling River EL**
Personnel	18,974	15 219
Travel & Accommodation	1 695	1 839
Geological Consultants	21 385	14 638
Geochemical Consultants & Assays	2 959	0
Geophysical Consultants	1 890	1 750
Geophysical Surveys	34 875	45 590
Track Cutting & Gridding	10 747	13 257
Photogrammetry	0	15 594
Other Consultants & Contractors	3 040	9 006
Drilling	33 821	5 574
Stores & Supplies	1 540	2 035
Vehicles, Plant & Equipment	3 358	2 313
Tenement Rentals	635	1 977
Computing	2 176	3 308
Office Expenses	13 600	10 436
Administration Fee	15 070	14 254
TOTAL	**$165 765**	**$156 790**

Admin. Fee @ 10%

5 GENERAL GEOLOGY

The Tullah and Sterling River licences cover units of the highly prospective Cambrian Mt Read Volcanics and associated sediments, extending along a 16km length of the Henty Fault. The Henty Fault is a major NNE–SSW trending and steeply west–dipping structure located towards the eastern margin of the volcanic belt. See Figures 3 & 4.

Within the EL's the volcanics range from rhyolitic to basaltic in composition but are generally dacitic. They include lavas, intrusives, pyroclastics and volcanomict epiclastics, the latter incorporating a large unit of black shales and bedded sandstones – the Farrell Slates.

West of the Henty Fault the volcanics are dominated by lavas and subvolcanic intrusives, in the dacitic Mt Black Volcanics and a large mafic wedge immediately west of the fault in the Sterling Valley.

East of the Henty Fault there is an extensive unit of west–facing and west–dipping volcanomict sediments – the Farrell Slates. East of this the rhyodacitic Murchison Volcanics include epiclastics and lavas, intruded by the Cambrian Murchison Granite and unconformably overlain by Ordovician Owen Conglomerate. The Murchison Volcanics are extensively hydrothermally altered, particularly in the vicinity of the Murchison Granite.

The area is extensively underlain by Devonian granite, which is shallowest along a buried NE–trending crest passing beneath the northern part of the Sterling Valley and Murchison Mine, where it is thought to be about 1.5–2km below surface (Leaman, pers comm 1992). The effects of the buried granite are evident in both alteration and mineralization styles in the overlying volcanics. The granite outcrops at Granite Tor, 4km east of the EL areas.

Lead, zinc, copper, silver, gold, arsenic, tin and barite mineralization is widespread in the Farrell Slates, and to a lesser extent in the Murchison Volcanics, along the eastern side of the Henty Fault. The only mineralization known west of the fault occurs at the 'Arsenic Resource' in the Sterling Valley (see Figure 4).

The mineralization is generally of a structurally-controlled lode and vein style, commonly almost conformable with the primary layering in the enclosing rocks. Lodes closest to the Henty Fault tend to parallel the steep west dip of this structure (as does bedding).

The presence of gold-tin mineralization, as well as evidence from lead and sulphur isotopes, suggests that the mineralization in the Tullah-Sterling River area is a Cambrian-Devonian hybrid. The bulk of the mineralization, particularly the basemetals, silver and gold, are apparently of Cambrian volcanogenic origin and were remobilised in the Devonian with inputs at that time of tin, arsenic, further basemetals and silver. However, gold is a notable absentee from the Pb-Zn-Ag ore in the Farrell orebodies at Tullah - the largest mineralized occurrence known on the EL's.

Although there are no current mining operations, mining was carried out over a period of 74 years prior to 1973 and a brief outline of the mining history appears in Purvis (1992). The old mines and other known mineral showings are shown on Figure 4, with the most significant also listed in Table 1.

Note, two of the larger mineralized bodies (the Lakeside gold deposit with 750,000t @ 2.1g/t Au, 4% As & 20g/t Ag, and the 'Arsenic Resource' with 480,000t @ 5% As & 1g/t Au), are not exposed at surface and were found by exploration in the 1980's.

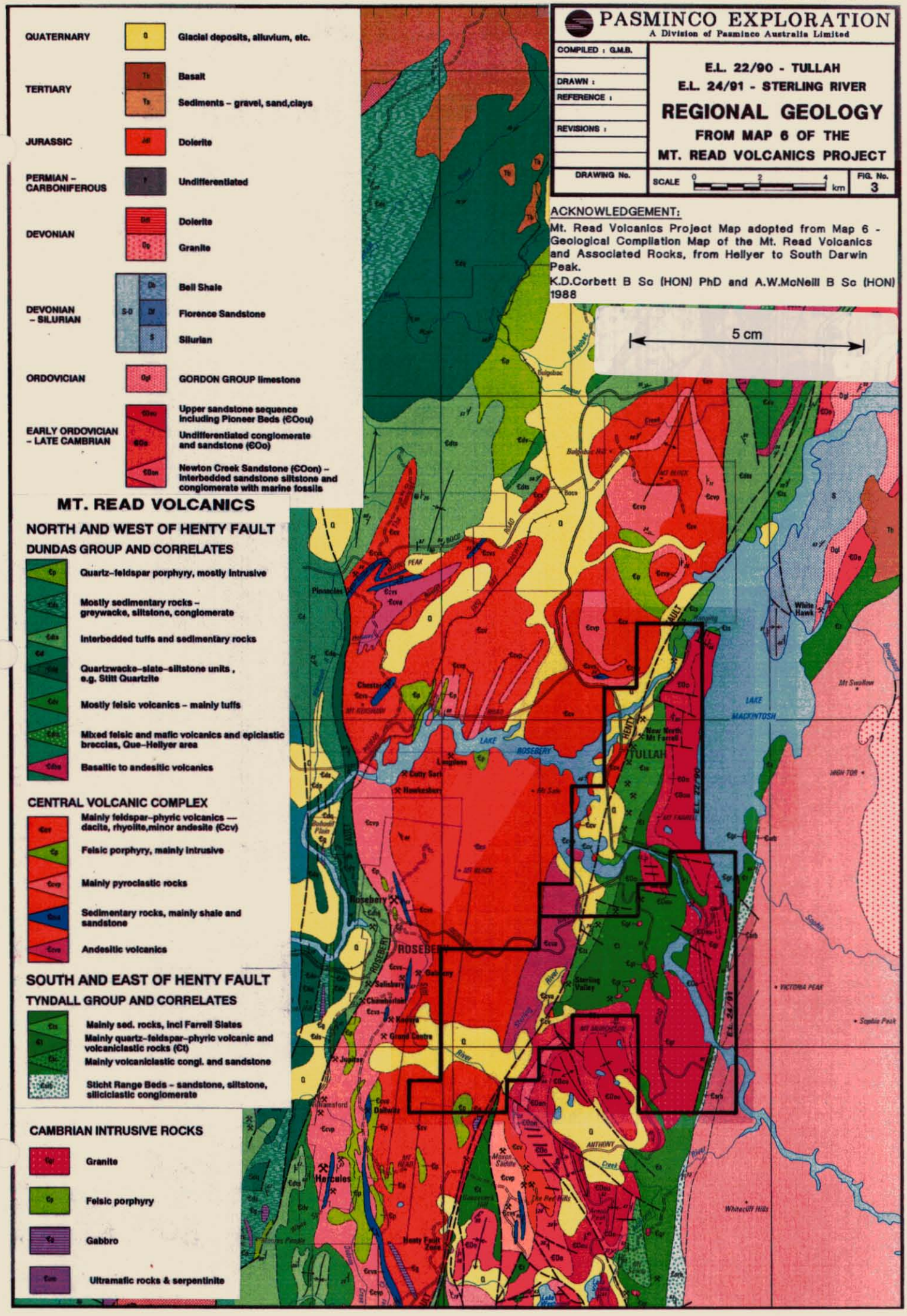
TABLE 1

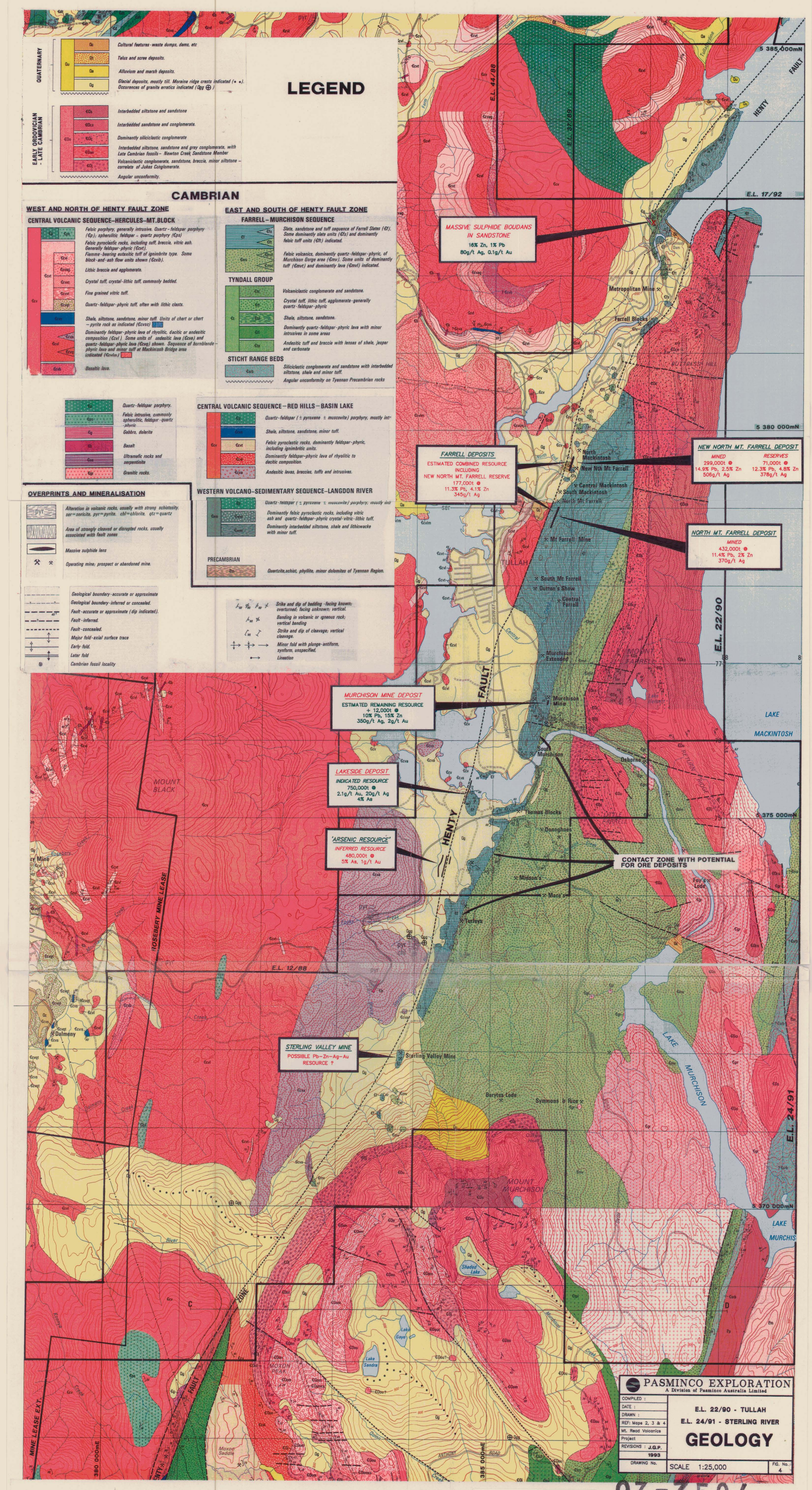
MINERAL DEPOSITS ALONG HENTY FAULT

ON TULLAH & STERLING RIVER EL's

Deposit	Commodity	Resource	Status
North Mt Farrell	Pb–Ag–Zn	Mined: 432,000t @ 11.4% Pb, 370 g/t Ag, 2% Zn.	Mined 1899–1933 Workings flooded.
New North Mt Farrell	Pb–Ag–Zn	Mined: 299,000t @ 14.9% Pb, 506g/t Ag, 2.5% Zn. Proved reserves: 71,000t @ 12.3% Pb, 378 g/t Ag, 4.8% Zn.	Mined 1933–73. Workings flooded.
Lakeside	Au–As–Sn	Indicated resource: 750,000t @ 2.1g/t Au. (4% As, 20g/t Ag, 0.2% Sn).	Undeveloped & inactive. Estimate by Billiton based on 9 drillholes.
'Arsenic Resource'	As–Au–Sn	Inferred resource: 480,000t @ 5% As, 1 g/t Au.	Inactive. Estimate by EZ, based on 4 drillholes.
Murchison Mine	Zn–Pb–Ag–Au	Indicated resource: +12,000t @ 15% Zn, 10% Pb, 350g/t Ag, 2 g/t Au.	Inactive. Estimate by Pasminco, 1993, based on on-site investigations by Mancala P/L and 1947 EZ drilling.
Sterling Valley Mine	Pb–Zn–Ag–Au	?	Inactive. Ore-grade intercepts in old DDH's, best: STP 96 5.5m @ 9% Pb, 6% Zn, 160g/t Ag, 1g/t Au.

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COMPILED : G.M.B.
DRAWN :
REFERENCE :
REVISIONS :
DRAWING No.
E.L. 22/90 - TULLAH
E.L. 24/91 - STERLING RIVER
REGIONAL GEOLOGY
FROM MAP 6 OF THE
MT. READ VOLCANICS PROJECT
SCALE 0 2 4 km
FIG. No. 3
ACKNOWLEDGEMENT:
Mt. Read Volcanics Project Map adopted from Map 6 - Geological Compilation Map of the Mt. Read Volcanics and Associated Rocks, from Hellyer to South Darwin Peak.
K.D.Corbett B Sc (HON) PhD and A.W.McNeill B Sc (HON) 1988
5 cm
QUATERNARY
Glacial deposits, alluvium, etc.
TERTIARY
Basalt
Sediments – gravel, sand, clays
JURASSIC
Dolerite
PERMIAN – CARBONIFEROUS
Undifferentiated
DEVONIAN
Dolerite
Granite
DEVONIAN – SILURIAN
Bell Shale
Florence Sandstone
Silurian
ORDOVICIAN
GORDON GROUP limestone
EARLY ORDOVICIAN – LATE CAMBRIAN
Upper sandstone sequence including Pioneer Beds (€Oou)
Undifferentiated conglomerate and sandstone (€Oo)
Newton Creek Sandstone (€Oon) – interbedded sandstone siltstone and conglomerate with marine fossils
MT. READ VOLCANICS
NORTH AND WEST OF HENTY FAULT
DUNDAS GROUP AND CORRELATES
Quartz–feldspar porphyry, mostly intrusive
Mostly sedimentary rocks – greywacke, siltstone, conglomerate
Interbedded tuffs and sedimentary rocks
Quartzwacke–slate–siltstone units, e.g. Stitt Quartzite
Mostly felsic volcanics – mainly tuffs
Mixed felsic and mafic volcanics and epiclastic breccias, Que–Hellyer area
Basaltic to andesitic volcanics
CENTRAL VOLCANIC COMPLEX
Mainly feldspar–phyric volcanics — dacite, rhyolite, minor andesite (Ccv)
Felsic porphyry, mainly intrusive
Mainly pyroclastic rocks
Sedimentary rocks, mainly shale and sandstone
Andesitic volcanics
SOUTH AND EAST OF HENTY FAULT
TYNDALL GROUP AND CORRELATES
Mainly sed. rocks, incl Farrell Slates
Mainly quartz–feldspar–phyric volcanic and volcaniclastic rocks (Ct)
Mainly volcaniclastic congl. and sandstone
Sticht Range Beds – sandstone, siltstone, siliciclastic conglomerate
CAMBRIAN INTRUSIVE ROCKS
Granite
Felsic porphyry
Gabbro
Ultramafic rocks & serpentinite
TULLAH
ROSEBERY
LAKE MACKINTOSH
LAKE ROSEBERY
Mt Swallow
Pinnacles
White Hawk
Hercules
Henty Fault Zone
Whitecliff Hills
Victoria Peak
Sophia Peak


LEGEND
QUATERNARY
Cultural features - waste dumps, dams, etc
Talus and scree deposits.
Alluvium and marsh deposits.
Glacial deposits, mostly till. Moraine ridge crests indicated (• •).
Occurences of granite erratics indicated (Qgg ⊕)
EARLY ORDOVICIAN - LATE CAMBRIAN
Interbedded siltstone and sandstone
Interbedded sandstone and conglomerate.
Dominantly siliciclastic conglomerate
Interbedded siltstone, sandstone and grey conglomerate, with Late Cambrian fossils – Newton Creek Sandstone Member
Volcaniclastic conglomerate, sandstone, breccia, minor siltstone – correlate of Jukes Conglomerate.
Angular unconformity.
CAMBRIAN
WEST AND NORTH OF HENTY FAULT ZONE
CENTRAL VOLCANIC SEQUENCE – HERCULES – MT. BLOCK
Felsic porphyry, generally intrusive. Quartz - feldspar porphyry (Cp); spherulitic feldspar - quartz porphyry (Cps)
Felsic pyroclastic rocks, including tuff, breccia, vitric ash. Generally feldspar - phyric (Cvt).
Flamme - bearing eutaxitic tuff of ignimbrite type. Some block - and - ash flow units shown (Cvtb).
Lithic breccia and agglomerate.
Crystal tuff, crystal - lithic tuff, commonly bedded.
Fine grained vitric tuff.
Quartz - feldspar - phyric tuff, often with lithic clasts.
Shale, siltstone, sandstone, minor tuff. Units of chert or chert – pyrite rock as indicated (Ccvse)
Dominantly feldspar - phyric lava of rhyolitic, dacitic or andesitic composition (Cvl). Some units of andesitic lava (Cvva) and quartz - feldspar - phyric lava (Cvq) shown. Sequence of hornblende - phyric lava and minor tuff at Mackintosh Bridge area indicated (Cvvhv)
Basaltic lava.
EAST AND SOUTH OF HENTY FAULT ZONE
FARRELL – MURCHISON SEQUENCE
Slate, sandstone and tuff sequence of Farrell Slates (Cf). Some dominantly slate units (Cfs) and dominantly felsic tuff units (Cft) indicated.
Felsic volcanics, dominantly quartz - feldspar - phyric, of Murchison Gorge area (Cmv). Some units of dominantly tuff (Cmvt) and dominantly lava (Cmvl) indicated.
TYNDALL GROUP
Volcaniclastic conglomerate and sandstone.
Crystal tuff, lithic tuff, agglomerate - generally quartz - feldspar - phyric
Shale, siltstone, sandstone.
Dominantly quartz - feldspar - phyric lava with minor intrusives in some areas
Andesitic tuff and breccia with lenses of shale, jasper and carbonate
STICHT RANGE BEDS
Siliciclastic conglomerate and sandstone with interbedded siltstone, shale and minor tuff.
Angular unconformity on Tyennan Precambrian rocks
Quartz - feldspar porphyry.
Felsic intrusive, commonly spherulitic, feldspar - quartz - phyric
Gabbro, dolerite
Basalt
Ultramafic rocks and serpentinite
Granitic rocks.
CENTRAL VOLCANIC SEQUENCE – RED HILLS – BASIN LAKE
Quartz - feldspar (± pyroxene ± muscovite) porphyry, mostly intrusive.
Shale, siltstone, sandstone, minor tuff.
Felsic pyroclastic rocks, dominantly feldspar - phyric, including ignimbritic units.
Dominantly feldspar - phyric lava of rhyolitic to dacitic composition.
Andesitic lavas, breccias, tuffs and intrusives.
WESTERN VOLCANO - SEDIMENTARY SEQUENCE – LANGDON RIVER
Quartz - feldspar (± pyroxene ± muscovite) porphyry; mostly intrusive.
Dominantly felsic pyroclastic rocks, including vitric ash and quartz - feldspar - phyric crystal - vitric - lithic tuff.
Dominantly interbedded siltstone, shale and lithicwacke with minor tuff.
PRECAMBRIAN
Quartzite, schist, phyllite, minor dolomites of Tyennan Region.
OVERPRINTS AND MINERALISATION
Alteration in volcanic rocks, usually with strong schistosity. ser = sericite, pyr = pyrite, chl = chlorite, qtz = quartz
Area of strongly cleaved or disrupted rocks, usually associated with fault zones
Massive sulphide lens
Operating mine; prospect or abandoned mine.
Geological boundary - accurate or approximate
Geological boundary - inferred or concealed.
Fault - accurate or approximate (dip indicated).
Fault - inferred.
Fault - concealed.
Major fold - axial surface trace
Early fold.
Later fold
Cambrian fossil locality
Strike and dip of bedding - facing known; overturned; facing unknown; vertical.
Banding in volcanic or igneous rock; vertical banding
Strike and dip of cleavage; vertical cleavage.
Minor fold with plunge - antiform, synform, unspecified.
Lineation
MASSIVE SULPHIDE BOUDANS IN SANDSTONE
16% Zn, 1% Pb
80g/t Ag, 0.1g/t Au
FARRELL DEPOSITS
ESTIMATED COMBINED RESOURCE INCLUDING
NEW NORTH MT. FARRELL RESERVE
177,000t
11.3% Pb, 4.1% Zn
345g/t Ag
NEW NORTH MT. FARRELL DEPOSIT
MINED
299,000t
14.9% Pb, 2.5% Zn
506g/t Ag
RESERVES
71,000t
12.3% Pb, 4.8% Zn
378g/t Ag
NORTH MT. FARRELL DEPOSIT
MINED
432,000t
11.4% Pb, 2% Zn
370g/t Ag
MURCHISON MINE DEPOSIT
ESTIMATED REMAINING RESOURCE
+ 12,000t
10% Pb, 15% Zn
350g/t Ag, 2g/t Au
LAKESIDE DEPOSIT
INDICATED RESOURCE
750,000t
2.1g/t Au, 20g/t Ag
4% As
'ARSENIC RESOURCE'
INFERRED RESOURCE
480,000t
5% As, 1g/t Au
CONTACT ZONE WITH POTENTIAL FOR ORE DEPOSITS
STERLING VALLEY MINE
POSSIBLE Pb–Zn–Ag–Au RESOURCE ?
Metropolitan Mine
Farrell Blocks
North Mackintosh
New North Mt Farrell
Central Mackintosh
South Mackintosh
North Mt Farrell
Mt Farrell Mine
South Mt Farrell
Dutton's Show
Central Farrell
Murchison Extended
Murchison Mine
South Murchison
Osborne
Thomas Blocks
Donoghues
Midson's
Mace's
Turleys
Ferrier Lode
Dalmeny
Sterling Valley Mine
Barytes Lode
Symmons & Rice
Shaded Lake
Lake Gaye
Lake Sandra
Moxon Saddle
HENTY FAULT
MURCHISON FAULT
ANTHONY ROAD FAULT
ROSEBERY MINE LEASE
MINE LEASE EXT.
E.L. 44/88
E.L. 37/89
E.L. 17/92
E.L. 22/90
E.L. 12/88
E.L. 24/91
MOUNT BLACK
MOUNT FARRELL
MOUNT MURCHISON
MOXON PEAK
BULLWASSER HILL
TULLAH
LAKE MACKINTOSH
LAKE MURCHISON
RETURN SHOOT
5 385 000mN
5 380 000mN
5 375 000mN
5 370 000mN
380 000mE
385 000mE
ZONE C
ZONE D
5 cm
PASMINCO EXPLORATION
A Division of Pasminco Australia Limited
COMPILED :
DATE :
DRAWN :
REF: Maps 2, 3 & 4
Mt. Read Volcanics
Project
REVISIONS : J.G.P.
1993
DRAWING No.
E.L. 22/90 - TULLAH
E.L. 24/91 - STERLING RIVER
GEOLOGY
SCALE 1:25,000
FIG. No. 4
93-3504.

6 MURCHISON MINE AREA

6.1 Pasminco Evaluation 1992-93

6.1.1 WORK DONE

Evaluation of the Zn-Pb-Ag-Au occurrence at the old Murchison Mine, begun in mid 1992, continued and concluded in early 1993.

Work done included:

* Mapping, and geochemical sampling of the underground workings, surface exposures, and on the Murchison Dam Road 250m south along strike.
* Relogging and sampling of drillcore from old EZ holes MP 28-30 & 32.
* Structural analysis of the general mine area
* Compilation of new geological sections and plan.

The mapping and sampling is shown in Figures 8, 9 & 14. Drill sections for holes MP 28, 29, 30 & 32 are in Figures 10-12. Geochemical results are listed in Table 2.

These investigations led to the drilling of hole MM1a under the old mine in January 1993 (see Section **6.4.**).

6.1.2 GEOLOGY

The Murchison Mine lies 2km SSE of Tullah (see Figure 4). It comprises a massive lode of sp-py-aspy-gn, 1-6m wide, 40-50m long, and a known depth extent in excess of 80m. The lode cross-cuts a 20m thick quartz-feldspar crystal sandstone band 30m above the base of the Farrell Slates.

While the flanking rocks are the thinly bedded, grey to black shale and fine volcaniclastic sandstone/siltstone typical of the Farrell Slates, the crystal sandstone unit is unique - there are no similar sandstones above or below it in the local sequence. The crystal sandstone has a finely graded top indicating it faces as it dips - to the west.

The Murchison Mine occurrence had attracted Pasminco's interest because:

1. It has the highest zinc content of any of the known mineral showings in the Tullah–Sterling River area. (It also contains some gold).

2. It lies adjacent to the Farrell Slates / Murchison Volcanics contact, considered prospective as it marks a major stratigraphic break, with hydrothermally altered volcanics underlying fine grained sediments.

The Pasminco work has shown that the Murchison Mine mineralization is associated with a large fault that strikes slightly more easterly than the north–south striking Farrell Slates sediments. Where the structure is hosted by the shales it has a 60° westerly dip (essentially the same as the sediments which dip 55–60° west), and comprises a 1m wide barren pyritic crush zone flanked by crenulated shale.

When it contacts the crystal sandstone unit the structure is abruptly refracted into a NE heading with a near–vertical dip, and is mineralized with a complex mixture of coarse–grained semi–massive sulphides in quartz–siderite gangue. The relative geometries of bedding dip and fault orientation give the lode a southerly plunge between 40–60°.

Within the crystal sandstone several thin subsidiary lodes occur flanking and parallel to the main lode. Examples lie east of the main lode on 3 Level and on surface above the 1A Level Adit. The lodes reflect a ladder pattern of late–stage brittle fracturing of the lithified crystal sandstone.

Evidence in the mine and in exposures along the Murchison Dam Road, show the mine structure has normal and dextral shear sense. Other features, including cleaved disorientated sediment fragments within the fault, indicate it post–dates the cleavage formed during the ductile reverse movements on the adjacent Henty Fault (F. Murphy, pers comm 1992).

These observations suggest the Murchison Mine structure and lode were formed in a zone of very late–stage active east–west extension. Almost all the structural indicators in the local area point to normal movements associated with east–west extension, overprinting earlier compressional reverse movements (F. Murphy, pers comm 1992).

6.1.3 GEOCHEMISTRY AND ALTERATION

A total of 36 geochemical rock samples were analysed from the Murchison Mine workings and vicinity. Objectives included trying to characterise the ore to determine its likely origin, examination of the alteration pattern in the crystal sandstone to see if there was any association with the ore, and mapping the alteration in the upper part of the adjacent Murchison Volcanics. Sample results are listed in Table 2 and Appendix 2.

The 7 ore samples are characterised by major abundances of zinc, arsenic, lead and silver, with values between 5 – 43% Zn, 0.2 – 9.5% As, 1 – 4% Pb, and 86 – 390 g/t Ag. Other significant metal constituents include gold (0.1 – 2.5g/t), and copper (0.1 – 0.6%). Elevated values of tin and bismuth are present in all the samples (tin: 120 – 500ppm; bismuth 60 – 660 ppm).

The arsenic values are much higher than normal volcanogenic mineralization in the Mt Read Volcanics, and the tin and bismuth levels are likewise abnormally elevated. All three constituents are more typical of Devonian granite–related mineralization, as is the sideritic gangue. For reasons fully explained in Purvis (1992) the gold in the ore is almost certainly of Cambrian volcanogenic origin.

It is interesting to note that both the host crystal sandstone and the upper 150m of the Murchison Volcanics have slightly elevated barium contents, averaging 1400ppm and 1100ppm respectively, whereas the ore in the lode contains none (all 7 samples <100ppm Ba).

Visually, the host crystal sandstone generally appears very weakly silica–sericite–chlorite altered. The alteration is noticeably stronger (including bleaching) adjacent to the mineralization. To study the alteration geochemically a total of 16 samples were taken from the host crystal sandstone unit – 7 rock samples and 9 core samples from the old EZ holes.

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

971020

Sample Type Rock

Pas Ex Despatch Sheet N°s: 0190 (Analabs Job N° 111310.60.09024) Pas Ex: 0193 (Analabs: 111310.60.09116)
0192 (" " " 111310.60.09062)
0195 (" " " 111310.60.09145)

PROSPECT Murchison Mine & Vicinity
PROJECT Tullah EL 22/90

Sample No.	Sample Type	Location (AMG)	METAL CONTENT (ppm unless specified) Cu	Pb	Zn	Ag	Au	As	Ba	Bi	Co	Mo	Sn	W				COMMENTS
032791	o/c 1m chip	Murchison Dam Road 5376305mN/385660mE	50	340	195	3	0·017	<50	516	<10	4	<20	<100	<20				Murchison Mine Shear Zone. Crushed black shale. Minor py.
792	Float	3 Level, Murchison Mine	3650	3·75%	20·5%	390	1·200	5820	<10	310	47	30	142	24				Banded qtz-siderite-sulphide (sp-py-aspy, gn, cp)
793	Float	Open Cut, Murchison Mine	2050	0·89%	43·0%	185	0·483	6920	<10	78	7	50	504	42				Massive sp>py>aspy-gn-cp from FW zone
794	Float	" " " "	4150	2·15%	7·7%	255	0·077	1650	<10	255	14	<20	138	<20				Typical ore. 50% qtz, 10% carb, 40% sp-py>aspy-gn.
795	Float	" " " "	5800	3·5%	4·9%	270	0·133	4500	<10	660	16	<20	148	<20				Pyritic ore. 50% py>sp>gn-cp-aspy. 50% qtz>carb.
796	Float	3 Level, Murchison Mine	1300	0·86%	29·5%	86	2·480	9·46%	<10	59	355	44	494	40				Sp-aspy ore. 60% sulphides, 40% siderite.
797	Float	" " " "	5000	3·35%	11·5%	240	0·288	7640	<10	82	5	<20	174	20				Typical ore. Composite of 2 floaters. 40% sp-py-aspy.
032798	Float	" " " "	3500	2·8%	14·0%	255	0·864	3·28%	94	255	115	24	122	<20				Thin subsidiary lode FW to main lode; py>sp>gn.
032799	o/c	Open Cut, Murchison Mine	250	2·6%	1·05%	55	0·026	<50	640	<10	4	<20	140	<20				Chloritised xyl sst ± 3-5% gn>sp-py, FW to lode.

ORE SAMPLES

			Cu	Pb	Zn	Ag	As / Ba	Rb / Sr	Y / Zr	V / Nb	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / CaO	K_2O / MgO	P_2O_5 / SO_3	Na_2O / LOI	Sn / W	SAMPLES OF HOST CRYSTAL SST:
034209	o/c	2·5m HW to lode in Open Cut	20	390	110	<10	13 / 1850	170 / 50	30 / 230	15 / 11	13·74 / 74·5	0·32 / 3·0	0·04 / 0·07	3·08 / 0·93	0·054 / 0·11	1·72 / 2·50	/	Silif + bleached silfst/fine xyl sst ± minor sulphs.
210	o/c	FW x Cut, 3 Level, Murch Mine.	20	240	1580	<10	40 / 860	260 / 30	25 / 120	15 / 5	11·66 / 74·1	0·23 / 3·1	0·33 / 2·00	3·97 / 0·71	0·048 / 0·32	0·22 / 3·66	/	Highly alkred (silif + chloritised) xyl sst.
211	o/c	5m W of orebody, 3 Level adit.	<20	100	340	<10	20 / 1500	110 / 230	25 / 160	8 / 6	13·85 / 71·2	0·31 / 2·5	0·11 / 1·96	2·45 / 0·68	0·058 / 0·09	4·34 / 2·56	/	Massive xyl sst ± mod silica-chlorite-sericite alt.
212	o/c	13m W of orebody, 3 Level adit.	20	200	260	<10	9 / 1700	150 / 130	25 / 190	10 / 8	14·11 / 71·9	0·34 / 3·5	0·11 / 0·81	3·03 / 0·87	0·060 / 0·10	3·40 / 1·96	/	Massive xyl sst ± weak silica-chlorite-sericite alt.
034219	o/c	Murchison Dam Road 5376290mN/385690mE	<20	50	150	<10	2 / 1250	170 / 60	10 / 160	25 / 7	15·75 / 71·4	0·36 / 2·78	0·03 / 0·05	3·83 / 0·83	0·036 / 0·01	2·16 / 2·62	9 / <5	Massive xyl sst (Mine Host Rock). Sericite-chlorite matrix.
034228	o/c	Glory Hole above Adit 1A 5376520N/385715mE	25	280	125	<10	6 / 1700	140 / 140	20 / 190	14 / 8	15·44 / 71·4	0·35 / 3·03	0·05 / 0·06	2·87 / 0·80	0·042 / 0·02	3·81 / 2·34	<3 / <5	Mod oxidised xyl sst. S/sericitic + chloritic stringers.
034229	Float	Dump of Adit 1A.	125	3550	2700	<10	<2 / 930	280 / 6	20 / 120	20 / 5	11·38 / 68·1	0·29 / 6·42	2·34 / 0·16	4·24 / 0·78	0·058 / 0·96	0·21 / 4·65	30 / <5	Mod alt (silica-bleaching) xyl sst ± 1-2% py.

			Cu	Pb	Zn	Ag	As / Ba	Rb / Sr	Y / Zr	V / Nb	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / CaO	K_2O / MgO	P_2O_5 / SO_3	Na_2O / LOI	Sn / W	SAMPLES OF MURCHISON VOLCANICS:
034215	Float	5376520mN/385770mE	53	120	675	1	1400	220 / 25	50 / 240	75 / 11	16·92 / 65·0	0·50 / 5·30	0·04 / 0·02	5·10 / 1·67	0·082 / 0·89	0·77 / 3·75	/	Top of Murchison Volcanics. Sericitic tuffaceous siltstone.
216	Float	" "	9	170	225	<1	1700	180 / 20	40 / 210	<5 / 9	11·61 / 76·8	0·18 / 3·59	0·28 / <0·01	4·54 / 0·35	0·017 / 0·01	0·44 / 1·97	/	" " " " Sericitized sandy volc.
217	o/c	" /385805mE	7	99	125	<1	1050	150 / 35	40 / 200	<5 / 8	10·91 / 75·9	0·17 / 3·19	0·19 / 1·81	3·51 / 0·36	0·017 / 0·01	0·80 / 3·01	/	Murch Volcs. Mod sericitized cleaved felsic volc.
218	o/c	" /385905mE	4	6	36	<1	1450	300 / 17	45 / 290	<5 / 11	13·39 / 73·8	0·27 / 3·39	0·03 / <0·01	6·51 / 0·62	0·021 / <0·01	0·05 / 1·93	/	" " " " " " " "
034221	o/c	Murchison Dam Road 5376280mN/385725mE	<20	<25	75	<10	<2 / 1200	220 / 14	35 / 280	<5 / 14	13·16 / 75·7	0·27 / 2·20	0·03 / 0·04	6·35 / 0·49	0·041 / 0·01	0·14 / 1·76	<3 / <5	Top of Murch Volcs. Strongly sericitized vitric volc.
222	o/c	Murchison Dam Road 5376270mN/385775mE	<20	40	100	<10	<2 / 580	160 / 30	35 / 260	<5 / 11	12·42 / 74·0	0·26 / 2·57	0·07 / 1·82	4·68 / 0·33	0·038 / 0·01	0·48 / 3·14	<3 / 7	" " " " " " " "
223	o/c	Murchison Dam Road 5376280mN/385810mE	<20	30	125	<10	6 / 700	210 / 40	35 / 250	8 / 11	12·20 / 70·8	0·25 / 2·94	0·17 / 3·21	5·51 / 0·41	0·039 / 0·18	0·07 / 4·10	7 / 14	" " " " " " " "
224	o/c	Murchison Dam Road 5376285mN/385830mE	125	5950	400	20	7 / 710	190 / 17	35 / 220	25 / 8	10·67 / 71·2	0·38 / 3·21	2·36 / 1·29	4·44 / 1·00	0·099 / 0·39	0·07 / 4·57	6 / 5	Murch Volcs. Grey sericitic shale ± minor sp-gn.
225	o/c	Murchison Dam Road 5376285mN/385827mE	20	2150	600	<10	<2 / 590	120 / 9	55 / 170	<5 / 6	7·88 / 58·8	0·18 / 7·45	7·45 / 2·70	3·16 / 0·87	0·031 / 4·44	0·18 / 8·54	6 / <5	" " Altered unidentifiable volc ± 2% py + minor gn.
226	o/c	Murchison Dam Road 5376290mN/385850mE	25	120	325	<10	<2 / 1450	240 / 50	25 / 190	45 / 8	13·91 / 66·3	0·46 / 3·89	0·18 / 2·73	5·47 / 1·54	0·088 / 0·07	1·16 / 4·04	<3 / <5	" " Chlor-ser schist after volc ± glass frags.
034227	o/c	Murchison Dam Road 5376285mN/385885mE	575	<25	125	<10	3 / 1000	160 / 80	45 / 160	14 / 7	8·96 / 74·0	0·35 / 4·02	0·17 / 2·79	4·25 / 1·26	0·080 / 0·26	0·05 / 3·50	6 / 8	" " " " " after felsic lava.

Note: Gold assayed on samples 034215, 216, 221—227. All values <0·008.

Analytical Methods: Cu, Pb, Zn, Ag by AAS; Au by Fire Assay; Co, Bi by AAS; All others by XRF except on ore samples As, Ba, Mo, W + Sn by ICP OES.

A 18625

TABLE 2

The results show clear evidence of local hydrothermal depletion of the sandstone, with some samples having values of <0.2% Na_2O against a background level of 2 – 5% Na_2O. Although the pattern of depletion is not consistent, the alteration in the sandstone is commonly concentrated:

a) adjacent to the lode on its eastern (footwall) side

b) along the upper contact of the sandstone band.

Visually, the outcropping Murchison Volcanics appear strongly sericite–chlorite altered. This was confirmed by sampling of the upper 150m of these rhyodacitic volcaniclastics and lavas. Of 11 samples taken only one had a Na_2O value in excess of 1% (1.16%), and six were <0.2%, ranging down to 0.05%. Alteration Index values ranged from 58 to 99, with an average of 76. No directional trend is indicated by the results.

6.2 Investigations by Mancala Pty Ltd

Early in the Pasminco programme it became apparent that the Murchison Mine lode was much larger than the recorded production of 300t implied (Ward, 1908). It was estimated that the lode could originally have been in the order of 30,000t, with possibly 7,000t of this being unmined ore below 3 Level (Purvis, 1992).

This was brought to the attention of F.W.Lannen & Associates, whose subsidiary Mancala Pty. Ltd. entered into an agreement with Pasminco Exploration to test the feasibility of mining the remnant ore and trucking it to Pasminco's Rosebery Mine.

Under the agreement, Mancala were allowed to peg a 17.5ha Mining Lease over the Murchison Mine. Operations were confined to the known lode structure above 125m RL (58m below 3 Level), between 5376400mN and 5376600mN AMG. The ML was pegged in late November 1992.

Mancala commenced pumping the winzes below 3 Level on 22nd December and completed their examination of the remnant ore on 3rd January 1993.

Their full report appears in Appendix 3.

Mancala lowered the water to 8m beneath 3 Level. They found extensive unrecorded stoping had been carried out on the ore block reported as unmined by Ward (1908). The stope connects the two winzes which are 20m apart. From the stope's attitude the orebody apparently dips 80° west and plunges 50–55° south, averaging 2.5m in width of which 1 – 1.5m has been left by the old miners as a sphalerite–rich skin on the hangingwall (western) side.

Mancala estimated 3,000t of untouched ore lies beneath the old stope between 170m RL and 153m RL, ie: between 13m and 30m below 3 Level rails (183m RL). A further 2,500t is estimated to remain as a skin on the hangingwall of the worked lode between 185m RL and 170m RL. They put the likely zinc grade of the remaining ore at 12–17%.

Hanson (1976) calculated there was 650t of high grade zinc ore in the wall of the open–cut as a skin footwall to the main lode. Mancala put 3 short percussion holes into this skin to test its continuity. This was found to be poor, the skin comprising a series of sub–parallel veins.

In January 1993 Mancala withdrew their ML application, considering the remaining resources in the old mine to be uneconomic.

6.3 Conclusions from the Investigations

6.3.1 REMNANT ORE POTENTIAL

The remaining ore in the Murchison Mine lode is certainly greater than the 5,500t estimated by Mancala. The indicated resource is at least 12,000t and potentially it could be substantially greater than this. The grade would be around 15% Zn, 10% Pb, 350g/t Ag and 2g/t Au (Purvis, 1992).

Assuming an SG of 4, width of 2.5m, and mineable length of 40m for the orebody, and using the lode's 80° west dip and 50–55° south plunge in the stope under 3 Level, the lode contains 400t/vertical metre. (This figure indicates the early mining could have produced up to 25,000t of ore).

Therefore Mancala's estimate of virgin ore between 170m and 153m RL should be almost 7,000t, not 3,000t. But as they mapped the bottom of the old stope at 167m RL and not 170m, the tonnage for this block is probably around 5,500t.

Their figure of 2,500t for the remnant zinc-rich hangingwall skin between 170m and 185m RL is reasonable.

There will be more ore in the old mine than this. Hole MP 28 intersected the lode right at the top of the crystal sandstone at 154m RL (29m below 3 Level), which means it must have hit the very southern end of the lode at this point (see Figures 9 & 11). Hole MP 29 passed through the crystal sandstone at 130m RL and was barren.

Conservatively assuming the lode extends in depth halfway between MP 28 & 29 (ie: to 142m RL), 10,000t of ore lies in the unmined block under the old stope. This block is shown on Figure 9.

There are valid reasons why the lode can be expected to extend below 142m. The EZ holes were drilled in 1947. MP 28 was surveyed downhole for both dip and azimuth, went very straight, and its position can be plotted with some confidence. However, MP 29 was only surveyed for dip and lifted sharply (collared at -51° the hole was at -31° 90m downhole).
In such circumstances the hole cannot have maintained its azimuth. Given its heading relative to local rock cleavage direction it is considered MP 29 swung sharply south. It is probable the hole went over the top of the south-plunging ore shoot.

There is no structural or geometric reason why the ore shoot shouldn't continue down the plunge. The nearby geologically-similar and also south-plunging Farrell lodes had vertical dimensions exceeding 400m - five times the presently known limits at Murchison.

Just as likely is the existence of major new blind lodes within the crystal sandstone unit parallel to the known lode. Murchison Mine occurs in a zone of extension which has caused multiple brittle fracturing of the sandstone. While the known subsidiary lodes to date are small, a major new lode could well be present. Again, this is the experience at Farrell.

New lodes could help overcome what appears to be the most critical limiting economic factor at Murchison - the potential of only 400t/ vertical metre in the known lode.

6.3.2 ORIGIN OF LODE

For Pasminco, the geological understanding gained from the studies of the old mine was always going to be of greater value than any remnant ore. Structurally, it is evident the lode is very late-stage and formed by normal movements associated with a zone of east-west extension.

Geochemically and mineralogically, the lode displays a measure of Cambrian-Devonian hybridization. At least some of its base and precious metal constituents were remobilised from a Cambrian volcanogenic source.

It is concluded that the Murchison Mine lode is probably upper Devonian in age and still largely over its source, as there is no evidence of substantial strike-slip movement on the Henty Fault since that time (F. Murphy, pers comm, 1992). It is likely the mineralization was generated from both Cambrian and Devonian source rocks at the time of intrusion of the underlying Devonian granite batholith.

6.4 Drillhole MM1/1a

Following the evaluation it was decided to drill a deep hole directly beneath the Murchison Mine to test for the postulated mineralized Cambrian source rocks. The decision to conduct the drill test was also influenced by the fact that the old mine is the best zinc occurrence on the prospective Farrell Slates / Murchison Volcanics contact. The principal target was an epiclastic unit at the top of the Murchison Volcanics, but it was also intended the hole provide a down-plunge test of the Murchison Mine crystal sandstone host rock.

Drillhole MM1 was collared at 5 376487mN / 385433mE beside the Murchison Dam Road, on 13th January 1993 (bearing 102° AMG @ -70°). By 60m depth the hole had lifted 10° and a chrome barrel was then used to hold the hole straight. The chrome barrel unintentionally started a new hole (MM1a) at 18m, cutting out from the underside of the original hole.

MM1a finished at 400.7m in Murchison Volcanics on 19th February, without encountering significant mineralization (best intersect: 1.25m @ 0.15% Zn & 0.1% Pb, from a tuffaceous siltstone band in the Murchison Volcanics). The drill log is in Appendix 1 and the drill section appears in Figure 13.

From collar to 267.5m the hole encountered the Farrell Slates, comprising thinly-interbedded grey to black shale, siltstone and fine sandstone. The rocks are strongly calcareous, essentially unaltered, with ubiquitous pyrite and pyrrhotite. The sediments dip west at about 50° and from 57m to 218m consistently face west. The only basemetal mineralization in these rocks is minor sp-gn-cp in thin kink zones parallel to the hole axis.

The Murchison Mine host crystal sandstone was intersected from 218.05 - 236.7m (17m true width), at a vertical depth of 200m beneath the old workings (see Figure 9). The unit fines uphole (to the west) and is unmineralized apart from a thin pyritic fault zone near its base. The essentially unaltered appearance of the crystal sandstone is confirmed by the lithogeochemistry, with Na_2O at 2.21% and Alteration Index at only 47.

Below the crystal sandstone the basal 30m of the Farrell Slates is marked by an abrupt reversal of facing due to a major anticlinal axis with an overturned eastern limb. Deformation increases towards the base of the sequence, including small-scale folding, kinking, shearing and intervals of annealed breccia.

This deformed zone is part of a major unmapped structure on the Farrell Slates / Murchison Volcanics contact. In the hole the actual contact comprises 600mm of cataclasite underlain by 100mm of fault breccia cemented by 10% sp-gn-aspy-py. Shearing lineation angles suggest the fault dips 55-60° west, parallel to bedding. The structural zone's surface expression is a local topographic low with no outcrop (see Figure 13).

From 267.5m to its end at 400.7m, MM1a was in the Murchison Volcanics. These comprise sericitized vitric rhyodacitic volcaniclastics and lesser lavas. The volcaniclastics are mainly epiclastic and include bedded fine tuffaceous siltstone bands containing minor disseminated sp-gn. Grading, where present, indicates facing to the west (suggesting the Murchison

Volcanics do indeed stratigraphically underlie the Farrell Slates). Overall, the volcaniclastics are coarser towards the base of the hole and dip west at an angle similar to the Farrell Slates.

Petrology and lithogeochemistry confirms the visual estimate that the Murchison Volcanics in MM1a are on average moderately altered (sericite-carbonate-chlorite, with zones of silica-albite). Na_2O values range from 0.46 to 1.67%, with Alteration Index values of 39 to 67 (5 samples).

6.5 Downhole EM Survey, Hole MM1a (N.Hughes)

6.5.1 SUMMARY

DHEM surveying of drill-hole MM1A detected a conductor lying approximately 125m west of the drill-hole, striking north-south. The estimated dip of 75 to 80 degrees to the east required for the correct profile polarity is contrary to known dips in the area which are usually 65 to 75 degrees to the west.

6.5.2 INTRODUCTION

On August 4, 1993 drill-hole MM1A was surveyed using the Crone DHEM system, by Crone Geophysics. The drill-hole was surveyed from two transmitter loops (Figure 5) and the three components of the decay of the secondary magnetic field were measured. For the Crone system this entails two passes down the hole for each loop, first measuring the axial component (Z) and then the cross-components (X,Y). A base frequency of 25 Hz and a shut off ramp of 1.0ms was used for the surveys.

Figures 1 to 6 in Appendix 6 show the responses for the first 15 channels of data for the X, Y and Z components for each transmitter loop. For a 25 Hz repetition rate 17 channels of data are collected between 0.0765 and 6.6465 milli seconds using the standard 20 channel configuration. Figures 7 and 8 in Appendix 6 are comparisons of the measured (and for the X and Y components, rotated) inducing field to the calculated inducing field.

Probe rotation for the X and Y component are solved by comparing the measured induced

magnetic field to the theoretical inducing field in the correct planes. It is obvious for this method to work that the loop location be known accurately. For the Crone system the positive orientation for the X, Y and Z components is found using the right hand rule where the thumb points up the hole and correlates to positive Z, the index finger points up and correlates to positive X and the middle finger to positive Y.

The data was judged noisy, so to increase the signal to noise ratio the operator took several readings at each station and averaged the results. This appears to work better than taking longer stacks, for the Crone system.

6.5.3 INTERPRETATION OF RESULTS

The data from both loops indicates a conductor which lies to the west of the drill-hole and strikes north-south. The west loop data indicates a steep dip to the east.

Figures 9 and 10 in Appendix 6 show the inducing field vectors and relative field strengths in the plane of the drill section for both loops. For the west loop to obtain the correct profile polarity the conductor has to dip to the east.

The broad positive to negative cross over in the axial (Z) data and broad positive in the X data indicate a conductor below and sub parallel to the hole. The Y data is of lower amplitude than the X and Z, and negative in the mid channels suggesting the drill-hole is mostly centred on the conductor with more strike extent north of the hole than south. The data was modelled with simple filaments and using the Multiloop program from Lamontagne Geophysics. Neither programme gave consistent fits to all the data, however a reasonable fit to the data was obtained using a 400m x 400m plate with a conductance of 5 to 10 Siemens. The important dimension for modelling is the depth extent and it is likely the strike length of the conductor is greater than 400m, as suggested by past surveying. Because of the orientation of the conductor with respect to the drill hole it is difficult to get an accurate depth to top, but it is of the order 50m to 75m. The distance from the drill-hole collar to the conductor is interpreted to be 125m to 150m to the west.

6.5.4 PREVIOUS EXPLORATION

In 1988 Billiton covered the area with a max-min EM survey. The survey was done on 100m line intervals and used a 25m sample interval. An intercoil spacing of 100m was used and data was collected at 222 Hz, 888 Hz and 1777 Hz. A plan map of survey coverage and profiles for lines 376400N, 376500N and 376600N are shown in Figures 11 to 14 in Appendix 6. Weak out of phase responses are noted at the position of the conductor, but not on line 376500N. There is however a distinct IP trend at this position.

Billiton drilled this conductive trend to the south of MM1A. The drill-hole, RED86-1, intersected conductive sulphides in a breccia stockwork zone in a black shale within the Farrell Sequence.

6.5.5 CONCLUSIONS AND RECOMMENDATIONS

DHEM in MM1A has detected a broad response interpreted as due to a north-south striking conductor lying approximately 125m west of the drill-hole collar. The conductor is expected to be the same as intersected in RED86-1, sulphides in a breccia stockwork, however because the response is poorly resolved as to depth to top, size and distance from the drill-hole, and has a dip contrary to expected it is recommended further EM surveying be done to resolve these questions.

These surveys should consist of a surface EM line along the section of the drill-hole using the west transmitter loop. This will fix the location, dip and depth to top of the conductor. A further loop to the west of the conductor should be surveyed from the surface line as well as down the hole. This loop will maximally couple the conductor giving further information as to position, size and quality. See Figure 5.

385 000 mE

386 000 mE

5 377 000 mN

RED87-4

5 377 000 mN

65°

SILICIFIED DACITIC LAVAS

FARRELL SLATES

Fault

22,000 V Powerline

MURCHISON HIGHWAY

FARRELL SLATES

55°

Fault

MURCHISON VOLCANICS (RHYODACITIC VOLCANICLASTICS AND LAVAS)

475 500 525 550 575 600 625 650

WEST LOOP

EAST LOOP

56°

MURCHISON MINE (Zn-Pb-Ag-Au)

MMIA

400·7 m

Henty

(Heavy Load)

Recommended Surface Survey Line

MRP227

PROPOSED LOOP

MRP226

54°

300 275 250 225 325 350 375 400 425 450 475 500 525 550 575 600 625 650

5 cm

22,000 V Powerline (Light Load)

EM ANOMALY

ASSOCIATED WITH 1m WIDE SULPHIDE BRECCIA ZONE DIPPING 60-70°W

5 376 000 mN

386 000 mE

PASMINCO EXPLORATION

A Division of Pasminco Australia Limited

COMPILED : J.G.P/N.H	E.L. 22/90 - TULLAH
DATE : Sept., 1993	MURCHISON MINE
DRAWN : G.M.B.	EM LOOPS FOR DOWNHOLE SURVEY IN MM1a
REF. :	
REVISIONS :	
DRAWING No.	SCALE 1:5000 0 100 FIG. No. 5

971029

7 MASSIVE SULPHIDE BOUDINS NEAR MACKINTOSH DAM

In 1986 W. Herrmann, while working on EL 42/85 for Pancontinental, found an outcrop of small (150 x 40mm) disrupted lenses of massive pyrite in shale of the Farrell Slates. The occurrence is 100m east of the Henty Fault, in a spillway channel 150m west of the Mackintosh Dam (Figure 15).

The mineralization was sampled by Herrmann (1986) and Billiton (1988), but contained nothing of significance. The area was covered by UTEM by Pancontinental without detecting any anomalies (although coverage was affected by the proximity of the dam). Billiton did dipole-dipole IP on lines 100m north and south of the occurrence, which gave the normal high chargeability and high resistivity of the Farrell Slates in this area (Hungerford, 1988). No further work was carried out.

In November 1992 the pyrite occurrence was examined by Pasminco and several small massive basemetal sulphide boudins were found in a 0.3m thick bed of siliceous pyritic sandstone immediately alongside the pyrite lenses. The boudins are lozenge-shaped, up to 0.35m x 0.2m, and occur in at least two indistinct rows. The strike extent of the sulphide boudins is about 3m (see sketch in Figure 15).

The largest sulphide boudin assayed 15.7% Zn, 1.5% Pb, 79 g/t Ag and 0.13 g/t Au. It also contained 0.2% Cu, 0.12% As, 640ppm Sn and 30ppm Ba.

Selected material from a 1m wide zone of copper veining in sheared altered felsic volcanics 45m east of the boudins, assayed 6.5% Cu and 39 g/t Ag, with negligible levels of Au, Pb, Zn, As & Sn. This zone, apparently fault-related, was originally found by Herrmann in 1986.

Locating the possible source of the basemetal massive sulphide boudins is likely to be extremely difficult given the structural complexities of this area close to the Henty Fault. Pancontinental and Billiton mapped several offsets on the Henty Fault in the vicinity, which points to major cross-structures being present.

It is intended to map and sample the exposures in the overflow channel and to review the Pancontinental–Billiton geophysical and other data, before conducting a drill test of the sulphide occurrence. Investigations will be somewhat constrained by the proximity of the Mackintosh Dam.

8 GEOPHYSICS

8.1 Aeromagnetic Survey

In early March 1993 the entire Sterling River EL was flown by low-level high-resolution aeromagnetics and radiometrics, using an Aerospatiale Squirrel helicopter. Several areas of the Tullah EL where the original 1991 aeromagnetics were out of specification (generally due to +200m ground clearance), were also reflown. These areas were along the eastern slopes of the Farrell Range, around the Murchison Mine and over Tullah Township.

The survey was carried out by Geoterrex Pty. Limited using a Scintrex cesium vapour bird-mounted magnetometer and a Nuclear Data 256 channel spectrometer with a 16.8l NaI crystal. Navigation was by a Sercel UHF DGPS system with flight path recovery assisted by continuous video camera recording.

The east-west flight line spacing was 100m with north-south tie lines at 1000m intervals. Specified magnetic sensor terrain clearance was 80m (spectrometer in aircraft at 110m clearance). A total of 737 line km were flown, 569 line km on Sterling River EL and 168 line km on Tullah EL.

Plans showing the flight lines and contoured residual magnetic data appear in Figures 16-25.

Although the evaluation and interpretation of the aeromagnetic results is still in progress, it is clear the data is of very high quality (R.Richardson, pers comm, 1993).

8.2. Gravity Survey

One of the major activities of the 1992-93 exploration programme was a semi-regional gravity survey over both the Tullah and Sterling River EL's. Nominal station spacing was 500m x 200m. Given the rugged and inaccessible nature of much of the ground, the survey necessarily involved a large programme of grid line cutting and refurbishment. A helicopter was used to get to some stations on the Farrell Range and east of Lake Mackintosh.

The gravity survey was carried out by a two-man team from the Department of Mines, led by Dr. R.Richardson. Richardson's operations report appears in Appendix 4. Survey control was provided by a range of methods including GPS and theodolite. Extensive use was made of existing HEC and Pasminco survey points. Most stations in inaccessible terrain were levelled with a barometer to an accuracy of ±3m.

Access preparation commenced in October 1992 and the gravity survey a month later in mid-November. By the time the survey was completed at the end of January 1993, a total of 537 stations had been measured - 287 on the Tullah EL and 250 on the Sterling River EL. Station distribution and raw bouguer values are shown in Figures 26-33.

At the time of writing the gravity results are being interpreted (in conjunction with the aeromagnetics). It is hoped the results will:

1 Help delineate the subsurface extent of the Devonian and Cambrian granites.
2 Map out major structures, particularly those intersecting the Henty Fault.
3 Define areas of hydrothermal alteration.

It was for these reasons that the gravity and aeromagnetic surveys were undertaken.

9 DRILLHOLE DATABASE

The compilation of old drillhole data continued in the 1992-93 year. Of the 100 identified surface diamond drillholes (pre MM1a), full survey details for 67 have now been entered in the Pasminco Exploration computer database. These survey details are listed in Appendix 5 and the hole locations are shown in Figures 26-33.

Strenuous efforts have been made to only enter surveys known to be reasonably accurate. The collars of holes STP101, STP105 and SV2/3, in the Sterling Valley, were picked up by theodolite survey. It is anticipated that many of the remaining old holes will never be accurately located.

Geochemical assay data from 55 of the old holes has been entered in the computer database. It is proposed to match this with edited geological information from the old logs, as well as surface geological, geochemical and geophysical data, in order that sections can be constructed along the length of the Henty Fault within the EL's.

10 PREPARATION OF STERLING RIVER BASE PLANS

In late 1992 HEC Enterprises Corporation was commissioned to prepare contoured topographic base plans over the Sterling River EL, as no detailed bases existed for this area.

In March 1993 the HEC carried out new aerial photography of the area, both colour (1:10,000 scale) and black & white (1:25,000 scale). The latter was used to produce the base plans. The information was delivered both in coloured hard copies at 1:5,000 scale and in digital form suitable for use in the Autocad computer programme.

An index showing the new plans appears in Figure 6. Some of the new information was used in the bases for Figures 28 & 30–33.

360 000mE
380 000mE
400 000mE
5 400 000mN
5 380 000mN
5 360 000mN
5 340 000mN

375 000mE
377 500mE
382 500mE
385 000mE
387 500mE
390 000mE
395 000mN

5 394 000mN
5 392 000mN
5 390 000mN
5 388 000mN
5 386 000mN
5 384 000mN
5 382 000mN
5 378 000mN
5 376 000mN
5 374 000mN
5 372 000mN
5 370 000mN
5 368 000mN
5 366 000mN
5 364 000mN
5 362 000mN
5 358 000mN
5 356 000mN
5 354 000mN
5 352 000mN
5 350 000mN
5 346 000mN

365 000mE
370 000mE
372 500mE
375 000mE
377 500mE
382 500mE
385 000mE
387 500mE
390 000mE

3 4 5 6 7 8 9 10 11 13 32 34

A B C D

i ii iii iv

5 cm

KEY

1993 Photogrammetry

PASMINCO EXPLORATION A Division of Pasminco Australia Limited	
COMPILED : G.M.B.	BASE SHEET LAYOUT
DATE : August, 1993	
DRAWN : G.M.B.	
REFERENCE :	
REVISIONS :	
DRAWING No. SLAY_A3	SCALE 1:200 000 (0 400 m)
	FIG. No. 6

97036

11 CONCLUSIONS

1 The basemetal massive sulphide boudins discovered in the Farrell Slates sequence near Mackintosh Dam, are a significant occurrence warranting drill testing.

2 The EM anomaly detected during downhole surveying of hole MM1a is probably due to a narrow mineralized structural zone, known to exist 150m west of the hole collar. Further EM testing is needed to confirm this interpretation.

3 Hole MM1a has shown both the Farrell Slates and underlying Murchison Volcanics young to the west, confirming the stratigraphic basis for targeting this contact zone (ie: altered volcanics giving way to quiescent sedimentary conditions). However, a major, previously unrecognised structure exists on this contact and its implications for the perceived prospectivity are not yet understood.

4 The remaining ore in the old Murchison Mine is estimated to be substantially in excess of 12,000t, grading around 15% Zn, 10% Pb, 350g/t Ag and 2g/t Au. While this ore is reasonably accessible, the major limiting economic factor would appear to be the potential of only 400t/vertical metre in the known lode. Geologically, there is high potential for major new lodes alongside the known one.

5 The Murchison Mine lode apparently formed during the Upper Devonian in an zone of east-west extension related to intrusion of underlying granite. Some of the lode constituents were evidently remobilised from a Cambrian volcanogenic source.

6 Pending interpretations of the gravity and aeromagnetic data acquired during 1992-93, as well as use of the computerised exploration database, will have an important bearing on the direction of the exploration programme during 1993-94.

12 RECOMMENDATIONS

1 Undertake drilling to test the basemetal massive sulphide boudin occurrence near Mackintosh Dam.

2 Give priority to the compilation of previous exploration data, with a view to using it in conjunction with the gravity and magnetic results to define targets for drilling in the near term.

3 Try to get another small mining group to further investigate the remaining ore potential in the Murchison Mine, with the intention of increasing ore flow to Rosebery Mine.

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14 KEYWORDS & LOCALITY

KEYWORDS

ZINC, LEAD, GOLD, SILVER, ARSENIC, MT READ VOLCANICS, HENTY FAULT, DRILLING, MINERAL RESOURCES, STRUCTURE.

LOCATION

BURNIE SK55-3 & QUEENSTOWN SK55-5: TULLAH, STERLING RIVER, MT MURCHISON

APPENDICES

Appendix 1

Log of Hole MM1/MM1a

HOLE No. MM1/MM1a

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

LOCATION	TASMANIA
PROJECT	TULLAH EL 22/90
PROSPECT	MURCHISON MINE
DESIGNED BY	J.G. PURVIS
LOGGED BY	J.G. PURVIS
RELOGGED	
COMMENCED	14·1·93
COMPLETED	19·2·93
DRILLED BY	W. HOW
DRILL RIG	LONGYEAR 38

OBJECTIVE

TO LOCATE POSTULATED CAMBRIAN VOLCANOGENIC SOURCE OF THE REMOBILIZED BASEMETAL SULPHIDES IN THE DEVONIAN LODE AT THE MURCHISON MINE.

RESULT

HOLE MM1 ABORTED AT 60m AFTER LIFTING SHARPLY AND RECOMMENCED FROM 18m AS HOLE MM1a.
NO SIGNIFICANT MINERALIZATION INTERSECTED.
FARRELL SLATES SEQUENCE ENCOUNTERED TO 267·5m, AND ALTERED RHYODACITIC VOLCANICLASTICS AND LAVAS OF MURCHISON VOLCANICS BELOW 267·5m. UNMINERALIZED MURCHISON MINE HOST ROCK INTERSECTED 218–237m.

LOCATION/SURVEY DATA (AMG)

Grid	AMG		RL Collar m 178·7
Northing m	S 376487·1		Bearing Collar 102°
Easting m	385432·9		Dip Collar −70°
DH Survey Type	SINGLE SHOT EASTMAN CAMERA		Length Hole m 400·7m

Depth m	Bearing	Dip	Depth m	Bearing	Dip
MM1: (0–60m)					
30	099·5°	−65·25°			
60	098°	−60·25°			
MM1a: (18–400·7m)					
30	100·5°	−67·5°			
61	101·5°	−66·75°			
91	100°	−65°			
121	097·5°	−63°			
151	096°	−59·75°			
181	096°	−56·75°			
211	097·75°	−55°			
241	097·25°	−53·25°			
271	098·5°	−52°			
301	098°	−50°			
331	097°	−49°			
361	097·5°	−48·5°			
391	097°	−48°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m	Pb	Zn	Ag			Comments
351·6	352·85	1·25	0·09%	0·15%	2 g/t			BEST INTERSECTION: TUFFACEOUS SILTSTONE BAND IN MURCHISON VOLCANICS.

SIGNIFICANT CORE LOSS

From m	To m	% Lost

POOR GROUND CONDITION ZONES

From m	To m	Condition
0	8	FLUVIOGLACIAL SAND AND WEATHERED BROKEN SHALE

HOLE SIZE

Size	Depth m
HQ	69
NQ	400·7

HOLE CONDITIONS AFTER COMPLETION

Collar	STEEL CAP SCREWED INTO CASING CEMENTED AT GROUND SURFACE
Steel Casing	6·5m OF HW-SIZED GALVANIZED STEEL CASING PLACED IN TOP OF HOLE
PVC Casing	40mm ID UNSLOTTED PVC PLACED TO BASE
Ground Water	
Wedge	
Drill Pad	

97103

HASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth (m)	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						0 - 60.0m: FARRELL SLATES								
						0 - 5.5m: NO CORE								
						5.5 - 15.85m: PREDOMINANTLY DARK GREY SHALE **Lithology:** Partly carbonaceous & sericitic shale, with common interbeds of calcareous siltstone & v minor fine sandstone. **Alteration:** Essentially unaltered - sericite after degradation of vitric component, not hydrothermal alteration. Irreg barren qtz-carb vein 14 -14.35m. Minor carb veinlets. **Structure:** Generally thinly & regularly bedded. Bedding 38°/LCA @ 7m. Weak-mod cleavage (bedding //). Slight kinking in places. Broken, worst above 8m. Basal contact sharp (bedding plane) 43°/LCA.								
						15.85 - 18.85m: FINE VOLCANICLASTIC SANDSTONE **Lithology:** Grey, mod calcareous. Massive appearance, but slight variations in grainsize indicate unit comprises several pulses of detritus. Composed of feldspar > qtz & lithic grains, av <1mm, in sl sericitic and carbonaceous shaley matrix. Abund tiny wisps of deformed black shale. Bands of fine stretched-pebble conglomerate @ 16.05 - 16.25m & 17 -17.1m. (Pebbles comprise tuffaceous shale, cherl, carbonate & black shale. Up to max 10-20mm long & <5mm wide). **Alteration:** Essent unaltered. Feldspar grains carbonatised. Minor carb veinlets. **Structure:** Mod cleaved, with minor kinking. Basal contact sharp (bedding) 43°/LCA.								
						18.85 - 57.0m: CALCAREOUS SILTY TO SANDY SHALE **Lithology:** Dark grey. A mod calcareous fi gr sed, comprising subordinate silt to sand-sized feldspar, qtz and silic lithic grains scattered in dark grey to black, partly-carbonaceous & sl sericitic shaley matrix. Some qtz xyl grains to 4mm. Occ fine massive sst bands - largest 30.65 - 32.3m. **Alteration:** Carbonatisation of feldspar grains. Common veinlets (& lesser veins) of carb > qtz, gen in cleavage.								

5 cm

5.5 - 15.85m:

2% py-po, locally up to 3-5% (core weakly magnetic).
Fi gr dissem & v thin stringers along cleav.

15.85 - 18.85m.

Minor to 1% dissem py.

18.85 - 57.0m:

Gen 1% py>po, fi gr dissem. Varies from minor to +2%.

Trace cp in places.

97104

TASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth (m)	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Minor chlorite-sericite alteration assoc with carb-qtz veinlets in kink zones below 43m.				Minor coarse xylline sp>gn-py>cp in qtz-carb veinlets in axis of kink zone //LCA, 43-49m.				
						Structure: Bedding: 55°/LCA @ 24.2m (orientated core: dips 75° to 270° AMG), 48°/LCA @ 27.2m (orientated core: dips 72° to 261° AMG), 46°/LCA @ 37m, 57°/LCA @ 57m.	50	Silty to sandy shale						
						Bedding gen indistinct due to bedding-// mod-strong cleavage and assoc deformation (unit characteristic).	52	Kinks // LCA ± trace sp-cp		Similar (same?) kink zone @ 52 - 56.75m, with minor py & trace cp-sp.				
						Common augen of carb &/or qtz, av 2-3mm, up to 20-30mm. Most augen after deformed carbonatised feldspars.	54							
						Locally stronger deformation around kink zones sub-// LCA @ 43 - 49m & 52 - 56.75m.	56							
						Sl broken, esp 20 -22.5m & 55.7 - 56.25m. Qtz-healed breccia after weak fault @ 30.7m.	58	Predominantly shale						
						Basal contact sharp (bedding/cleav) 60°/LCA.	60							
						57.0 - 60.0m: GREY CALCAREOUS SHALE				57 - 60m:				
						Lithology: Weakly carbonaceous & sl sericitic. Some siltstone component.				Minor to 1% py. Traces of sp & cp. Dissem & tiny stringers.				
						Alteration: Occ carb veins & veinlets.								
						Structure: Bedding gen irreg & deformed with small folds in places. Bedding 65°/LCA @ 59.5m. At 60m grading in siltstone bed fines uphole.								
						Weak-mod bedding-// cleavage.								
						END OF HOLE				5 cm				

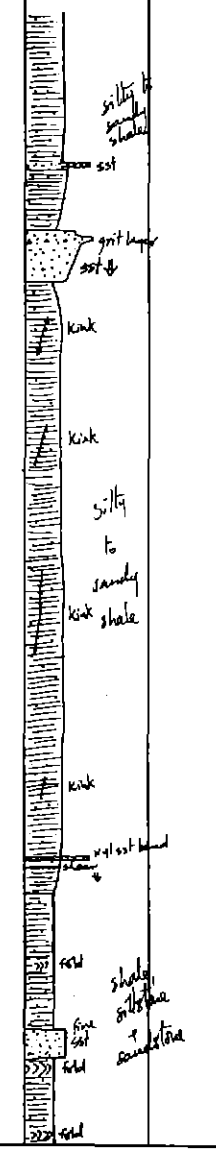
91043

TASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology / Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Hole commences at 18m from underside of hole MM1. First core at 22.3m.							
						22.3 - 267.5m: FARRELL SLATES							
						22.3 - 57.25m: CALCAREOUS SHALEY SILTSTONE **Lithology:** Grey to dark grey. Predom fi-med gr mod calcareous sed comprising silty to sandy grains (gen abraded feldspar>qtz, av 1mm or less, with qtz occ to 4mm), in partly-carbonaceous shaley matrix. Trace graphite on cleavage. Characteristic 'spots' (1-2mm) & small augen (5-30mm) of calcite, some centered on carbonatised feldspar grains. Minor fine massive volcaniclastic sst bands - largest 30.75 - 32.75m (fining downhole). Downhole fining in sst @ 56.35m. Minor irreg intercalations & beds of med-coarse gr feld>>qtz xyl sst to 200mm. **Alteration:** Common carb>qtz veinlets (esp in kink zones), occ veins of same to 100mm. Trace sericite-chlorite alt assoc with some qtz-carb veinlets. **Structure:** Rock mod-strongly deformed by bedding-// cleav, which gen oblit the original fine bedding and causes marked stretching of grains, esp feldspar. Some soft-sed or diagenetic disruption of bedding, incl boudinaging of sst & rare intraformational folding. Bedding: 43°/LCA @ 32.75m; 52°/LCA @ 39m; 49°/LCA @ 51m. Series of kink zones at 0° to 15° to LCA below 35m, centered 44.8 - 47.3m. Unit gen unbroken to sl broken. Basal contact, bedding/cleav plane 57°/LCA.	22 24 26 28 30 32 34 36 38 40 42 44 46 48 50		5 cm 22.3 - 57.25m: 1-2% ubiquitous fi gr dissem (& occ fine veinlets) py>>po. Trace sp-gn-cp, mostly as xylline blebs in qtz-carb veinlets assoc with kink bands.				
						57.25 - 151.25m: CALCAREOUS SHALE, SILTSTONE & FINE SANDSTONE **Lithology:** Grey thin shaley, silty & finely sandy beds, intercalated with partly-carbonaceous dark grey to black shale laminae 1-3mm. 35% shale, 40% siltst, 25% sst. Gen strongly calcareous (inc with depth), with some beds of impure limestone. Sst bands uncommonly to 1.5m thick, often with "cloudy" internal structure suggesting movement after deposition (current effects?). Obvious current bedding @ 125m & uphole-younging scour & fill @ 143.5m. Sst ungraded above 130m, occ graded (all uphole-fining) below 130m. **Alteration:** Trace sericite-chlorite alt assoc with veined & folded zones. Abund carb>qtz veinlets. Occ large qtz>carb-chlorite veins // cleav, esp 115.8 - 119.5m. These veins gen 100-200mm, up to 1m (88.1 - 89.1m), with brecciation & chloritisation of wall rocks evident on vein margins.	52 54 56 58 60 62 64 66 68		57.25 - 151.25m: Ubiquitous finely dissem po>py, & lesser tiny stringers of py>po // cleav. Sulphs vary from <1% in sst intervals, to 5% in shale/siltst intervals. Much of dissem po is drawn out along cleav. Irreg bedding-// pre-cleav calcite-po veins. Traces of cp>sp-gn in carb±qtz veinlets.				

96 1065

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY

From m	Interval m	%	RQD

DESCRIPTION

From m	Interval m	(Incl. LITHOLOGY, STRUCTURE & ALTERATION)

Structure: Unit is much less cleaved than unit above, but displays common apparent soft-sed deformation with pre-cleav v small-scale folding & microfaulting, esp in shale laminae 96.5 - 109m, & 119.5 - 125m (below veined zone). Thin sst beds often boudinaged.
Fold noses evident @ 60.5m, 64.3m, 67.6m, 103.8m, 122m (synclinal), 123.0 - 123.9m.
Deformation & folding decreases markedly below 130m.
Bedding: 67°/LCA (// cleav) @ 61.7m (orientated core: dips 47° to 254° AMG); 45°/LCA @ 76.5m (cleav 58°/LCA, same sense); 66°/LCA @ 95m; 68°/LCA @ 107m (// cleav); 70°/LCA @ 115m (// cleav); 65°/LCA @ 126m (// cleav); 69°/LCA @ 136m; 66°/LCA @ 147m (// cleav).
Basal contact sharp, bedding, 70°/LCA.

Sampling: 034230: 96 - 98m (For assay).
034231: 146 - 148m (Assay).

151.25 - 179.2m: PREDOMINANTLY TURBIDITIC SANDSTONE

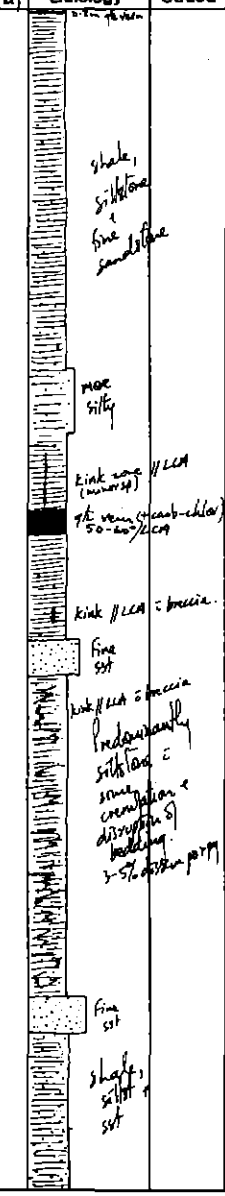
Lithology: Grey. Shale dark grey to black.
Strongly calcareous sequence, comprising numerous rhythmic bands of fi-med gr turbiditic sst (65%), & thinly bedded siltstone (20%)/shale (15%). Shale partly carbonaceous & gen not calcareous.
Sst bands to 1.25m (160.1 - 161.35m), gen 100 - 300mm. All fine uphole.
Basal parts of sst contain 1mm grains of feld>qtz, & stretched lithic grains (to 5mm) of cherty silica & fi gr seds (incl black shale).
Alteration: Minor carb veinlets.
Structure: Bedding gen regular & undeformed: some boudinaging of thin sst beds & occ microfaulting of shale.
Small-scale fold nose @ 169.6m.
Weak-mod cleavage, stretches lithic grains in sst.
Bedding: 70°/LCA @ 151.7m & cleav 40°/LCA, same sense (orientated core: bedding dips 50° to 232° AMG, cleav dips 82° to 276° AMG); 72°/LCA @ 162m; 64°/LCA @ 170.6m.
Largely unbroken - black shale intervals sl fissile.
Basal contact sharp, bedding, 65°/LCA.

179.2 - 218.05m: INTERBEDDED SHALE, SILTSTONE & SANDSTONE

Lithology: Grey to black.
Interbedded shale, siltstone & fine turbiditic sandstone, in equal proportions.
Sst beds to 700mm, av 100 - 200mm, all fining up hole.
Sst comprises grains of fi gr silic lithics, qtz, feldspar, minor mica, & tiny wisps of deformed black shale.
Shale variably carbonaceous - some true black shale with graphitic partings, eg: basal 4m of unit.

Depth (m)

Graphic Lithology / Struct.



MINERALISATION

Zones ≥ 3% sulphs:
95 - 104m:
3-5% po>py, mainly v fi gr dissem.
Trace sp-gn-cp in kink-breccia zone //LCA.
126 - 128.5m:
3% po>py.
141 - 144.5m:
3-5% po>>py, rare cp.
146 - 150m:
3-5% po>>py. Trace cp.

5 cm

151.25 - 179.2m:
Av minor to 1% po-py, fi gr dissem & stringers.
Sst gen contains minor dissem py. Shaley zones contain up to 3% fi gr po.

Best sulphs 3-5% po>py

173.3 - 174.5m, centered on kinked zone in black shale @ 173.85m.

179.2 - 180.5m:
Minor to 1% py-po, fi gr dissem.

180.5 - 181.5m:
3-5% po>py, v fi gr dissem & tiny stringers, in black shale interval.

CODES

LITHO	STRUCT	ALTN	MIN

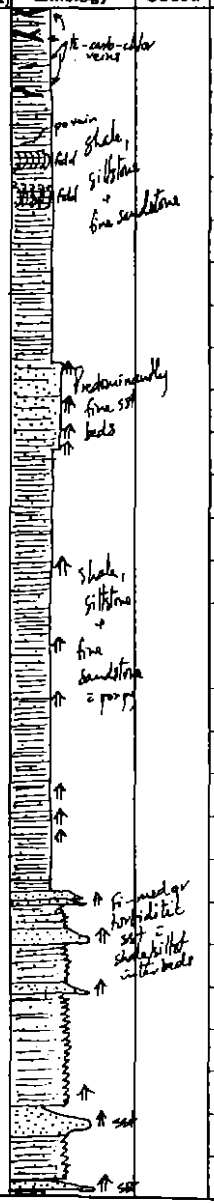
27012

HOLE No. MM1a

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION					CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth (m)	Graphic Lithology / Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Mod-strongly calcareous, esp silty to sandy beds (some shale non-calcareous). Occ thin beds of impure limestone. Calcareous character is not present in faulted zone below 214m. **Alteration:** Essentially unaltered. Carb veinlets throughout, filling fracts at all angles but most commonly // cleav. Trace sericite-chlorite alt assoc with fault below 214m. **Structure:** Regularly bedded: 68°/LCA @ 181.7m (orientated core: dips 52° to 237° AMG); 65°/LCA (cleav 35°/LCA same sense) @ 191.6m; 75°/LCA (cleav 55°/LCA) @ 202.3m; 83°/LCA @ 211.8m. Weak-mod cleavage, stronger towards base. Sl to mod broken in some black shale zones. Fault 204.3 - 204.6m, 45°/LCA (// cleav). STRONG FAULT 214.1 - 216.5m, 60 - 75°/LCA (sub // bedding), centred on puggy crushed & broken zone @ 214.6 - 215.2m (some core loss). Basal contact sharp (bedding) @ 68°/LCA (cleav 57°/LCA, same sense). **Sampling:** 034232: 216 - 218m. (For assay).	118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150 152 154 156 158 160 162 164		181.5 - 191.2m: Overall approx 2% po>py. Varies from <1% py in some sst beds to 5% po in some black shales. Mainly v fi gr dissem. Occ po or py veinlets in narrow strongly cleaved zones in black shale. 191.2 - 204m: Minor to 1% po &py, Dissem. 204 - 206m: 1-2% py in veinlets mainly // cleav. 206 - 214m: V minor py>po, dissem & stringer. 214 - 218.05m: 3-4% py stringers & fi gr dissem. Single 3mm sp veinlet @ 217.5m. 218.05 - 224m: Minor dissem & stringer py>>po. Rare sp-gn, mainly assoc with carb veinlets. 224 - 235.5m: Trace py. 235.5 - 236.7m: 1-2% dissem & stringer py. Trace sp-gn.				
						218.05 - 236.7m: MASSIVE CRYSTAL SANDSTONE (MURCHISON MINE HOST ROCK) **Lithology:** Pale grey. Mod hard. Massive & uniform. Med gr. Loosely packed abraded feldspar>qtz xyl grains, in subordinate silic & sericitic matrix that contains possible fine pumice frags (?). Felds av 1-2mm, qtz ditto but towards base occ up to 7mm (v fractured). Grainsize fines uphole and uppermost 1.65m of unit comprises pale grey sericitic siltstone. Occ small deformed black shale frags & wisps along cleavage, becoming inc common & larger (to 70mm x 10mm) in basal 3m, where there are also similarly-sized lithics of qtz-phyric altered volcs. Black shale band 235.95 - 236.2m. **Alteration:** Weak qtz-sericite-chlorite-carbonate alteration. Matrix sl silicified. *Carb veinlets and minor qtz-carb veins, scattered throughout.* **Structure:** Gen unit lacks bedding. Bedding 54°/LCA at abrupt base of siltstone @ 219.7m, and 70°/LCA in black shale band @ 236m..							

5 cm

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ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth (m)	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Mod-strongly cleaved. Feldspars deformed in strongly sheared basal 1m of unit. Cleav: 68°/LCA @ 221m; 80°/LCA @ 230m; 60°/LCA @ 236.5m	166							
						Gen unbroken. Mod broken 223 - 223.5m (assoc with qtz-carb veined fault zone 20°/LCA), & in basal 1m (centred on fault zone @ 235.95m, angle unknown).	168			10mm semi-massive py & minor sp-gn, in carb gangue in fault zone @ 235.95m.				
						Basal contact sharp (sheared bedding plane), 67°/LCA.	170							
						Sampling: 034233: 235.5 - 236.7m (For assay).	172							
						034238: 227 - 228m (For lithogeochemistry).	174			5 cm				
						236.7 - 257.4m: INTERBEDDED SHALE, SILTSTONE & SANDSTONE	176							
						Lithology: Grey to black.	178							
						Black & grey partly carbonaceous & graphitic shale, thinly interbedded with variably calcareous grey siltstone & turbiditic sandstone. Minor thin impure limestone beds.	180			236.7 - 238m:				
						Black shale predominates above 246.5m, & sst 246.5 - 250m.	182			3-5% py, dissem & veinlets.				
						Sst varies from fine to coarse gr, comprising grains of fi gr sed lithics (most commonly silic, also black shale), qtz & feldspar xyls, carbonate & minor mica.	184			238 - 242m:				
						Grains gen 1mm or less, where coarser are highly stretched (to max 7mm long).	186			2-3% py, dissem & veinlets.				
						Alteration: Trace sericite-chlorite alteration in places.	188			242 - 257.4m:				
						Carb veinlets at all angles throughout. Rare larger veins of qtz-carb±chlor.	190			Minor to 1% py>po. Varies. Dec with depth.				
						Structure: Gen strongly cleaved, sub // bedding. In places shales are mildly kinked & folded on small scale. An inconspicuous 2nd cleav occurs at high angle to bedding .	192							
						Anticlinal fold axis indicated (but not visible in core), by reversal of fining in sst beds between 241m & 242m. Above 241m individual sst beds fine uphole, below 242m sst beds all fine downhole.	194							
						Bedding: 65°/LCA (// 1st cleav, 2nd cleav 15°/LCA, same sense) @ 241.7m (orientated core: bedding & 1st cleav dips 60° to 300° AMG, 2nd cleav dips 71° to 075° AMG); bedding 68°/LCA @ 249.5m & 251.8m (cleav 45°/LCA, same sense).	196							
						Unbroken except for uppermost 0.7m (continuation of strongly sheared zone at base of unit above).	198							
						Basal 'contact' deformed bedding 82°/LCA.	200							
						Sampling: 034234: 236.7 - 238m. (For assay).	202							
							204							
						257.4 - 267.5m: STRONGLY DEFORMED ZONE IN SHALE	206			257.4 - 267.4m:				
						Lithology: Grey & black.	208			Minor to 1% dissem & stringer py>>po.				
						Predom non-calcareous grey to black shale, thinly interbedded with strongly calcareous siltstone & fine sandstone. Minor impure limestone.	210							
						Below 264.7m, intercalations up to 300mm of bleached sericitised siltstone identical to that in top of Murchison Volcanics unit below.	212							

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ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

Alteration: Trace sericite-chlorite alteration in most-deformed zones. Common carb veinlets & lesser qtz-carb veins. These gen contain minor sericite & chlorite.

Structure: Unit characterised by very strong deformation, esp below 260m. Includes small scale folding, kinking & boudinaging of bedding; shearing & annealed brecciation (latter mainly towards base of unit).
Bedding variable, but most commonly around 62°/LCA, with strong bedding-// slatey cleavage. An inconspicuous 2nd cleav also present, approx 40°/LCA (same sense as bedding).
Several small puggy faults // bedding. Sl-mod fissile & broken.
Basal contact marked by 600mm annealed cataclasite with 100mm of fault breccia (70°/LCA) at base, with black shale frags cemented by qtz-carb-sulphides. This underlain by parallel 30mm puggy brittle fault.

Sampling: 034244: 260.25m. (For petrology/cleavage examination).

Trace sp-gn-cp, gen assoc with carb veinlets in highly deformed zones.

267.4 - 267.5m:

10% sp-gn-aspy -py, in annealed breccia zone.

5 cm

267.5 - 400.7m: MURCHISON VOLCANICS

267.5 - 283.0m: ALTERED SERICITIC SILTSTONE & CRYSTAL SANDSTONE

Lithology: Pale greyish-green.
Interbedded epiclastic sequence comprising med gr qtz-xyl sandstone & lesser bleached sericitic (vitric) siltstone. Upper 3.5m and basal 4m are dominated by the fi gr rocks.
Some grey to black shale in upper 3m, in places dismembered & incorp into sst.
Sst massive & uniform, with abund angular to sub-rounded qtz xyl grains, av 1mm or less, occ to 3mm, evenly distributed in lineated sericitic matrix containing deformed carbonatised feldspars and small pumice frags.

Alteration: Mod sericite-carbonate-chlorite-bleaching alteration.
Carb pervasive but also often conc into small diffuse patches, veinlets & occ qtz-carb-chlor veins to 50mm.

Structure: Bedding: 69°/LCA (// cleav) @ 270.7m (orientated core: dips 60° to 278° AMG); 70°/LCA @ 279.1m.
Mod-strong bedding-// cleavage. Unbroken.
267.8m: small fault 70°/LCA, // upper contact.
Basal contact abrupt, // bedding, 68°/LCA.

Sampling: 034235: 268 - 269m. (For assay).
034236: 269 - 270m. (For assay & lithogeochemistry).
034237: 270 - 271m. (For assay).

267.5 - 283m:

10% dissem py over 100mm @ top contact, otherwise minor py & rare sp-gn.

Minor grains of magnetite in sst, around 278m.
2-3% magnetite along cleav in basal 0.4m of unit.

97 0690

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(Incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth (m)	Graphic Lithology / Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						283.0 - 293.0: UNIDENTIFIED ALTERED QUARTZ-PORHYRITIC VOLCANIC **Lithology:** Probable lava or intrusive porphyry. Purplish-grey, pink & green. V hard. Unbroken. Massive coarse-gr volc. Uniform but with banded appearance due to alteration patches // cleavage. Subhedral (rarely euhedral) fractured qtz xyls av 1-3mm, occ to 5mm, scattered through silicified lineated fi gr groundmass. **Alteration:** Strong silica-albite alteration, with lesser magnetite-hematite & sericite-chlorite. Core gen at least weakly magnetic, locally mod-strongly magnetic below 285m. Several barren comb-structured qtz veins up to 150mm thick. **Structure:** Strong cleavage: 68°/LCA @ 286m. Basal contact abrupt, 90°/LCA.	262 264 266 268 270 272 274	seams Mostly blacke grey shale ± fault common crenulations thin tectonic breccia zones 0.6m fault breccia silst/sst 70°/LCA. xyl sst siltst xyl sst siltst MURCHISON VOLCANICS	283 - 293m: Several % v fi gr pervasive magnetite *in places*. Trace py. 5 cm				
						293.0 - 310.6m: QUARTZ-PHYRIC FINE EPICLASTIC VOLCANICLASTICS **Lithology:** Greenish-grey. Fi-med gr. *Sandy to silty textured, gen xyl-rich fine vitric volcaniclastics*, ranging from coarse xyl sst to tuffaceous siltstone/shale (minor). 1° texture gen indistinct due to alteration & cleavage deformation.	276 278 280 282	xyl sst Siltst sst	293 - 298.3m: Several % magnetite, mainly in threads // bedding/cleav. Minor py, often coarsely xylline & gen assoc with mag. At 298m: 5mm zone of sp veinlets 65°/LCA (// cleav).				
						Common xyl grains to 2-3mm, av 1mm or less, of angular to subrounded qtz & lesser, deformed, carbonatised feldspar. In highly vitric fi gr matrix, now alt to qtz-sericite-chlorite. Textural, compositional and grainsize variations confirm original layered nature of unit. Bedded in places. Upper 5.3m of unit comprises bedded fine to coarse gr qtz-xyl sst, clearly related to qtz-porphyritic unit above. **Alteration:** Mod qtz-sericite-chlorite-carbonate alt. Some chlorite-magnetite alt above 298.3m. **Structure:** Bedding: 68°/LCA @ 296m. Mod-strong bedding-// cleavage. Largely unbroken - minor fracturing below 306m. Basal contact sharp, 60°/LCA (1° layering/cleav). **Sampling:** 034239: 305 - 306m. (For lithogeochemistry).	284 286 288 290 292 294 296 298 300	altered - cleaved silt - qtz-porphyritic LAVA. xyl sst Fine sst/siltst Coarse xyl sst Fine sst/ Siltst/shale Fine sst	298.3 - 300m: Minor sp>gn-py, mainly in veinlets // cleav. Minor magnetite. 300 - 310.6m: Trace dissem py, po, sp.				
						310.6 - 333.6m: FINE PUMICEOUS VOLCANICLASTICS **Lithology:** Probably epiclastic. Similar to unit above except marked decrease in qtz xyls, and abund visible pumice frags. Greenish-grey. Fi-med gr, sandy to silty textured, strongly lineated rock. 1° features indistinct due to alteration & cleavage deformation.	302 304 306 308						

91053

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1: 200

CORE RECOVERY				DESCRIPTION					CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth (m)	Graphic Lithology / Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Largely comprises highly deformed finely comminuted tiny pumice frags, gen only up to a few mm long, but rarely to several tens of mm. Occ fi gr volc lithic frags ditto. Rock also contains highly deformed feldspars (av <2mm), and lesser, gen smaller, qtz xyl grains. Minor bands of grey tuffaceous siltstone/shale above 318m, largest: 316 - 316.3m. These bands contain best sulphides. **Alteration:** Mod-strong chlorite-sericite-carbonate alt. Numerous carb veinlets & small patches, minor larger qtz-carb veins. **Structure:** Strongly cleaved. Bedding in grey siltstone/shale: 70°/LCA @ 317.55m. Cleav: 62°/LCA @ 331.7m (orientated core: dips 9° to 262° AMG). Largely unbroken - minor fracturing in places. Small fault 60°/LCA (// cleav), @ 316m (top of siltstone band). Basal contact v indistinct & diffuse. **Sampling:** 034241: 336 - 337m (For lithogeochemistry).	310 312 314 316 318 320 322 324 326 328 330 332 334 336 338 340 342 344 346 348 350 352 354 356	fine xyl sst fine pumiceous volcaniclastics silst/shale fine pumiceous volcaniclastics amygdaloidal Dacitic lava or dyke sst fine sst volcaniclastic xyl-lithic sst/tuff silst/shale ± sp Coarse sst	310.6 - 316m: Trace dissem py, po & sp. 316 - 316.3m: 2% sp-po, thin stringers in cleav. 316.3 - 333.6m: V minor py>sp. Ubiquitous minor leucoxenised black grains (after mag?). 5 cm 333.6 - 347m: Minor py, trace sp> gn-cp. Dissem. Ubiquitous small grains of leucoxenised opaques. 347 - 351.6m: Minor py, & trace sp-gn-po. Dissem. 351.6 - 352.85m: 1-2% py, sp & po. Dissem & veinlets.				
						333.6 - 347m: DACITIC LAVA OR DYKE **Lithology:** Greenish-grey. Fi-med gr. Massive. Weakly lineated. Rather similar in overall appearance to units above & below, but has largely undeformed finely granular feldspar-phyric texture, lacks visible pumice, is much less strongly lineated & contains apparent stretched amygdales to 10mm of calcite & chlorite (best developed around 336.5m). Scattered small feldspar phenocrysts throughout, av 1mm. **Alteration:** Mod carbonate-chlorite alteration. Common veinlets & clots of carb. **Structure:** Mod cleaved. Largely unbroken. Basal contact diffuse & v hard to pick. **Sampling:** 034241: 336 - 337m. (For lithogeochemistry). 034245: 337.2m. (For petrology).				
						347 - 366.7m: ALTERED VARIABLE FINE EPICLASTIC VOLCANICLASTICS **Lithology:** Greenish-grey. Fi-med gr. 1° texture indistinct due to alt/deform. A variable layered sequence, predominantly pulses of vitric qtz-feld xyl (±pumiceous) sst, grading in places to fine lithic-rich breccio-conglomerate. Intercalated with finer volcaniclastic sst & vitric bedded tuffaceous siltstone/shale (latter 351.85 - 352.85m & 361.2 - 363.2m).				

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ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90 Graphic Scale 1: 200

CORE RECOVERY

From m	Interval m	%	RQD

DESCRIPTION

From m	Interval m	(Incl. LITHOLOGY, STRUCTURE & ALTERATION)

Xyls av <2mm, pumice gen a few mm & highly deformed. Lithics angular to subrounded, gen <15mm, occ to 50mm. Incl: fi gr carbonate, fi gr silica, qtz-phyric volcs, & fi gr seds (incl rare black shale).
Pumiceous sst pulse 352.85 - 361.2m displays gradual coarsening below 358m to lithic-rich breccio-cong at base.

Alteration: Mod-strong carbonate-sericite-chlorite alteration. Sericitisation inc below 361m, approaching veined zone at base.
Common veinlets, small patches & occ thin laminae, of carb.
Several white & pale pink qtz>>carb-chlorite-albite veins below 363.2m, largest 363.9 - 364.5m, irreg margins - lower disrupts cleavage.

Structure: Deformed bedding visible in tuffaceous siltstone/shale zones: 65°/LCA @ 351.9m & 361.4m.
Mod-strong bedding-// cleavage, 63°/LCA @ 361.7m (orientated core: dips 73° to 270° AMG). Cleavage strength varies according to rock type: eg: pumiceous & vitric types are more cleaved, deformed & sericitic than xyl rich sst.
Sl fractured & broken in basal 6m, otherwise unbroken.
Basal contact irreg upper edge of large qtz vein, 80°/LCA.

Sampling: 034240: 351.6 - 352.85m. (For assay).
034242: 361.3 - 363.3m. (For assay & lithogeochemistry).

366.7 - 372.1m: ZONE OF QUARTZ-ALBITE VEINING

Lithology: White, pink & green.
Brecciated zone comprising:
75% irreg massive xylline qtz-albite>carb-chlorite vein material.
25% brecciated & fractured, strongly qtz-sericite-chlorite alt, fi gr sandy-textured volc containing abund 1mm fractured qtz & feld xyl grains.

Alteration: As above.

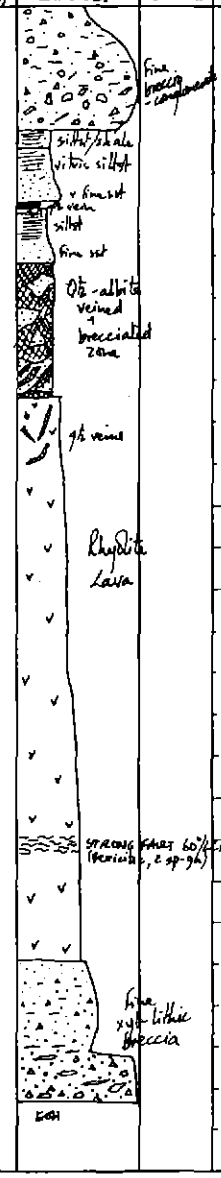
Structure: Sl broken. At base veins 15°/LCA - opp sense cleav.

372.1 - 395m: QUARTZ & FELDSPAR-PHYRIC VITRIC RHYOLITIC LAVA

Lithology: Pale fawny-grey. Massive. Hard.
Primary rock type almost unidentifiable due to alteration.
Finely granular, mod foliated, fairly uniform.
Qtz & feld xyls, av 1-2mm, occ to 3mm below 386m, in qtz-sericite-albite altered groundmass, that originally was highly vitric and has snowflake devitrification texture in places.
Below 389m occ tiny wispy grains - poss pumice.

Depth (m): 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400

Graphic Lithology / Struct.



MINERALISATION

352.85 - 360m:
Minor py, trace sp.

360 - 366.7m:
1% sp, po, py, gn.
Dissem, & stringers, also as grains in qtz veins.
Sp most common in siltst/shale zone 361 - 363.3m.
5mm sp-gn-qtz vein @ 363.25m
In basal 2-3m sulphs dec to minor, with trace arsenopy.

5 cm

366.7 - 372.1m:
Minor sp-gn>py, in clots in qtz veins & in small tension gash veinlets.

372.1 - 395m:
Minor but persistent dissem sp-gn-py.
Several % fi gr dissem sp-gn in fault @ 389.9 - 390.3m.

CODES

LITHO	STRUCT	ALTN	MIN

9710533

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MM1a

PROJECT: MURCHISON MINE, TULLAH EL 22/90

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(Incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Alteration: Mod silica-sericite-albite-bleaching. Local strong silif.								
						Qtz-carb veinlets & veins throughout but no pervasive carb alt.								
						Occ thick qtz veins assoc with margin of unit above extend to 374.7m.								
						Structure: Weak-mod cleavage: 70°/LCA @ 385m & 395m.								
						Slight tectonic micro-fracturing & brecciation of rock fabric.								
						Badly broken in strong puggy and sericitzed fault 389.9 - 390.5m (60°/LCA								
						// cleav), otherwise unbroken.								
						Basal contact indistinct.								
						Sampling: 034246: 385.7m (for petrology).								
						395 - 400.7m: FINE CRYSTAL-LITHIC BRECCIA								
						Lithology: Grey-green. Massive. Unbroken. Foliated.								
						Abund matrix-supported angular to subangular frags, commonly stretched				395 - 400.7m:				
						& deformed, in matrix dominated by qtz xyls & fine pumice.								
						Frags include: v chloritic qtz-feld phyric volc, fi gr vitric volcs,				1% dissem po.				
						qtz, carbonate, tuffaceous siltstone & rare black shale.				Trace sp.				
						Frags gen 5-20mm, siltstone to +50mm. Matrix qtz xyls av 1mm, occ to 4mm.								
						Alteration: Mod carbonatized. Weak-mod sericite-chlorite alt.								
						Structure: Mod-strongly cleaved 65°/LCA.								
						Sampling: 034243: 397-398m (for lithogeochemistry).								
						END OF HOLE								

971054

HOLE No. MM1a

FASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

PROJECT : MURCHISON MINE, TULLAH EL 22/90

SAMPLE						ASSAYS (ppm unless specified)																						COMMENTS
Number	Type	From m	To m	Interval m	Recovered m	Cu	Pb	Zn	Ag	Au	Ba / As	Sn / W	Rb / Sr	V / Nb	Y / Zr	Al_2O_3 / SiO_2 (%)	TiO_2 / Fe_2O_3 (%)	MnO / CaO (%)	K_2O / MgO (%)	P_2O_5 / Na_2O (%)	LOI / S (%)	
034230	Split NQ	96	98	2·0		78	40	128	<1	<0·008	510 / 11	7 / 7																Shale ± 3-5% po>>py
231	" "	146	148	2·0		67	22	99	<1	<0·008	476 / 10	8 / <5																" " " " "
232	" "	216	218	2·0		86	152	282	1	0·014	1203 / 64	6 / <5																Black shale ± 3-4% py, minor sp.
233	" "	235·5	236·7	1·2		11	137	217	<1	<0·008	1029 / 21	12 / <5																2% py, minor sp-gn in xyl sst.
234	" "	236·7	238	1·3		70	188	251	1	0·008	1184 / 330	9 / <5																Black shale ± 3-5% py
034235	" "	268	269	1·0		8	54	172	<1	<0·008	725 / 14	4 / <5																Sericitic siltstone, minor py
236	" "	269	270	1·0		6	86	63	<1	<0·008	600 / 4	4 / <5	105 / 167	10 / 11	30 / 182	10·61 / 74·3	0·23 / 2·52	0·08 / 3·95	2·45 / 0·63	0·035 / 0·93	4·24 / 0·147	Qtz-xyl sst. Minor py.
237	" "	270	271	1·0		9	18	90	<1	<0·008	931 / 4	9 / <5																Sericitic siltstone, minor py
238	" "	227	228	1·0									248 / 91	23 / 10	30 / 170	13·06 / 69·7	0·29 / 3·09	0·68 / 2·46	3·22 / 0·90	0·050 / 2·21	4·14 / 0·147	Xyl sst (Murchison Mine Host)
239	" "	305	306	1·0									131 / 90	<5 / 14	36 / 229	11·45 / 74·5	0·21 / 2·77	0·21 / 2·35	3·49 / 0·39	0·020 / 1·67	3·03 / 0·015	Fine xyl sst ± trace py, po, sp.
034240	" "	351·6	352·85	1·25		14	893	1517	2	<0·008	571 / 13	7 / 5																1-2% py, sp, po in tuff-shale
241	" "	336	337	1·0									173 / 132	61 / 11	27 / 237	14·24 / 62·0	0·45 / 4·68	0·22 / 4·89	4·00 / 1·22	0·102 / 1·63	6·38 / 0·024	Amygdaloidal dacite lava
242	" "	361·3	363·3	2·0		10	914	1142	2	<0·008	818 / 10	8 / <5	240 / 51	<5 / 13	33 / 129	13·65 / 71·7	0·15 / 1·92	0·18 / 1·95	4·87 / 0·92	0·021 / 0·89	3·41 / 0·314	Sericitic siltstone ± 1-2% py, sp
243	" "	397	398	1·0									190 / 59	<5 / 12	32 / 109	10·30 / 73·7	0·13 / 1·71	0·32 / 3·91	4·01 / 0·48	0·016 / 0·46	4·82 / 0·043	Sandy xyl-lithic epiclastic
Laboratory ANALABS, COOEE				Analytical Method		AAS	AAS	AAS	AAS	FIRE ASSAY	XRF / HA101	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	XRF / XRF	
Job-No. 0235, 111310.60.09395		Date 27·4·93		Detection Limit (ppm)		2	3	2	1	0·008	10 / 1	3 / 5	5 / 5	5 / 3	5 / 5	0·05% / 0·1%	0·01% / 0·01%	0·01% / 0·01%	0·01% / 0·01%	0·005% / 0·05%	0·01% / 0·005%	

CR 91053

PASMINCO EXPLORATION
DIAMOND DRILL HOLE SUPPLEMENTARY DATA

PROJECT: MURCHISON MINE, TULLAH EL 22/90

HOLE No. MM1a

PETROLOGICAL SAMPLE RESULTS

SAMPLE NUMBER: 034246 MM1a 385.7m.

SUMMARY:

This is a formerly glassy, highly evolved quartz+ plagioclase-phyric rhyolitic lava that has suffered strong hydrothermal sericite alteration.

HAND SPECIMEN:

This is a mottled grey-green rather weakly cleaved felsic plagioclase+quartz-phyric lava with darker, much more cleaved bands, and quartz segregations up to several cm long.

THIN SECTION:

In the best preserved parts of this thin section, there are beautifully preserved perlitic cracks through devitified glass that indicate (together with less diagnostic criteria) that this was a glassy felsic lava. Albitized plagioclase phenocrysts are just slightly less abundant than quartz phenocrysts, each probably in the range 5-8 modal%. The plagioclase phenocrysts were mainly less than 2mm long, and are rather broken and disaggregated by the weak to moderate deformation that has affected this rock. Most are slightly speckled by very fine-grained sericite. Quartz phenocrysts are mainly less than 2mm across, many being resorbed and rather anhedral to slightly rounded. All are strained and fractured, and partially disaggregated, with subgrain recrystallization common along the fractures. This sample was so evolved that it contains no FeTi oxide phenocrysts, either fresh or altered. Nor were there any mafic silicate phenocrysts in this rock.

The groundmass, as noted above, was totally glassy, and shows excellent perlitic cracks in better preserved areas of the slide. Approaching more cleaved domains, the intensity of sericite development increases, building up to a very dense pervasive mesh throughout the groundmass in the strongly cleaved zones. In these zones, quartz phenocrysts are totally disaggregated and strung out into the cleavage. A few discontinuous bands of very ragged polycrystalline quartz with spotty calcite overprinting cut the rock, as well as a single thicker (to 3mm thick) vein of calcite.

This was an unusually evolved quartz+plagioclase-phyric rhyolitic glassy lava that has suffered strong sericitic hydrothermal alteration.

SAMPLE NUMBER: 034245 MM1a, 337.2m

SUMMARY:

This is a quite strongly hydrothermally altered (sericite-calcite), sparsely plagioclase-phyric dacitic to rhyodacitic lava or shallow dyke rock.

HAND SPECIMEN:

This is a dark green strongly altered felsic lava or tuff with a weak cleavage and a few stretched or flattened quartz or calcite-filled vesicles.

THIN SECTION:

This is a very strongly altered felsic volcanic rock, in which the combination of weak cleavage development and strong hydrothermal alteration have effectively obliterated the original mineralogy and texture. The rock consists of a rather heterogeneous quartzo-feldspathic 'background' that has been thoroughly pervaded by a dense mesh of sericite and fine calcite. Several deformed and albitized plagioclase phenocrysts are present but are stretched, rather disaggregated, and strongly overprinted by calcite and sericite, so as to be virtually indiscernible. Former FeTi oxide phenocrysts are totally altered to leucoxene, but have been dragged out and disaggregated, and small anhedral magnetite grains formed in this breakdown reaction form trails that sometimes stretch out into the cleavage. Apatite microphenocrysts and smaller crystals are not abundant, but are scattered through the groundmass, and small subhedral zircon crystals are also rather common.

The groundmass of this rock was almost certainly largely glassy. It presumably devitrified to a very fine-grained quartzo-feldspathic intergrowth that has coarsened, then been strongly overprinted by intense sericite-calcite alteration. Sericite forms a pervasive mesh throughout the rock, almost forming a cleavage. Calcite is also abundant, forming mainly small streaks and occasional larger lozenge-shaped crystal aggregates that may be deformed vesicles. Discontinuous streaks of chlorite are not uncommon, elongate in the direction of the sericite-defined 'cleavage'.

This sample was almost certainly a dacitic or rhyodacitic lava or shallow intrusive rock. To distinguish between these possibilities, the primary groundmass texture is critical. Unfortunately however, the strong alteration precludes an assessment of a volcanic versus intrusive origin. Many shallow intrusive felsic rocks in the Mount Read Volcanics have groundmass textures that suggest an originally largely glassy nature, so the apparently former glassy groundmass of this sample lends no diagnostic clues.

This was a sparsely plagioclase-phyric dacitic to rhyodacitic lava or shallow intrusive dyke rock that has suffered strong hydrothermal sericite-calcite alteration.

9301 96

HOLE MM1/1A : RECOVERY, MAGNETIC SUSCEPTIBILITY, SPECIFIC GRAVITY.

HOLE	AREA	FROM (m)	TO (m)	RECOVERED (m)	DEPTH (m)	MAG. SUS.	SIZE	DEPTH (m)	SG
MM1	6	0.00	6.20	0.50	6.2				
MM1	6	6.20	6.30	0.20	6.3				
MM1	6	6.30	6.90	0.60	6.9	0.42	HQ		
MM1	6	6.90	7.50	0.60	7.5	0.26	HQ		
MM1	6	7.50	8.00	0.50	8.0				
MM1	6	8.00	8.40	0.40	8.4	1.30	HQ		
MM1	6	8.40	9.00	0.60	9.0	0.31	HQ		
MM1	6	9.00	9.50	0.50	9.5				
MM1	6	9.50	9.70	0.40	9.7	0.37	HQ	9.90	2.74
MM1	6	9.70	10.30	0.60	10.3				
MM1	6	10.30	10.80	0.40	10.8	0.52	HQ		
MM1	6	10.80	11.30	0.60	11.3	0.39	HQ		
MM1	6	11.30	12.80	1.50	12.8	1.22	HQ		
MM1	6	12.80	13.20	0.50	13.2	1.64	HQ		
MM1	6	13.20	13.60	0.40	13.6	0.87	HQ		
MM1	6	13.60	14.60	1.00	14.6	0.43	HQ		
MM1	6	14.60	15.20	0.60	15.2	0.53	HQ		
MM1	6	15.20	16.50	1.40	16.5	0.24	HQ		
MM1	6	16.50	18.10	1.60	18.1	0.46	HQ		
MM1	6	18.10	19.40	1.40	19.4	0.22	HQ		
MM1	6	19.40	20.40	1.00	20.4	0.20	HQ		
MM1	6	20.40	21.20	0.80	21.2	0.20	HQ		
MM1	6	21.20	22.40	1.20	22.4				
MM1	6	22.40	23.00	0.60	23.0	0.28	HQ		
MM1	6	23.00	24.20	1.10	24.2	0.24	HQ		
MM1	6	24.20	24.50	0.30	24.5	0.26	HQ		
MM1	6	24.50	26.00	0.60	26.0	0.28	HQ		
MM1	6	26.00	27.20	1.60	27.2	0.95	HQ		
MM1	6	27.20	28.70	1.10	28.7	0.20	HQ		
MM1	6	28.70	30.00	1.50	30.0	0.21	HQ		
MM1	6	30.00	30.90	1.20	30.9	0.18	HQ		
MM1	6	30.90	32.70	1.30	32.7	0.32	HQ		
MM1	6	32.70	34.10	1.60	34.1	0.21	HQ		
MM1	6	34.10	35.50	1.40	35.5	0.20	HQ		
MM1	6	35.50	36.20	1.40	36.2	0.14	HQ		
MM1	6	36.20	37.60	0.60	37.6	0.19	HQ		
MM1	6	37.60	39.20	1.50	39.2	0.18	HQ		
MM1	6	39.20	40.70	1.50	40.7	0.18	HQ		
MM1	6	40.70	42.20	1.50	42.2	0.24	HQ		
MM1	6	42.20	43.70	1.40	43.7	0.18	NQ		
MM1	6	43.70	45.20	1.50	45.2	0.28	HQ		
MM1	6	45.20	46.70	1.40	46.7	0.20	HQ		
MM1	6	46.70	48.20	1.60	48.2	0.22	HQ		
MM1	6	48.20	49.70	1.50	49.7	0.16	HQ	50.00	2.72
MM1	6	49.70	51.20	1.50	51.2	0.20	HQ		
MM1	6	51.20	52.70	1.40	52.7	0.20	HQ		
MM1	6	52.70	54.20	1.50	54.2	0.22	HQ		
MM1	6	54.20	55.70	1.50	55.7	0.43	HQ		
MM1	6	55.70	56.20	0.50	56.2	0.25	HQ		
MM1	6	56.20	57.20	1.10	57.2	0.54	HQ		
MM1	6	57.20	58.70	1.60	58.7	0.24	HQ		
MM1	6	58.70	60.00	0.30	60.0	0.24	HQ		

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HOLE	AREA	FROM (m)	TO (m)	RECOVERED (m)	DEPTH (m)	MAG. SUS.	SIZE	DEPTH (m)	SG
MM1A	6	18.00	22.90	0.40	22.9	0.20	HQ		
MM1A	6	22.90	24.70	1.50	24.7	0.22	HQ		
MM1A	6	24.70	25.10	0.50	25.1	0.82	HQ		
MM1A	6	25.10	27.60	2.60	27.6	0.14	HQ		
MM1A	6	27.60	28.10	1.00	28.1	0.48	HQ		
MM1A	6	28.10	31.50	2.80	31.5	0.22	HQ		
MM1A	6	31.50	33.50	2.10	33.5	0.24	HQ		
MM1A	6	33.50	34.70	1.20	34.7	0.18	HQ		
MM1A	6	34.70	35.90	1.30	35.9	0.18	HQ		
MM1A	6	35.90	37.70	1.90	37.7	0.21	HQ		
MM1A	6	37.70	40.70	3.00	40.7	0.25	HQ		
MM1A	6	40.70	43.70	3.00	43.7	0.30	HQ		
MM1A	6	43.70	46.70	3.00	46.7	0.21	HQ		
MM1A	6	46.70	49.70	3.00	49.7	0.40	HQ		
MM1A	6	49.70	52.70	3.00	52.7	0.38	HQ		
MM1A	6	52.70	55.70	3.00	55.7	0.29	HQ		
MM1A	6	55.70	58.70	3.00	58.7	0.06	HQ		
MM1A	6	58.70	61.70	3.00	61.7	0.31	HQ		
MM1A	6	61.70	64.70	3.00	64.7	1.07	HQ		
MM1A	6	64.70	67.70	3.00	67.7	1.48	HQ		
MM1A	6	67.70	69.00	1.10	69.0	0.49	HQ		
MM1A	6	69.00	70.70	1.10	70.7	0.55	NQ		
MM1A	6	70.70	73.50	1.60	73.5	1.75	NQ		
MM1A	6	73.50	76.60	2.80	76.6	0.36	NQ		
MM1A	6	76.60	79.70	3.00	79.7	0.32	NQ		
MM1A	6	79.70	82.70	3.10	82.7	0.26	NQ		
MM1A	6	82.70	83.00	0.30	83.0	0.18	NQ		
MM1A	6	83.00	85.70	2.70	85.7	0.22	NQ		
MM1A	6	85.70	88.70	3.00	88.7	0.02	NQ		
MM1A	6	88.70	91.70	3.00	91.7		NQ		
MM1A	6	91.70	94.70	3.00	94.7		NQ		
MM1A	6	94.70	97.70	3.00	97.7	0.42	NQ		
MM1A	6	97.70	100.70	3.00	100.7	1.05	NQ	100.00	2.77
MM1A	6	100.70	103.70	3.00	103.7	0.88	NQ		
MM1A	6	103.70	106.70	3.00	106.7	0.67	NQ		
MM1A	6	106.70	109.70	3.00	109.7	0.09	NQ		
MM1A	6	109.70	112.70	3.00	112.7	1.07	NQ		
MM1A	6	112.70	115.70	3.00	115.7	1.10	NQ		
MM1A	6	115.70	118.70	3.00	118.7	0.92	NQ		
MM1A	6	118.70	121.70	3.00	121.7	1.26	NQ		
MM1A	6	121.70	124.70	3.00	124.7	1.42	NQ		
MM1A	6	124.70	127.70	3.00	127.7	0.99	NQ		
MM1A	6	127.70	130.70	3.00	130.7	0.27	NQ		
MM1A	6	130.70	133.70	3.00	133.7	0.37	NQ		
MM1A	6	133.70	136.70	3.00	136.7	0.47	NQ		
MM1A	6	136.70	139.70	3.00	139.7	0.41	NQ		
MM1A	6	139.70	142.70	3.00	142.7	0.55	NQ		
MM1A	6	142.70	145.70	3.00	145.7	0.18	NQ		
MM1A	6	145.70	148.70	3.00	148.7	3.11	NQ		
MM1A	6	148.70	151.70	3.00	151.7	0.30	NQ	150.00	2.75
MM1A	6	151.70	154.70	3.00	154.7	0.21	NQ		
MM1A	6	154.70	157.70	3.00	157.7	0.53	NQ		
MM1A	6	157.70	160.70	3.00	160.7	0.33	NQ		
MM1A	6	160.70	163.70	3.00	163.7	0.30	NQ		
MM1A	6	163.70	166.70	3.00	166.7	0.24	NQ		

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HOLE	AREA	FROM (m)	TO (m)	RECOVERED (m)	DEPTH (m)	MAG. SUS.	SIZE	DEPTH (m)	SG
MM1A	6	166.70	169.70	3.00	169.7	0.24	NQ		
MM1A	6	169.70	172.70	3.00	172.7	0.42	NQ		
MM1A	6	172.70	175.70	3.00	175.7	0.26	NQ		
MM1A	6	175.70	178.70	3.00	178.7	0.27	NQ		
MM1A	6	178.70	181.70	3.00	181.7	0.54	NQ		
MM1A	6	181.70	184.70	3.00	184.7	0.19	NQ		
MM1A	6	184.70	187.70	3.00	187.7	0.30	NQ		
MM1A	6	187.70	190.70	3.00	190.7	0.36	NQ		
MM1A	6	190.70	193.70	3.00	193.7	0.15	NQ		
MM1A	6	193.70	196.70	3.00	196.7	0.25	NQ		
MM1A	6	196.70	199.70	3.00	199.7	0.26	NQ	200.00	2.73
MM1A	6	199.70	202.70	3.00	202.7	0.24	NQ		
MM1A	6	202.70	205.70	3.00	205.7	0.20	NQ		
MM1A	6	205.70	208.70	3.00	208.7	0.24	NQ		
MM1A	6	208.70	211.70	3.00	211.7	0.19	NQ		
MM1A	6	211.70	214.70	3.00	214.7	0.20	NQ		
MM1A	6	214.70	216.10	1.40	216.1	0.09	NQ		
MM1A	6	216.10	218.90	2.80	218.9	0.02	NQ		
MM1A	6	218.90	220.70	3.00	220.7	0.36	NQ		
MM1A	6	220.70	223.70	3.00	223.7	0.09	NQ		
MM1A	6	223.70	226.70	3.00	226.7	0.07	NQ	225.00	2.68
MM1A	6	226.70	229.70	3.00	229.7	0.08	NQ		
MM1A	6	229.70	232.70	3.00	232.7	0.08	NQ		
MM1A	6	232.70	235.70	3.00	235.7	0.10	NQ		
MM1A	6	235.70	236.90	1.20	236.9	0.09	NQ		
MM1A	6	236.90	238.70	1.80	238.7	0.07	NQ		
MM1A	6	238.70	241.70	3.00	241.7	0.24	NQ		
MM1A	6	241.70	244.70	3.00	244.7	0.18	NQ		
MM1A	6	244.70	247.70	3.00	247.7	0.26	NQ		
MM1A	6	247.70	250.70	3.00	250.7	0.26	NQ	250.00	2.76
MM1A	6	250.70	253.70	3.00	253.7	0.22	NQ		
MM1A	6	253.70	256.70	3.00	256.7	0.11	NQ		
MM1A	6	256.70	259.70	3.00	259.7	0.33	NQ		
MM1A	6	259.70	262.70	3.00	262.7	0.12	NQ		
MM1A	6	262.70	265.70	3.00	265.7	0.13	NQ		
MM1A	6	265.70	268.70	3.00	268.7	0.13	NQ		
MM1A	6	268.70	271.70	3.00	271.7	0.17	NQ		
MM1A	6	271.70	274.70	3.00	274.7	0.11	NQ		
MM1A	6	274.70	277.70	3.00	277.7	0.09	NQ		
MM1A	6	277.70	280.70	3.00	280.7	0.69	NQ		
MM1A	6	280.70	283.70	3.00	283.7	0.03	NQ		
MM1A	6	283.70	286.70	3.00	286.7	0.05	NQ		
MM1A	6	286.70	289.70	3.00	289.7	0.11	NQ		
MM1A	6	289.70	292.70	3.00	292.7	0.04	NQ		
MM1A	6	292.70	295.70	3.00	295.7	0.59	NQ		
MM1A	6	295.70	298.70	3.00	298.7	0.07	NQ		
MM1A	6	298.70	301.70	3.00	301.7	0.07	NQ	300.00	2.72
MM1A	6	301.70	304.70	3.00	304.7	0.07	NQ		
MM1A	6	304.70	307.70	3.00	307.7	0.08	NQ		
MM1A	6	307.70	310.70	3.00	310.7	0.09	NQ		
MM1A	6	310.70	313.70	3.00	313.7	0.12	NQ		
MM1A	6	313.70	316.70	3.00	316.7	0.06	NQ		
MM1A	6	316.70	319.70	3.00	319.7	0.17	NQ		
MM1A	6	319.70	322.70	3.00	322.7	0.16	NQ		
MM1A	6	322.70	325.70	3.00	325.7	0.16	NQ		

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HOLE	AREA	FROM (m)	TO (m)	RECOVERED (m)	DEPTH (m)	MAG. SUS.	SIZE	DEPTH (m)	SG
MM1A	6	325.70	328.70	3.00	328.7	0.14	NQ		
MM1A	6	328.70	331.70	3.00	331.7	0.16	NQ		
MM1A	6	331.70	334.70	3.00	334.7	0.11	NQ		
MM1A	6	334.70	337.70	3.00	337.7	0.13	NQ		
MM1A	6	337.70	340.70	3.00	340.7	0.11	NQ		
MM1A	6	340.70	343.70	3.00	343.7	0.11	NQ		
MM1A	6	343.70	346.70	3.00	346.7	0.10	NQ		
MM1A	6	346.70	349.70	3.00	349.7	0.24	NQ		
MM1A	6	349.70	352.70	3.00	352.7	0.32	NQ	350.00	2.73
MM1A	6	352.70	355.70	3.00	355.7	0.16	NQ		
MM1A	6	355.70	358.70	3.00	358.7	0.34	NQ		
MM1A	6	358.70	361.70	3.00	361.7	0.05	NQ		
MM1A	6	361.70	364.70	3.00	364.7	0.07	NQ		
MM1A	6	364.70	367.70	3.00	367.7	0.02	NQ		
MM1A	6	367.70	370.70	3.00	370.7	0.17	NQ		
MM1A	6	370.70	373.70	3.00	373.7	0.04	NQ		
MM1A	6	373.70	376.70	3.00	376.7	0.06	NQ		
MM1A	6	376.70	379.70	3.00	379.7	0.05	NQ		
MM1A	6	379.70	382.70	3.00	382.7	0.04	NQ		
MM1A	6	382.70	385.70	3.00	385.7	0.06	NQ		
MM1A	6	385.70	388.70	3.00	388.7	0.07	NQ		
MM1A	6	388.70	391.70	3.00	391.7	0.08	NQ		
MM1A	6	391.70	394.70	3.00	394.7	0.04	NQ		
MM1A	6	394.70	397.70	3.00	397.7	0.03	NQ		
MM1A	6	397.70	400.70	3.00	400.7	0.14	NQ	400.00	2.75

971066

Appendix 2

Relogs of Holes MP 28, 29, 30, 32, Murchison Mine

HOLE No. MP 28

PASMINCO EXPLORATION
DIAMOND DRILL HOLE LOG

LOCATION	MURCHISON MINE
PROJECT	
PROSPECT	
DESIGNED BY	
LOGGED BY	
RELOGGED	J.G. PURVIS
COMMENCED	11·12·47
COMPLETED	30·1·48
DRILLED BY	
DRILL RIG	

OBJECTIVE

TO TEST BELOW No 3 LEVEL FOR THE CONTINUATION OF THE MURCHISON LODE.

RESULT

HOLE INTERSECTED 1·3m GRADING 7·5% Pb, 16·9% Zn, 401 g/t Ag and 0·85 g/t Au ON UPPER CONTACT OF CRYSTAL SANDSTONE UNIT.

LOCATION/SURVEY DATA (AMG)

Grid	AMG	STERLING VALLEY MAP GRID	RL Collar m	197·9
Northing m	5 376 489·3	19,942′	Bearing Collar	090·3°
Easting m	385 569·7	7,451′	Dip Collar	−29°
DH Survey Type			Length Hole m	403′ (122·8m)

Depth m	Bearing	Dip	Depth m	Bearing	Dip
30·5	090·6°	−26·5°			
61	091°	−25°			
91·4	091·5°	−25°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m	Pb	Zn	Cu	Ag	Au	Comments
312′	314′9″	2′9″	10·6%	22·4%	0·43%	566 g/t	1·25 g/t	2′8″ @ core. Original 1947 assays.
314′9″	316′3″	1′6″	1·0%	5·2%	0·26%	59 g/t	<0·16 g/t	5″ @ core. " " " "

SIGNIFICANT CORE LOSS

From m	To m	% Lost
CORE RECOVERY NOT CALCULATED IN ORIGINAL EZ LOG. PERSISTENT AND CONSIDERABLE CORE LOSS EVIDENT THROUGHOUT HOLE. CORE NOW IN DISORDERED CONDITION DUE TO MISHANDLING AND DISINTERGRATING CORE BOXES. CORE HELD IN STORAGE AT CORE COMPOUND, ROSEBERY.		

POOR GROUND CONDITION ZONES

From m	To m	Condition

HOLE SIZE

Size	Depth m
EX	122·8

HOLE CONDITIONS AFTER COMPLETION

Collar	
Steel Casing	
PVC Casing	
Ground Water	
Wedge	
Drill Pad	ESTIMATED POSITION OF DRILLSITE SURVEYED BY G. WATTS, OCTOBER 1992

907069

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 28

PROJECT : TULLAH-STERLING RIVER. MURCHISON MINE

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology / Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						NOTE: LOGGING HAMPERED BY POOR CONDITION OF THE EX CORE.							
						CORE GENERALLY JUMBLED AND OUT OF ORDER. UBIQUITOUS CORE LOSS - LOCALLY +50% LOST. NO EVIDENCE OF ANY SAMPLING BY BILLITON.							
				0 – 157'		CORE MISSING							
						Original log states predominantly 'slate' with intercalated 'tuff'.							
				157' – 260' (approx)		CALCAREOUS TUFFACEOUS SILTSTONE WITH LESSER FINE SANDSTONE AND SHALE			To 225': 1% fine dissem py>po.				
						Grey. Shales grey to black and sl carbonaceous.			Also in carb-qtz veinlets (c fracs),				
						Coarser sediments strongly calcareous, shales weakly or non-calcareous			225' – 260': 2% fine dissem py>				
						Silty/sst bands contain xyl grains of feld + qtz, with small stretched			po, with some thin beds of +10% py.				
						and flattened lithics of fi gr seds incl black shale.							
						Silt/sst sl sericitic due mainly to tuffaceous content with v weak chlorite-							
						sericite alteration overprint.							
						Bedding in silt/sst gen on a scale of 20 – 100mm, with larger massive							
						sst beds to 300mm. Shales typically thinly bedded in bands 10-30mm.							
						Grading evident in coarser sediments but no facings can be determined							
						because core is so jumbled.							
						Bedding: 70°/LCA @ 160'; 75°/LCA @ 185' (cleavage 87°/LCA, same sense);							
						78°/LCA @ 212' (cleavage 86°/LCA, same sense); 82°/LCA @ 251' (cleavage							
						82°/LCA, opp sense).							
						Mod-strong cleavage (stretches lithics + feld xyls).							
						Minor carb/qtz veinlets in cleavage. Occ larger barren qtz > carb veins to 70mm.							
						Shales inc common below 225' and overall bedding is thinner.							
				260' – 312'		AS ABOVE EXCEPT MORE SHALES (30-40% OF TOTAL)			260' – 294'6": 1% dissem py>>po,				
						Dark grey. Thinly bedded (typically 1 – 30mm, with sst bands to 100mm).			with some sulphide in qtz-carb				
						Strongly calcareous except for shales which are either weakly or non-calcareous.			veinlets and on fracts.				

97 1063

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP28

PROJECT : TULLAH - STERLING RIVER. MURCHISON MINE.

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT.	ALTN	MIN
						Overall, sequence is finer gr than below, with more siltstone/shale and less sst. Some impure lst beds. Minor v thin qtz-carb veinlets (in cleavage). Bedding: 92°/LCA @ 277' (cleavage / bedding); 80°/LCA @ 290' (cleavage 85°/LCA same sense); cleavage stronger and 80°/LCA towards base of interval.				294'6"—312': 2-3% py, inc ē depth - locally +5% py in shales towards base. Py as 1mm stringers in the increasingly deformed shales, also in carb-qtz veinlets and as dissem in siltst.				
				312'-316'3"		MINERALIZED ZONE				Some qn in basal 1'.				
						To 314'9": Semi-massive coarse gr sphalerite > pyrite - galena, with trace chalcopyrite, in carbonate gangue (siderite ? dolomite ?). Below 314'9": upper half comprises near-massive med gr pyrite > qn > sp, trace cp, in carbonate. Lower half is gtose ē lesser carbonate and possible barite and 10% med gr dissem sp > qn - py. Shadowy feld xyls in base of zone - transition to unit below.								
				316'3"-362'		MASSIVE MEDIUM GRAINED SILICEOUS CRYSTAL SANDSTONE				316'3"—318' (approx): 1% dissem + veinlet sp > qn - py, dec ē depth. Below 318': <1% dissem py + trace dissem sp. 322': 50mm carb-qtz-sericite vein ē 1-2% qn-sp. 45°/LCA 330': 65mm carb vein ē 5-10% sp-py > qn. 45°/LCA. 333': 60mm py-sp in carb-qtz-chlorite gangue.				
						Pale creamy grey. Abraded and packed xyl grains of feld + qtz, with v minor lithic grains including wisps of black shale. Felds av 1-2mm, qtz gen fractured and sl smaller than the felds. Some variation in grainsize but no obvious layering or bedding. Overall, unit coarsens with depth but basal section is finer again. Below 353' some black shale intervals and trace carbonaceous material in sst matrix. Weak-mod carbonate-silica-chlorite-sericite alteration, dec sl ē depth. Dec qtz > carb veins + veinlets to 20mm, often diffuse + patchy networks marking brecciated zones to 40mm, esp above 326' where sst is sl silicified (strongest above 318'). Mod cleavage - felds often stretched into augen. Cleavage: 75°/LCA @ 324'; 80°/LCA @ 356'. Basal contact sharp + sl irreg: 80°/LCA.								

97109

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 28

PROJECT : TULLAH – STERLING RIVER. MURCHISON MINE

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology / Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
				362'–393'		GREY TO BLACK SHALE			362'–375': 2% dissem py				
						Thinly bedded and mod-strongly cleaved above 375'.			375'–393': 1% py.				
						Some interbeds of dark grey calcareous and tuffaceous siltstone.							
						Bedding: 77°/LCA @ 385'; 82°/LCA @ 392'. Small carb veinlets.							
				393'–403'		VOLCANICLASTIC SANDSTONE			393'–403': Minor dissem py.				
						Calcareous. Composed of feld + qtz xyls, fine sedimentary lithics (poss not fully lithified when incorporated into unit), and possible glass shards and small pumice frags. Minor carbonaceous material in matrix.							
						Grainsize ranges from v fine to fine stretched-pebble conglomerate (locally). [Unit is more lithic-rich and less siliceous than the mineralization host rock].							
						Mod-strongly cleaved + deformed c marked stretching + flattening of lithics, (these effects could be partly diagenetic).							
						Cleavage: 80°/LCA @ 398' – parallel to bedding.							
						V minor chlorite-sericite alteration: – strongest at base.							
						END OF HOLE							

971069

HOLE No. MP 28

HASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

PROJECT : TULLAH / STERLING RIVER. MURCHISON MINE

SAMPLE						ASSAYS (ppm unless specified)																COMMENTS
Number	Type	From	To	Interval	Recovered m	Cu / Pb	Zn / Ag	As / Ba	Rb / Sr	Y / Zr	V / Nb	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / CaO	K_2O / MgO	P_2O_5 / SO_3	Na_2O / L.O.I.			
032800	EX CORE	321'	322'	1'	9"	20 / 90	340 / <10	<2 / 1850	340 / 70	25 / 190	25 / 8	14.16 / 68.7	0.36 / 2.6	0.35 / 2.89	5.18 / 0.86	0.063 / 0.29	0.09 / 4.55			Plt-feld xyl sst. Sl silicified + qtz veined.
034201	" "	340'	341'	1'	1'	150 / 90	210 / <10	3 / 1150	120 / 20	16 / 150	17 / 3	13.61 / 69.1	0.33 / 4.3	0.57 / 1.47	4.85 / 0.89	0.056 / 0.13	0.07 / 4.71			- - - - - - - Carb veinlets.
Laboratory	ANALABS			Analytical Method		AAS 104	AAS 104	XRF 401	XRF 401	XRF 401	XRF 401	XRF 408	XRF 408	XRF 408	XRF 408	XRF 408	XRF 408			
Job-No.	111310-60-09062	Date	10-11-92	Detection Limit		20 / 25	20 / 10	2 / 10	5 / 5	5 / 5	5 / 3	0.05 / 0.1	0.01 / 0.1	0.01 / 0.01	0.01 / 0.01	0.005 / 0.01	0.05 / 0.01			

97 1066

HOLE No. MP29

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

LOCATION	MURCHISON MINE
PROJECT	
PROSPECT	
DESIGNED BY	
LOGGED BY	
RELOGGED	J.G. PURVIS
COMMENCED	4·2·48
COMPLETED	25·2·48
DRILLED BY	
DRILL RIG	

OBJECTIVE

TO TEST FOR MINERALIZATION BELOW THAT EXPOSED IN MP 28.

RESULT

NO MINERALIZATION INTERSECTED.

LOCATION/SURVEY DATA (AMG)

Grid	AMG	STERLING VALLEY MP GRID		RL Collar m	197·9
Northing m	5376489·3	19,942'		Bearing Collar	090·3°
Easting m	385569·4	7,450'		Dip Collar	−51°
DH Survey Type	GYROSTAT			Length Hole m	113·7m

Depth m	Bearing	Dip	Depth m	Bearing	Dip
30·5		−45°			
61		−37·5°			
91·4		−31°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m						Comments

SIGNIFICANT CORE LOSS

From m	To m	% Lost
CORE RECOVERY NOT CALCULATED		

POOR GROUND CONDITION ZONES

From m	To m	Condition
IN ORIGINAL EZ LOG. CORE NOW IN BADLY DISORDERED CONDITION DUE TO MISHANDLING AND BILLITON SAMPLING. CORE HELD IN STORAGE AT CORE COMPOUND, ROSEBERY.		

HOLE SIZE

Size	Depth m
EX	113·7

HOLE CONDITIONS AFTER COMPLETION

Collar	
Steel Casing	
PVC Casing	
Ground Water	
Wedge	
Drill Pad	ESTIMATED POSITION OF DRILLSITE SURVEYED BY G. WATTS, OCTOBER 1992

97067

HOLE No. MP 29

HASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT : TULLAH – STERLING RIVER. MURCHISON MINE.

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						NOTE: EX CORE HAS BEEN SPLIT DOWN TO 242' AND FROM 318' TO BASE, BY BILLITON AND IS IN DREADFUL CONDITION – EXTENSIVELY JUMBLED. LOGGING GENERAL ONLY AS MOST DEPTHS APPROXIMATE.								
				0 – 12'		NO CORE								
				12'–250'		SHALE, SILTSTONE AND VERY FINE SANDSTONE Dark grey to grey. Shale v sl carbonaceous. Siltstone + sst highly calcareous, shale weakly or non calcareous. Minor beds of impure limestone Sst predom below 185', in massive beds to 750mm, av 100–200mm, commonly graded (core too jumbled for facing to be determined). SSA contains feld + qtz xyl grains and stretched lithics of fgr sed's incl black shale. Sequence gen thinly-bedded, some irreg bedding and syn-depositional intraformational folding. Bedding: 80°/LCA ↻ 21' (clean 90°/LCA); 82°/LCA ↻ 67'; 80°/LCA ↻ 87' (clean 55°/LCA, same sense); 81°/LCA ↻ 99' (clean 50°/LCA, same sense); 84°/LCA ↻ 180' (clean 60°/LCA, same sense); 87°/LCA ↻ 210' (clean 60°/LCA, same sense); 88°/LCA ↻ 234' (clean 78°/LCA, same sense); 81°/LCA ↻ 250' (clean 60°/LCA, same sense). Clean mod–strong. feld + lithic grains in sst are flattened + stretched. Rocks weakly sericitic and chloritic – prob reflection of tuffaceous component rather than genuine alteration. Occ barren qtz-carb veins + veinlets.				12'–90': 1% (locally 2%) fine dissem py > po. Sometimes bedded but smeared out into cleavage. 90'–99': 3–4% fine dissem po > py as above, plus some stringers. 99'–150': 2–3% dissem po–py 150'–250': 1–2% dissem po–py.				
				250'–318'		DISORDERED CORE Approx 250'–275': Increase in amount of shales including black carbonaceous shales, and sl increase in sericite content of all rocks. Increase in strength of cleavage (80°/LCA) with minor crenulations in places. Approx 275'–318': At approx 300', 12–18" of sheared black shale with				1% (locally 2%) dissem py + po, occ some black shale contains 5% py > sp in stringers along cleav.				

97 1068

ASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 29

PROJECT : TULLAH-STERLING RIVER. HUTCHISON MINE.

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						occ carb veinlets and 2% py in stringers. Cleavage angles in shear zone 50-70°/LCA.				Below approx 270': v minor				
						Below shear zone, sequence comprises mixed calcareous siltstone/sst and				thin carb veinlets in cleavage				
						black shale, with strong cleavage and some crenulation.				(dolomite? siderite?), containing				
						Bedding @ approx 280': 81°/LCA (cleavage 85°/LCA, opposite sense).				traces of gn-sp.				
						Basal few ft of this interval contains some bleached, sl silicified + sericitised,				Below 300': 2% py, + minor sp-gn				
						and defextried, sst (incl some xyl sst towards base). Appears to be an				in thin qtz-carb (siderite?)				
						altered contact zone on unit below. Cleavage at base 80°/LCA.				veinlets. Most py in black shale as				
										stringers.				
				348'-362'6"		MASSIVE SILICEOUS CRYSTAL SANDSTONE								
						Creamy-grey.				Overall: Minor dissem + veinlet				
						Comprises densely packed abraded qtz < feld xtls av 1-2mm, to +3mm;				py > sp-gn. Both types (dissem				
						poss small pumice frags in sst matrix. Below 340' occ small wisps of black				+ veinlet selvedges) assoc ē carb				
						shale material - most common in basal 5-10'.				348'9": 50mm qtz > siderite(?)				
						Minor variations in grainsize - but unit is coarsest towards base.				vein c several % sp-aspy-py.				
						Overall: Moderate chlorite-silica-sericite-carb alteration. Alteration				360'-363': 2% dissem py > sp-gn-cp.				
						strongest near both margins of unit - esp chloritisation. Carbonatisation								
						locally strong towards base.								
						Occ qtz-carb veins + veinlets - often diffuse. Where these veins contain siderite(?)								
						or dolomite(?) there are traces of sp-gn-py.								
						Mod cleaved (felds sometimes deformed): 78°/LCA @ 325'; 85°/LCA @ 342'.								
				362'6"-373'		CRENULATED GREY-BLACK PYRITIC SHALE								
						Calcareous in places. Strongly cleaved and partly crenulated.				2-3% py in small threads on				
						Cleavage @ 370': 88°/LCA.				cleavage, also dissem.				
						"Lodey-looking" zone of irreg qtz-carb (siderite/dolomite?) veinlets and				Minor py-sp in qtz-carb zone				
						breccia-fill in sl graphitic sheared + brecciated zone at top of interval				at top of interval.				
						(362'6"-364' in original log). Appears to be a strong structure here.								
						END OF HOLE								

971069

HOLE No. MP 29

HASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

PROJECT : TULLAH / STERLING RIVER. MURCHISON MINE

SAMPLE						ASSAYS (ppm unless specified)														COMMENTS
Number	Type	From	To	Interval	Recovered	Cu / Pb	Zn / Ag	As / Ba	Rb / Sr	Y / Zr	V / Nb	Al_2O_3 / SiO_2 (%)	TiO_2 / Fe_2O_3 (%)	MnO / CaO (%)	K_2O / MgO (%)	P_2O_5 / SO_3 (%)	Na_2O / LOI (%)	
034202	SPLIT EX CORE	342'	343'	1'	1'	<20 / 60	110 / <10	7 / 1400	150 / 170	25 / 170	15 / 6	13.40 / 72.7	0.30 / 2.3	0.10 / 1.35	2.64 / 0.75	0.056 / 0.06	3.72 / 2.65	Typical xyl sst, ± weak-mod chlorite-silica-sericite-carbonate alteration.
Laboratory	ANALABS			Analytical-Method		AAS 104	AAS 104	XRF 401	XRF 401	XRF 401	XRF 401	XRF 408	XRF 408	XRF 408	XRF 408	XRF 408	XRF 408	
Job-No.	111340-60-09062	Date	10.11.92	Detection-Limit		20 / 25	20 / 10	2 / 10	5 / 5	5 / 5	5 / 3	0.05 / 0.1	0.01 / 0.1	0.01 / 0.01	0.01 / 0.01	0.005 / 0.01	0.05 / 0.01	

971070

HOLE No. MP 30

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

LOCATION	MURCHISON MINE
PROJECT	
PROSPECT	
DESIGNED BY	
LOGGED BY	
RELOGGED	J.G. PURVIS
COMMENCED	4·3·48
COMPLETED	13·4·48
DRILLED BY	
DRILL RIG	

OBJECTIVE

TO TEST BELOW N°3 LEVEL FOR THE CONTINUATION OF THE MURCHISON LODE.

RESULT

ONLY TRACES OF MINERALIZATION ENCOUNTERED.

LOCATION/SURVEY DATA (AMG)

Grid	AMG	STERLING VALLEY IMP GRID	RL Collar m	
Northing m		19,847'N	Bearing Collar	100°
Easting m		7,481'E	Dip Collar	−44°
DH Survey Type	GLINDSTAT		Length Hole m	125·3

Depth m	Bearing	Dip	Depth m	Bearing	Dip
30·5		−36·75°			
61		−32·25°			
91·4		−26·75°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m						Comments

SIGNIFICANT CORE LOSS

From m	To m	% Lost
CORE RECOVERY NOT CALCULATED IN ORIGINAL LOG BUT ZONES OF POOR RECOVERY EVIDENT. CORE NOW IN PARTLY		
DISORDERED CONDITION DUE TO MISHANDLING. CORE HELD IN STORAGE AT CORE COMPOUND, ROSEBERY.		

POOR GROUND CONDITION ZONES

From m	To m	Condition

HOLE SIZE

Size	Depth m
EX	125·3

HOLE CONDITIONS AFTER COMPLETION

Collar	
Steel Casing	
PVC Casing	
Ground Water	
Wedge	
Drill Pad	ESTIMATED POSITION OF DRILLSITE SURVEYED BY G. WATTS, OCTOBER 1992.

9710 71

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 30

PROJECT : TULLAH – STERLING RIVER. MURCHISON MINE

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						NOTE: CORE CONDITION FAIR – BEST OF ALL THE HOLES AT MURCHISON MINE. CRYSTAL SST UNIT AND BASAL 10-15' OF HOLE HAS BEEN SAWN BY BILLITON. SOME CORE LOSS AND JUMBLING OF CORE.								
				0 – 28'		NO CORE								
				28' – 290'		SHALE SILTSTONE AND LESSER FINE SANDSTONE Grey. Some shale is black. Siltstone is mott'd abund – sl silic, sericitic + chloritic. Shale gen more chloritic. Siltstone/sst mod to v strongly calcareous. Shale weakly or non-calcareous. Some impure lst bands. Ubiquitous qtz-carb veinlets in cleav + qtz-carb veins to 300mm. Sst common 168' – 275', actually predominates 168'-210'. Sst contains qtz + feld xyl grains (<1mm) and small stretched lithics of fi gr seds (most appear cherty"), and some black shale wisps. Finer seds have finely bedded bit sst in massive beds to 2.1m, typically 100mm – 300mm. Some current bedding and intraformational hypsedimentary disruption of bedding. Sst commonly graded and all fine uphole. Bedding: 80°/LCA ∂ 30' (cleav 80°/LCA, opp sense); 81°/LCA ∂ 57'; 85°/LCA ∂ 110' (cleav 83°, opp sense); 80°/LCA ∂ 145' (cleav 67°, opp sense); 85°/LCA ∂ 171' (cleav 80°, opp sense); 85°/LCA ∂ 220' (cleav 82°, opp sense); 85°/LCA ∂ 253' (cleav 78°, same sense); 88°/LCA ∂ 282' (cleav 82°, opp sense). Cleavage mod, becoming stronger below approx 200'. Mild crenulation of cleav 230'-240' along small cross-fractures. Below 245' occ shears in shaley zones, with strong cleavage and veinlets of py in cleav. Below 255' occ small pieces of core of highly cleaved + sheared pyritic black shales (cleav 65°/LCA), ± patches + veinlets of carb. Also some detextured siltstone/sst. These pieces of core poss from one zone now jumbled up (original log notes sheared zone 290'-286½').				28'-70': Minor dissem py-po (also in qtz-carb veinlets). 70'-168': 2% dissem py < po (varies from 1-4%). 168'-210': Minor to 1% py-po 210'-284': 1% py > po, ± small zones to 5% py in cleaved black shale ± traces of sp-gn-py-aspy in carb veinlets, towards lower part of interval. 284'-290': 1-2% py-po, dissem + in veinlets in cleav, ± carb				

91076

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 30

PROJECT : TULLAH-STERLING RIVER. MURCHISON MINE.

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
				290' approx	298' approx	ALTERED AND DISRUPTED ZONE				290'-292': 2-3% py, dissem + in veinlets ± carb (trace sp-gn in latter). 292'-298': 1% py > sp-gn-cp-aspy in qtz-carb veinlets + veins, to 5mm				
						Top 1' comprises strongly cleaved + sheared shale, which gives way to grey, detextured sericitic and chloritic siltstone, becoming coarser ē depth and passing gradually to fine sst ē visible qtz > feld xyl grains. Sericite and chlorite reflect mod alteration. Numerous carb (dolomite?) veinlets + veins, ± qtz, ± chlorite (chloritisation of rock prob assoc ē this veining). Noticeable fine leucoxene. Cleavage 75°/LCA, strongest at top of zone - disruption concentrated here.								
				298' approx	307' (approx)	CHLORITISED FINE CRYSTAL SANDSTONE				1-2% coarse xylline py > gn-sp-arseno-cp in semi-massive sulph veins to 60mm ē gangue of qtz-carb (siderite? dolomite?) -chlorite-sericite. Also dissem				
						Transitional phase from zone above to xyl sst proper (below). Dark greenish-grey. Massive. Grainsize coarsens gradually ē depth. Feld > qtz grains, av <1mm. Fine leucoxene. Strong chlorite > sericite - silica - carb (dolomite?) alteration. Weakly cleaved (80°/LCA. Mineralized veins 40°/LCA in opp sense). Gradual change at base.								
				307' (approx)	341'6"	MASSIVE CRYSTAL SANDSTONE				1% py + trace sp-gn-cp-aspy to 313', then minor. Mostly dissem, assoc ē diffuse qtz-carb-chlor flooding. Dissem leucoxene after titaniferous oxides (remnants visible).				
						Pale greenish-grey. Massive, unbedded. Feld > qtz xyl grains, av 1mm, to 3mm (esp qtz). Abraded. Occ flecks of carbonaceous shaley material, also + minor small pumice frags. Weak-mod carb-chlor-sericite > silica alteration. Chloritisation mod-strong above 310'. Qtz-carb veinlets + veins to 15mm, relatively minor + barren. Weak-mod cleavage: 78°/LCA @ 313'; 70°/LCA @ 328'.								
				341'6"	368'	STRONGLY CLEAVED GREY SHALE				1-2% py, veinlet + dissem, above approx 350', minor below this.				
						Dark grey. Major core loss in this unit.								

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PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 30

PROJECT : TULLAH - STERLING RIVER. MURCHISON MINE.

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Non-calcareous. Sl carbonaceous								
						Silicified and chloritised in places in uppermost few ft.								
						Minor crenulations of cleavage in places. Cleavage: 72°/lCA @ 350; 45°/lCA @								
						367'. Minor bursey qtz-carb veinlets - gen barren.								
				368'	387'6"	LITHIC-RICH SANDSTONE TO FINE BRECCIO-CONGLOMERATE				Minor dissem py.				
						Mod core loss evident and core badly jumbled. Unit has been sampled by Billiton.								
						Varies from fine sst to fine breccio-cong, unit coarsest at top and finest at base.								
						Lithics (gen fi qz seds + highly stretched) > xyl grains (felds > qtz).								
						Lithics + xyl grains densely packed, angular to sl rounded (abraded).								
						Lithics up to 10mm x 3mm, incl "cherty" seds, xyl sst, shale (incl minor								
						black pyritic shale) and prob pumice.								
						[Because of lithic content is quite unlike the main mineralisation host rock]								
						Rock is mod calcareous in uppermost few ft, otherwise not.								
						Unit contains grainsize variations indicative of layering but no bedding								
						actually noted. Cleavage 70-75°/lCA (lineation of lithics).								
				387'6"	411'	SHALE, SILTSTONE AND QUARTZ-SERICITE SCHIST				Minor dissem py in places.				
						Core loss and jumbling of core. Mixed sequence.								
						To 401'6": Predominantly non-calcareous siltst/shale. Grey, strongly cleaved 80-85°/lCA								
						401'6"-407': 8" of core frags of highly altered + cleaved qtz-sericite schist, poss								
						after rock containing abund fine glass frags. Bleached. Cleavage 85°/lCA								
						407'-411': 3 or 4 frags of dark grey shale. Cleavage 85°/lCA.								
						END OF HOLE								

97107A

HOLE No. MP 30

HASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

PROJECT : TULLAH/STERLING RIVER. MURCHISON MINE

SAMPLE						ASSAYS (ppm unless specified)													COMMENTS
Number	Type	From	To	Interval	Recovered	Cu / Pb	Zn / Ag	As / Ba	Rb / Sr	Y / Zr	V / Nb	Al_2O_3 / SiO_2 (%)	TiO_2 / Fe_2O_3 (%)	Mn / CaO (%)	K_2O / MgO (%)	P_2O_5 / SO_3 (%)	Na_2O / L.O.I. (%)		
034203	SPLIT EX CORE	323'	324'	1'	1'	70 / 40	110 / <10	<2 / 900	140 / 240	25 / 140	17 / 5	12.69 / 62.3	0.27 / 3.6	0.29 / 6.95	2.59 / 1.14	0.055 / 0.04	2.76 / 7.59		Typical xyl sst ± weak-mod chlorite-sericite-carbonate-silica alteration
034204	" "	307'6"	308'6"	1'	1'	<20 / 1180	820 / <10	<2 / 1100	380 / <5	25 / 180	20 / 7	13.40 / 69.5	0.34 / 5.8	0.65 / 0.17	4.51 / 0.94	0.060 / 0.28	0.16 / 4.23		chlorite-carbonate-sericite altered xyl sst just below mineralized zone.

HOLE No. MP 32

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

LOCATION	MURCHISON MINE
PROJECT	
PROSPECT	
DESIGNED BY	
LOGGED BY	
RELOGGED	J. G. PURVIS
COMMENCED	27·4·48
COMPLETED	26·5·48
DRILLED BY	
DRILL RIG	

OBJECTIVE

TO TEST THE MURCHISON TUFF BAND IN THE REGION OF THE MURCHISON FISSURE FOR THE EXISTENCE OF OTHER ORE LENSES ARRANGED "EN ESCHELON".

RESULT

LOCATION/SURVEY DATA (AMG)

Grid	AMG	STERLING VALLEY IMP GRID	RL Collar m	232·4
Northing m	S 376577·0	20,259'	Bearing Collar	280°
Easting m	385710·5	7,884'	Dip Collar	−60°
DH Survey Type	GUNOSTAT		Length Hole m	110·0

Depth m	Bearing	Dip	Depth m	Bearing	Dip
15·2		−59°			
30·5		−57°			
45·7		−52·5°			
61		−47°			
76·2		−43·5°			
91·4		−39·5°			
106·7		−35°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m						Comments

SIGNIFICANT CORE LOSS

From m	To m	% Lost

POOR GROUND CONDITION ZONES

From m	To m	Condition

HOLE SIZE

Size	Depth m
EX	110·0

HOLE CONDITIONS AFTER COMPLETION

Collar	
Steel Casing	
PVC Casing	
Ground Water	
Wedge	
Drill Pad	

971076

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. MP 32

PROJECT: TULLAH- STERLING RIVER. MURCHISON MINE.

Graphic Scale 1:

CORE RECOVERY				DESCRIPTION						CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
				0'	318'	MASSIVE CRYSTAL SANDSTONE				To 186': Trace dissem py.				
						Creamy greenish-grey. Uniform apart from minor grainsize and packing variations, esp towards base. Hard. Sl oxidised to 100'.				186'–225': Minor to 1% dissem + veinlet py-sp-gn-aspy-cp.				
						Med gr, feld > qtz xyls + xyl grains, partly abraded, av 1-2mm, to 3mm.				Sulphs gen in veins of qtz-carb (dolomite?)-				
						Gen densely packed with minor matrix. Ubiquitous minor dissem leucoxene.				sericite-chlorite, but some of these				
						Occ deformed black shale frags 2-4mm. Some poss wispy pumice frags.				are v diffuse "greisen-like" invasions				
						Gen no carbonate, but mod carb alteration below 185'–much is non-calcareous (dolomite?)				of rock matrix along the cleavage.				
						Mod silif, locally strong. Weak chlorite-sericite alteration, inc to mod				Best min is 197½' to 198¼' (gn-sp-py),				
						below 185' (where sericite-chlor stronger, eg: 185-265', silif decreases).				+ 220-221'.				
						Occ qtz-carb ± chlor veins throughout, gen <10mm, to 60mm, gen at high angle				225'– 305: Trace dissem py.				
						to LCA. Most abund 270'-280'.				305'–318': Minor to 1% dissem				
						115'-120': sev irreg bands of chlorite to 30mm (dykes or veins?)				py and trace py-sp-gn-aspy				
						Above 305' rock is weakly cleaved: 18°/LCA @ 21'; 5° @ 60'; 10° @ 102';				in common qtz-carb (dolomite				
						15° @ 175'; 20° @ 238'; 40° @ 275' + 300'; 28° @ 304'.				or siderite?) veins av 5-10mm,				
						Below 305', xyl sst is sl finer gr and more strongly cleaved (40°/LCA @				+ opp sense to cleav.				
						314'), and unit merges to unit below.								
				318'	331'	SILICEOUS SILTSTONE				Minor to 1% py - dissem + in				
						Fine sst at top, becoming bleached siliceous + sericitic shale (after				qtz-carb (siderite?) veinlets				
						grey shale) below 328'. Shale appears tuffaceous, vitric + cherty.				containing traces of sp-gn-aspy.				
						Silst unit is mod-strongly silica > sericite-chlorite-carb altered and								
						strongly cleaved.								
				331'	361'	SILICEOUS BLACK SHALE				2-3% py, locally 5%. Dissem				
						Finely laminated, strongly cleaved (bedding //) ± local crenulations. cleav				+ in veinlets // cleavage.				
						av 20-30°/LCA. Shale carbonaceous + siliceous. Strongly silif 331'-335'				Minor sp in qtz-carb veinlets				
						± some brecciation (331'-333') on top contact-this filled ± qtz-carb veinlets.				331'-333'				
						END OF HOLE.								

97107

HOLE No. MP 32

PASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

PROJECT : TULLAH/STERLING RIVER. MURCHISON MINE

SAMPLE						ASSAYS (ppm unless specified)																		COMMENTS
Number	Type	From	To	Interval	Recovered	Cu / Pb	Zn / Ag	As / Ba	Rb / Sr	Y / Zr	V / Nb	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	Mn / CaO	K_2O / MgO	P_2O_5 / SO_3	Na_2O / LOI							
034205	EX CORE	45'	45'6"	6"		60 / 1400	140 / <10	<2 / 1400	75 / 180	25 / 180	17 / 4	13.49 / 75.4	0.30 / 1.8	0.01 / 0.11	1.92 / 0.55	0.063 / 0.07	5.04 / 1.04							V. sl oxidation effects. Crystal sst. V weak silica-chlor-ser alt.
034206	" "	219'	220'	1'		<20 / 360	700 / <10	4 / 1800	570 / 60	20 / 180	17 / 8	14.38 / 70.5	0.35 / 3.1	0.56 / 0.29	5.73 / 0.82	0.060 / 0.16	1.42 / 2.55							On edge of weakly mineralised Crystal sst. zone. Mod ser-chlo-sil-chlor alt.
034207	" "	294'	295'	1'		50 / 60	110 / <10	10 / 1650	110 / 170	30 / 200	17 / 8	14.22 / 72.4	0.35 / 2.4	0.06 / 0.66	2.39 / 0.82	0.043 / 0.17	4.61 / 1.75							Crystal sst. Weak sil-chlor-ser alt.
034208	Split EXCore	320'	321'	1'		30 / 440	1090 / <10	7 / 1050	370 / 8	25 / 170	8 / 8	9.26 / 81.2	0.20 / 1.9	0.45 / 0.30	3.33 / 0.65	0.054 / 0.33	0.17 / 2.36							Silicous + sericitic siltstone. Minor qtz veins
Laboratory	ANALABS			Analytical-Method		AAS 104	AAS 104	XRF 401	XRF 401	XRF 401	XRF 401	XRF 408	XRF 408	XRF 408	XRF 408	XRF 408	XRF 408							
Job-No. 111310-60-0062	Date 10-11-92			Detection-Limit		20 / 25	20 / 10	2 / 10	5 / 5	5 / 5	5 / 3	0.05 / 0.1	0.01 / 0.1	0.01 / 0.8	0.01 / 0.01	0.005 / 0.01	0.05 / 0.01							

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Appendix 3

Mancala P/L

Report on Activities at the Murchison Mine, Tullah, 22.12.92 - 3.1.93

MANCALA Pty Ltd

Mine Management & Contracting
ACN 056 204 267

971080

2 Gepp Street
Rosebery, Tas. 7470
Ph. (004) 71 6418

P.O. Box 175
Rosebery Tas. 7470

15th January, 1993

Fergus Fitzgerald
Regional Exploration Manager - Tasmania
Pasminco Exploration
"Old Burnie Railway Station"
Marine Terrace
BURNIE 7320

Dear Fergus,

Please find enclosed a brief report outlining the results of our activities at the Murchison mine - Tullah for the period 22nd December 1992 to 3rd January 1993.

You will note that our activities were extremely disappointing with the majority of the mineralisation below the 3 level drive having been already mined. We believe that in the order of 3,000 tonnes remains in a virgin state between the 170m RL to 153m RL level and a futher approximate 2,500 tonnes remains as a skin on the western (hanging wall) side of the lens between the 185m RL to 170m RL level.

To extract this resource a decline of 230m would be required at a gradient of 1 in 7. Even for a small, high cost constraint company such as ourselves, the proposition to mine the resource is uneconomic.

As you would be aware, Mancala had applied to the Department of Mines for a mining lease over the area prior to resource definition. The application, although now appearing premature was dispatched to expedite the application process, hence allowing mining to commence as soon as possible after positive resource definition. Owing to the negative results, I have contacted Dennis Burgess at the Mines Department outlining the situation and have requested that he suspend the processing of the lease. I have also contacted the HEC at Tullah and in Hobart informing them of the situation.

.../2

I appreciate greatly the advice, co-operation and assistance you and your staff have extended to us in this project. I hope that in the future, a situation will arise where Mancala as a small mining company and Pasminco Exploration as a large explorer can work together to successfully exploit resources hitherto considered uneconomic.

Yours faithfully,

T. Akerman

Tim Akerman
Senior Geologist

enc:

MANCALA PTY LTD: ACTIVITIES AT THE MURCHISON MINE - TULLAH

22/12/92 - 3/1/93

BACKGROUND

The Murchison Mine was a significant lead and silver producer early in the 20th century. The mine was developed by 3 levels driven into the steep hillside. Stoping has been carried out between the levels, with only minor development below the lowermost level having been reported.

The mine is situated within exploration licence 22/90, currently held by Pasminco Exploration.

During the course of exploration in the region, geological staff of Pasminco Exploration had tenatively defined a small, high grade zinc resource below the mines lowermost level. An approach was made to Mancala Pty Ltd to assess the feasbility of mining the resource, independent of Pasminco Exploration with the condition that production be sold to the Pasminco Mining concentrator at Rosebery.

An assessment of historical records and all recent exploration in the area suggested that diamond drilling in 1947 had not closed off the plunge continuation of the mineralisation below the main 3 level adit. The high probability of an extractable resource and the necessity of Mancala to maintain a continuity of operations in western Tasmania led to an agreement between the companies allowing a depth limited mining lease to be applied for prior to positive resource definition. This would have expediated the granting of the lease and the immediate commencement of mining operations following positive resource definition. Consequently, a mining lease of 17 hectares was applied for from the Department of Mines.

RESOURCE DEFINITION

Historical records of mining at Murchison indicated that two winzes had been sunk in the floor of the 3 level drive with a drive connecting the two at a depth of 15m. It had been reported that the high zinc grades encountered in the lowermost development were such that economic recovery of lead from the ore was not possible, and hence no stoping was carried out.

The procedure of resource definition to be performed by Mancala involved 2 stages. Firstly, the winzes were to be pumped dry, the workings to be inspected and sampled, followed by the drilling of 2 diamond drill holes below the lowermost development.

On the 22/12/92 a pneumatic pump was installed into the northern most winze (figure 1) and pumping commenced. Pumping was carried out almost continuously for 26 hours, after which time the level of water in both winzes was lowered by 8m. Pumping was discontinued at this point as approximately 2m of mud was encountered which was unable to be pumped. It would appear a solid floor would be present at the 10m mark in the winze.

The pumping to 8m below the floor of 3 level revealed a large stoped void containing stull supports after each successive stoping lift. The ore body in this region has an average width of 2.5m, dipping 80° to the west. A skin containing 1-1.5m of coarse grain arsenopyritic and sphaleritic ore was apparent on the hanging wall (western) side of the fault zone. Samples of this reminant or are awaiting analysis.

Open Cut

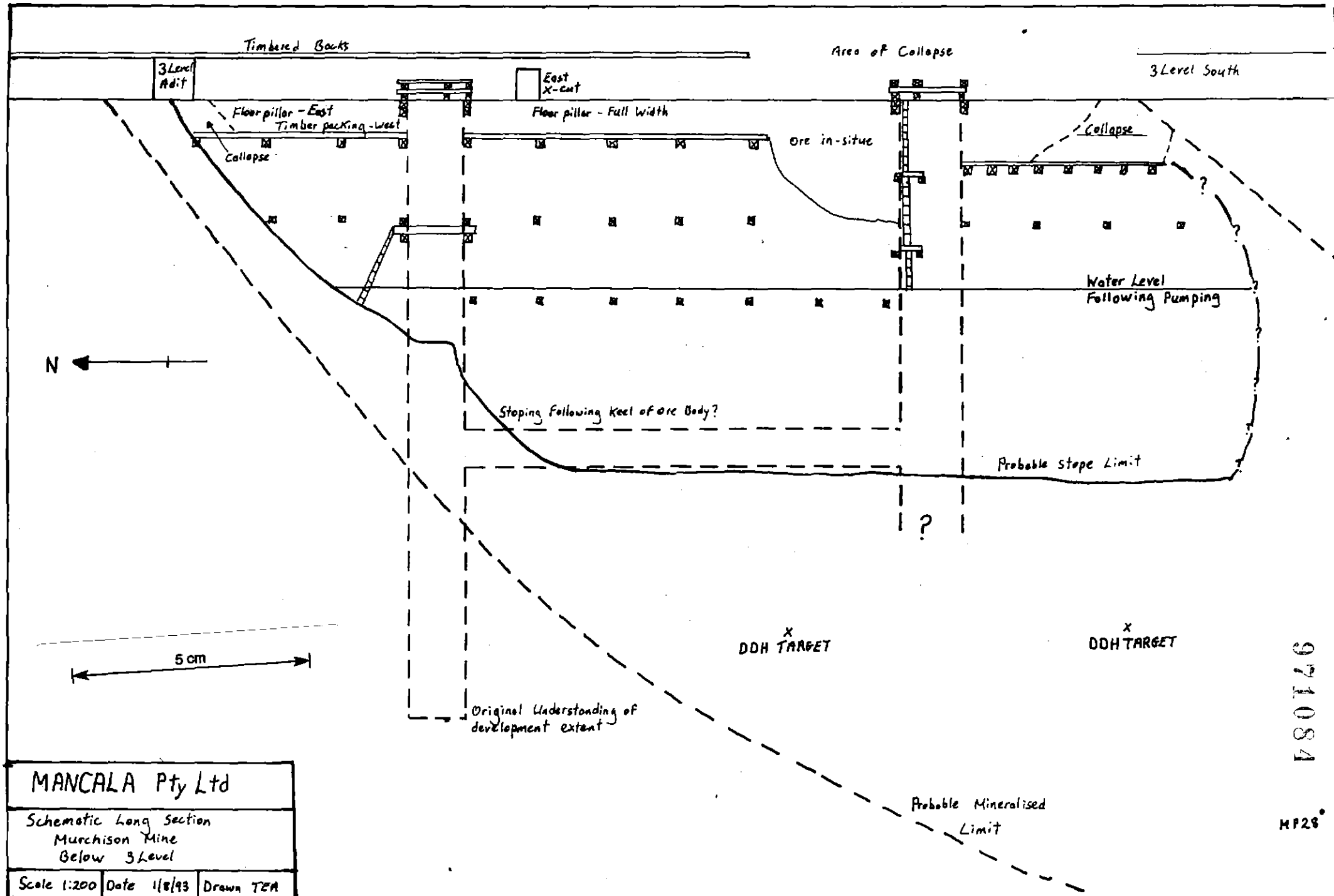
A very small (approx. 600 tonnes) resource had been identified in the open cut of the Murchison mine. To test the continuity, approximate tonnage and grade of this resource, Mancala undertook to bore 3 percussion holes into the mineralisation.

The continuity of the lode was found to be poor, being a series of sub-parallel veins on the hanging wall of the main lode. This fact, combined with the large quantity of overburden that would have to be removed, and the possiblity of voids beneath the fill in the floor of the open cut, has lead to the conclusion that open cut operations would be uneconomic.

CONCLUSIONS

It would appear likely that stoping of the ore occurred from the level of the southern winze to 3 level. The apparent solid floor at the 10m mark in the northern winze may indicate that as mining proigressed northward from the southern winze, the keel of the orebody was intersected and followed. Consequently, the southern plunge of the ore zone is probably in the order of 50-55° south. the plunge of norther boundary of the ore zone may have a similar orientation as it is estimated 10-15m of stoping had occurred south of the southern winze at a depth of 8m below the floor.

A broad and simplistic calculation of reminant and virgin resources are in the order of 2,500 and 3,000 tonnes respectively. Zinc grades in the order of 12-17% would be expected.


Timbered Backs
Area of Collapse
3 Level South
3 Level Adit
East X-cut
Floor pillar - East
Timber packing - West
Floor piller - Full Width
Collapse
Ore in-situe
Collapse
Water Level Following Pumping
N
Stoping Following Keel of ore Body?
Probable stope Limit
?
5 cm
DDH TARGET
DDH TARGET
Original Understanding of development extent
Probable Mineralised Limit
MANCALA Pty Ltd
Schematic Long Section
Murchison Mine
Below 3 Level
Scale 1:200
Date 1/8/93
Drawn TEA
MP28
97108A

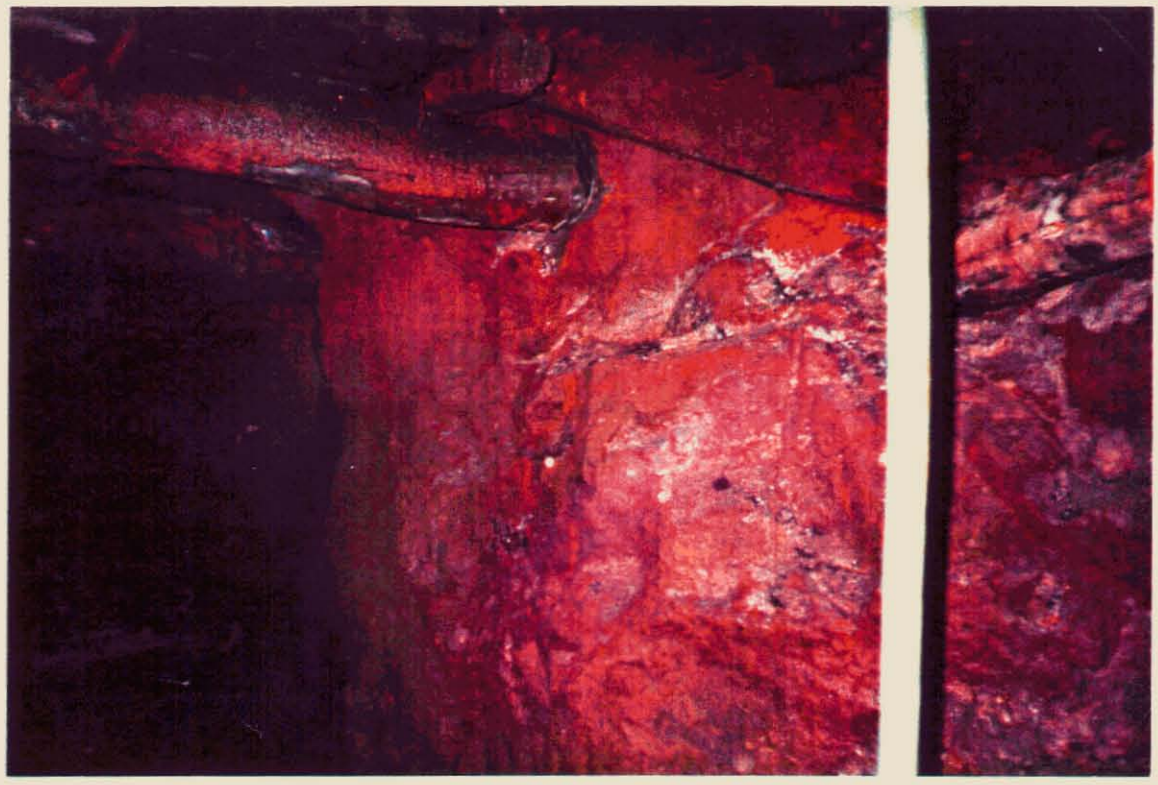


Plate 1: View south from the 5m below the 3 level floor in the northern winze.
Note stull suports hitched into skin of ore on the hanging wall.

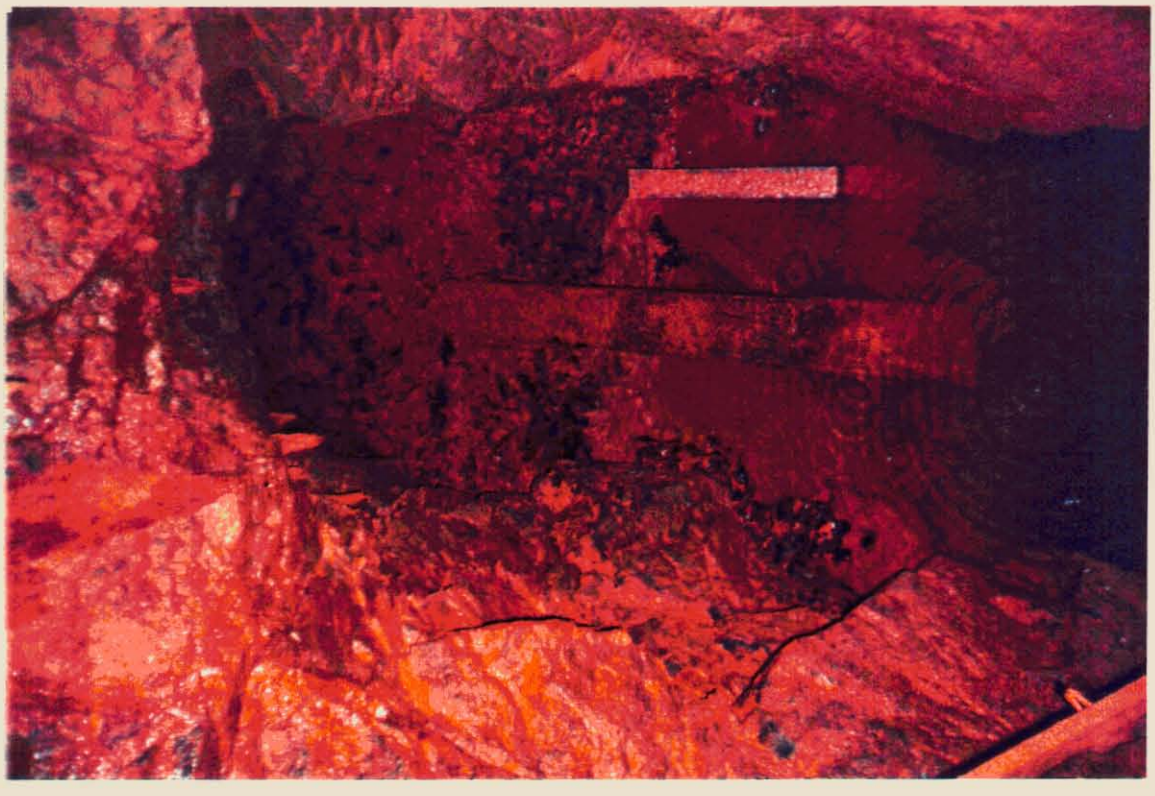


Plate 2: View south from southern winze at 3m below 3 level floor.

Appendix 4

Operations Report – Gravity Survey of Tullah and Sterling River EL's

971087

Operations Report — Gravity survey of Tullah and Sterling River exploration licences for Pasminco Exploration

Tasmania Department of State Development & Resources

Division of Mines

971088

Tasmania Department of State Development & Resources

Division of Mines

Operations Report — Gravity survey of Tullah and Sterling River exploration licences for Pasminco Exploration

by R.G. Richardson, B.Sc. (Hons), Ph. D.

Abstract

At the request of Pasminco Exploration the Department of Mines acquired gravity data at 537 points in the areas of interest. Of these most were levelled to an accuracy of 3 m or better using a barometer; the remainder were either levelled using an electronic hydrostatic level or conventional surveying. The survey was conducted from 16 November 1992 to 29 January 1993 inclusive, and involved 30.5 days of meter operation. Access was by boat, foot, helicopter and vehicle.

BASE STATIONS

Only the Tullah base station of Richardson and Dix (1986) was used. This is station number 8051.9902 and has an observed gravity value of 980274.89 mgal. The height is 168.399 metres. Base readings were normally made twice per day.

GRAVITY METERS

Only Worden meter number 913, with a constant of 0.09558 mgal/scale division and a reading accuracy of better than 0.1 mgal, was used.

DATA PROCESSING

All data were corrected for linear drift between base readings. The gravity data were integrated with the height data and reduced to Bouguer Anomalies using the 1930 International Gravity Formula and a Bouguer Density of 2.67 t/m^3. Gravity stations acquired prior to 31 December 1992 have station numbers of the form 9251.NNNN whilst stations acquired after this have station numbers of the form 9351.NNNN. Terrain corrections were computed to a radius of 21 km using a density of 2.67 t/m^3. The data were then combined with the pre-existing data that had been corrected and reduced in the same manner.

DISCUSSION

(i) Mt Black co-ordinates

Previous gravity surveys on Mt Black have located errors in the grid co-ordinates flagged on cut lines. For this survey it was proposed that Billiton EM loop 12, with eastern and western edges flagged at 383 400 mE and 383 000 mE respectively, be read. Previous work by the writer showed that the flagged co-ordinates in this area were approximately 150 m greater than the true co-ordinates (e.g. 383 000 mE flagged is really 382 850 mE) although others were sceptical. This error has been confirmed, as the point flagged as 383 000 mE, 375 000 mN should, in theory, lie part of the way up a steep slope. In reality it lies near the edge of a large flat area with an easting of 382 860 mE.

(ii) Helicopter work

Access to a number of points on the southern end of Mt Farrell, northern end of Mt Farrell, and east of Lake Mackintosh was not possible on foot and a helicopter was used. Flight time was 2 h 8 m (Queenstown to Queenstown) with 1 h 26 m spent in the area of interest. Eleven gravity readings and four barometer checks (a total of 15 landings) were made in this time.

(iii) GPS

With the use of a base station, GPS has the potential to yield positions with an accuracy of about one metre at Tullah using a base in Launceston. There is a time penalty, as the Magellan system requires about 20 minutes at each site to achieve this accuracy. GPS was used to provide height control where no other control was available, for example on Mt Murchison.

(iv) Barometric heighting

Accuracy of heights determined using this method was enhanced by:

(a) determining air temperatures accurately when working in areas of high relief. This was done by taking pressure measurements at BM5870 and BM5775 on the Anthony Road (vertical interval 193 metres) and calculating the air temperature.

A comparison made between barometer measurements (out and back) and electronic hydrostatic level measurements on 10 December 1992 was:

Station No.	*Barometric height*	*Hydrostatic level height*
6681	389(.0)	388.9
6682	434(.5)	434.0
6683	520(.4)	520.9
6684	570(.2)	571.5

The reference point was at 377 metres

(b) using the electronic hydrostatic level in areas of extreme relief or where pressure changes due to wind and topography would be expected. Barometric heighting would then be used.

(c) having a maximum time of 20 minutes between barometer readings.

(d) reading the barometer "out and back" to ensure smaller time, height and pressure intervals.

(e) closing onto spot heights or survey marks when possible. With the exception of the extreme height range encountered on Mt Murchison (600+ metres) closure errors using out and back techniques were less than 3 metres.

Following some surveying of detailed traverses in the Tullah area a number of pre-existing stations were also surveyed. A comparison of the barometric and surveyed heights is:

Station No.	*Barometric Height*	*Surveyed Height*
6525	231	230.06
6527	233	231.34
6531	180	180.47
6533	175	174.81
6537	201	204.58
6548	341	339.01
6552	469	467.30
6625	590	587.16
6109	177	178.11

DATA SUPPLIED

(i) Floppy disc of reduced data. Columns are station number, easting, northing, elevation, observed gravity, theoretical gravity, terrain correction and Bouguer Anomaly. All data collected for Pasminco Exploration in the 1992/93 summer season are included (Tullah 287 stations, Sterling River 250 stations).

(ii) A listing of the contents of the floppy disc.

(iii) One set of handwritten field maps showing station positions.

REFERENCE

RICHARDSON, R. G.; DIX, M. J. 1986. West Coast gravity tie stations (Revision 1). *Unpublished Report Department of Mines Tasmania* 1986/79.

R.G. Richardson

SUPERVISING GEOPHYSICIST

February 1993

Appendix 5

AMG Survey Details for Old Drillholes in Tullah – Sterling River Area

TULLAH / STERLING RIVER DDH COLLARS

971091

HOLE_ID	AMG_N	AMG_E	RL	EOH
1F	5379599.20	385573.00	172.90	483.1
2F	5378821.60	385286.40	177.80	258.8
3F	5378821.60	385286.40	177.80	626.1
MM1	5376487.10	385432.90	178.70	60.0
MM1A	5376487.10	385432.90	178.70	400.7
MP28	5376489.30	385569.70	197.90	122.8
MP29	5376489.30	385569.40	197.90	113.7
MP30	5376457.00	385573.70	200.00	125.3
MP32	5376577.00	385710.50	232.40	110.0
MR1	5375175.00	384964.00	165.00	111.0
MR2	5375226.00	384972.00	160.50	122.0
MRP212	5375330.60	384424.40	170.00	293.5
MRP219	5375106.30	384449.20	173.40	140.8
MRP226	5376288.40	384692.80	165.10	211.5
MRP227	5376394.00	384778.00	158.50	155.6
MRP233	5375422.00	384485.90	158.60	197.7
RED86-1	5375604.00	384943.00	167.00	235.2
RED87-10	5375746.20	384592.90	163.50	169.2
RED87-11	5380330.00	386038.00	177.00	250.1
RED87-2	5375420.50	384436.20	160.10	260.3
RED87-3	5375401.40	384516.20	159.90	153.4
RED87-4	5376995.00	384890.00	172.00	328.0
RED87-5	5375350.00	384530.00	165.30	145.5
RED87-6	5375300.30	384499.70	174.20	157.0
RED87-7	5375550.90	384411.80	162.90	277.0
RED87-8	5375551.00	384412.20	162.90	280.0
RED88-1	5375551.10	384411.10	162.90	322.0
RED88-2	5375249.50	384375.80	173.70	289.3
RED88-3	5377450.20	385093.10	170.40	178.5
RED88-4	5375352.10	384386.00	167.90	325.0
SS1	5370000.00	382609.00	610.00	145.6
SS2	5370000.00	382609.00	610.00	211.4
STP100	5372164.40	383839.20	250.50	218.2
STP101	5372873.00	384333.00	214.50	289.6
STP105	5373196.00	384505.10	209.00	323.7
STP217	5374392.60	384190.40	176.00	249.1
STP218	5374716.60	383903.50	255.80	165.0
STP220	5374254.80	384604.80	177.20	268.8
STP221	5374399.10	384270.70	173.70	203.3
STP231	5374266.80	384216.30	176.40	150.6
STP232	5374729.40	384393.00	174.00	14.0
STP232A	5374728.50	384395.80	174.00	92.8
STP232A1	5374728.50	384395.80	174.00	198.2
STP234	5374495.10	384162.30	173.20	342.5
STP283	5373443.00	383894.00	235.00	179.6
STP284	5374386.00	384418.00	176.00	116.7
STP299	5371903.70	383858.60	282.70	70.1
STP300	5371948.30	383885.10	279.00	79.5
STP301	5371918.00	383919.00	287.40	142.7
STP302	5371883.00	383887.80	289.60	119.0

TULLAH / STERLING RIVER DDH COLLARS

971092

HOLE_ID	AMG_N	AMG_E	RL	EOH
STP74	5371920.40	383867.50	276.60	45.4
STP75	5371959.70	383889.30	273.20	45.7
STP76	5371881.20	383845.10	283.30	45.7
STP77	5371843.90	383815.70	284.20	45.7
STP78	5371812.10	383799.00	291.50	45.7
STP79	5371781.20	383782.80	296.10	45.7
STP80	5372006.20	383900.00	269.30	45.7
STP96	5371913.50	383950.00	294.30	239.3
STP98	5371940.60	383719.90	259.60	267.6
SV2	5373355.00	384272.40	188.90	125.4
SV3	5373356.00	384270.00	188.90	292.4
SVD87-1	5373385.00	384073.00	215.00	30.0
SVD87-1A	5373385.00	384072.00	215.00	298.5
SVD87-2	5374243.00	384295.00	177.50	142.5
SVD89-1	5372600.00	383975.00	225.00	154.1
SVD89-2	5371245.00	383290.00	330.00	129.5
SVD89-3	5374400.00	385091.00	208.00	364.2

TULLAH / STERLING RIVER DDH SURVEYS

971093

HOLE_ID	DEPTH	AMG_AZ	DIP
1F	0.0	100.80	-88.00
1F	30.5	97.80	-88.00
1F	61.0	94.80	-85.50
1F	91.4	91.80	-79.00
1F	121.9	88.80	-75.50
1F	152.4	85.80	-66.00
1F	182.9	85.00	-58.50
1F	213.4	85.00	-48.00
1F	243.8	85.00	-37.50
1F	274.3	85.00	-30.00
1F	304.8	85.00	-25.00
1F	335.3	85.00	-21.00
1F	365.8	85.00	-18.50
1F	396.2	85.00	-17.00
1F	426.7	85.00	-16.50
1F	483.1	85.00	-16.00
2F	0.0	15.30	-90.00
2F	30.5	15.30	-90.00
2F	61.0	15.30	-88.50
2F	91.4	15.30	-87.00
2F	121.9	15.30	-87.50
2F	152.4	15.30	-84.75
2F	182.9	15.30	-82.50
2F	213.4	15.30	-80.00
2F	243.8	15.30	-78.50
2F	258.8	15.30	-77.50
3F	0.0	100.80	-85.00
3F	30.5	94.80	-84.75
3F	61.0	88.80	-83.50
3F	91.4	82.80	-82.75
3F	121.9	76.80	-82.25
3F	152.4	70.80	-81.25
3F	182.9	64.80	-81.00
3F	213.4	66.50	-77.50
3F	243.8	68.20	-73.00
3F	274.3	69.80	-70.00
3F	304.8	72.60	-61.00
3F	335.3	74.00	-45.50
3F	365.8	75.50	-36.50
3F	396.2	77.00	-24.50
3F	426.7	78.50	-22.00
3F	457.2	80.00	-18.00
3F	626.1	88.00	-15.00
MM1	0.0	102.00	-70.00
MM1	30.0	99.50	-65.25
MM1	60.0	98.00	-60.25
MM1A	0.0	102.00	-70.00
MM1A	30.0	100.50	-67.50
MM1A	61.0	101.50	-66.75
MM1A	91.0	100.00	-65.00

TULLAH / STERLING RIVER DDH SURVEYS

971094

HOLE_ID	DEPTH	AMG_AZ	DIP
MM1A	121.0	97.50	-63.00
MM1A	151.0	96.00	-59.75
MM1A	181.0	96.00	-56.75
MM1A	211.0	97.75	-55.00
MM1A	241.0	97.25	-53.25
MM1A	271.0	98.50	-52.00
MM1A	301.0	98.00	-50.00
MM1A	331.0	97.00	-49.00
MM1A	361.0	97.50	-48.50
MM1A	391.0	97.00	-48.00
MM1A	400.7	97.00	-48.00
MP28	0.0	90.30	-29.00
MP28	30.5	90.60	-26.50
MP28	61.0	91.00	-25.00
MP28	91.4	91.50	-25.00
MP28	122.8	92.00	-25.00
MP29	0.0	90.30	-51.00
MP29	30.5	90.30	-45.00
MP29	61.0	90.30	-37.50
MP29	91.4	90.30	-31.00
MP29	113.7	90.30	-26.00
MP30	0.0	100.00	-44.00
MP30	30.5	100.00	-36.75
MP30	61.0	100.00	-32.25
MP30	91.4	100.00	-26.75
MP30	125.3	100.00	-20.75
MP32	0.0	280.00	-60.00
MP32	15.2	280.00	-59.00
MP32	30.5	280.00	-57.00
MP32	45.7	280.00	-52.50
MP32	61.0	280.00	-47.00
MP32	76.2	280.00	-43.50
MP32	91.4	280.00	-39.50
MP32	106.7	280.00	-35.00
MP32	110.0	280.00	-34.00
MR1	0.0	90.00	-60.00
MR1	57.0	88.50	-55.00
MR1	110.0	82.50	-47.00
MR1	111.0	82.50	-47.00
MR2	0.0	90.00	-60.00
MR2	51.0	88.50	-57.00
MR2	120.0	88.50	-48.50
MR2	122.0	88.50	-48.25
MRP212	0.0	90.00	-60.00
MRP212	49.0	90.00	-54.50
MRP212	143.0	89.00	-43.00
MRP212	200.5	90.00	-37.00
MRP212	293.5	96.00	-25.00
MRP219	0.0	101.90	-58.50
MRP219	56.0	101.90	-56.50

TULLAH / STERLING RIVER DDH SURVEYS

971095

HOLE_ID	DEPTH	AMG_AZ	DIP
MRP219	98.0	101.90	-55.50
MRP219	140.8	101.90	-54.00
MRP226	0.0	90.00	-60.00
MRP226	39.0	94.00	-58.50
MRP226	75.0	86.00	-48.00
MRP226	120.0	88.00	-44.00
MRP226	165.0	92.00	-41.50
MRP226	210.0	88.00	-39.00
MRP226	211.5	88.00	-39.00
MRP227	0.0	90.00	-65.00
MRP227	20.0	92.00	-63.50
MRP227	65.0	92.00	-61.50
MRP227	110.0	91.00	-60.00
MRP227	155.0	96.00	-58.00
MRP227	155.6	96.00	-58.00
MRP233	0.0	90.00	-60.00
MRP233	34.0	86.00	-57.00
MRP233	70.0	84.00	-51.00
MRP233	112.0	84.00	-47.00
MRP233	154.0	87.00	-44.00
MRP233	196.0	89.00	-30.00
MRP233	197.7	89.00	-29.50
RED86-1	0.0	90.00	-55.00
RED86-1	30.0	91.00	-52.00
RED86-1	60.0	90.50	-48.00
RED86-1	110.0	91.50	-41.00
RED86-1	160.0	93.00	-38.50
RED86-1	210.0	95.00	-36.00
RED86-1	235.2	96.00	-35.00
RED87-10	0.0	90.00	-50.00
RED87-10	58.1	92.00	-49.00
RED87-10	105.0	89.50	-47.50
RED87-10	169.2	89.50	-44.00
RED87-11	0.0	144.00	-50.00
RED87-11	49.0	142.50	-45.50
RED87-11	100.0	134.00	-35.25
RED87-11	160.0	133.00	-32.75
RED87-11	199.0	132.50	-28.50
RED87-11	250.1	130.50	-22.00
RED87-2	0.0	90.50	-60.00
RED87-2	45.0	91.50	-58.50
RED87-2	72.5	91.70	-56.50
RED87-2	102.0	92.50	-56.00
RED87-2	129.0	93.00	-56.25
RED87-2	162.0	92.50	-55.50
RED87-2	192.0	94.00	-55.00
RED87-2	231.0	93.50	-54.70
RED87-2	260.3	94.50	-53.25
RED87-3	0.0	90.00	-45.00
RED87-3	35.0	91.00	-43.70

TULLAH / STERLING RIVER DDH SURVEYS

971096

HOLE_ID	DEPTH	AMG_AZ	DIP
RED87-3	69.0	91.00	-43.00
RED87-3	98.0	91.00	-42.70
RED87-3	141.0	92.30	-42.20
RED87-3	153.4	92.50	-42.00
RED87-4	0.0	90.00	-50.00
RED87-4	30.0	89.50	-49.50
RED87-4	60.0	89.00	-50.00
RED87-4	98.0	88.50	-49.50
RED87-4	142.0	89.00	-49.25
RED87-4	186.0	88.50	-48.70
RED87-4	237.0	89.50	-48.00
RED87-4	280.0	91.50	-47.50
RED87-4	328.0	94.00	-44.30
RED87-5	0.0	90.00	-56.50
RED87-5	37.0	90.50	-55.70
RED87-5	67.0	90.50	-55.70
RED87-5	97.0	89.50	-53.30
RED87-5	128.0	89.50	-51.30
RED87-5	145.5	89.50	-50.20
RED87-6	0.0	90.00	-51.00
RED87-6	30.0	92.00	-51.00
RED87-6	60.0	91.50	-50.30
RED87-6	90.0	91.70	-49.75
RED87-6	125.0	92.00	-49.25
RED87-6	157.0	92.00	-48.75
RED87-7	0.0	106.00	-45.00
RED87-7	30.0	106.00	-45.00
RED87-7	60.0	106.00	-44.00
RED87-7	90.0	107.00	-43.75
RED87-7	120.0	107.00	-43.00
RED87-7	150.0	107.00	-42.50
RED87-7	180.0	107.00	-42.00
RED87-7	210.0	107.00	-42.00
RED87-7	240.0	108.00	-41.50
RED87-7	270.0	107.00	-41.00
RED87-7	277.0	107.00	-41.00
RED87-8	0.0	90.00	-45.00
RED87-8	30.0	90.00	-45.00
RED87-8	60.0	92.00	-42.70
RED87-8	90.0	91.50	-42.00
RED87-8	120.0	93.00	-41.50
RED87-8	150.0	93.50	-40.80
RED87-8	180.0	94.50	-40.50
RED87-8	210.0	95.50	-40.00
RED87-8	240.0	96.00	-40.00
RED87-8	270.0	96.00	-39.20
RED87-8	280.0	96.00	-39.00
RED88-1	0.0	106.00	-60.00
RED88-1	51.0	106.00	-60.00
RED88-1	102.0	105.00	-59.00

TULLAH / STERLING RIVER DDH SURVEYS

971097

HOLE_ID	DEPTH	AMG_AZ	DIP
RED88-1	201.0	106.00	-57.50
RED88-1	250.0	106.00	-57.00
RED88-1	300.0	107.00	-56.00
RED88-1	322.0	107.50	-55.50
RED88-2	0.0	90.00	-50.00
RED88-2	51.0	93.00	-50.00
RED88-2	101.0	93.00	-49.00
RED88-2	150.0	94.50	-49.00
RED88-2	200.0	97.00	-47.50
RED88-2	250.0	97.00	-42.00
RED88-2	289.3	98.00	-39.00
RED88-3	0.0	110.00	-60.00
RED88-3	51.0	106.00	-57.00
RED88-3	110.0	104.50	-57.00
RED88-3	160.0	108.00	-51.50
RED88-3	178.5	109.30	-49.50
RED88-4	0.0	90.00	-65.00
RED88-4	25.0	86.70	-64.00
RED88-4	75.0	80.00	-61.50
RED88-4	125.0	80.00	-60.00
RED88-4	177.0	81.00	-59.00
RED88-4	225.0	83.00	-58.50
RED88-4	275.0	83.00	-58.00
RED88-4	322.0	82.50	-55.00
RED88-4	325.0	82.50	-54.80
SS1	0.0	94.00	-63.00
SS1	30.0	100.50	-63.00
SS1	34.0	101.50	-64.00
SS1	75.0	97.50	-66.00
SS1	100.0	94.00	-66.00
SS1	130.0	93.00	-64.00
SS1	145.6	92.50	-63.00
SS2	0.0	272.00	-53.00
SS2	30.0	270.75	-51.00
SS2	70.0	269.00	-51.00
SS2	100.0	268.00	-50.50
SS2	131.0	266.50	-48.50
SS2	180.0	264.50	-47.00
SS2	202.0	265.00	-47.00
SS2	211.4	265.00	-47.00
STP100	0.0	129.00	-57.00
STP100	30.5	129.00	-55.50
STP100	61.0	129.00	-52.50
STP100	91.4	129.00	-48.50
STP100	121.9	129.00	-40.50
STP100	152.4	129.00	-34.50
STP100	182.9	129.00	-29.50
STP100	213.4	129.00	-28.00
STP100	218.2	129.00	-27.75
STP101	0.0	289.60	-47.00

TULLAH / STERLING RIVER DDH SURVEYS

971098

HOLE_ID	DEPTH	AMG_AZ	DIP
STP101	30.5	289.60	-44.00
STP101	61.0	289.60	-32.75
STP101	91.4	289.60	-25.00
STP101	121.9	289.60	-15.00
STP101	152.4	289.60	-13.00
STP101	182.9	289.60	-9.00
STP101	213.4	289.60	-6.00
STP101	265.2	289.60	-1.00
STP105	0.0	288.60	-53.00
STP105	30.5	288.60	-53.00
STP105	61.0	288.60	-49.00
STP105	91.4	288.60	-41.50
STP105	121.9	288.60	-35.00
STP105	152.4	288.60	-32.50
STP105	182.9	288.60	-30.00
STP105	213.4	288.60	-25.50
STP105	243.8	288.60	-20.00
STP105	274.3	288.60	-19.80
STP105	304.8	288.60	-12.50
STP105	323.7	288.60	-8.00
STP217	0.0	108.00	-60.00
STP217	30.0	108.50	-63.00
STP217	66.0	109.00	-60.00
STP217	84.0	112.00	-58.50
STP217	120.0	112.00	-56.00
STP217	150.0	108.00	-50.00
STP217	200.0	109.00	-40.00
STP217	249.0	108.00	-26.50
STP217	249.1	108.00	-26.50
STP218	0.0	102.00	-62.00
STP218	44.0	92.00	-56.50
STP218	74.0	97.75	-53.75
STP218	104.0	100.00	-52.50
STP218	134.0	105.00	-50.50
STP218	164.0	105.00	-49.00
STP218	165.0	105.00	-49.00
STP220	0.0	108.00	-60.00
STP220	91.8	101.40	-46.00
STP220	121.8	99.25	-44.00
STP220	157.8	96.70	-41.00
STP220	208.8	93.00	-26.00
STP220	239.0	96.50	-22.00
STP220	261.8	95.00	-21.00
STP220	268.8	94.50	-20.70
STP221	0.0	75.50	-60.00
STP221	79.8	75.50	-56.50
STP221	109.8	75.50	-55.00
STP221	178.8	75.50	-38.00
STP221	203.0	75.50	-33.00
STP221	203.3	75.50	-33.00

TULLAH / STERLING RIVER DDH SURVEYS

971099

HOLE_ID	DEPTH	AMG_AZ	DIP
STP231	0.0	108.00	-60.00
STP231	60.0	110.00	-56.00
STP231	90.0	111.50	-55.00
STP231	120.0	110.00	-52.00
STP231	150.0	109.00	-50.50
STP231	150.6	109.00	-50.50
STP232	0.0	108.00	-60.00
STP232	14.0	108.00	-60.00
STP232A	0.0	108.00	-60.00
STP232A	92.8	108.00	-60.00
STP232A1	0.0	108.00	-60.00
STP232A1	67.0	106.50	-52.00
STP232A1	109.0	105.00	-49.50
STP232A1	151.0	98.00	-45.00
STP232A1	192.0	98.00	-39.00
STP232A1	198.2	98.00	-38.00
STP234	0.0	108.00	-70.00
STP234	72.0	101.00	-67.00
STP234	102.0	101.50	-65.00
STP234	132.0	98.00	-61.00
STP234	162.0	97.00	-58.00
STP234	192.0	100.00	-54.50
STP234	222.0	98.00	-49.50
STP234	252.0	97.00	-45.00
STP234	282.0	98.00	-43.00
STP234	312.0	93.50	-38.50
STP234	342.0	96.00	-32.00
STP234	342.5	96.00	-32.00
STP283	0.0	108.00	-45.00
STP283	83.0	102.00	-46.00
STP283	131.0	102.00	-46.00
STP283	179.0	98.00	-46.00
STP283	179.6	98.00	-46.00
STP284	0.0	108.00	-60.00
STP284	26.0	99.00	-60.00
STP284	71.0	102.00	-56.00
STP284	116.0	100.00	-51.00
STP284	116.7	100.00	-51.00
STP299	0.0	307.00	-60.00
STP299	34.0	302.00	-59.00
STP299	70.0	300.00	-56.30
STP299	70.1	300.00	-56.30
STP300	0.0	302.00	-60.00
STP300	24.0	294.00	-55.60
STP300	56.0	296.60	-53.30
STP300	79.0	298.50	-50.00
STP300	79.5	298.50	-50.00
STP301	0.0	302.00	-63.00
STP301	41.0	299.00	-60.60
STP301	83.0	297.50	-56.20

TULLAH / STERLING RIVER DDH SURVEYS

971100

HOLE_ID	DEPTH	AMG_AZ	DIP
STP301	116.0	299.50	-47.20
STP301	134.0	299.00	-43.00
STP301	142.7	298.00	-41.80
STP302	0.0	302.00	-63.00
STP302	50.0	290.00	-58.00
STP302	75.0	302.50	-53.30
STP302	110.0	301.50	-49.50
STP302	119.0	300.00	-47.00
STP74	0.0	309.00	-55.00
STP74	45.4	309.00	-55.00
STP75	0.0	309.00	-55.00
STP75	45.7	309.00	-55.00
STP76	0.0	309.00	-55.00
STP76	45.7	309.00	-55.00
STP77	0.0	309.00	-55.00
STP77	45.7	309.00	-55.00
STP78	0.0	309.00	-55.00
STP78	45.7	309.00	-55.00
STP79	0.0	309.00	-55.00
STP79	45.7	309.00	-55.00
STP80	0.0	309.00	-55.00
STP80	45.7	309.00	-55.00
STP96	0.0	308.00	-81.00
STP96	30.5	308.00	-78.00
STP96	61.0	308.00	-76.00
STP96	91.4	308.00	-73.00
STP96	121.9	308.00	-67.50
STP96	152.4	308.00	-62.50
STP96	182.9	308.00	-59.50
STP96	213.4	308.00	-56.25
STP96	239.3	308.00	-53.50
STP98	0.0	128.00	-57.00
STP98	30.5	128.00	-56.50
STP98	61.0	128.00	-56.25
STP98	91.4	128.00	-51.25
STP98	121.9	128.00	-45.50
STP98	152.4	128.00	-42.00
STP98	182.9	128.00	-39.00
STP98	213.4	128.00	-36.00
STP98	243.8	128.00	-33.00
STP98	267.6	128.00	-30.70
SV2	0.0	113.30	-60.00
SV2	71.0	110.30	-54.00
SV2	125.4	108.00	-49.40
SV3	0.0	113.30	-62.00
SV3	55.0	114.30	-59.50
SV3	110.0	113.30	-50.00
SV3	120.0	114.30	-47.00
SV3	169.0	115.30	-41.00
SV3	190.0	121.30	-36.00

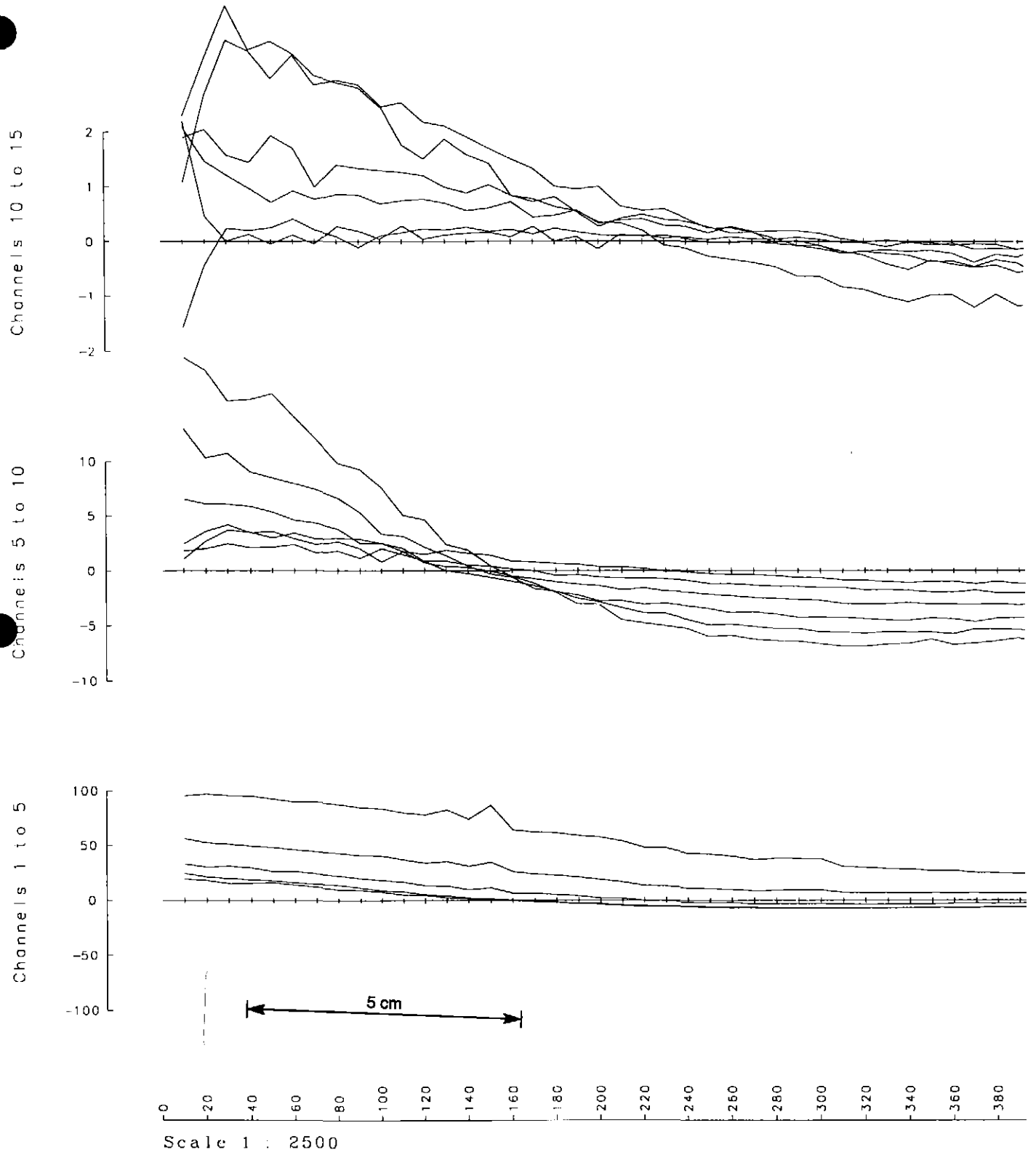
TULLAH / STERLING RIVER DDH SURVEYS

971101

HOLE_ID	DEPTH	AMG_AZ	DIP
SV3	217.0	117.30	-34.00
SV3	232.0	114.30	-29.00
SV3	277.0	115.30	-29.50
SV3	292.4	115.30	-29.50
SVD87-1	0.0	108.00	-56.00
SVD87-1	30.0	108.00	-56.00
SVD87-1A	0.0	108.00	-76.00
SVD87-1A	30.0	108.50	-76.50
SVD87-1A	59.0	108.00	-75.75
SVD87-1A	100.0	107.00	-76.30
SVD87-1A	158.0	105.50	-72.75
SVD87-1A	212.0	105.00	-70.30
SVD87-1A	266.0	102.00	-61.30
SVD87-1A	298.0	103.50	-53.70
SVD87-1A	298.5	103.50	-53.70
SVD87-2	0.0	108.00	-61.00
SVD87-2	100.0	106.50	-59.00
SVD87-2	140.0	107.30	-54.00
SVD87-2	142.5	107.30	-53.70
SVD89-1	0.0	112.00	-50.00
SVD89-1	50.0	111.70	-50.00
SVD89-1	100.0	111.70	-47.00
SVD89-1	150.0	109.70	-44.00
SVD89-1	154.1	109.50	-43.75
SVD89-2	0.0	112.00	-50.00
SVD89-2	50.0	116.50	-48.30
SVD89-2	126.0	115.50	-44.00
SVD89-2	129.5	115.50	-43.80
SVD89-3	0.0	90.00	-50.00
SVD89-3	49.0	87.00	-48.50
SVD89-3	100.0	88.00	-48.00
SVD89-3	155.0	89.00	-48.00
SVD89-3	201.0	89.50	-46.00
SVD89-3	250.0	90.50	-45.00
SVD89-3	300.0	92.00	-44.50
SVD89-3	350.0	94.00	-44.00
SVD89-3	364.2	94.60	-43.90

Appendix 6

Downhole EM Results, Hole MM1a



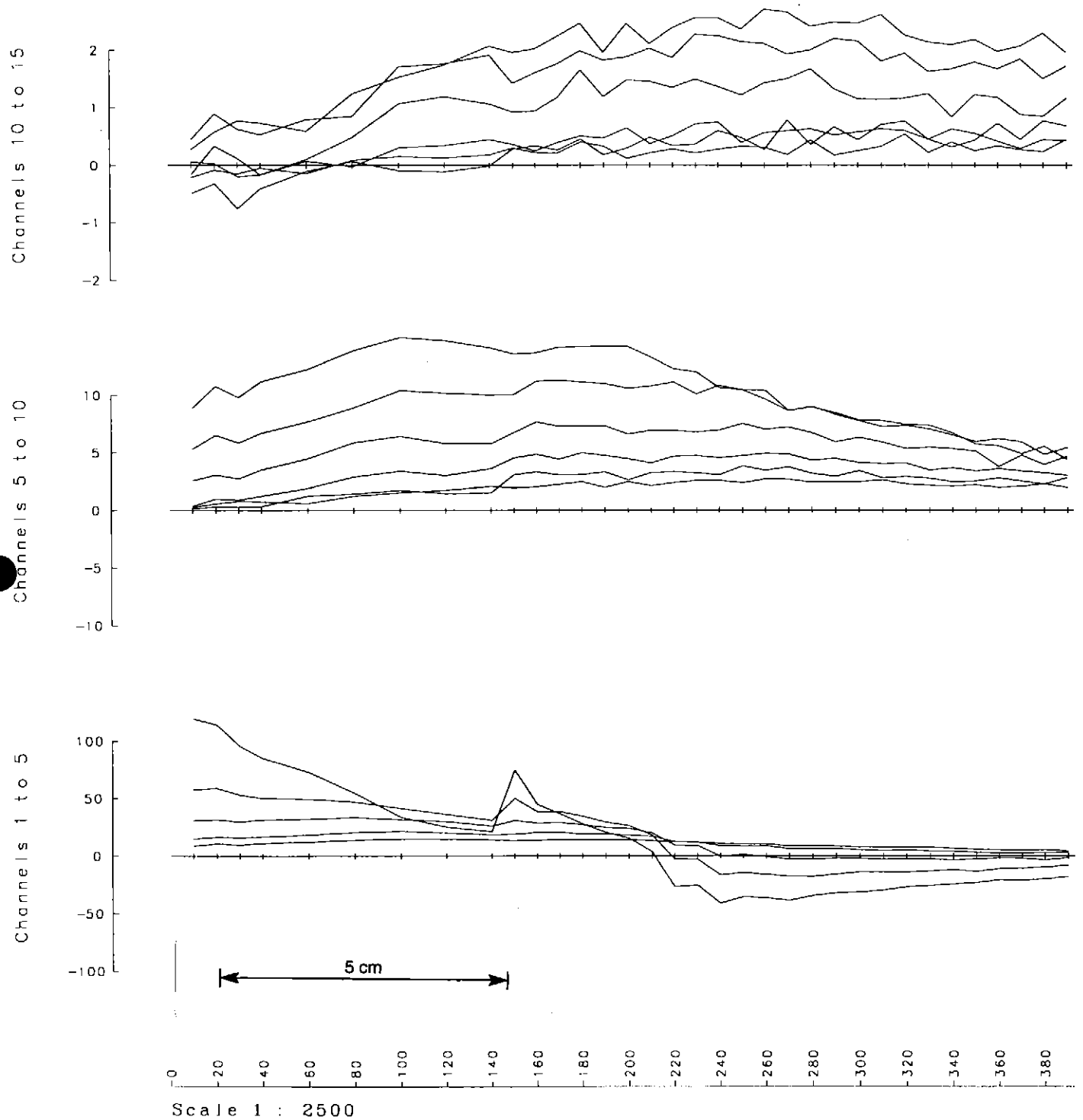
Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)

Axial Component : West Loop

Survey by Crone Geophysics, August 04.93
Loop Size : 300m x 300m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms
Channels : 1 to 17 (0.0765 to 6.6465 milliseconds)

Figure 1



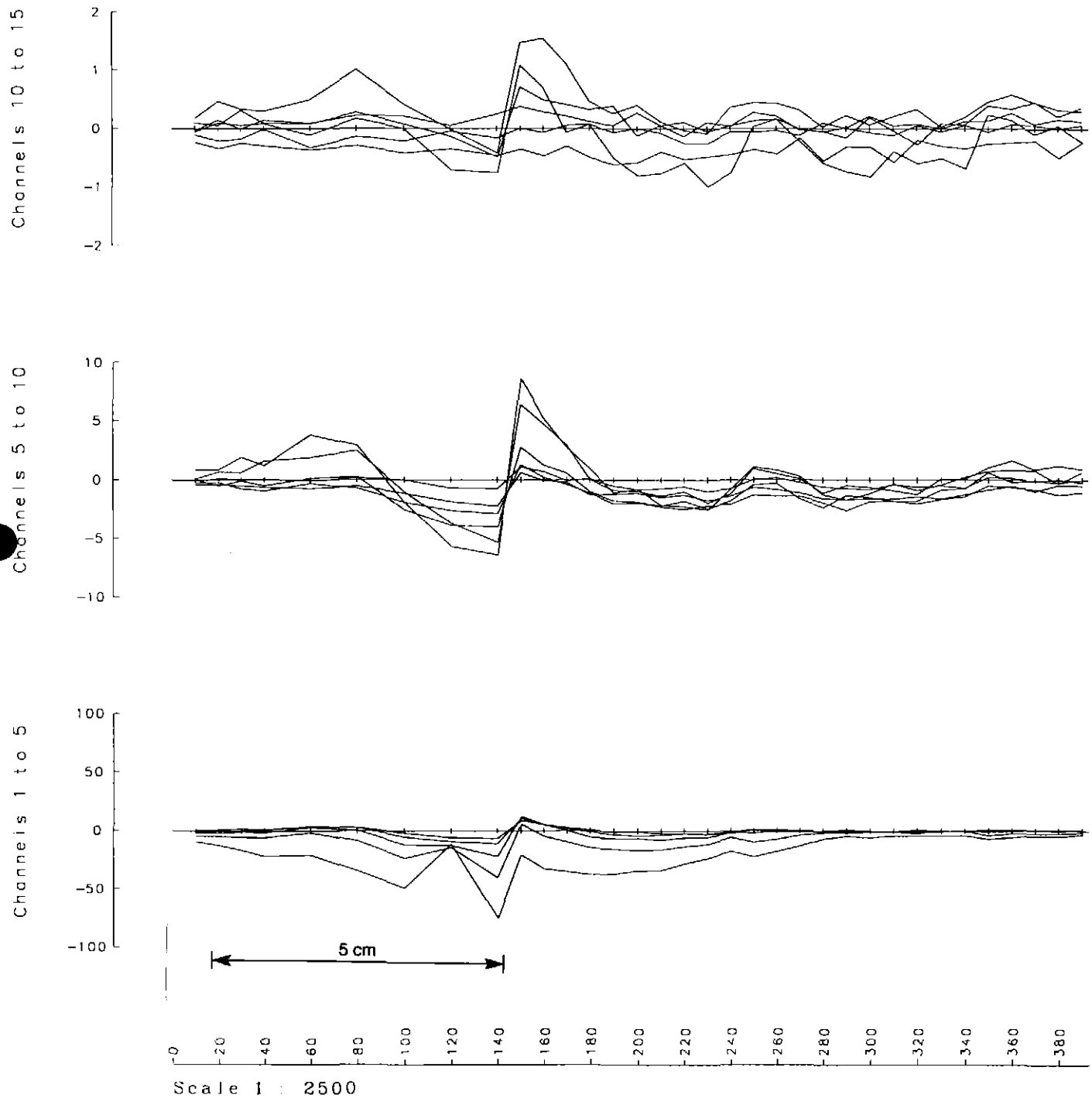
Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)

X Component : West Loop

Survey by Crone Geophysics, August 04, 93
Loop Size : 300m x 300m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms
Channels : 1 to 17 (0.0765 to 6.6465 milliseconds)

Figure 2

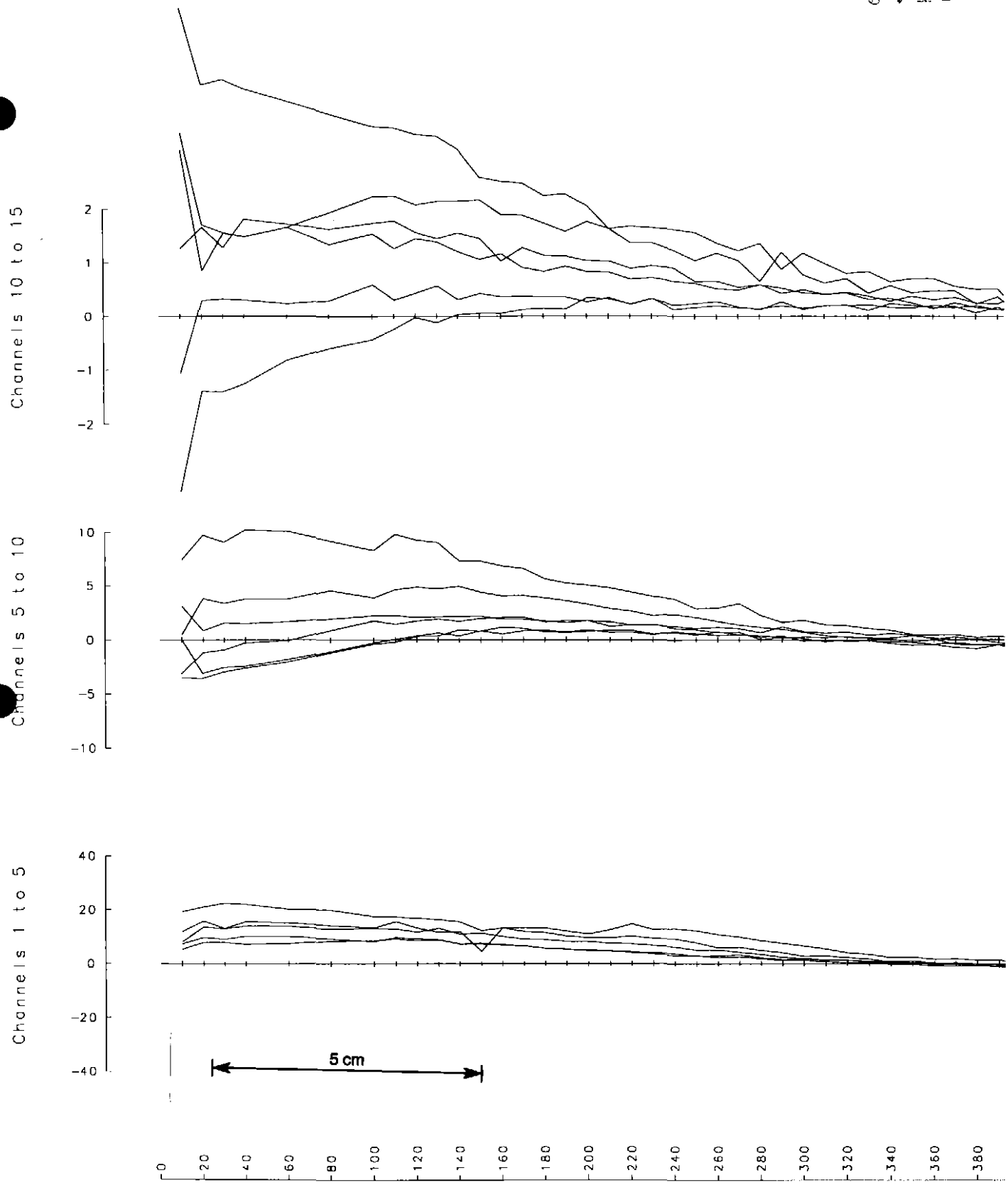


Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)
Y Component : West Loop

Survey by Crone Geophysics, August 04, 93
Loop Size : 300m x 300m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms
Channels : 1 to 17 (0.0765 to 6.6465 milliseconds)

Figure 3



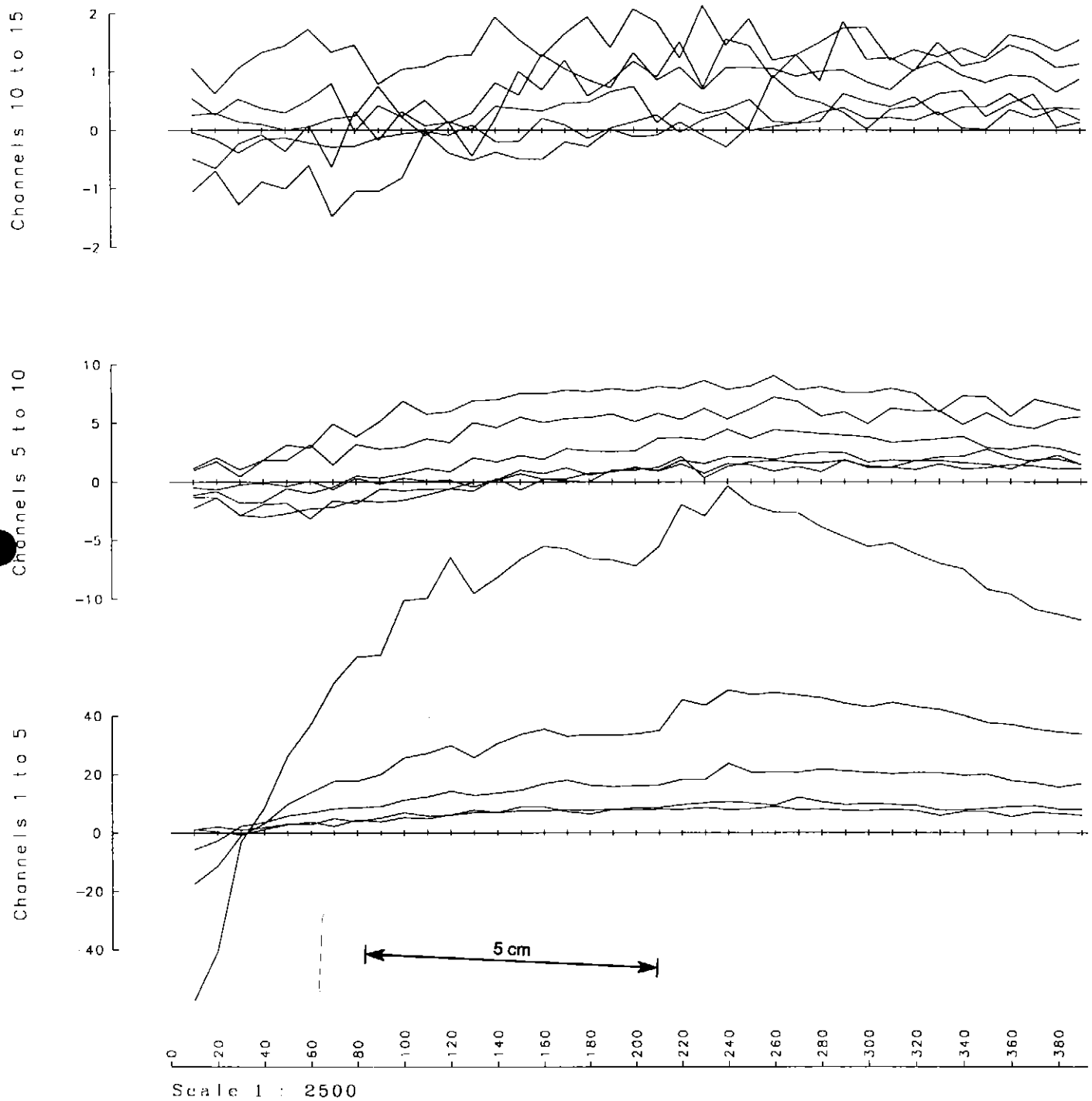
Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)

Axial Component : East Loop

Survey by Crone Geophysics, August 04, 93
Loop Size : 300m x 460m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms
Channels : 1 to 17 (0.0765 to 6.6465 milliseconds)

Figure 4



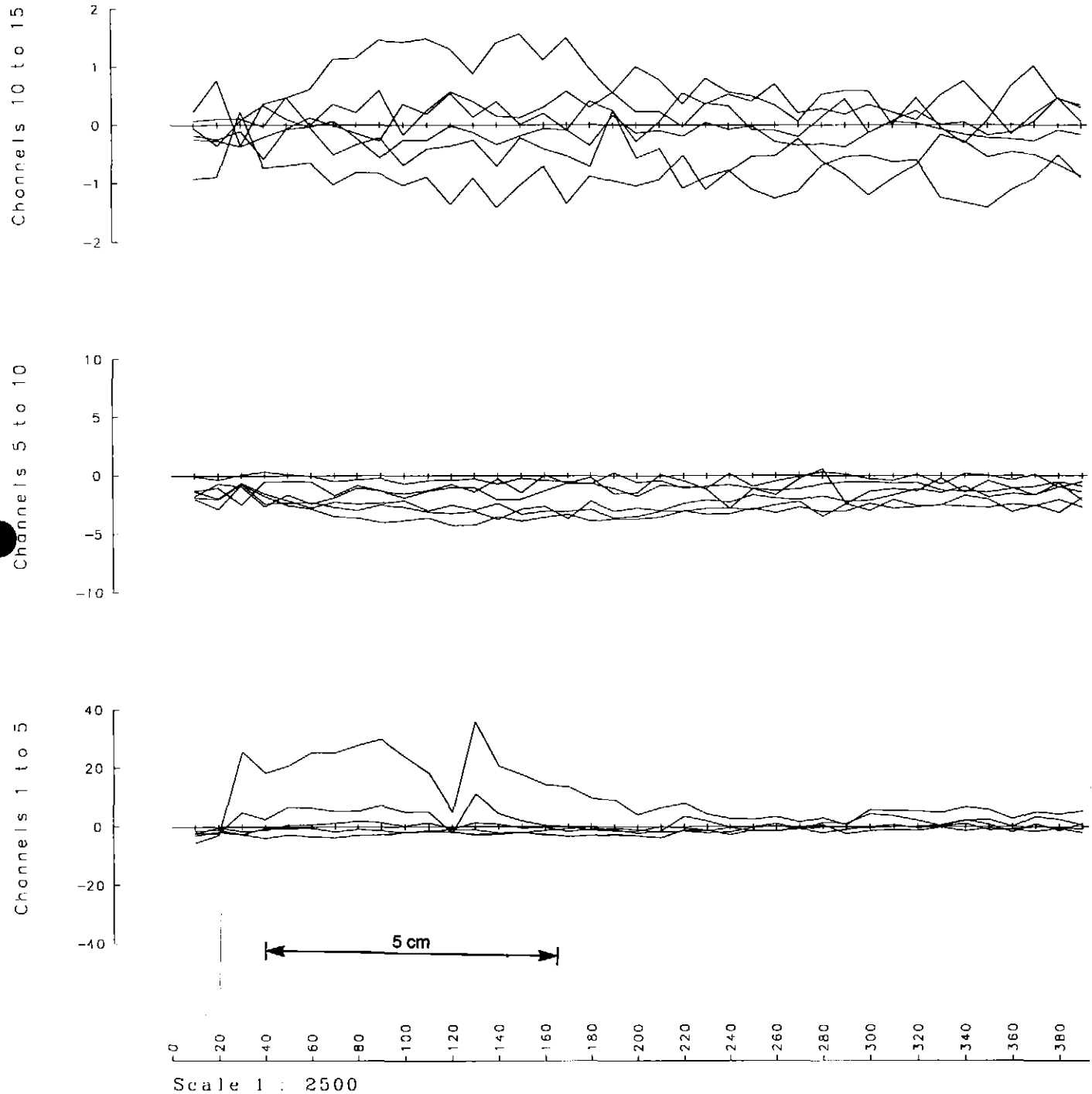
Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)

X Component : East Loop

Survey by Crone Geophysics, August 04.93
Loop Size : 300m x 460m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms
Channels : 1 to 17 (0.0765 to 6.6465 milliseconds)

Figure 5

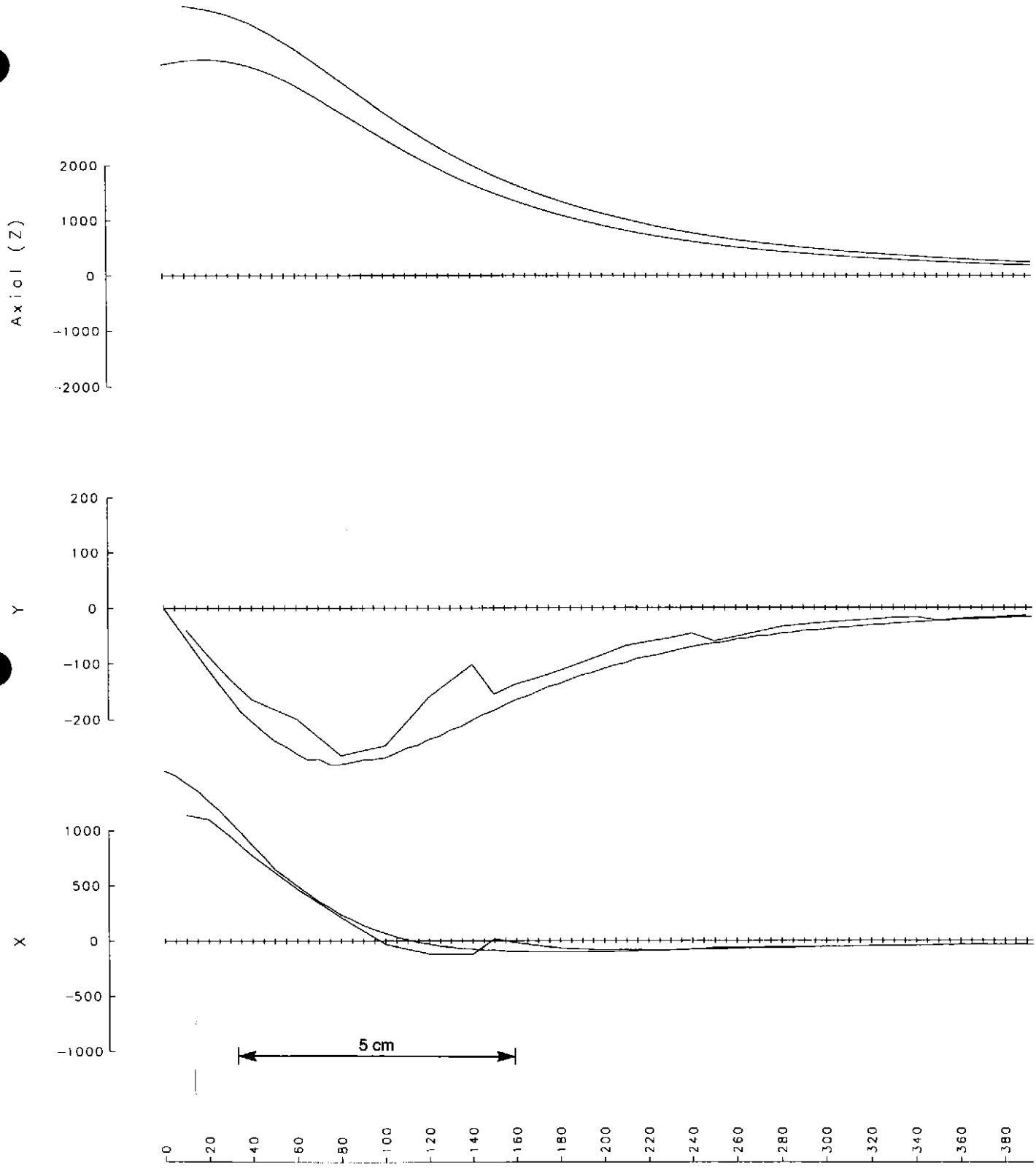


Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)
Y Component : East Loop

Survey by Crone Geophysics, August 04,93
Loop Size : 300m x 460m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms
Channels : 1 to 17 (0.0765 to 6.6465 milliseconds)

Figure 6

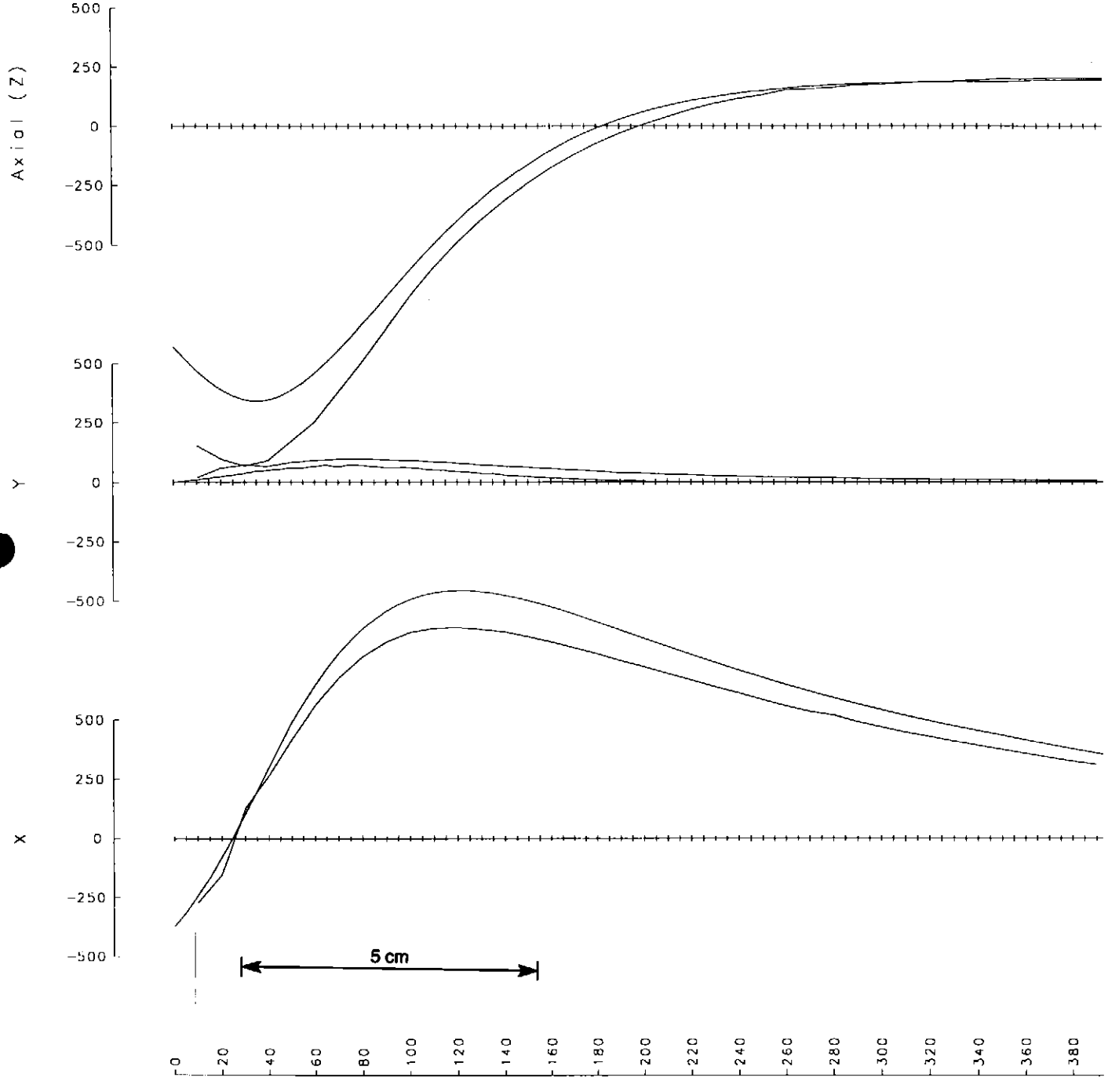


Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)
Measured vs Calculated PP : West Loop

Survey by Crone Geophysics, August 04.93
Loop Size : 300m x 300m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms

Figure 7

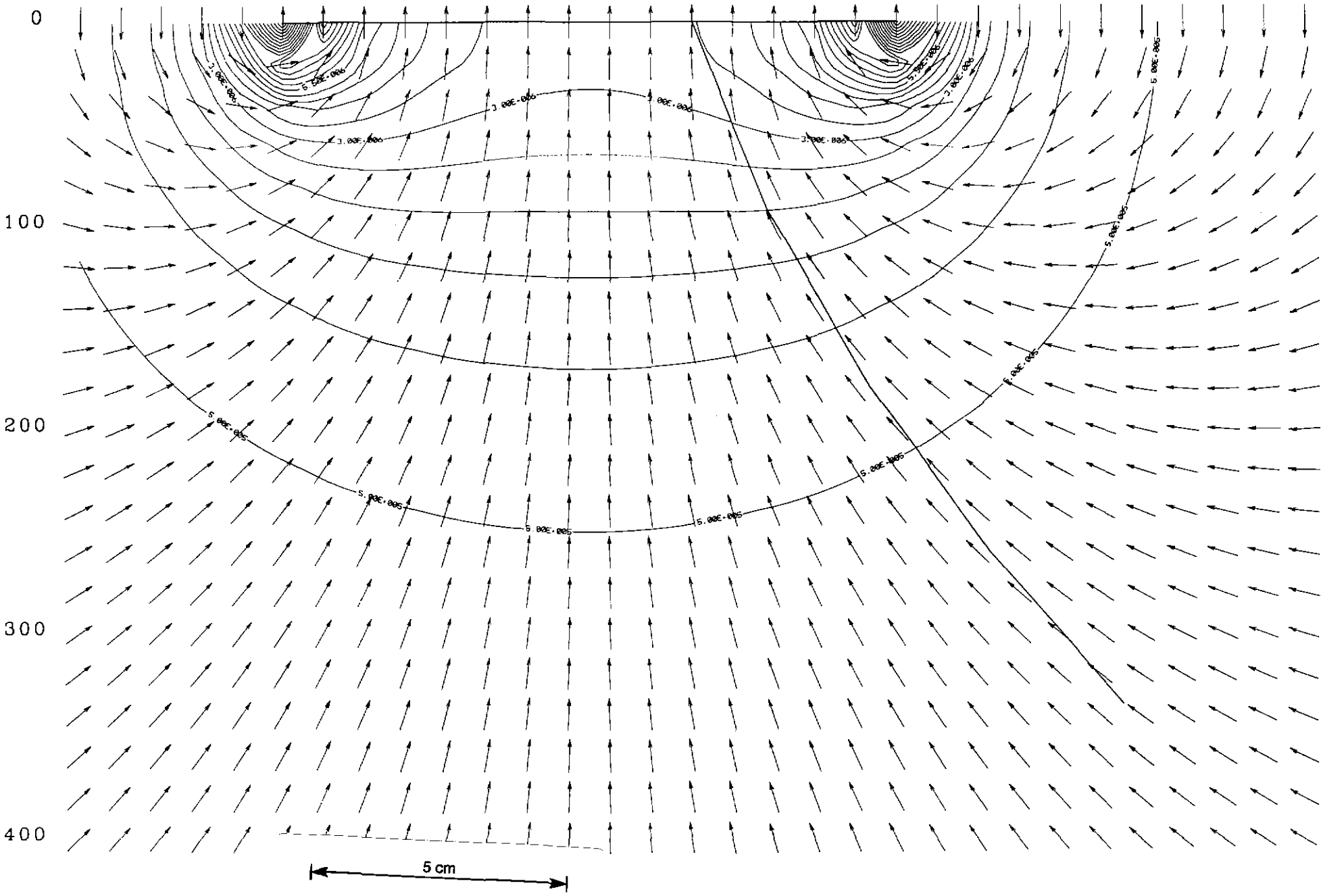


Scale 1 : 2500

DHEM : MM1A (Tullah EL22/90)
Measured vs calculated PP : East Loop

Survey by Crone Geophysics, August 04, 93
Loop Size : 300m x 460m
Units : nV/Amp-m2
Settings : Frequency 25Hz, Ramp 1.00ms

Figure 8



97111

Figure 9

DHEM MM1A, East Loop, 1:2500

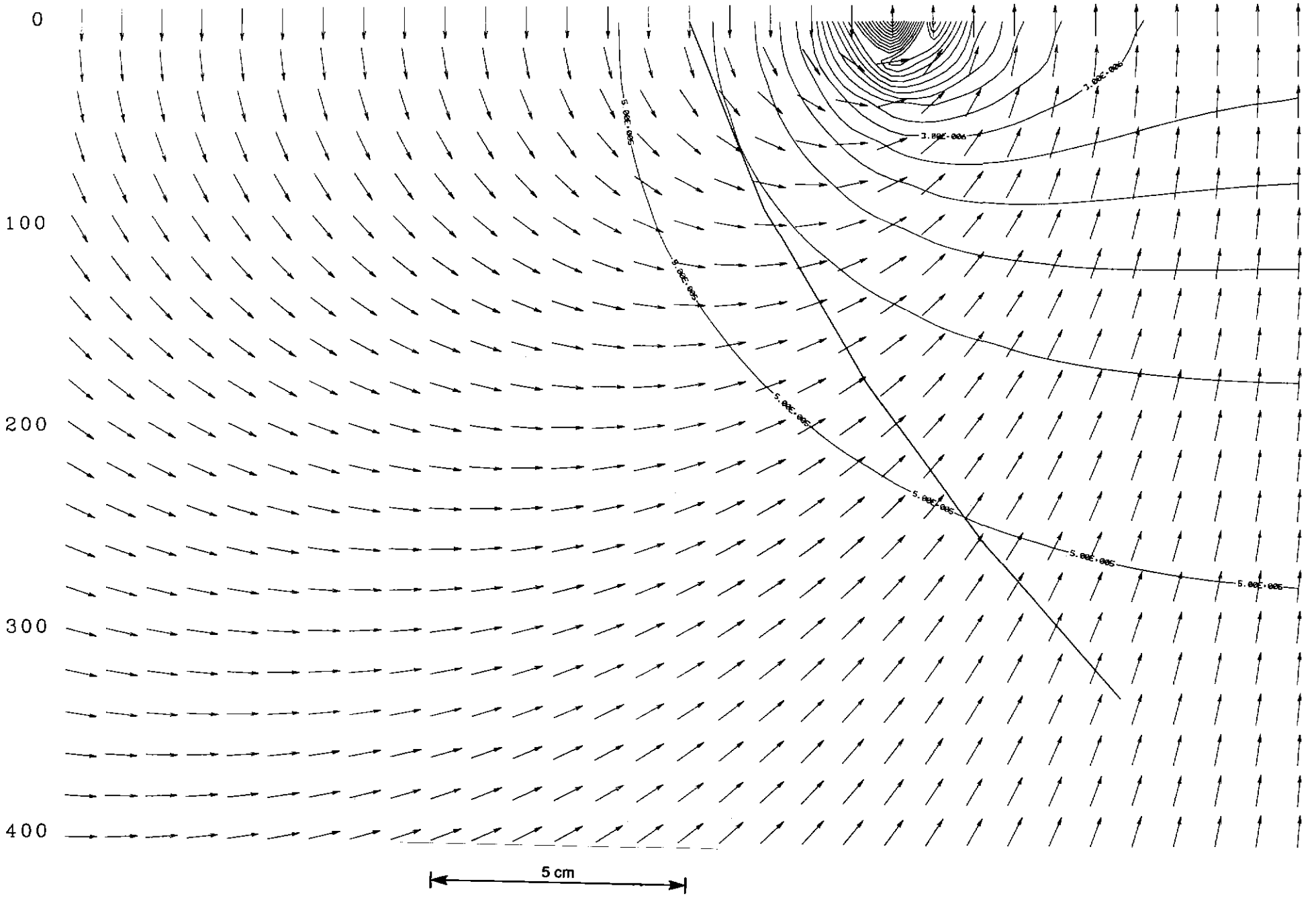


Figure 1

971172

971113

LAKE ROSEBERY

LAKESIDE PROSPECT

HENTY FAULT

GLACIALS

RED 86-1

RED 87-4

5 cm

384600 E

384800 E

385000 E

385200 E

385400 E

385600 E

Surface posn of intersection 0·85m @ 31% Pb, 5% Zn, 670g/t Ag in black shales W. minor py + po

(1986)

(1987)

QUARRY

PROPOSED D.H. LOC'N

MURCHISON HIGHWAY (+ POWERLINE)

FAULT (MAG)

FAULT (IP)

M-G

GLACIALS

€, FARRELL SEDIMENTS & TUFFS

3756000 N

3758000 N

3760000 N

3762000 N

3764000 N

3766000 N

3768000 N

3770000 N

O IP PROFILES

NB SEE ALSO: IP CONTOURS (LJ50/1060) (1987)

IP PROFILES (LJ50/1074)

GROUND MAGNETIC TRENDS

DIGHEM EM ANOMALIES

FOR 1988 LINES, COIL SPACING = 100m

MAX - MIN LINES

W - WEAK (OUT-OF-PHASE ONLY)

M - MODERATE (IN & OUT-OF-PHASE RESPONSES)

Billiton Australia

Project: ROSEBERY EAST J.V.
N.W. TASMANIA

TULLAH FLATS

MAX-MIN EM ANOMALIES

(OVERLAYS GROUND MAG PLAN LJ50/1134)

Author N.H	Date 11/88	Scale 1:5000
Drawn	Office Melb	Revised / Date

Drawing No. LJ50/1148

Figure 11

971114

222 Hz
0
-10%
20%
10%
888 Hz
0
10%
0%
20%

Tx Rx Facing East

-10%
444 H
0
-10%

5 cm

+20%
+10%
1777 Hz
0
-10%
-20%

Power Line
Parallel 40m

Weak
Conductor

385 270E
385 370E
385 470E
100 metres

Coil Separation = 100m

In Phase
Out of Phase

Billiton Australia

STATE	TAS.
PROSPECT	Rosebery East J.V. Tullah Flats
LINE	376 400N
	MAX-MIN E.M.
SCALE 1:2 000	DATE 28/10/88
AUTHOR R.D.	DRAWN A.B.
OFFICE AHO	REP.No.
DRG.No.LJ50/1135	Figure 12

971115

22 Hz
0
Tx Rx Facing East
+10%
444 Hz
0
-10%
-20%
10%
8 Hz
0
-10%
5 cm
20%
+80%
+10%
1777 Hz
0
-10%
-20%

385 230 E
100 metres
385 530 E
Coil Separation = 100m
In Phase
Out of Phase

Billiton Australia

STATE	Tas.
PROSPECT	Rosebery East J.V.
LINE	Tullah Flats 376 500 N
	MAX-MIN E.M.
SCALE 1:2000	DATE 25-10-88
AUTHOR R.D.	DRAWN A.M.
OFFICE AHO	REP.No.
DRG.No. LJ50/1136	FIG.No. 13

222 Hz

888 Hz

444

17771

5 cm

Steep Slopes

Conductor
385 170E (??)

Weak
Conductor

385 190E | 385 290E | 385 390 | 385 490 | 385 590

100 metres

Coil Separation = 100m

In Phase

Out of Phase

971116

Billiton Australia

STATE	TAS.
PROSPECT	Tullah Flats Rosebery East J.V.
LINE	376600N
	MAX-MIN E.M.
SCALE 1: 2 000	DATE 26-10-88
AUTHOR R.D.	DRAWN AB.
OFFICE ANO	REP.No.
DRG.No. LJ50/1137	FIG.No. 14

971117

OPEN FILE

MICROFILMED
FICHE No. 012978-84

PASMINCO EXPLORATION

TULLAH EL 22/90 &
STERLING RIVER EL 24/91
ANNUAL REPORT

OCTOBER 1992 - SEPTEMBER 1993
volume 2 of 2

93-3504.

AUTHOR: JG Purvis
JG Purvis & Associates Pty Limited

DATE: September 1993

REPORT No.: T93-12

SUBMITTED TO: Regional Exploration Manager - Tasmania

DISTRIBUTION: Pasminco Exploration - Burnie
- Melbourne
- Rosebery

Department of Mineral Resources - Tasmania

MINES EL 24/91
FILE REF. EL 22/90
27 SEP 1993
DOC. REF.
OFFICER | FOR ACTION | FOR INFO.
SEE COVERING
LETTER
EL 22/90 FOLIO
100 - 101
EL 24/91 FOLIO
REGISTRY DATE
66-67

SUBMITTED BY: J.G. Purvis

ACCEPTED BY:

Burnie
September 1993

FIGURES

385 450mE. 385 500mE. 385 550mE 385 600mE. 385 650mE. 385 700mE.

376 600mN 376 600mN.

SECTION 376 580mN. SECTION 376580m N.

376 550mN. 376 550mN.

376 500mN. 376 500mN.

SECTION 376 490mN. SECTION 376 490mN.

SECTION 376 450mN. SECTION 376 450mN.

MP32

No. 1 Level
Rails R.L. = 218.4m

Contacts of
Crystal sandstone
unit at 221m R.L.
(No. 1 Level Backs
= Floor of open cut)

Position of workings
on surface above No. 1 Level

No. 1 LEVEL ADIT

MP32

032794
032795

57°
034209

OPEN CUT

032793

No. 3 Level
Rails R.L. = 182.3m

No. 3 LEVEL ADIT

58°
034212

034211

032796

032792

032797

034210

032798

50°

STOPED ABOVE No.3 LEVEL

INTERBEDDED
SILTSTONE
SHALE
&
FINE SANDSTONE

CRYSTAL
SANDSTONE
(at open cut level)

INTERBEDDED
SILTSTONE
SHALE
&
FINE SANDSTONE

BILLITON GRIDLINE 376500N

No. 1A LEVEL ADIT

No. 1A Level
Rails R.L. = 221m

60°

MM1/1a

HEC ROAD TO MURCHISON DAM

KITSON'S TRACK

MP28,29

MP29

MP28

Contacts of
Crystal sandstone
unit at 185m R.L.

CRYSTAL
SANDSTONE
(at 3 Level Backs = 185m R.L.)

MP30

MP30

KEY

- 034212 — Pasminco Rock Sample
- Winze
- Orebody at Surface
- Orebody on 3 Level
- Lode Structure

5 cm

971119

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L. 22/90 – TULLAH
DATE : Nov., 1992	MURCHISON MINE
DRAWN : T.G.D.S.	OPEN CUT & 3 LEVEL
REFERENCE :	**GEOLOGY**
REVISIONS :	
Sept., 1993	
DRAWING No. MMGPLAN	SCALE 1:500 0 20 40 m — FIG. No. 8

NORTH

SOUTH

5 376 600mN

5 376 500mN

5 376 400mN

Billiton Line
376 500N

OPEN CUT

Shaft

No. 1A Adit
Entrance

No 1 LEVEL

E–W
X–Cut

Stoped

Stoped

No. 2 LEVEL

Stoped

Inaccessible

Stoped

200mR.L.

200mR.L.

MURCHISON
MINE
WORKINGS

Boundary of ore shoot
in crystal sandstone unit

Shales, siltstones and fine sandstones
(FARRELL SLATES)

Rise

W Adit

E X–Cut

No 3 LEVEL

0.2m @
6.7% Pb, 6.8% Zn
115g/t Ag, 2.5g/t Au

MP32

Winze

Winze

Stoped

Stoped

Boundary of ore shoot
in crystal sandstone unit

2,500t ZINC RICH
ORE REMNANTS
BESIDE OLD STOPE

Limit of
stoping

Shales, siltstones and fine sandstones
(FARRELL SLATES)

MP28

1.3m @
7.5% Pb, 16.9% Zn
401g/t Ag, 0.85g/t Au

MP30
Trace mineralisation

10,000t INDICATED ORE BLOCK

Location doubtful
(azimuth not measured
in downhole surveys)

MP29
Barren

Inferred location
of MP29

100mR.L

100mR.L.

00mR L.

00mR.L.

MM1a

–100mR.L.

–100mR.L.

5 cm

5 376 600mN

5 376 500mN

5 376 400mN

KEY

O MP30 — Drillhole intersection in crystal sandstone host unit

971120 93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L. 22/90 – TULLAH
DATE · Jan, 1993	MURCHISON MINE
DRAWN . G.M.B.	**LONGITUDINAL PROJECTION LOOKING EAST**
REFERENCE .	
REVISIONS :	
Sept, 1993	
DRAWING No	SCALE 1·500 0 10 20 m — FIG No 9

250mR.L.

385 600mE.

385 650mE.

385 700mE.

250mR.L.

MURCHISON DAM ROAD

KITSON'S TRACK

MP30
-44°
7mN

200mR.L.

200mR.L.

INTERBEDDED SILTSTONE, SHALE AND FINE SANDSTONE
generally calcareous

100'

50m

200'

sheared zone

Disrupted & altered zone (chlorite-sericite)

MASSIVE CRYSTAL SANDSTONE

GREY SHALE
strongly cleaved

LITHIC-RICH SANDSTONE/BRECCIO-CONGLOMERATE

SHALE & SILTSTONE

300'

100m

400'

5% py

1.4m at 0.1% Pb,
0.7% Zn, 22g/t Ag

qtz-carb-py-sp-gn
veins to 60mm

11mS

E.O.H
411'
(125.3m)

Qtz-sericite schist
(altered zone)

5 cm

150mR.L.

150mR.L.

971121

93-3504.

385 600mE.

385 650mE.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L. 22/90 – TULLAH
DATE : Nov., 1992	MURCHISON MINE
DRAWN : T.G.D.S.	SECTION
REFERENCE :	5 376 450mN
REVISIONS :	LOOKING NORTH
DRAWING No. 376450N	SCALE 1:500 0 10 m
	FIG. No. 10

385 600mE.

385 650mE.

385 700mE.

KITSON'S TRACK

No. 1A LEVEL ADIT

South of Section

200mR.L.

MP28
-29°
0.7mS

MP29
-51°

INTERBEDDED SILTSTONES, FINE SANDSTONES & SHALES
generally calcareous

3 LEVEL

MASSIVE CRYSTAL SANDSTONE

1.3m at 7.5% Pb, 16.9% Zn
401 g/t Ag, 0.85 g/t Au

MINERALIZED ZONE
(semi-massive sp-py-gn in carb-qtz ganque)

BLACK SHALE

VOLCANICLASTIC SANDSTONE
calcareous

3-4% po, py

2-3% po, py

SILTSTONES, FINE SANDSTONES & SHALES
generally calcareous

Increasing shales

cleavage stronger

silicified

2-3% py

carb-py-sp-gn veins to 65mm

2.7mS

E.O.H
403'
(122.8m)

150mR.L.

Increasing shales & cleavage stronger

MAJOR SHEAR

50mm vein qtz-carb sp-aspy-py

MASSIVE CRYSTAL SANDSTONE

BLACK SHALE
Crenulated

2-3% py

E.O.H
373'
(113.7m)

1.1mS

sheared & brecciated zone

385 600mE.

5 cm

971122

93 - 3504

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L. 22/90 – TULLAH
DATE : Nov., 1992	MURCHISON MINE
DRAWN : T.G.D.S.	SECTION
REFERENCE :	5 376 490mN
REVISIONS :	LOOKING NORTH
DRAWING No.	SCALE 1:500 (0 10 m)
	FIG. No. 11

385 600mE.

385 650mE.

385 700mE.

385750m E.

250m R.L.

200mR.L.

150mR.L.

Lode fissure

MP32

−60°

3mS

Access track to Open cut

No. 1 LEVEL ADIT

South of Section

4.25m at 0.26% Pb, 0.23% As, 150 ppm Sn

100'

MASSIVE CRYSTAL SANDSTONE

50m

N End of No. 3 LEVEL drive 2m S of section

200'

0.2m at 6.7% Pb, 6.8% Zn, 115 g/t Ag, 2.5 g/t Au

silicified brecciated & cleaved zone

SILICEOUS BLACK SHALE strongly cleaved

300'

2.9m at 1.95% Zn, 7 g/t Ag

100m

2–3% py

E.O.H 361' (110.0m)

10mN

971123

93-3504

5 cm

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L. 22/90 – TULLAH
DATE : Nov., 1992	MURCHISON MINE
DRAWN : T.G.D.S.	SECTION
REFERENCE :	5 376 580mN
REVISIONS :	LOOKING NORTH
DRAWING No.	SCALE 1:500 0 10 m — FIG. No. 12

5 376 600mN

385 400m E. | 385 500m E. | 385 600m E. | 385 800m E. | 385 900m E. | 386 000m E.

MP32

5 376 500mN

MM1A
MM1
MP29
MP28
MP30

SECTION LINE

PLAN

5 376 400mN

400m R.L

385 400m E. | 385 500m E. | 385 600m E. | 385 700m E. | 385 800m E. | 385 900m E. | 386 000m E.

WEST

EAST

300m R.L

200m R.L

100m R.L

0m R.L

−100m R.L

−200m R.L

Billiton cross line

Qtz veins to 0.1m

Hematite flecks & veinlets

CREEK

Qtz veins to 0.25m

Old Glory Hole

Old Track

Dump

Tip heads of Adit 1A

Billiton grid pegs

ADIT 1A Entrance
@ 5 376 510mN

0.3m wide sulphide lode

KITSON'S TRACK

ROAD TO MURCHISON DAM

HEC ROAD TO MURCHISON DAM

Profile on Billiton Line 376500N
(@ 5 376 520mN)

Profile on 5 376 490mN

MM1/MM1a
−70°
2.9mS

MP28, MP29
0.7mS
−29°
−51°

MAINLY FELSIC VOLCANICLASTICS
sericitized and cleaved

FINELY PORPHYRITIC RHYODACITIC LAVAS
chloritized and sericitized

FLUVIOGLACIAL SANDS

SHALE

FINE SANDSTONE
Calcareous

SHALEY SILTSTONE
Calcareous. Strongly slvd.

Minor sp–py in qtz zone // LCA

SHALE Calcareous

set of kink bands

MM1 7mS
E.O.H. 60m

fold noses

2–3% py–po

1m qtz vein

CALCAREOUS SHALE, SILTSTONE AND FINE SANDSTONE

FARRELL

INTERBEDDED SHALES SILTSTONES AND FINE SANDSTONES
Generally calcareous, with ubiquitous disseminated po and py

3 LEVEL
(MURCHISON MINE)

1.3m at 7.5% Pb, 16.9% Zn, 401g/t Ag, 0.85 g/t Au

INTERBEDDED SILTSTONES FINE SANDSTONES & SHALES generally calcareous

MASSIVE CRYSTAL FINE SANDSTONE

carb–py–sp–gn veins to 65mm

BLACK SHALE

VOLCANIC SANDSTONE
Calcareous

MP28
2.8mS
E.O.H
(122.8m)
403'

MP29
1.1mS
E.O.H
(113.7m)
373'

Increasing shales cleavage stronger

MAJOR SHEAR

50mm vein qtz–carb sp–stepy–py

BLACK SHALE

sheared & brecciated zone

MASSIVE CRYSTAL SANDSTONE

SLATES

ZONE

TUFFACEOUS SHALE & SILTSTONE

VITRIC TUFFACEOUS SHALE & SILTSTONE

MURCHISON

VOLCANICS

FINE VITRIC AND CRYSTAL–RICH EPICLASTIC VOLCANICLASTICS
Includes minor lavas.
Strongly cleaved and sericitized

3–5% py–po

100m Zone of mild small scale folding

3–5% py–po

2–3% py–po

qtz veining

fold noses current bedding

3% py–po

current bedding

3–5% py–po

CALCAREOUS TURBIDITIC SANDSTONE
Minor siltstone/shale

fold nose

3–5% py–po

CALCAREOUS SHALE SILTSTONE AND SANDSTONE

MAJOR SHEAR

FAULT

200m

MASSIVE CRYSTAL SANDSTONE

3–4% py

Sheared

Anticlinal fold axis indicated

CALCAREOUS SHALE, SILTSTONE & SANDSTONE

FAULT

STRONGLY DEFORMED ZONE IN SHALE
small scale folding, kinking & shearing

VITRIC SILTSTONE AND CRYSTAL SANDSTONE

QUARTZ–PORPHYRITIC VOLCANIC
ser–co clvd

Probable loss of intrusive

sil–qtz–mag clvd

FINE EPICLASTIC VOLCANICLASTICS
Probable loss of intrusive
vitric qtz–crystal–rich
sil–ser–chl–co

0.6m of cataclasite with 0.3m of 10% py–gn–cpy at base

MAJOR

sp veinlets

400m

0.3m siltstone/shale band with sp veinlets

FINE PUMICEOUS VOLCANICLASTICS
Probably epiclastic
chl–ser–co

amygdales

DACITE LAVA/DYKE
ser–co

FINE EPICLASTIC VOLCANICLASTICS
Probable lithic crystal sandstone and crystal–lithic breccia–conglomerate
co–ser–chl

ZONE OF QUARTZ–ALBITE VEINS
in brecciated sandy volc.

RHYOLITIC LAVA
sil–ser

STRONG FAULT (sp–gn stream)

FINE CRYSTAL–LITHIC BRECCIA
co. clvd.

minor sp stream & veinlets in mafic shale bands

400m

33mS
E.O.H 400.7m

MM1a

LEGEND

Shear
Brittle Fault
Geological contacts
Cleavage
Facing
Bedding
Bedding Oriented core
Flow banding
Zones of disseminated sulphides
Significant assay intervals

Alteration

co	carbonatized
chl	chloritized
ser	sericitized
sil	silicified
clvd	cleaved

971154

5 cm

93-3504.1

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P	E.L. 22/90 – TULLAH
DATE : Nov., 1992	MURCHISON MINE
DRAWN : T.G.D.S	SECTION 5 376 490mN
REFERENCE :	DRILLHOLE
	MM1a
REVISIONS : J.G.P. Jan., 1993	
DRAWING No.	SCALE 1:1000 0 20 40 m — FIG. No. 13

SECTION

385 000mE
385 500mE
386 000mE
386 500mE
387 000mE
5 378 000mN
5 377 500mN
5 377 000mN
5 376 500mN
5 376 000mN

REDB8-3 G
REDB7-4
MURCHISON HIGHWAY
MOUNT FARRELL
MURCHISON DAM ROAD
Lake Herbert
Lake Rosebery
MP32
MP28, MP29
MP30
MW1, MW1a
AB1 TA
5 LEVEL PIT
Sbsh
Sh/sst
Sst, vf
Sltst, vf
Sltst/sh
Sltst/sst
Sltst, vf
Sltst, vf, py
Sltst, vf, py
Sltst, vf, py

385 500mE.
386 000mE.
386 500mE.
387 000mE.
387 500mE.
5 383 500mN.
5 383 000mN.
5 382 500mN.
5 382 000mN.
E.L. 22/90 BOUNDARY
Dense Timber
Sketch Detail:
MACKINTOSH DAM
Intake
Power Station
MASSIVE BASEMETAL SULPHIDE BOULDERS in pyritic sst (15·7%Zn, 1·5%Pb, 73g/t Ag)
Cu Veining (in situ) Malachite (6·5%Cu, 39g/t Ag)
Sill/sst
Clast. Sill/sst
Sst dyke
FV ser.
Sill/sst

LEGEND

1. GENERAL FORM

Rock type, colour, grain size, overall texture, constituents & textutres, alteration, mineralisation.

Rock Types can be combined using a –
Subordinate Rock Types are separated by /
Each Descriptor Group is separated by ,
Descriptors within a group are separated by .
Derwent series 19 colours (in brackets) are intended for the Cambrian sequences.

2. ROCK TYPES

Lavas L Intrusives I or Volcaniclastics V

a	(14)	acid
i	(46)	intermediate
b	(49)	basic
u	(23)	ultrabasic
r		rhyolite
d	(11)	dacite
n	(46)	andesite
ba	(48)	basalt
g	(20)	granite
di	(22)	diorite
do	(45)	dolerite
gb	(25)	gabbro
s	(23)	serpentinite

Sediments S or Volcaniclastics V

bsh	(35)	black shale
sh	(36)	shale
slt	(35)	siltstone
sst	(39)	sandstone
w	(37)	greywacke
cong	(38)	conglomerate
bx		breccia
tbd		turbidite
mst		mass flow
cht	(34)	chert
ls	(65)	limestone
dol	(65)	dolomite
fe	(64)	iron formation
gl	(4)	glacial deposits
fgl	(4)	fluvioglacial deposits
alv	(4)	alluvial deposits
cvl	(4)	colluvial deposits (talus)

Metamorphic and Tectonic Rocks M

Colours should be hatched

sht	(38)	schist
qzt	(40)	quartzite
hf	(50)	hornfels
sk	(50)	skarn
mb	(48)	marble
m		mylonite
fz		fault breccia (pug)

Unassigned ?

Use alone or as a qualifier to other rock types where uncertain

3. DESCRIPTORS

Colour:

pk	pale	bl	blue
dk	dark	wht	white
gy	grey	yel	yellow
or	orange	buf	buff
blk	black	grn	green
pk	pink	ppl	purple
rd	red	crm	cream
brn	brown	khk	khaki

Grainsize:

fg	fine grained
mg	medium grained
cg	coarse grained
vcg	very coarse grained

4. MAPPING SYMBOLS

- Strike and Dip of Strata (25)
- Strike and dip of inverted strata
- Strike and dip of cleavage or foliation (60)
- Plunge of lineation (50)
- Geological boundary position accurate
- Geological boundary position approximate
- Mine
- Abandoned prospect or mine
- Costean or trench
- Diamond drill hole, including projection
- x Sample location
- Unconformity
- Fault
- Fault with dip (70)
- Thrust Fault
- Plunging antiform
- Plunging synform
- Shear/strong cleavage
- Vein

DESCRIPTORS continued

Overall Texture:

fb	flow banded
fbx	flow brecciated
hyl	hyaloclastic
pill	pillowed
peg	paperitic
mav	massive
blo	blocky
aph	aphyric
por	porphyric
peg	pegmatitic
bd	bedded
xbd	cross bedded
ufs	upwards fining sequence
ps	poorly sorted
cs	clast supported
ms	matrix supported
fol	foliate
clvd	cleaved
shd	sheared
bx	brecciated
aug	augen
vnd	veined

Constituents & internal Textures:

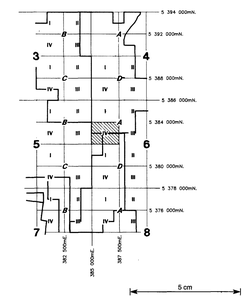
ply	polymict
li	lithic
pm	pumice
xl	crystal
vit	vitric
sph	spherulites
ves	vesicles
amy	amygdules
wsp	wisps
sty	stylolites
f	feldspar
q	quartz
mic	micaceous
cal	calcareous
px	pyroxene
hb	hornblende
cr	chromite
mag	magnetite

Alteration:

bch	bleached
dtx	de-textured
ox	oxidised
alb	albitised
cb	carbonatised
chl	chloritised
ser	sericitised
kao	kaolinitised
ep	epidotised
sil	silicified
fuc	fuchsitic

Mineralisation:

dis	disseminated
py	py
str	stringer
mav	massive
bnd	banded
cls	clasts
gos	gossan
sul	sulphides
py	pyrite
po	pyrrhotite
asp	arsenopyrite
gn	galena
sp	sphalerite
cp	chalcopyrite
ba	barite
mag	magnetite
hm	haematite
lm	limonite
au	gold
ag	silver
tz	tourmaline
q	quartz
cb	carbonate
sd	siderite
mn	manganese carbonate
fl	fluorite



971126

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : A.N.L.	E.L. 22/90 - TULLAH
DATE : Sept., 1991	OUTCROP GEOLOGY
DRAWN :	
REFERENCE :	
REVISIONS : J.G.P. Sept., 1993	
DRAWING No.	SCALE 1:2500 (0 50 100 METRES) FIG. No. 15

386000E 387000E 388000E 389000E

41°40'00"S

41°41'00"S

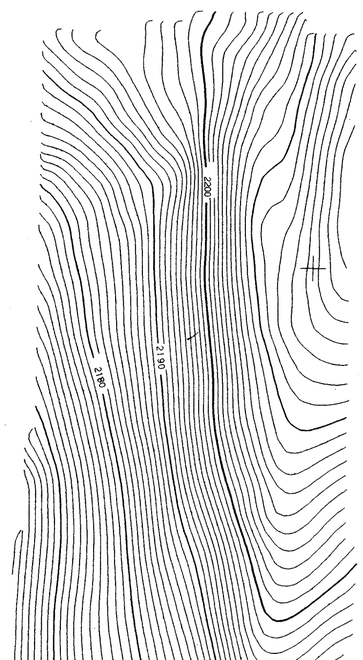
41°42'00"S

41°43'00"S

41°43'30"S

145°37'30"E 145°38'00"E 145°39'00"E 145°40'00"E

5386000N 5385000N 5384000N 5383000N 5382000N 5381000N 5380000N



AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1.0 km
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	real time from UHF DGPS system corrected for selected availability

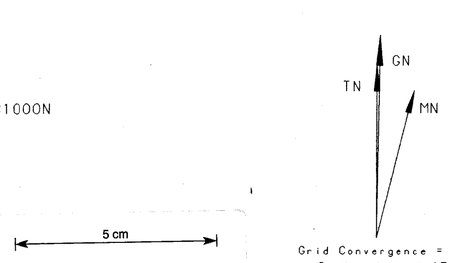
RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55

Magnetics :	Diurnals removed, Tie-line levelled
IGRF :	1990 model (updated for secular variation to March 1993) removed, datum 2000 nT added
Total Field :	62194 nT (at 414500S, 1453730E)
Inclination :	72 degrees S
Declination :	13.2 degrees E
Grid mesh size :	25 x 25 metres
Grid filter :	None
Contour interval :	1, 10 and 100 nT

MAP INDEX

145°37'30"E 145°40'00"E
41°40'00"S 41°40'00"S
1
2
41°47'30"S 41°47'30"S
145°37'30"E 145°40'00"E



Grid Convergence = 0.90°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB NO : 3-446
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD. SYDNEY
Processed by GEOTERREX PTY LTD. SYDNEY

971127

PASMINCO EXPLORATION

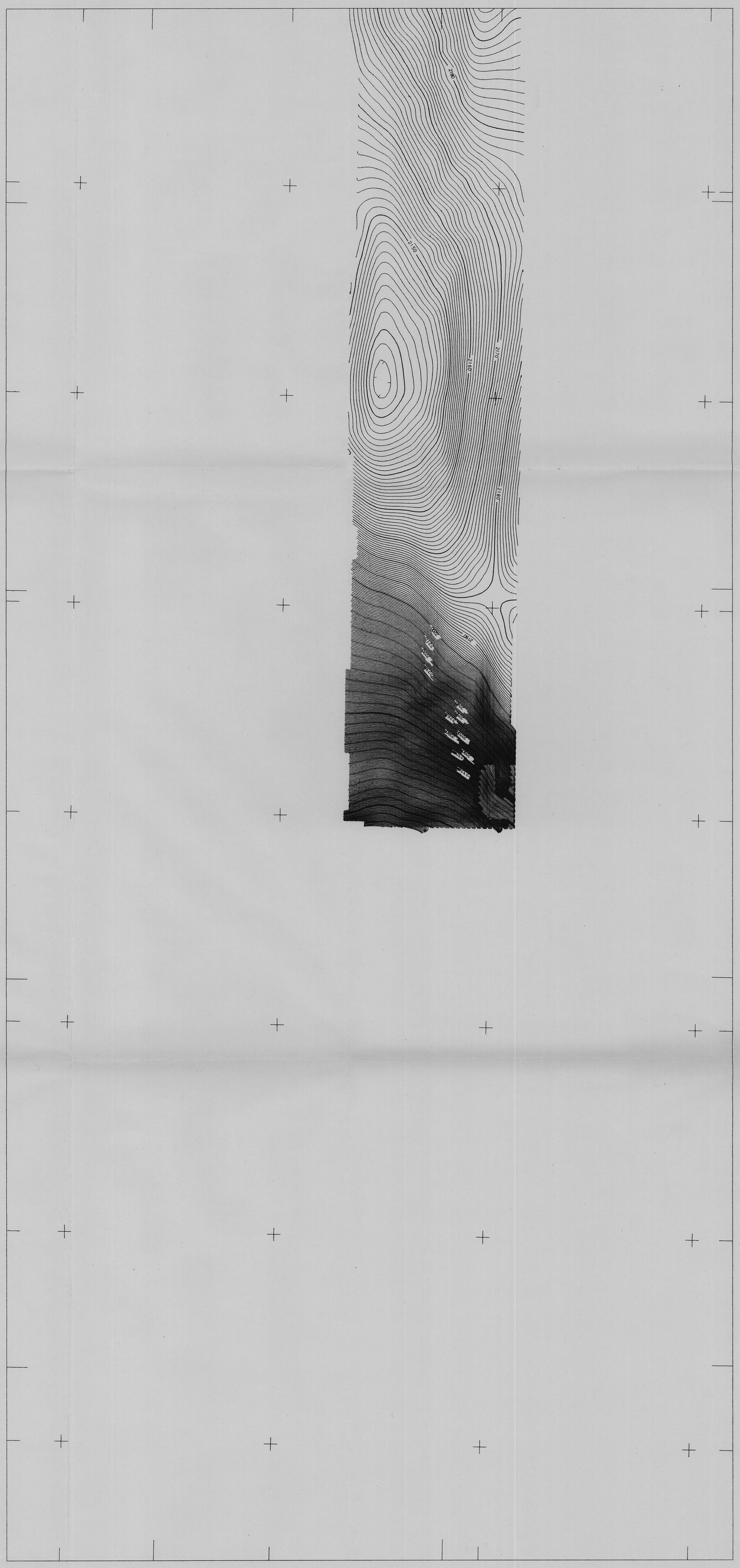
FARRELL RANGE EL 22/90
RESIDUAL MAGNETIC CONTOURS
BURNIE SK55-3
SHEET 1 OF 2

Figure 16

DRAWING NO: | DATE : 13-MAY-1993

386000E 387000E 388000E 389000E

41°43'30"S
41°44'00"S
41°45'00"S
41°46'00"S
41°47'00"S
41°47'30"S



145°37'30"E 145°38'00"E 145°39'00"E 145°40'00"E

5379000N
5378000N
5377000N
5376000N
5375000N
5374000N
5373000N

AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1.0 km
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	real time from UHF DGPS system corrected for selected availability

RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55

Magnetics :	Diurnals removed, Tie-line levelled
IGRF :	1990 model (updated for secular variation to March 1993) removed, datum 2000 nT added
Total Field :	62194 nT (at 4145005, 1453730E)
Inclination :	72 degrees S
Declination :	13.2 degrees E
Grid mesh size :	25 x 25 metres
Grid filter :	None
Contour interval :	1, 10 and 100 nT

MAP INDEX

145°37'30"E 145°40'00"E
41°40'00"S 41°40'00"S
1
2
41°47'30"S 41°47'30"S
145°37'30"E 145°40'00"E

GN
TN
MN

5 cm

Grid Convergence = 0.90°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB NO : 3-
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD, SYDNEY
Processed by GEOTERREX PTY LTD, SYDNEY

971128

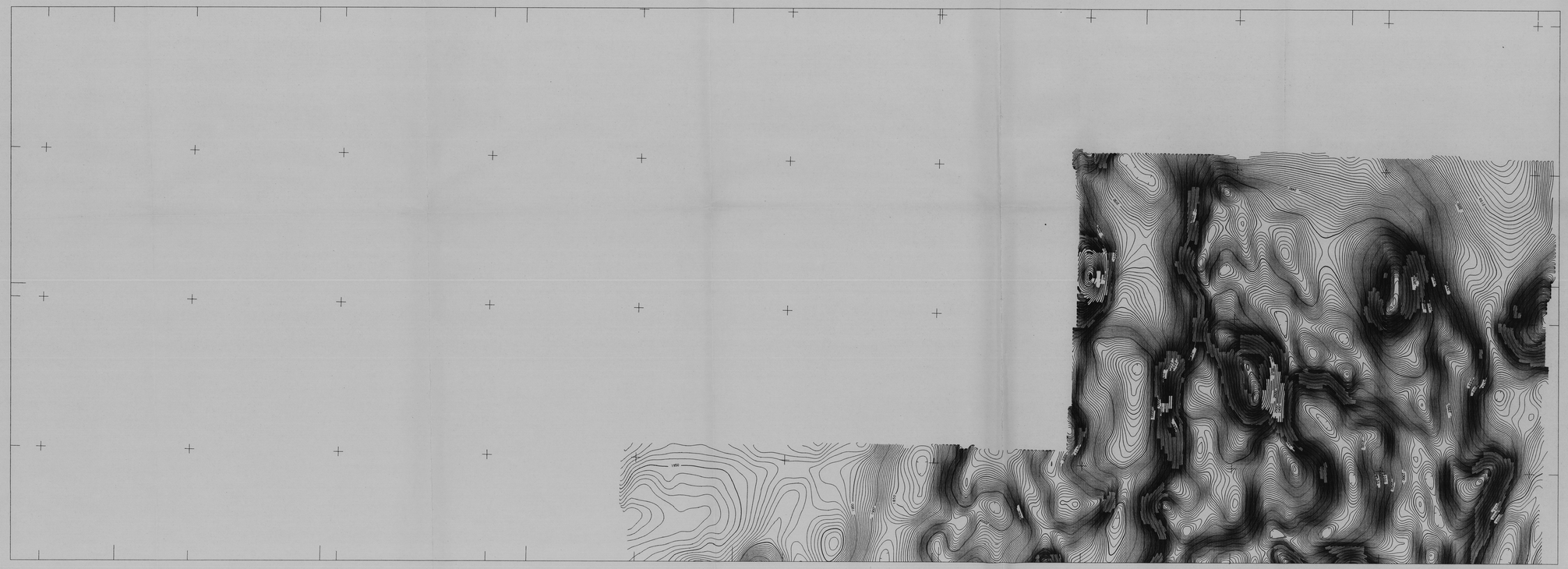
PASMINCO EXPLORATION

FARRELL RANGE EL 22/90
RESIDUAL MAGNETIC CONTOURS
BURNIE SK55-3
SHEET 2 OF 2

Figure 17

DRAWING NO:

DATE : 13-MAY-1993



AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Spectrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	256 channel (4 096 channel) ADC Volume : 15.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.41 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1000 m
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL ND5100 UHF DGPS navigation system, real time from UHF DGPS system corrected for selected availability
FLIGHT PATH RECORD :	

RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55	
Magnetics :	Diurnals removed IGRF corrected for secular variation to March 1993 removed, datum 2000 nT added
Total Field :	60217 nT (at 41°47'30S, 145°35'00E)
Inclination :	72 degrees S
Declination :	12.5 degrees E
Grid cell size :	25 x 25 metres.
Grid filter :	None
Contour interval :	5, 50 and 500 nT

MAP INDEX

145°32'30"E 145°40'00"E
41°45'00"S 41°45'00"S
1 2
41°50'00"S 41°50'00"S
145°32'30"E 145°40'00"E

971129

5 cm

GN
TN
MN

Grid Convergence = 0.93°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

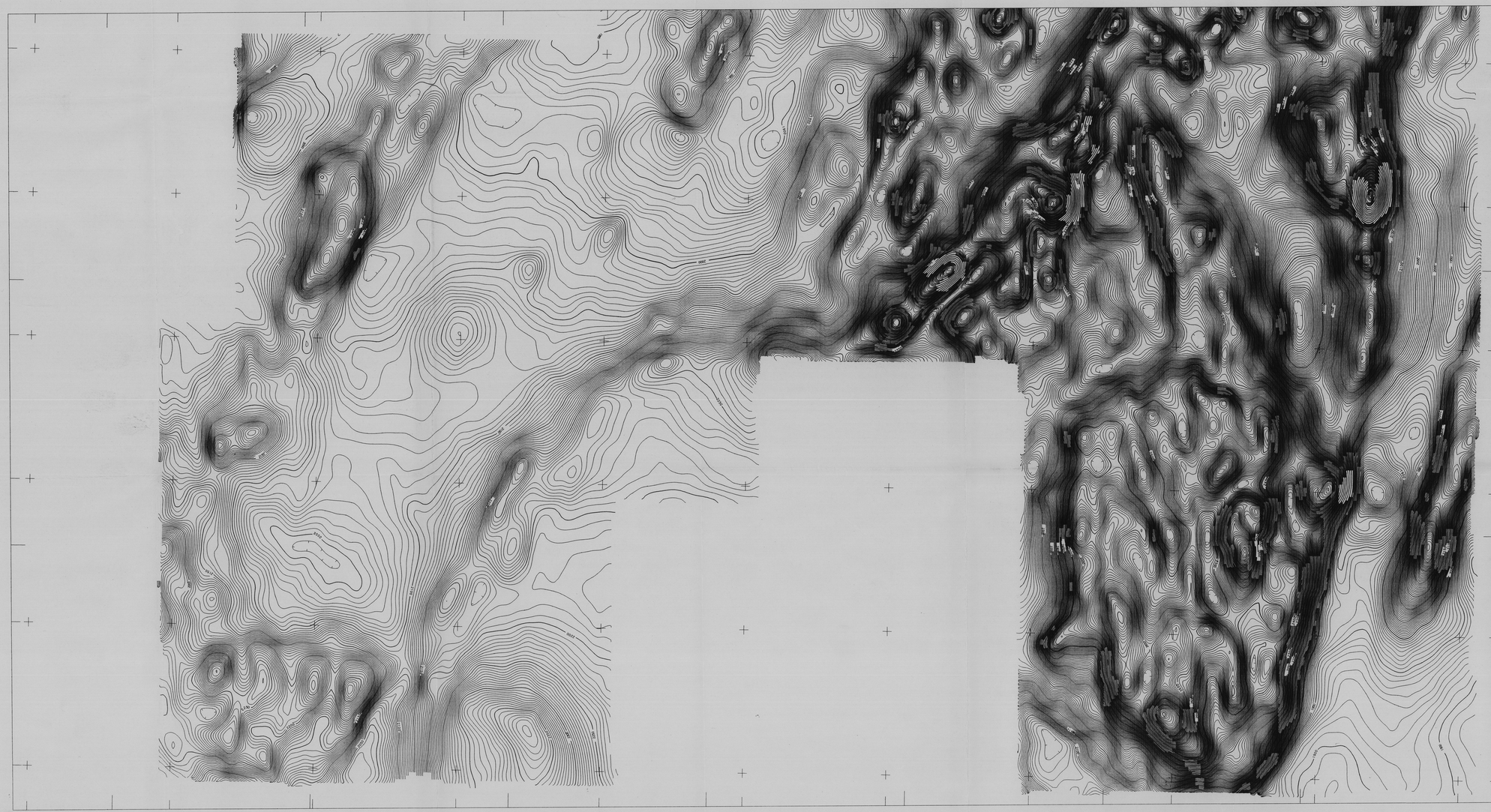
JOB NO : 3-4466
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD. SYDNEY
Processed by GEOTERREX PTY LTD. SYDNEY

PASMINCO EXPLORATION

STERLING RIVER EL 24/91
RESIDUAL MAGNETIC CONTOURS
BURNIE SK55-3
SHEET 1 OF 2

Figure 18

DRAWING NO: | DATE : 13-MAY-1993



AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Sesurral Helicopter
MAGNETOMETER :	SCINTREX caesium vapour optical absorption mounted on a Bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC Resolution : 16-B litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.40 - 2.82 MeV
SPECTRAL RECORDING INTERVAL :	0.5 secs
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1000 m
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	Real time from UHF DGPS system corrected for selected availability

RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55	
Magnetics :	Diurnals removed
IGRF :	1990 model (updated to epoch 1993.0) removed. Values for 1993 removed, datum 2000 nT added
Total Field :	62217 nT (at 4147305, 1453500E)
Inclination :	72 degrees S
Declination :	13.2 degrees E
Grid Interval :	25 x 25 metres
Grid Filter :	None
Contour interval :	5, 50 and 500 nT

MAP INDEX
145°32'30"E 145°40'00"E
41°45'00"S
41°50'00"S
1
2

GN
TN
MN

Grid Convergence = 0.93°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB NO = 3-440
Surveyed by GEOTERREX PTY LTD - March 1993
Compiled by GEOTERREX PTY LTD, SYDNEY
Processed by GEOTERREX PTY LTD, SYDNEY

PASMINCO EXPLORATION

STERLING RIVER EL 24/91
RESIDUAL MAGNETIC CONTOURS
BURNIE SK55-3
SHEET 2 OF 2

Figure 19

DRAWING NO: | DATE : 13-MAY-1993

383000E 384000E 385000E 386000E 387000E

41°43'00"S

41°44'00"S

41°45'00"S

41°46'00"S



5380000N

5379000N

5378000N

5377000N

5376000N

145°35'30"E 145°36'00"E 145°37'00"E 145°38'00"E 145°38'30"E

AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1.0 km
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	real time from UHF DGPS system corrected for selected availability

RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55

Magnetics :	Diurnals removed
IGRF :	1990 model (updated for secular variation to March 1993) removed. datum 2000 nT added
Total Field :	62195 nT (at 414500S, 1453730E)
Inclination :	72 degrees S
Declination :	13.2 degrees E
Grid mesh size :	25 x 25 metres
Grid filter :	None
Contour interval :	2, 20 and 200 nT

971131

5 cm

GN TN MN

Grid Convergence = 0.92°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB NO : 3-446
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD. SYDNEY
Processed by GEOTERREX PTY LTD. SYDNEY

PASMINCO EXPLORATION

TULLAH GAP EL 22/90
RESIDUAL MAGNETIC CONTOURS
BURNIE SK55-3
SHEET 1 OF 1

Figure 20

DRAWING NO: DATE : 13-MAY-1993

386000E 387000E 388000E 389000E

41°40'00"S
41°41'00"S
41°42'00"S
41°43'00"S
41°43'30"S

5386000N
5385000N
5384000N
5383000N
5382000N
5381000N
5380000N

< 601/1 < 603/1 < 605/1 < 607/1 < 753/1

602/1 > 604/1 > 606/1 > 608/1 >

145°37'30"E 145°38'00"E 145°39'00"E 145°40'00"E

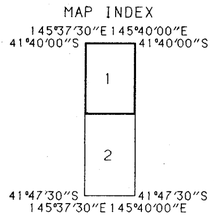
AIRBORNE SURVEY SPECIFICATIONS

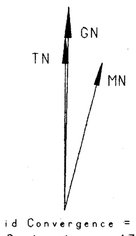
AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird
	Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC
	Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system
	Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m.
	Tie lines 1.0 km
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	real time from UHF DGPS system corrected for selected availability

FLIGHT PATH

Grid notation refers to Australian Map Grid Zone 55
Navigation fix . 32768

MAP INDEX





Grid Convergence = 0.90°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

971132

5 cm

93-3504.

JOB NO : 3446
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD. SYDNEY
Processed by GEOTERREX PTY LTD. SYDNEY

PASMINCO EXPLORATION

FARRELL RANGE EL 22/90
FLIGHT PATH
BURNIE SK55-3
SHEET 1 OF 2

Figure 21

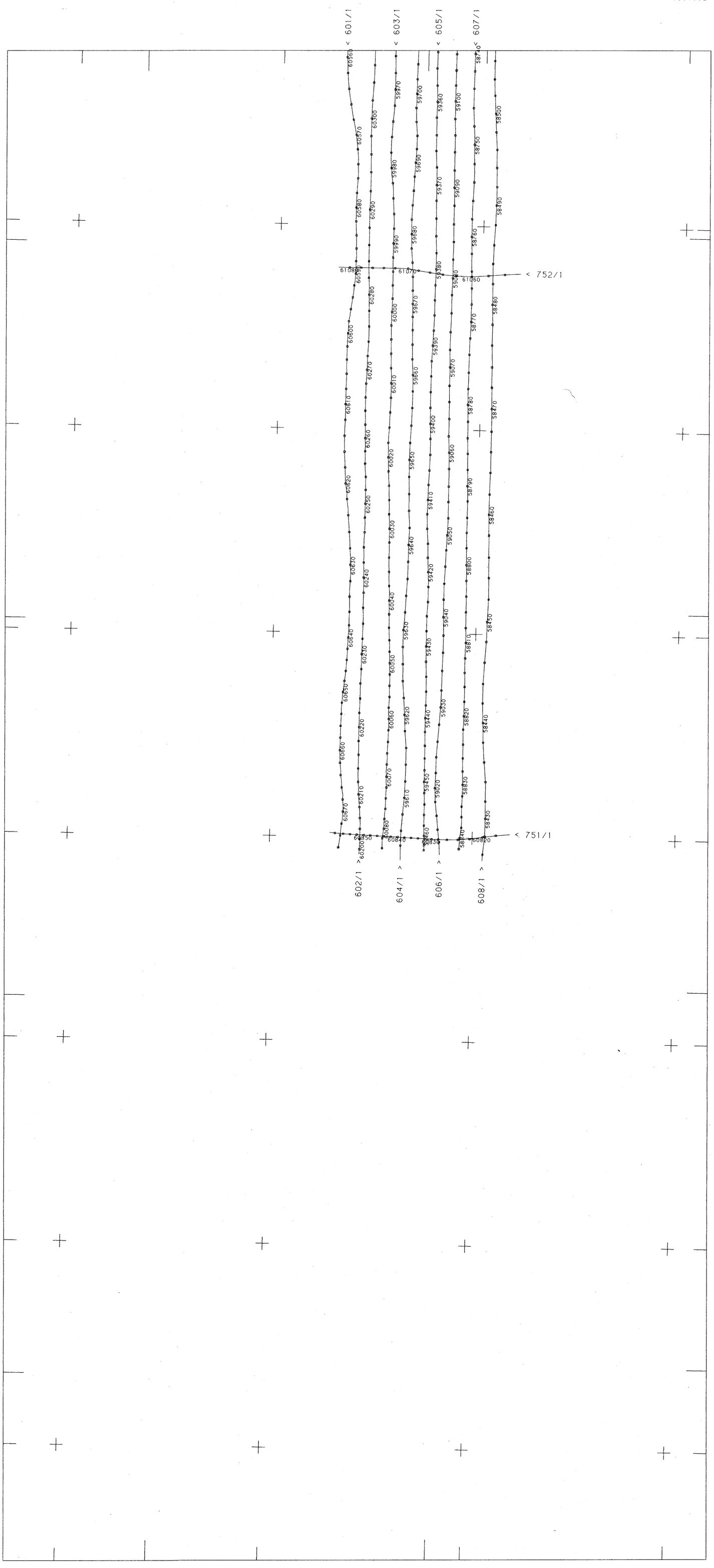
DRAWING NO: | DATE : 13-MAY-1993

386000E 387000E 388000E 389000E

41°43'30"S
41°44'00"S
41°45'00"S
41°46'00"S
41°47'00"S
41°47'30"S

5379000N
5378000N
5377000N
5376000N
5375000N
5374000N
5373000N

145°37'30"E 145°38'00"E 145°39'00"E 145°40'00"E



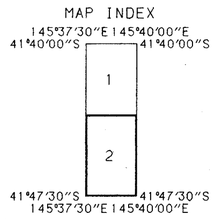
AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1.0 km
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	real time from UHF DGPS system corrected for selected availability

FLIGHT PATH

Grid notation refers to Australian Map Grid Zone 55
Navigation fix 32768

MAP INDEX



SCALE 1:10000

200 0 200 400 600 800 m

93-3504

JOB NO : 3-448
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD, SYDNEY
Processed by GEOTERREX PTY LTD, SYDNEY

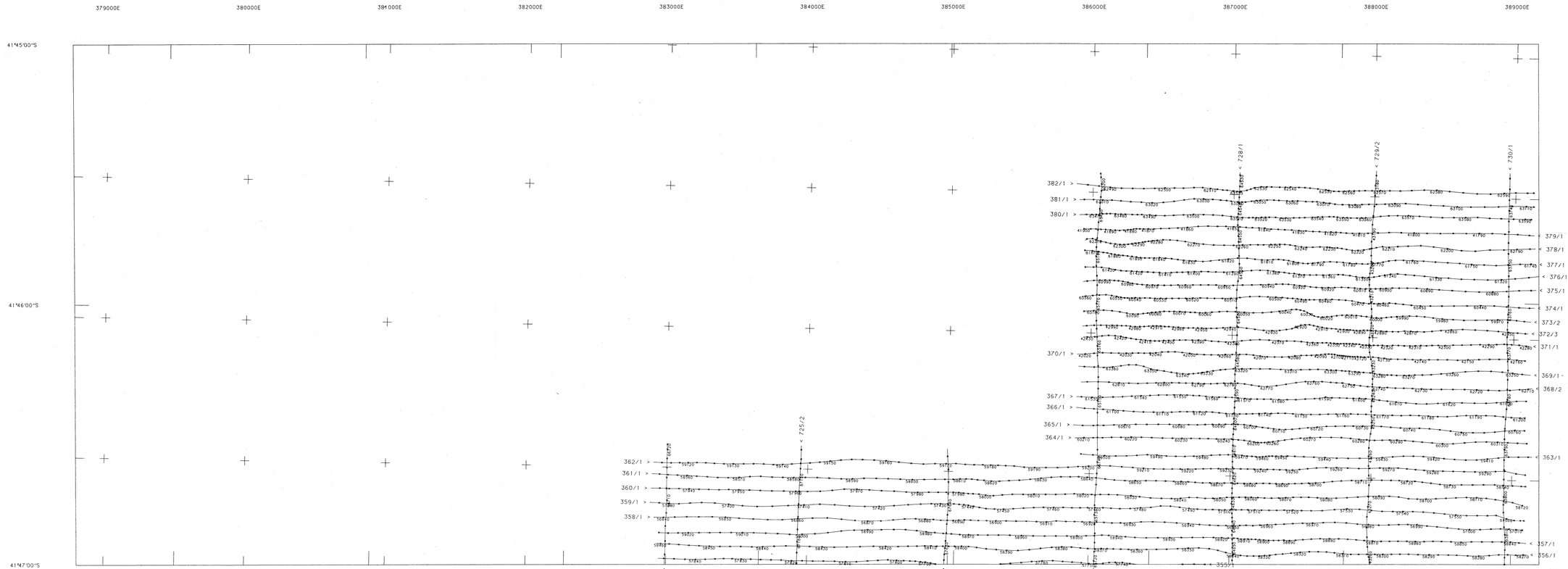
PASMINCO EXPLORATION

FARRELL RANGE EL 22/90
FLIGHT PATH
BURNIE SK55-3
SHEET 2 OF 2

Figure 22

DRAWING NO:

DATE : 13-MAY-1993



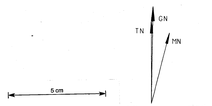
AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT	Squirrel Helicopter
MAGNETOMETER	SCINTREX cesium vapour optical detection mounted on a bird
RECORDING INTERVAL	Sensitivity = 0.05 nT 0.1 sec
NOMINAL TERRAIN CLEARANCE	Sensor to towed bird at 80 m
SPECTROMETER	Nuclear Data 256 channel ADC Volume 5 litres
TOTAL COUNT WINDOW	0.41 - 3.00 MeV
POTASSIUM WINDOW	1.35 - 1.57 MeV
URANIUM WINDOW	1.63 - 1.89 MeV
THORIUM WINDOW	2.42 - 2.82 MeV
RECORDING INTERVAL	1.0 sec
DATA RECORDING	Geosoft MADAGS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE	Detectors in aircraft at 110 m
NOMINAL LINE SPACING	Traverse lines 100 m Tie lines 1.0 km
FLIGHT PATH NAVIGATION	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD	Navigation fix every 1 sec, system corrected for selected availability

FLIGHT PATH

Grid notation refers to Australian Map Grid Zone 55
Navigation Fix 22768

MAP INDEX
145°32'30"E 145°40'00"E
41°45'00"S — 1 — 41°45'00"S
41°50'00"S — 2 — 41°50'00"S
145°32'30"E 145°40'00"E



Grid Convergence = 0.93°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB NO : 3-446
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD, SYDNEY
Processed by GEOTERREX PTY. LTD. SYDNEY

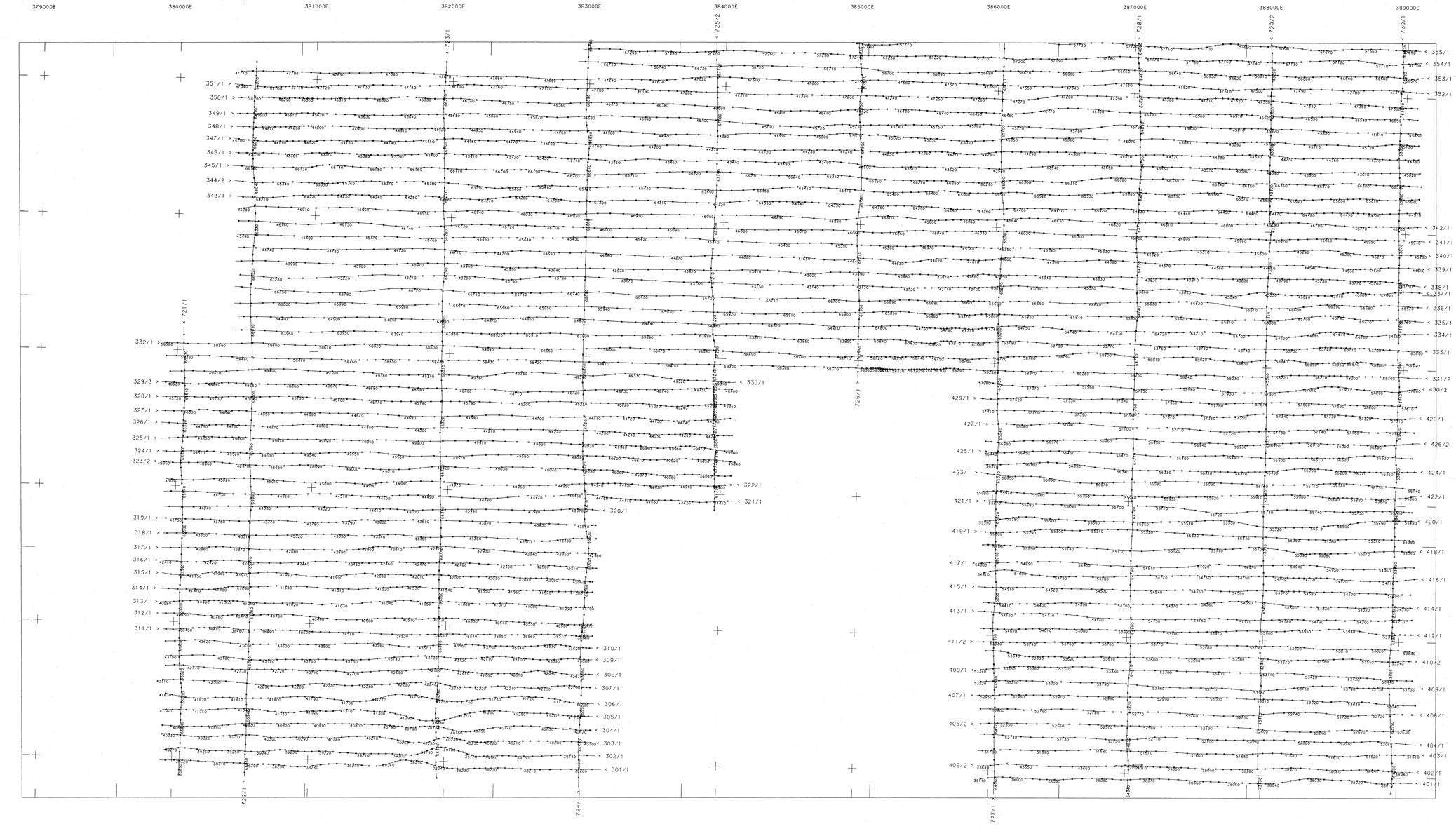
971134

PASMINCO EXPLORATION

STERLING RIVER EL 24/91
FLIGHT PATH
BURNIE SK55-3
SHEET 1 OF 2

Figure 23

DRAWING NO: | DATE : 13-MAY-1993



AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX caesium vapour optical absorption mounted on a bird
RECORDING INTERVAL :	Sensitivity : 0.005 nT 0.2 secs
NOMINAL TERRAIN CLEARANCE :	80m in towed bird at 80 m/s
SPECTROMETER :	Nuclear Data 256 channel ADC Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.66 - 2.06 MeV
THORIUM WINDOW :	2.43 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detector in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines:100 m Tie lines: 1000 m
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF/DGPS navigation system
FLIGHT PATH RECORD :	Real time from UHF/DGPS system corrected for selected availability

FLIGHT PATH

Grid notation refers to Australian Map Grid Zone 55
Navigation fix 32768

MAP INDEX
145°32'30"E 145°40'00"E
41°45'00"S — 41°45'00"S
1
2
41°50'00"S — 41°50'00"S
145°32'30"E 145°40'00"E

TN GN MN

5cm

Grid Convergence = 0.93°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB 971135
Surveyed by GEOTERREX PTY LTD - March 1993
Compiled by GEOTERREX PTY LTD, SYDNEY
Processed by GEOTERREX PTY LTD, SYDNEY

PASMINCO EXPLORATION

STERLING RIVER EL 24/91
FLIGHT PATH
BURNIE SK55-3
SHEET 2 OF 2

Figure 24

DRAWING NO: DATE : 13-MAY-1993

383000E 384000E 385000E 386000E 387000E

41°43'00"S

41°44'00"S

41°45'00"S

41°46'00"S

5380000N

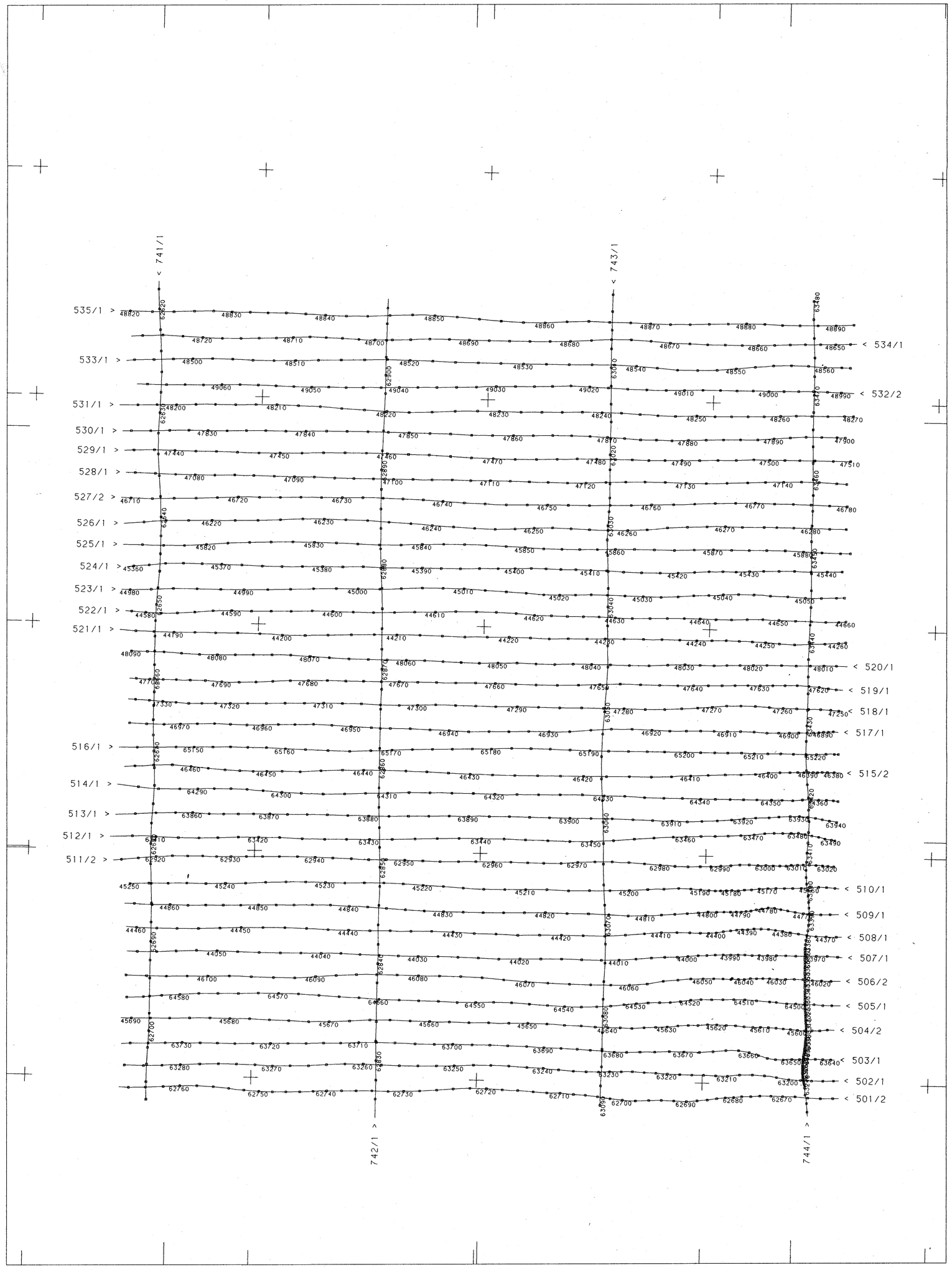
5379000N

5378000N

5377000N

5376000N

145°35'30"E 145°36'00"E 145°37'00"E 145°38'00"E 145°38'30"E



AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT :	Squirrel Helicopter
MAGNETOMETER :	SCINTREX cesium vapour optical absorption mounted on a bird Sensitivity : 0.05 nT
RECORDING INTERVAL :	0.1 sec
NOMINAL TERRAIN CLEARANCE :	Sensor in towed bird at 80 m
SPECTROMETER :	Nuclear Data 256 channel ADC Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.4 - 3.00 MeV
POTASSIUM WINDOW :	1.35 - 1.57 MeV
URANIUM WINDOW :	1.63 - 1.89 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	1.0 sec
DATA RECORDING :	Geoterrex MADACS acquisition system Digital to magnetic tape
NOMINAL TERRAIN CLEARANCE :	Detectors in aircraft at 110 m
NOMINAL LINE SPACING :	Traverse lines 100 m Tie lines 1.0 km
FLIGHT PATH NAVIGATION :	SERCEL NR103 GPS and SERCEL NDS100 UHF DGPS navigation system
FLIGHT PATH RECORD :	real time from UHF DGPS system corrected for selected availability

FLIGHT PATH

Grid notation refers to Australian Map Grid Zone 55
Navigation fix : 32768

5 cm

GN
TN
MN

Grid Convergence = 0.92°
Declination = 13.20°

SCALE 1:10000

200 0 200 400 600 800 m

93-3504.

JOB NO : 3-446
Surveyed by GEOTERREX PTY LTD : March 1993
Compiled by GEOTERREX PTY LTD. SYDNEY
Processed by GEOTERREX PTY LTD. SYDNEY

971136

PASMINCO EXPLORATION

TULLAH GAP EL 22/90
FLIGHT PATH
BURNIE SK55-3
SHEET 1 OF 1

Figure 25

DRAWING NO: | DATE : 13-MAY-1993

386 000mE | 387 000mE | 388 000mE | 389 000mE | 390 000mE

5 385 000mN.

5 384 000mN.

5 383 000mN.

5 382 000mN.

E.L. 37/89

E.L. 44/88

E.L. 22/90

LAKE MACKINTOSH
(Full Supply Level: 229.5m)

TULLABARDINE DAM

Tullabardine Creek

SNAKE ISLAND

SPILLWAY

INTAKE

MACKINTOSH DAM

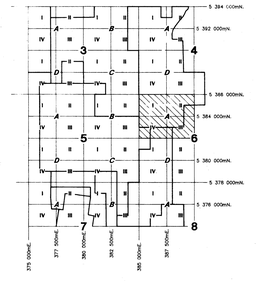
POWER STATION

9251-6568 -22·95
9251-6567 -22·79
9251-6566 -22·59
9251-6569 -22·98
9351-6102 -25·28
9351-6101 -22·99
9251-6537 -23·31
9351-6100 -23·51
9351-6097 -23·85
9351-6098 -24·72
9351-6099 -24·68
9351-6091 -24·25
9351-6090 -25·01
9351-6089 -24·67
9251-6519 -26·35
9251-6527 -26·43
9251-6541 -22·88
9351-6064 -28·45
9251-6578 -27·15
9251-6579 -28·10

LEGEND

9251-6568 -22·95 — STATION NUMBER / RAW BOUGUER VALUE

IF — D.D. HOLE



5 cm

GN
MN
GRID CONVERGENCE 1.0°
GRID/MAGNETIC 12.0°

971137

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 22/90 - TULLAH
DATE : Sept.,1993	GRAVITY STATIONS,
DRAWN : N.W.D.S.	RAW BOUGUER VALUES
REFERENCE :	& DRILLHOLE LOCATIONS
REVISIONS :	
DRAWING No.	SCALE 1:5000 (0 100 200 METRES) — FIG. No. 26

LAKE MACKINTOSH

E.L. 44/88

E.L. 22/90

E.L. 22/90

MURCHESON HIGHWAY

MACKINTOSH DAM ROAD

MACKINTOSH BRIDGE

LAKE ROSEBERY

FARRELL SHORE

End Creek

North

TULLAH

REDB7-II

386 000mE.
387 000mE.
388 000mE.
389 000mE.
390 000mE.

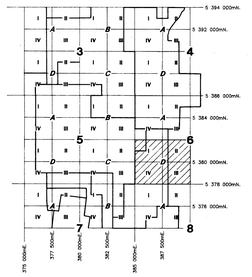
5 381 000mN.
5 380 000mN.
5 379 000mN.
5 378 000mN.

9251-6536 -24·03
9351-6088 -24·81
9251-6519 -26·35
9251-6579 -28·10
9351-6087 -25·20
9351-6070 -25·10
9351-6071 -26·15
9351-6072 -26·44
9251-6535 -25·00
9251-6526 -25·33
9351-6073 -26·12
9251-6520 -25·24
9251-6580 -27·67
9351-6074 -27·87
9251-6539 -23·17
9351-6075 -27·78
9351-6076 -28·43
9351-6235 -25·33
9351-6077 -29·63
9351-6234 -24·90
9351-6078 -31·58
9251-6521 -25·22
9251-6540 -25·23
9251-6079 -29·01
9251-6581 -27·22
9251-6534 -23·52
9351-6233 -24·47
9351-6080 -31·82
9351-6232 -25·48
9351-6081 -31·25
9251-6538 -23·74
9251-6516 -25·47
9351-6231 -25·46
9251-6522 -25·62
9251-6605 -27·25
9251-6606 -31·50
9251-6582 -30·45
9251-6523 -25·62
9351-6230 -24·97
9251-6607 -29·23
9251-6583 -30·92
9351-6229 -25·18
9351-6036 -25·52
9351-6037 -25·74
9351-6039 -25·49
9351-6026 -25·71
9251-6525 -25·42
9351-6038 -25·65
9351-6025 -25·71
9251-6533 -25·13
9351-6027 -25·33
9351-6028 -25·33
9351-6029 -26·09
9351-6030 -26·39
9351-6031 -26·95
9251-6524 -25·61
9351-6032 -27·29
9251-6608 -31·81
9251-6584 -31·95
9351-6236 -25·99
9351-6033 -27·36
9251-6604 -32·62
9351-6034 -28·10
9351-6227 -25·28
9351-6035 -29·04
9351-6228 -25·57
9351-6226 -25·29
9251-6528 -25·49
9251-6609 -30·85
9251-6585 -33·28
9351-6040 -25·72
9351-6041 -26·04
9351-6042 -26·08
9351-6093 -25·68
9351-6092 -25·90
9351-6094 -25·41
9351-6043 -26·01
9351-6044 -25·68
9351-6225 -26·36
9351-6045 -26·02
9251-6529 -25·29
9351-6046 -26·31
9251-6610 -32·84
9251-6611 -34·66
9251-6548 -26·52
9251-6549 -29·33
9351-6049 -26·54
9351-6050 -27·30
9351-6051 -27·91
9351-6053 -29·07
9351-6052 -28·54
9351-6054 -30·73
9251-6552 -29·93
9351-6055 -32·10
9251-6586 -34·45
9351-6056 -32·49
9351-6047 -26·74
9351-6057 -33·76
9351-6058 -34·75
9351-6048 -27·39
9251-6550 -29·74

LEGEND

9251-6608 -31·81 — STATION NUMBER / RAW BOUGUER VALUE

IF — D.D. HOLE



5 cm

GRID CONVERGENCE 1.0°

GRID/MAGNETIC 12.0°

971138

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 22/90 - TULLAH
DATE : Sept, 1993	GRAVITY STATIONS,
DRAWN : N.W.D.S.	RAW BOUGUER VALUES
REFERENCE :	& DRILLHOLE LOCATIONS
REVISIONS :	
DRAWING No.	SCALE 1:5000 (0 100 200 METRES) — FIG. No. 27

E.L. 12/88

E.L.24/91

ROSEBERY MINE LEASE

MINE LEASE EXTENSION

MURCHISON HIGHWAY

STERLING SADDLE TRANSMISSION LINE

HEC TRANSMISSION LINE

Under construction

Abandoned Railway

Sadlers Creek

Fooks Creek

Slacks Creek

Quarry

Tunnel

SVD87-1

SVD89-1

SVD89-2

STP283 FC

STP105

STP101

STP100

STP80

STP75

STP300

STP301

STP96

STP302

STP77

STP78

STP79

5 373 000mN

5 372 000mN

5 371 000mN

5 370 000mN

381 000mE

382 000mE

383 000mE

384 000mE

385 000mE

5 374 000mN

5 386 000mN

5 384 000mN

5 380 000mN

5 378 000mN

5 376 000mN

5 372 000mN

5 370 000mN

5 368 000mN

5 364 000mN

5 362 000mN

377 500mE

380 000mE

382 500mE

385 000mE

387 500mE

LEGEND

x 9251·6643 −30·03 — STATION NUMBER, RAW BOUGUER VALUE

STP78 — D.D. HOLE

5 cm

GRID CONVERGENCE 1.0°

GRID/MAGNETIC 12.0°

971139

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 24/91 - STERLING RIVER GRAVITY STATIONS, RAW BOUGUER VALUES & DRILLHOLE LOCATIONS
DATE : Sept, 1993	
DRAWN : N.W.D.S.	
REFERENCE :	
REVISIONS :	
DRAWING No.	SCALE 1:5000 (0 100 200 m) — FIG. No. 28

381 000mE

382 000mE

383 000mE

384 000mE

385 000mE

5 377 000mN.

5 376 000mN.

5 375 000mN.

5 374 000mN.

MINE LEASE EXTENSION

ROSEBERY MINE LEASE

E.L. 12/88

E.L. 44/88

E.L. 22/90

MOUNT BLACK

STERLNG INLET

LAKE ROSEBERY

Sterling River

MBD1

MBD2

MBD3

MBD4

116R

114R

114RD2

114RD1

114RD3

88R

81R

82R

9351-6220 -26.48

9351-6221 -27.09

9251-6507 -26.10

9251-6543 -27.61

9351-6212 -28.62 REDBT-4

9351-6213 -27.30

9351-6210 -27.06

9351-6215 -27.34

9351-6209 -28.07

9351-6208 -30.14

9351-6214 -27.37

9351-6508 -26.90

9251-6518 -30.10

MRP227

9251-6509 -27.46

MRP226

9351-6206 -30.61

9251-6510 -27.70

9351-6205 -30.02

9351-6204 -30.57

REDBT-10

9351-6203 -31.26

REDB6-10

9351-6181 -29.53

REDBB-1

REDBT-8

REDBT-7

9251-6511 -30.07

9351-6180 -30.01

REDBT-2

MRP 233

REDBT-3

9351-6174 -30.48

REDBB-4

REDBT-5

MRP212

9351-6175 -30.70

9351-6176 -30.77

9351-6173 -30.10

REDBT-6

REDBB-2

9351-6177 -31.09

9351-6178 -31.30

9351-6187 -30.93

MR2

MR1

9351-6180 -30.68

9351-6183 -31.14

9351-6184 -31.00

9351-6179 -31.42

MRP219

9251-6506 -29.47

9351-6186 -31.50

9351-6185 -31.76

9251-6561 -31.46

9351-6146 -24.40

9351-6145 -24.76

9351-6144 -25.34

9351-6147 -24.29

9351-6152 -24.99

STP218

STP232 STP232A STP232A1

9251-6562 -31.78

9351-6148 -24.29

9351-6153 -23.82

STP234

9251-6563 -31.84

9351-6149 -24.42

9351-6154 -23.63

STP221

STP217

9251-6598 -31.07

STP284

9251-6224 -31.13

9351-6150 -23.85

9351-6155 -23.98

STP231

SVD87-2

9251-6564 -31.40

STP220

9351-6151 -25.25

9351-6156 -24.84

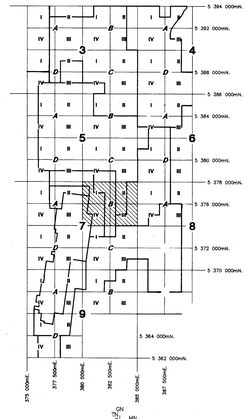
9251-6565 -31.37

9251-6560 -31.60

LEGEND

9251-6510 -27.70 — STATION NUMBER / BOUGUER VALUE

MR 2 — D.D. HOLE



971140

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 22/90 - TULLAH
DATE : Sept, 1993	GRAVITY STATIONS,
DRAWN : N.W.D.S.	RAW BOUGUER VALUES
REFERENCE :	& DRILLHOLE LOCATIONS
REVISIONS :	
DRAWING No.	SCALE 1:5000 (0 100 200 METRES)
	FIG. No. 29

E.L. 22/90

E.L. 24/91

LAKE MACKINTOSH

LAKE ROSEBERY

Lake Herbert

Lake Rosebery

MOUNT FARRELL

Murchison Bridge

Tunnel End

MURCHISON HIGHWAY

MURCHISON DAM ROAD

ANTHONY ROAD

MURCHISON HIGHWAY

388 000mE

389 000mE

390 000mE

5 377 000mN

5 376 000mN

5 375 000mN

5 374 000mN

LEGEND

9251-6596 −37·41 — STATION NUMBER, RAW BOUGUER VALUE

I.P. — D.D. HOLE

971141

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 22/90 - TULLAH
DATE : Sept.1993	E.L 24/91 - STERLING RIVER
DRAWN : N.W.D.S.	**GRAVITY STATIONS, RAW BOUGUER VALUES & DRILLHOLE LOCATIONS**
REFERENCE :	
REVISIONS :	
DRAWING No.	SCALE 1:5000 — FIG. No. 30

5 374 000mN

5 373 000mN

5 372 000mN

5 371 000mN

5 370 000mN

386 000mE

387 000mE

388 000mE

389 000mE

390 000mE

Murchison Dam

MURCHISON DAM ROAD

MURCHISON

ANTHONY HEC TRANSMISSION LINE ROAD

LAKE MURCHISON

E.L. 24/91

9251-6662 -31·29
9251-6657 -31·01
9251-6612 -31·46
9251-6613 -32·25
9251-6614 -33·42
9351-6121 -37·57
9351-6122 -37·64
9251-6803 -36·32
9251-6802 -37·05
9351-6009 -36·33
9251-6797 -36·24
9351-6010 -35·91
9351-6011 -36·10
9251-6800 -38·22
9251-6801 -39·59
9351-6012 -35·83
9351-6013 -35·77
9351-6067 -38·91
9251-6664 -33·03
9251-6661 -30·73
9251-6660 -31·51
9251-6615 -33·34
9251-6616 -33·03
9251-6617 -33·10
9251-6723 -35·80
9251-6799 -36·25
9351-6014 -33·88
9251-6663 -31·18
9251-6665 -31·51
9251-6618 -32·17
9351-6015 -33·27
9351-6016 -32·88
9351-6017 -34·50
9251-6724 -36·00
9251-6725 -36·35
9251-6726 -36·51
9351-6018 -33·37
9351-6019 -32·80
9251-6727 -36·71
9251-6728 -36·20
9351-6020 -31·03
9351-6021 -32·83
9351-6022 -32·13
9351-6023 -32·09
9351-6024 -33·44
9251-6730 -37·22
9251-6729 -37·01
9351-6008 -33·20
9351-6007 -32·76
9351-6006 -32·87
9351-6005 -32·30
9251-6731 -36·52
9351-6004 -32·28
9351-6003 -31·94
9351-6002 -31·66
9351-6001 -32·88
9351-6000 -31·70
9251-6732 -35·06
9251-6733 -35·24
9251-6734 -33·48
9251-6686 -28·59
9251-6685 -29·47
9251-6684 -31·04
9251-6683 -31·40
9251-6682 -30·45
9251-6681 -31·77
9251-6669 -30·72
9251-6674 -29·65
9251-6677 -31·06
9251-6678 -30·14
9251-6679 -30·31
9251-6680 -31·01
9251-6620 -32·01
9251-6621 -31·95
9251-6622 -32·33
9251-6675 -29·34
9251-6673 -27·64
9251-6777 -32·12
9251-6782 -30·94
9251-6778 -31·70
9251-6771 -30·89
9251-6779 -31·16
9251-6780 -30·75
9251-6769 -29·53
9251-6770 -29·83
9251-6781 -30·68
9251-6672 -27·11
9251-6671 -26·66
9251-6670 -29·39
9251-6669 -31·31
9251-6668 -31·03
9251-6667 -29·86
9251-6666 -30·50

LEGEND

9351-6008 -33·20 STATION NUMBER RAW BOUGUER VALUES

5 cm

TN MN

GRID CONVERGENCE 1.0°

GRID/MAGNETIC 12.0°

971142

93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 24/91 - STERLING RIVER
DATE : Sept.1993	GRAVITY STATIONS
DRAWN : N.W.D.S.	RAW BOUGUER VALUES
REFERENCE :	& DRILLHOLE LOCATIONS
REVISIONS :	
DRAWING No.	SCALE 1:5000 0 100 200 m — FIG. No. 31

E.L. 24/91

MINE LEASE EXTENSION

TRANSMISSION LINE

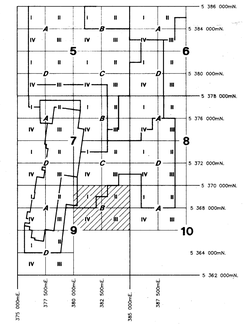
River

9251/6768 -22.62
9251/6767 -22.61
9251/6766 -22.32
9251/6765 -23.01
9251/6764 -22.34
9251/6763 -21.76
9251/6762 -22.77
9251/6761 -22.13
9251/6760 -22.09
9251/6759 -22.03
9251/6758 -23.27
9251/6757 -21.97
9251/6754 -22.51
9251/6753 -22.51
9251/6752 -22.59
9251/6751 -21.24
9251/6750 -21.30
9251/6746 -21.08
9251/6747 -21.98
9251/6748 -21.50
9251/6749 -21.24
9251/6745 -20.80
9251/6744 -20.88
9251/6720 -23.22
9251/6719 -23.22
9251/6718 -22.59
9251/6717 -24.80
9251/6704 -23.12
9251/6721 -22.48
9251/6732 -22.22
9251/6705 -23.21
9251/6706 -23.39
9251/6716 -22.38
9251/6715 -22.50
9251/6707 -22.88
9251/6713 -23.45
9251/6714 -25.62
9251/6708 -23.44
9251/6709 -23.44
9251/6710 -23.21
9251/6711 -23.70
9251/6712 -24.72

5 369 000mN
5 368 000mN
5 367 000mN
5 366 000mN
381 000mE
382 000mE
383 000mE
384 000mE
385 000mE
5 370 000mN

LEGEND

9251/6756 -23.63 — STATION NUMBER / RAW BOUGUER VALUE



5 cm

GRID CONVERGENCE 1.0°
GRID/MAGNETIC 12.0°

971143
93-3504.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 24/91 - STERLING RIVER
DATE : Sept., 1993	GRAVITY STATIONS,
DRAWN : N.W.D.S.	RAW BOUGUER VALUES
REFERENCE :	& DRILLHOLE LOCATIONS
REVISIONS :	
DRAWING No.	SCALE 1:5000 (0 100 200 m) — FIG. No. 32

386 000mE | 387 000mE | 388 000mE | 389 000mE | 390 000mE

5 369 000mN

5 368 000mN

5 367 000mN

5 366 000mN

9251-6794 -34·81

9251-6793 -33·36

9251-6792 -32·72

9251-6791 -32·61

9251-6790 -28·61

9251-6789 -29·93

9251-6788 -28·45

9251-6787 -27·51

9251-6786 -26·73

9251-6783 -30·22

9251-6784 -27·60

9251-6785 -26·40

9251-6776 -30·07

9251-6775 -30·09

9251-6772 -31·68

9251-6773 -30·23

9251-6774 -32·81

9251-6735 -33·03

9251-6736 -33·30

9251-6737 -34·80

9251-6738 -33·69

9251-6739 -32·17

9251-6740 -31·76

9251-6741 -30·92

9251-6742 -30·10

9251-6743 -31·13

9351-6082 -27·83

9351-6083 -28·15

9351-6084 -28·26

9351-6085 -28·63

9251-6086 -29·23

LAKE MURCHISON

ANTHONY ROAD

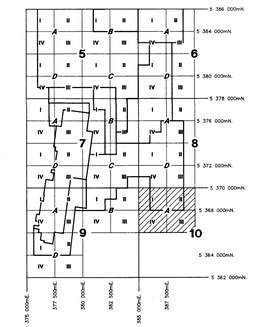
Anthony River

E.L. 24/91

LEGEND

9251-6741 -30·92 — STATION NUMBER / RAW BOUGUER VALUE

IP — D.D. HOLE



5 cm

GN
TN
MN
GRID CONVERGENCE 1.0°
GRID/MAGNETIC 12.0°

971144

93-3504.1

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L 24/91 - STERLING RIVER
DATE : Sept., 1993	GRAVITY STATIONS,
DRAWN : N.W.D.S.	RAW BOUGUER VALUES
REFERENCE :	& DRILLHOLE LOCATIONS
REVISIONS :	
DRAWING No.	SCALE 1:5000 (0, 100, 200 m)
	FIG. No. 33