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**PASMINCO EXPLORATION
MT BLACK EL 12/88
WESTERN TASMANIA**

**Pasminco - Austmin
Joint Venture**

**Annual Report
August 1991 - August 1992**

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AUTHOR: J G Purvis
J G Purvis & Associates Pty Limited

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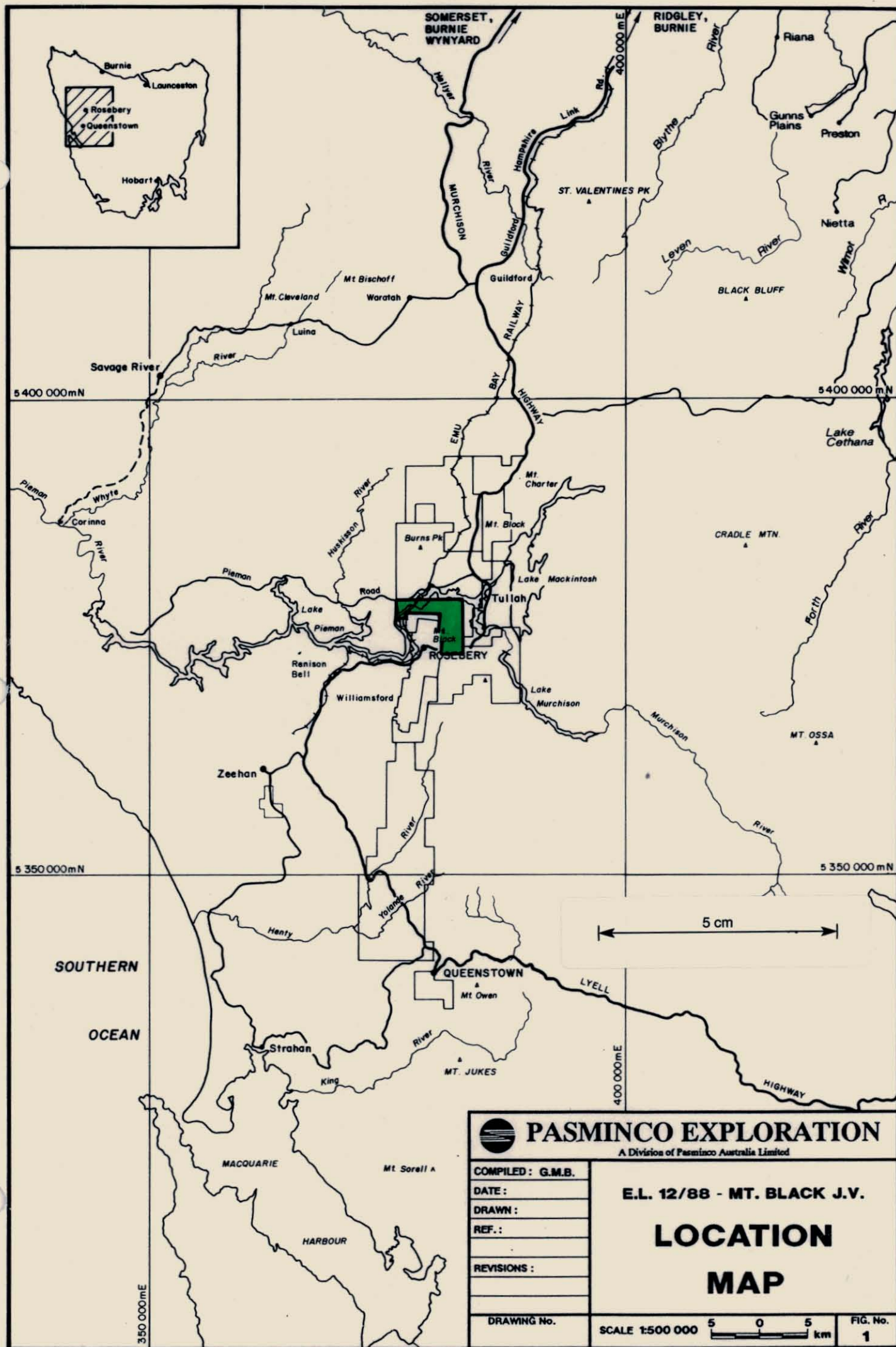
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1. SUMMARY

Active exploration of EL 12/88 continued during 1991–92, centred on the drilling of hole BY2 (412.5m) beneath the northern abutment of the Bastyan Dam.

The hole, designed to test for the source of the clastic massive basemetal sulphides in the Hangingwall Epiclastics near the dam, did not encounter any significant mineralization, with a best intersection of only 1.05m @ 0.12% Pb & 0.16% Zn.

An anticlinal fold within the Hangingwall Epiclastics in the hole opens up the possibility of the more-prospective lower parts of the Rosebery Mine sequence being present at depth in the area north of the dam.

This possibility is enhanced by the steep easterly dip of the Rosebery Fault in the bottom of the hole which, if not just an anomalous local warp, removes the danger of the volcanics being cut off by the thrust as happens south of the dam.

Lithogeochemical and oxygen isotope values show the volcanics in the immediate Bastyan area are not hydrothermally altered despite appearances to the contrary, and sulphur isotope values for the Bastyan clastic sulphides are most like those from sulphides at the Pinnacles Prospect, 5km to the north. This suggests that possibly the clastic sulphides are derived from the Pinnacles mineralizing system and not from a system in the Bastyan vicinity.

However, lithogeochemical sampling has discovered a zone of very strong hydrothermal alteration ($<0.1\% \text{ Na}_2\text{O}$) within a volcanoclastic section of the Mt Black Volcanics 500m north of the dam, near the northern EL boundary. This altered zone warrants further exploration and a programme of surface sampling and mapping is recommended to test it.

Following this surface programme, even if results are negative, a deep hole (estimated at 800m) is recommended to test for prospective parts of the Rosebery Mine sequence at depth north of the dam. As the Rosebery sequence will occur beneath the altered zone in the Mt Black Volcanics it may be possible to test both targets with the one hole.

The results of the other exploration work carried out in 1991–92 were not encouraging. A gravity survey east of Mt Black indicates the volcanics are massive, uniform and essentially unaltered, undoubtedly similar to the barren monotonous lavas in the four Austmin drillholes

near the summit of the mountain.

Evaluation of the Cutty Sark magnetic anomaly in the Mt Black Volcanics shows it is of geological interest only. The Cutty Sark and Langdon's basemetal occurrences were examined but are too minor to warrant further work. A downhole EM survey in hole BY1 failed to obtain any significant responses.

Apart from the programme already outlined for the northern Bastyan area and completion of a downhole EM survey planned for hole BY2, no other work is recommended on the EL at this time.

2. INTRODUCTION

This report covers work done on the Mt Black EL 12/88 from August 1991 to June 1992.

The exploration programme is a Joint Venture between Austmin Resources (the original EL holders), and Pasminco Exploration who have managed and funded exploration since May 1990. At the end of April 1992 Pasminco became the majority partner in the JV with 60% equity.

EL 12/88 covers 21 sq km of the Cambrian acid to intermediate Mt Read Volcanics which host several volcanogenic auriferous basemetal massive sulphide deposits in Western Tasmania. The EL lies immediately north and east of the largest of these deposits – the Rosebery Mine (24mnt). The principal aim of the exploration programme is to find more deposits of Rosebery type.

Most of the EL, especially on the main Mt Black massif (929m elevation), is rugged and heavily vegetated with access generally only possible on foot along cut gridlines. The Bastyan area in the NW corner of the EL has better access with numerous vehicular tracks but is also rugged and heavily vegetated.

Pasminco's exploration effort on EL 12/88 has been concentrated around the Bastyan Dam where units of the Rosebery Mine sequence outcrop. In 1991–92, diamond drilling (hole BY2 of 412.5m), comprehensive rock sampling (lithogeochemical, petrological and isotopic) and further geological mapping, was carried out in the Bastyan area.

Elsewhere on the EL the past year has seen detailed gravity traverses on the eastern side of Mt Black, relogging and further sampling of Austmin's drillholes MBD1–4, evaluation of the Cutty Sark magnetic anomaly and the continued monitoring of the rehabilitation of drillsite 5 on Mt Black by Austmin.

The detailed work on the EL was greatly assisted by Pasminco's regional studies. These included enhanced processed data and refined interpretations from aeromagnetic and gravity surveys both within and outside the EL, and the recent structural survey of the Rosebery area by Consultants ERA–Maptec.

3.TENURE

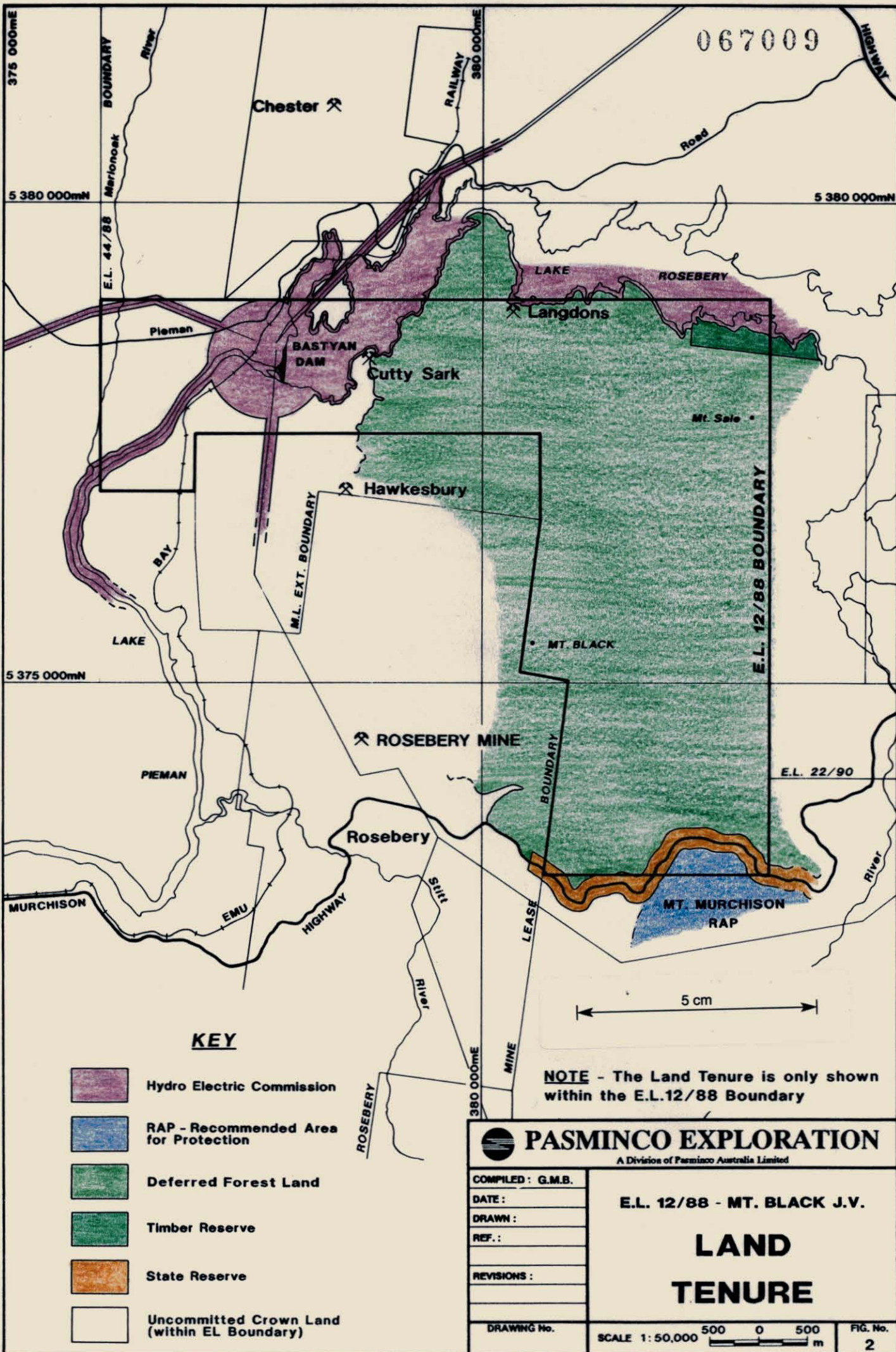
The Mt Black EL 12/88 covers 21 sq km adjoining the Rosebery Mine Lease. The Licence was first granted on 2nd September 1988 to Austmin Resources NL and Climax Mining Limited, for a renewable one year term. It was renewed again in September 1989, 1990 and 1991. A further one year renewal will be sought from September 1992.

Climax withdrew from the Joint Venture in March 1990 and their place was taken in May 1990 by Pasminco Exploration, who have been managers and sole funders of the exploration programme since that date.

At the end of April 1992 Pasminco's expenditure reached \$300 000, which under the JV Agreement entitles Pasminco to 60% equity in the EL.

Within the EL boundary approximately 2.3 sq km of land in the vicinity of the Bastyan Dam and around Lake Rosebery is vested in the HEC. Although legally not part of EL 12/88 the Licensee has exploration rights to this area, but work undertaken here is subject to the approval of the HEC. The amount of HEC vested land within the EL was reduced during the past year.

The EL and the HEC vested area are shown in Figure 2.



4. EXPENDITURE

Total expenditure on EL 12/88 during the twelve month period to 30th June 1992 was \$218 981. Total expenditure on the EL since its granting in September 1988 is now \$691 936.

Details of 1991-92 expenditure are as follows:

	\$
Personnel: salaries, wages & on-costs	32 140
Travel & Accommodation	2 071
Geological Contractors	39 468
Petrography	1 463
Analytical Services	5 071
Geophysical Consultants	4 180
Gravity survey, including topographic control	23 506 -
Down hole Em survey	1 534
Aeromagnetic survey - reprocessing data	5 114
Track cutting, Gridding	8 630
Other contractors: freight, photogrammetry	3 306
Drilling: contractor, site access, core processing, storage	33 466 -
Drafting services	1 673
Stores & supplies	2 698
Vehicles, Plant & Equipment	6 640
Rehabilitation (including Austmin expenditure of \$1705)	2 759
Tenement costs	600
Computing	2 269
Office running costs	22 641
Total Direct Costs	199 229
Administration, Management Fee	19 752
TOTAL EXPENDITURE	\$218 981

5. PREVIOUS EXPLORATION

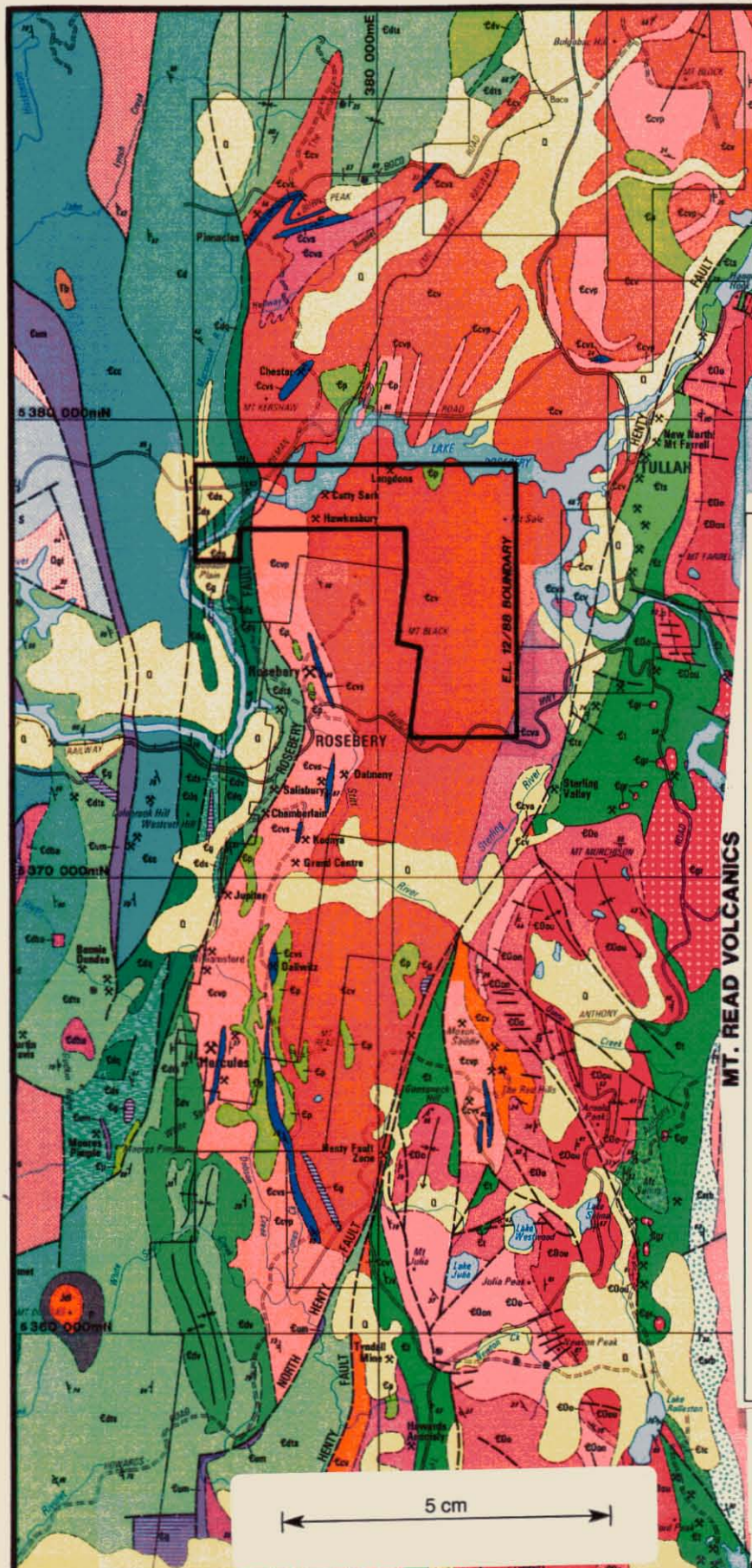
A detailed chronology of previous exploration on the area now covered by EL 12/88 appeared in the 1990-91 Annual Report (Purvis, 1991b).

To summarize, early prospecting located several minor basemetal shows in the general Bastyan Dam area, in and around the northern extensions of the volcanoclastic Rosebery Mine sequence. No mineralization was found within the lavas on Mt Black itself.

Modern exploration (post 1962), by EZ, Getty and Billiton, basically followed and confirmed this pattern. Detailed work (including drilling) concentrated on the area north of Rosebery while more broad-scale geochemical and geophysical surveys were carried out over Mt Black.

Apart from elevated zinc values in shale lenses within the Mine Hangingwall Epiclastics unit in the Bastyan area, no in-situ mineralization of note was discovered during nearly 25 years of semi-continuous exploration. However, large rafts and clasts of basemetal massive sulphides were uncovered within the Hangingwall Epiclastics by the HEC during construction of the Bastyan Dam in the late 1970's.

Austmin commenced exploration of EL 12/88 in early 1989 by drilling four diamond drillholes at weak UTEM responses on Mt Black. The holes all intersected barren lavas.



QUATERNARY	Q	Glacial deposits, alluvium, etc.
JURASSIC	JM	Dolerite
PERMIAN - CARBONIFEROUS	P	Undifferentiated
DEVONIAN - SILURIAN	Db, Dr, S	Bell Shale Florence Sandstone Silurian
ORDOVICIAN	Ogl	GORDON GROUP limestone
EARLY ORDOVICIAN - LATE CAMBRIAN	COou, COo, COon	Upper sandstone sequence including Pioneer Beds (COou) Undifferentiated conglomerate and sandstone (COo) Newton Creek Sandstone (COon) - interbedded sandstone siltstone and conglomerate with marine fossils
DUNDAS GROUP AND CORRELATES	Ep, Cd, Cdu, Cds, Cdr, Cdn, Cda	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
TYNDALL GROUP AND CORRELATES	Cts, Ct, Cc, Cb	Mainly sed. rocks, incl Farrell Slates Mainly quartz-feldspar-phyrific volcanic and volcanoclastic rocks (Ct) Mainly volcanoclastic congl. and sandstone Sticht Range Beds - sandstone, siltstone, siliciclastic conglomerate
CENTRAL VOLCANIC SEQUENCE	Cp, Ccv, Ccp, Ccm, Cca	Mainly feldspar-phyrific volcanics - dacite, rhyolite, minor andesite (Ccv) Felsic porphyry, mainly intrusive Mainly pyroclastic rocks Sedimentary rocks, mainly shale and sandstone Andesitic volcanics
WESTERN SEQUENCE	Cw, Cwp, Cws, Cwb, Cwn	Interbedded crystal and vitric tuff, shale, greywacke & qtz-feld-phyrific lavas & intr. (Cw) Felsic - porphyry, mainly intrusive Miners Ridge Sandstone - quartzwacke & siltstone Basaltic-andesitic volcanics and intrusives Tholeiitic basalt at Miners Ridge

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

CAMBRIAN INTRUSIVE ROCKS	PRECAMBRIAN
Granite	Quartzite-slate sequences - correlates of Oonah Formation
Felsic porphyry	Metamorphosed sequences of Tyennan Region. Major lithological boundary trends shown
Gabbro	
Ultramafic rocks & serpentinite	

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COMPILED :
 DATE :
 DRAWN : G.M.B.
 REF :
 REVISIONS :
 DRAWING No.

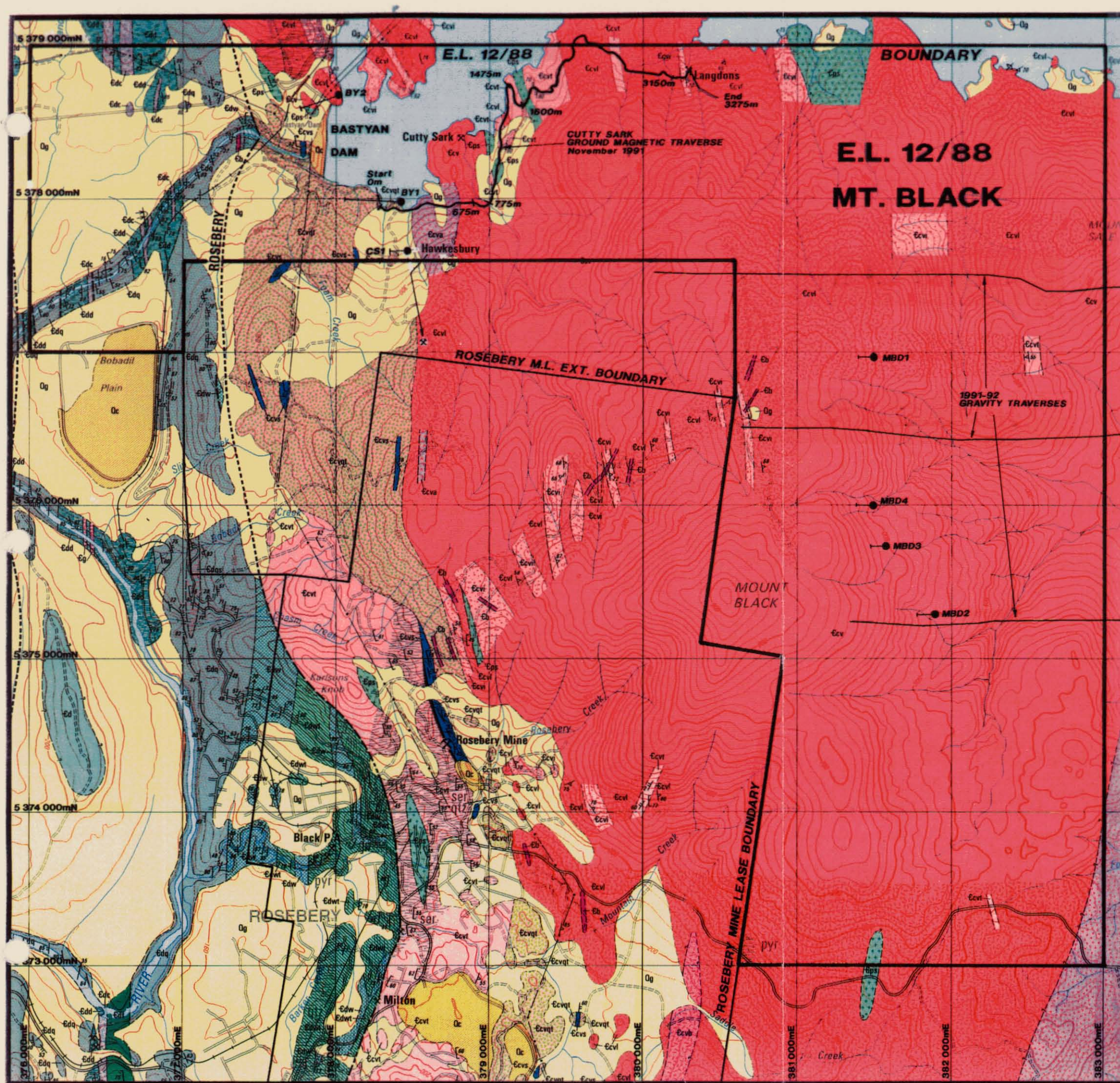
E.L. 12/88 - MT. BLACK J.V.

REGIONAL GEOLOGY

FROM MAP 6 OF THE
 MT. READ VOLCANICS PROJECT

SCALE 0 2 4 km

FIG. No. 3



5 cm

LEGEND

QUATERNARY

067013

Qc Cultural features-waste dumps, dams, etc

Qg Glacial deposits, mostly till. Moraine ridge crests indicated (* * *). Occurrences of granite erratics indicated (Qgg ⊕)

DUNDAS GROUP

Edd Dolomitic siltstone and sandstone with minor conglomerate

Edq Quartzwacke interbedded with black phyllitic mudstone, grey siltstone, minor conglomerate (Edq). Some dominantly siltstone units (Edqs) and conglomerate units (Edqc) indicated.

Edw Lower sequence of interbedded lithicwacke, siltstone, mudstone and quartz-feldspar-phryic tuff of White Spur Formation (Edw). Some tuff units (Edwt) indicated.

CAMBRIAN VOLCANIC SEQUENCE

CAMBRIAN

Felsic porphyry, generally intrusive. Quartz-feldspar porphyry (Eps); spherulitic feldspar-quartz porphyry (Eps)

Felsic pyroclastic rocks, including tuff, breccia, vitric ash. Generally feldspar-phryic (Ecvl). Some dominantly siltstone units (Edqs) and conglomerate units (Edqc) indicated.

Fiamme-bearing eutaxitic tuff of ignimbrite type. Some block-and-ash flow units shown (Ecvib).

Lithic breccia and agglomerate.

Crystal tuff, crystal-lithic tuff, commonly bedded.

Fine grained vitric tuff.

Quartz-feldspar-phryic tuff, often with lithic clasts.

Shale, siltstone, sandstone, minor tuff. Units of chert or chert-pyrite rock as indicated (Ecvsc)

Dominantly feldspar-phryic lava of rhyolitic, dacitic or andesitic composition (Ecvl). Some units of andesitic lava (Ecvb) and quartz-feldspar-phryic lava (Ecvq) shown. Sequence of hornblende-phryic lava and minor tuff at Mackintosh Bridge area indicated (Ecvlm)

Basaltic lava.

CAMBRIAN INTRUSIVE ROCKS

Eb Basalt

OVERPRINTS AND MINERALISATION

pyr 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

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DATE: July, 1991
DRAWN:
REF.:
REVISIONS:
DRAWING No.

E.L. 12/88 - MT. BLACK J.V.

GEOLOGY
(FROM MAP 2
MT. READ VOLCANICS PROJECT)

SCALE 1:25,000 250 0 250 m

FIG. No. 4

6. GEOLOGY

6.1 Stratigraphy

The Mt Black EL covers a north-striking and largely east-dipping and east-facing sequence of Lower to Middle Cambrian rhyolitic to andesitic volcanics – the Mt Read Volcanics. The geology of the EL is shown in Figure 4.

The eastern bulk of the EL is made up of the youngest unit, the **Mt Black Volcanics** – a pile of lavas and sub-volcanic intrusives with subordinate volcanoclastics and rare sediment lenses. Genuine hydrothermal alteration is very restricted in these rocks and only minor mineralization is known.

The Mt Black Volcanics overlie the epiclastic **Rosebery Mine sequence** which outcrops in the western part of the EL. This sequence hosts the Rosebery ore deposit 2.1km south of the EL boundary. Only the uppermost major unit of this sequence is known within the EL area: the **Hangingwall Epiclastics**, comprising massive volcanoclastic debris flows with intercalated tuffaceous sediment lenses and rafts. On the southern shore of Lake Rosebery a **quartz-feldspar porphyry** body has intruded the lowest exposed part of the Hangingwall Epiclastics.

Rafts and clasts of massive basemetal sulphides occur within the debris flows of the Hangingwall Epiclastics near the Bastyan Dam and the rocks are extensively altered.

In the far NW corner of the EL sediments of the Upper-Middle Cambrian **Dundas Group** outcrop. These comprise unaltered pyritic black shales, grey siltstones and quartzose sandstones. The sediments are folded but overall dip steeply west and face west. As shown by hole BY1 drilled in the Bastyan Dam area in 1991, there is some evidence that these sediments were deposited contemporaneously with the volcanics (see Purvis, 1991b).

6.2 Structure

Most of the volcanics on EL 12/88 lie on the eastern limb of a major regional anticline – the Rosebery Axis. This feature extends 20km from Hercules to Pinnacles, just east of and parallel to the Rosebery Fault. The eastern limb is upright and dips east at an average of 45°. In contrast, the western limb dips steeply west and is apparently locally overturned close to the Rosebery Fault. To the north of Rosebery the anticline has a northerly plunge which has been measured at 20° in the southern dam abutment at Bastyan.

The western edge of the volcanic belt has been thrust westwards over the edge of the Dundas Trough. This western volcanic margin is marked by several major parallel thrusts which, near surface at least, parallel the dip and strike of the volcanic sequence on the eastern fold limb (ie: strike north and dip approximately 45°E).

The largest individual structure is the Rosebery Fault, a major regional thrust extending over 30km from south of Hercules to north of Pinnacles and forming the western contact of the volcanic belt with the Dundas Group sediments. Drilling in the area north of Rosebery has shown that the thrust here flattens with depth, cutting off the volcanics down dip. However, in hole BY2 recently completed on the northern shore of Lake Rosebery within the EL, the Rosebery Fault dips very steeply to the NE with an anomalous NW strike.

A second fundamental structure, the Mt Black Fault ("Upper Thrust" of Purvis, 1991b) lies about 1km east of the Rosebery Fault on the contact between the Rosebery Mine sequence and the Mt Black Volcanics. Unlike the Rosebery Fault, the Mt Black Fault does not appear to flatten down dip remaining essentially conformable with the enclosing rock sequence.

On the northern side of Lake Rosebery, the Mt Black Fault was not evident on the Hangingwall Epiclastics/Mt Black Volcanics contact in recent drillhole BY2. From the drilling and aeromagnetic data it appears the main structure doesn't follow the contact as it swings around the anticlinal nose at Bastyan, but diverges from it somewhere near the southern lake shore and maintaining its northerly trend, cuts through the Mt Black Volcanics further east (see Figure 10).

Several other large structures occur on the EL, especially at Bastyan which is an area of considerable structural complexity. In the southern dam abutment on the south side of the old Pieman River the Rosebery Axis and the western fold limb are present at surface. However, on the northern side of the river only the eastern fold limb is exposed although the fold axis was apparently intersected in the lower part of hole BY2.

These features imply a major unmapped E-W structure runs along the path of the old river. The geology in this vicinity is also affected by a major NE trending structure that causes an offset in the Hangingwall Epiclastics / Mt Black Volcanics contact immediately north of hole BY2. See Figures 10 & 11.

6.3 Mineralization

For full details of mineralization on the EL see the 1990–91 Annual Report (Purvis, 1991b).

The most significant known mineralization on the EL is a series of high grade basemetal massive sulphide rafts and clasts incorporated in the debris flows of the Hangingwall Epiclastics at Bastyan. This material has to date been thought to have been locally derived from an as yet undiscovered massive sulphide body (or bodies), but there is now some evidence to suggest the source may be more distal (see Section 7.5).

Widespread minor basemetal sulphides and pyrite occur in the Rosebery Mine sequence in the Bastyan Dam area. Most shale lenses and rafts in the Hangingwall Epiclastics contain disseminated and veinlet sphalerite–pyrite, with typical values to 1% Zn.

The vast bulk of the Mt Black Volcanics are largely devoid of sulphides, except for widespread minor pyritization near the Mt Black Fault and in the northern Bastyan area. However, the volcanics commonly host disseminated and vein–style haematite–magnetite, and major zones of this type of mineralization are associated with intense chloritization and contain some pyrite. (A good example is a 6.3m wide barren quartz–chlorite–magnetite–pyrite vein intersected in Austmin drillhole MBD4).

One notable mineralized zone that does lie within the Mt Black Volcanics occurs just above and parallel to the Mt Black Fault which marks the base of the lava pile. Here patchy development of magnetite, with lesser pyrite and weak restricted copper–gold mineralization, is associated with very strong chlorite–quartz–carbonate alteration in a zone extending 3–4km north along strike from the Rosebery Mine to Lake Rosebery.

The zone does not appear to have any economic potential. Within the EL it is apparently represented by the small group of minor Cu–Au–Bi workings at Cutty Sark on the southern shore of Lake Rosebery (see Figure 10). Although the Cutty Sark occurrences lack magnetite they lie on the trend of the overall zone, evident from the magnetic anomaly associated with it. Cutty Sark comprises irregular patches to about 50m across of very strong chloritization and disseminated (rarely semi–massive breccia–fill) pyrite ± chalcopyrite, in massive dacitic lavas.

A 1–2m wide E–W fissure vein of high grade Pb–Zn–Ag sulphides in siderite gangue, occurs within the Mt Black Volcanics at Langdon's working on the southern shore of Lake Rosebery. This mineralization appears to be of Devonian age.

7. RESULTS OF 1991-92 PROGRAMME

The principal exploration activity on EL 12/88 during 1991-92 was the drilling of hole BY2 (412.5m) into the Rosebery Mine sequence on the northern side of the Bastyan Dam.

Other work undertaken included:

- * Further geological mapping and rock sampling in the Bastyan area
- * Lithogeochemical, petrological and isotopic studies
- * Gravity traverses on the eastern side of Mt Black
- * Relogging and further sampling of Austmin's four drillholes on Mt Black
- * Evaluation of the Cutty Sark magnetic anomaly
- * Examination of the Cutty Sark and Langdon's workings
- * Downhole EM survey of drillhole BY1
- * Continued monitoring by Austmin of the rehabilitation of drillsite 5 on Mt Black

7.1 Drillhole BY2

Hole BY2 was put down to 412.5m in March-April 1992, close to the northern abutment of the Bastyan Dam. The drillsite was on the northern shore of Lake Rosebery – see Figure 10 & Plate 1. The completed drillsection is shown in Figure 11, the summary log in Table 1 and the full geological log in Appendix 1.

Like hole BY1 drilled in 1991, the hole was designed to test for the source of the massive basemetal sulphide rafts and boulders that occur in the Hangingwall Epiclastics close to the Bastyan Dam (the location of this sulphide debris is shown on Figure 10). It was postulated that the sulphide source would lie in volcanics immediately beneath the Hangingwall Epiclastics.

Unfortunately, the hole did not encounter any sulphides or alteration zones of significance. Minor disseminated and vein-style pyrite with lesser sphalerite, galena and chalcopyrite, was widespread in the volcanics but the best values only amounted to 0.12% Pb and 0.16% Zn over 1.05m.

BY2 collared in bleached dacitic lavas of the Mt Black Volcanics and passed into the Hangingwall Epiclastics at 178.6m. There was no sign of the Mt Black Fault on this contact (unlike BY1) although there was slightly increased ductile deformation in the units 10-15m either side of the change.

From 178.6m until the Rosebery Fault was intersected at 365.65m, BY2 was in the altered crystal-lithic sandstones and fine breccias that make up the debris flows of the Hangingwall Epiclastics. Facings indicate there is a large anticlinal fold (the Rosebery Axis) within the Hangingwall Epiclastics in BY2, with repetition of units in the lower part of the hole.

It should be noted that virtually no bedding, primary layering or original contact attitudes were observed or measurable in the hole – all were either gradational, indistinct or smeared out along the cleavage. This made interpretation of the geological section difficult and it was only possible using the bedding/cleavage relationships seen on surface in this area and the orientated cleavage measurements obtained in the hole. (Orientation readings were taken on average at 30m intervals, with occasional checks at 1m intervals, commencing at 271m downhole).

The Rosebery Fault intersection was higher in the hole than expected, apparently again emphasizing the overall low-angle easterly dip of this structure in the area north of Rosebery Mine. However, orientated core measurement showed the intensely cleaved and deformed zone a few metres above the thrust (the closest measurement possible to the structure itself), strikes NW and dips steeply (78°) to the NE. A second orientated cleavage measurement taken only 0.4m higher in the hole gave a reading of vertical with W strike.

These orientations are quite anomalous for the fault in this general area and their significance is hard to judge, ie: whether they are just due to local complications or whether they are truly indicative of a marked change in attitude in the fault at depth.

Below the fault the hole finished in highly deformed intercalated black shale and grey quartzose sandstone of the Chamberlain Shale unit of the Dundas Group.

The anticlinal fold within the Hangingwall Epiclastics in BY2, combined with the apparent steepening of the Rosebery Fault, opens up the possibility that the more-prospective lower part of the Rosebery Mine sequence may exist at depth in the area north of the dam. These implications are discussed further in Section 8.

TABLE 1SUMMARY LOG OF HOLE BY2**0 - 178.6m: MT BLACK VOLCANICS**

- 0 -130.6m: DACITE LAVAS**
Strongly bleached. 0.2m bands of tuffaceous sediments @ 38.7m & 41.5m. Minor to 2% py. Persistent sp-gn-cp in qtz-carb veins.
- 130.6 -162.5m: DACITIC TUFF**
Apparent fine pyroclastic with feldspar xyls & rare small lithic frags. Strongly bleached. Minor to 2% py. Minor sp-gn veins.
- 162.5 -178.6m: PARTLY-DEFORMED RHYODACITE LAVA**
Bleached & sericitised. Cleaved and finely cracked. Numerous qtz-carb veins. Basal contact a 100mm qtz vein with no sign of the Mt Black Thrust usually in this position. Minor to 2% py.

178.6 - 365.65m: HANGINGWALL EPICLASTICS

- 178.6 -343.05m: ALTERED & DEFORMED CRYSTAL-LITHIC EPICLASTICS**
Sst to fine breccia, with small intervals of fine tuffaceous sediments marking the tops of debris-flow pulses.
Gen minor py, lesser sp-gn-arseno-cp. Sulph veins common below 298m. Best zone 3-4% py-sp-gn-cp-arsenopy, @ 311.35 -313.65m.
(Gave best intersection in hole: 1.05m @ 0.12% Pb, 0.16% Zn).
- 343.05 -356.4m: FINE CRYSTAL-LITHIC SANDSTONE**
Strongly altered & moderately cleaved. 1% py-sp-gn-arsenopy.
- 356.4 -365.65m: INTENSELY DEFORMED BANDED CARBONATE-QUARTZ-SERICITE ROCK**
Poss originally vitric tuffaceous sediments, now intensely-cleaved schist & cataclasite, composed largely of granular calcite. V minor py, trace sp-gn-cp.
- 365.65 -366.6m: ROSEBERY FAULT**
Puggy crushed and broken rock - mainly black shale. Minor py.

366.6 -412.5m: DUNDAS GROUP SEDIMENTS**CHAMBERLAIN SHALE**

Highly deformed intercalated black pyritic shale and fine grey quartzose sandstone. Some deformation appears to be of soft-sediment type. Amount of sst increasing with depth.

END OF HOLE

7.2 Relogging of Austmin Drillholes MBD1-4

The four holes put down by Austmin on Mt Black in 1989 were relogged and measurements of magnetic susceptibility and density made on the core. The new logs are in Appendix 2. Core samples were taken at approximately 50m intervals for lithogeochemistry and the results are evaluated in Section 7.4.

The Austmin holes vary from 169m to 295m deep and although they are spread over a strike length of 1750m the geology in each is essentially the same and very uninteresting from an economic point of view. The holes intersected massive thick dacitic lava flows (and equivalent sub-volcanic intrusives), with two zones of juvenile volcanoclastic material (apparently pyroclastic) of identical composition to the lavas. The lavas are feldspar-porphyritic and contain minor phenocrysts of hornblende and (less commonly) quartz.

The lavas are strongly and ubiquitously silica-albite altered, with trace disseminated haematite-magnetite and pyrite. The sequence is intruded by numerous chloritized mafic dykes, some of which appear to have been disrupted by flowage of the host dacite. This would suggest the dykes were essentially coeval with the lavas.

Only hole MBD4 (the only one not directed at a UTEM anomaly), showed any variation in the pattern of geological monotony. MBD4 intersected a 6.3m wide quartz-chlorite-magnetite vein within an extensive zone of strong chlorite alteration in the dacite. The chloritization is accompanied by magnetite-pyrite veining. However, Austmin's sampling showed none of the veining contains any base or precious metals.

The Austmin holes are shown in Figure 4. From the location of the drillsite clearings plotted from 1990 aerial photography onto Pasminco's latest generation of topographic plans, there are small errors (ranging from about 10m to 80m) in Austmin's calculated positions for the holes. Both sets of co-ordinates are listed in Appendix 2.

7.3 Geological Mapping

The detailed geological mapping programme was continued at Bastyan to try and resolve the obvious complexities in an area that is considered to be the most prospective on the EL.

Petrological sampling, air photo interpretation, acquisition of detailed HEC mapping and evaluation of the aeromagnetics, was carried out as part of this work. Eoin Rothery, Pasminco Exploration's structural expert, and Barry Murphy, geologist with structural consultants ERA-Maptec, made brief field examinations at Bastyan in September 1991 and May 1992.

respectively.

As outlined in Section 6, the Bastyan Dam vicinity is a locus of major structural compilations and numerous substantial structures are evident there. Despite the excellent exposure many of these structures are not mappable on the ground. The mapping and drilling to date has done more to highlight the problems than to solve them and the detailed structural geology at Bastyan is still not well understood.

The up-dated geological map of the Bastyan area is shown in Figure 10.

7.4 Lithogeochemistry

Samples for lithogeochemical study were taken at nominally 40–50m intervals from the core in hole BY2 and Austmin holes MBD1–4, as well as from a network of outcrops in the Bastyan area. The samples were analysed for a range of trace elements and oxides, primarily to determine the level of hydrothermal alteration and to assist in rock identification. Many lithogeochemical samples were also thin-sectioned and examined petrologically to aid interpretation of the results.

Combined with samples taken from hole BY1 in 1991, the lithogeochemical database on the EL now totals 46 samples. The full lithogeochemical results appear in Appendices 1, 2 & 3, while derivatives are shown in Table 2 and Figures 5–8.

Several features of interest are evident in the data:

7.4.1 TI/ZR RATIO

There are two distinct populations present in the Ti/Zr ratio values, with groupings in the range 5.1 – 8.3 and 11.6 –17.7. No samples contain values between 8.3 and 11.6.

The separation is starkly seen in the Austmin drillholes on Mt Black, despite the strong similarities in the geology of all the holes:

Hole	Ti/Zr Grouping	Ti/Zr Range	No of Samples
MBD1	Low	5.1 – 7.7	6
MBD2	High	15.8 – 16.8	3
MBD3	High	16.3 – 17.7	3
MBD4	High	12.8 – 13.8	4

It would be reasonable to assume that the two groupings reflect fundamental compositional divisions in the volcanics. However, the two groupings occur irrespective of the rock unit or type, being present within both the Hangingwall Epiclastics and Mt Black Volcanics, and within both lavas and volcanoclastics.

Considering that the Hangingwall Epiclastics appear to have mixed volcanic provenance within individual debris flows, it is strange that the two Ti/Zr groupings should remain so distinct in these rocks. The implication is that despite appearances the individual debris flows come from one or other of two physically separate volcanic sources. The same applies to lavas and volcanoclastics in the Mt Black Volcanics.

Petrologically and macroscopically there is nothing that distinguishes the two groupings, with the exception of a slight tendency for those samples with higher Ti/Zr ratio to contain a greater abundance of phenocrystal quartz than those with the lower Ti/Zr ratio. But this tendency is not clear cut and there are cases of volcanics containing a fair proportion of quartz phenocrysts and belonging to the lower Ti/Zr ratio grouping.

Perversely however, there is a clear association of higher total SiO₂ with lower Ti/Zr and vice versa (see Figure 5). The trend is best seen in the Mt Black Volcanics:

Unit	Ti/Zr	SiO ₂	No of Samples
Mt Black Volcanics	5.1 – 7.7	72.8%	15
Mt Black Volcanics	12.8 – 17.7	65.7%	16
Hangingwall Epiclastics	7.2 – 8.3	68.8%	5
Hangingwall Epiclastics	11.6 – 14.4	66.7%	10

It is worth noting that the overall averages for Ti/Zr and SiO₂ for the Mt Black Volcanics and Hangingwall Epiclastics are almost identical:

Ti/Zr & SiO₂ – All Samples:

Unit	Ti/Zr	SiO ₂	No of Samples
Mt Black Volcanics	10.8	69.1%	31
Hangingwall Epiclastics	11.1	67.4%	15

Work by Green (1990) showed that the Footwall Sequence at Rosebery has uniform low Ti/Zr values, in the range of 5.6 – 9.4. Three samples taken by the author from the nearest Footwall rocks to Bastyan (in hole 107R, 450m south of the EL) gave Ti/Zr values in the very tight grouping 8.00 – 8.18 (Purvis, 1990).

It is concluded that the low Ti/Zr – higher SiO₂ grouping in the Hangingwall Epiclastics and Mt Black Volcanics on EL 12/88 has a genetic connection with the feldspar–phyric pumiceous volcanoclastics of the Rosebery Footwall Sequence, ie: they are derived from the same volcanic centre. The high Ti/Zr – lower SiO₂ grouping, characteristic of parts of the Mt Black Volcanics and Hangingwall Epiclastics, is regarded as being derived from a different volcanic centre. The Rosebery Host Rocks display affinities with both groups (see Purvis, 1991b).

There is a very strong correlation between increases in V and P₂O₅ values and increasing Ti/Zr, in both the Hangingwall Epiclastics and the Mt Black Volcanics – see Figures 6 & 7. In both cases the Mt Black Volcanics plot in two distinct populations towards the bottom and top of the trends, ie:

low V and low P₂O₅ correlate with low Ti/Zr
high V and high P₂O₅ correlate with high Ti/Zr

The Hangingwall Epiclastics, while showing the same correlation, tend to be more centrally located on the trend. The significance of these results is not yet known.

7.4.2 ALTERATION INDICATORS

In outcrop and drillcore the rocks around the Bastyan Dam appear partly detextured, bleached, silicified, carbonatized and sericitized. They are hard and contain abundant, generally flat-lying, wide veins of quartz–carbonate (believed to be related to thrusting movements on the Rosebery Fault – Murphy, pers comm 1992). One of the principal aims of the lithogeochemical studies was to determine the origin and intensity of this alteration.

The lithogeochemical alteration indicator values for all 46 Bastyan and Mt Black samples are listed in Table 2 and shown in Figure 8.

It is immediately evident from the Na_2O , Alteration Index (AI)* and McKay Index (MI)** values, that only four samples (all from the Mt Black Volcanics), are strongly hydrothermally altered and depleted:

Sample No.	Na_2O	AI	MI	Rock Type	Location
031373	<0.05%	99	1	Sericitic siltstone	On northern EL boundary
031377	0.05%	98	1	Dacitic lava	Near Cutty Sark working
031379	0.19%	95	3	Dacitic lava	Cutty Sark adit wall
032775	0.09%	97	6	Dacitic lava	Pieman Rd near N EL bdy

The location of these samples is shown on Figure 12. No particular significance is attached to the Cutty Sark result as the strong alteration seems very localized. But the strongly altered zone near the northern EL boundary (samples 031373 & 032775) appears significantly larger and coincides with widespread minor pyritization in volcanoclastic units (pyroclastic and epiclastic) of the Mt Black Volcanics. More sampling is required to adequately define it. The indicated area of this altered zone is shown on Figure 10.

All other samples have Na_2O values above 1% (ranging from 1.08% to 8.31%), AI values from 21 to 70, and MI values from 37 to 230, all of which indicate a generally low level of genuine hydrothermal alteration.

It is worth noting that the SiO_2 values suggest the level of silicification at Bastyan (in the Hangingwall Epiclastics particularly) is not as strong as it appears in outcrop. The HW Epiclastics in BY1, BY2 and in outcrop, average only 67.4% SiO_2 . ("Need +75% SiO_2 for evidence of strong silicification" – G Green pers comm, 1992).

*

The Alteration Index: $\text{AI} = 100 \times (\text{K}_2\text{O} + \text{MgO}) / (\text{Na}_2\text{O} + \text{CaO} + \text{K}_2\text{O} + \text{MgO})$

**

The McKay Index: $\text{MI} = 100 \times (\text{Na}_2\text{O} + \text{CaO}) / (\text{Fe}_2\text{O}_3 + \text{MgO})$

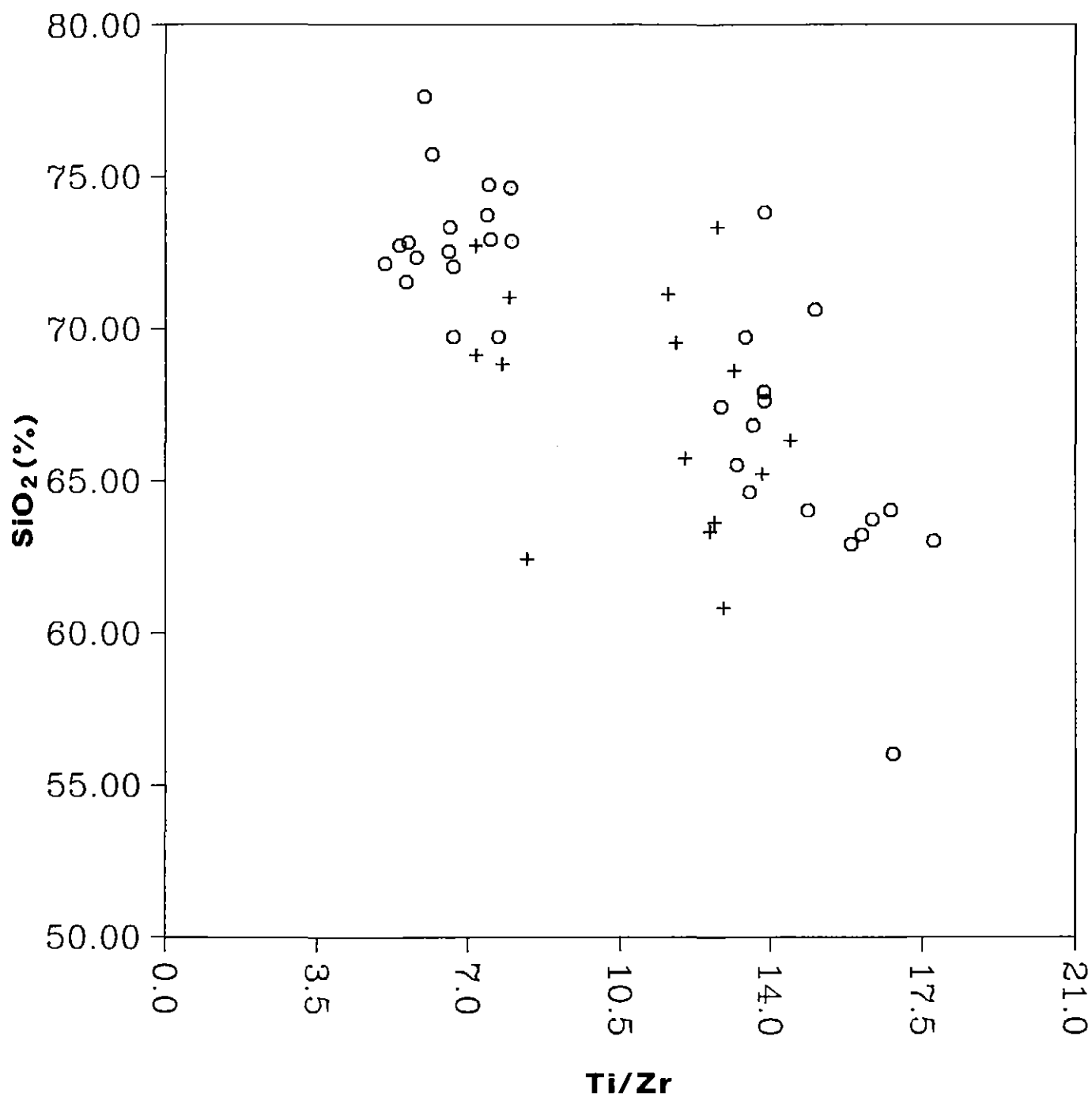
A full explanation of these indices appears in Green (1990).

TABLE 2 ALTERATION INDICATORS
MT BLACK ROCK AND CORE SAMPLES

067025

FORMATION	SAMPLE	NA2O	A.I.	M.I.	RB:K2O	TI:ZR	SI02
HW	31301	3.01	60	64	37	7.8	68.80
HW	31304	3.10	37	179	43	7.9	71.00
HW	31346	4.08	41	116	43	12.6	63.30
HW	31348	4.11	44	191	47	12.7	63.60
HW	31365	3.84	40	86	42	12.7	73.30
HW	31367	3.45	41	167	42	13.8	65.20
HW	31370	3.56	36	161	40	13.1	68.60
HW	31371	4.48	27	150	38	14.4	66.30
HW	31380	2.52	48	141	41	11.6	71.10
HW	31381	1.72	41	109	41	12.9	60.80
HW	32781	2.22	43	125	47	12.0	65.70
HW	32782	1.08	66	74	48	7.2	72.70
HW	32783	1.56	62	87	47	7.2	69.10
HW	32786	5.49	21	224	50	11.8	69.50
HW	32787	1.68	40	111	52	8.3	62.40
MB	31366	1.72	66	55	46	15.0	70.60
MB	31368	1.74	70	78	44	13.8	73.80
MB	31369	1.98	69	37	44	13.4	69.70
MB	31372	2.95	46	121	45	6.5	72.50
MB	31373	0.04	99	1	43	7.5	72.90
MB	31374	1.81	68	65	53	6.2	75.70
MB	31375	2.13	55	104	54	6.0	77.60
MB	31377	0.05	98	1	49	7.5	74.70
MB	31379	0.19	95	3	44	7.4	73.70
MB	32758	4.13	44	188	37	5.6	72.80
MB	32759	3.78	46	156	37	5.4	72.70
MB	32760	3.38	38	230	42	5.6	71.50
MB	32761	3.82	44	155	37	5.1	72.10
MB	32762	3.40	50	146	32	5.8	72.30
MB	32763	3.16	47	134	71	7.7	69.70
MB	32764	3.81	38	90	27	15.8	62.90
MB	32765	8.31	26	115	33	16.8	56.00
MB	32766	3.45	38	97	31	16.1	63.20
MB	32767	3.76	41	80	43	17.7	63.00
MB	32768	3.50	38	89	31	16.3	63.70
MB	32769	3.24	42	88	46	16.8	64.00
MB	32770	4.20	37	131	34	12.8	67.40
MB	32771	3.29	52	53	57	13.8	67.60
MB	32772	4.14	45	64	58	13.6	66.80
MB	32773	4.81	42	71	62	13.8	67.90
MB	32775	0.09	97	6	53	6.6	73.30
MB	32777	2.43	43	102	47	13.5	64.60
MB	32778	1.94	46	101	47	14.8	64.00
MB	32779	2.12	50	124	50	6.6	72.00
MB	32780	1.13	55	89	47	13.2	65.50
MB	84055	2.70	45	123	45	6.6	69.70

Mt BLACK EL 12/88

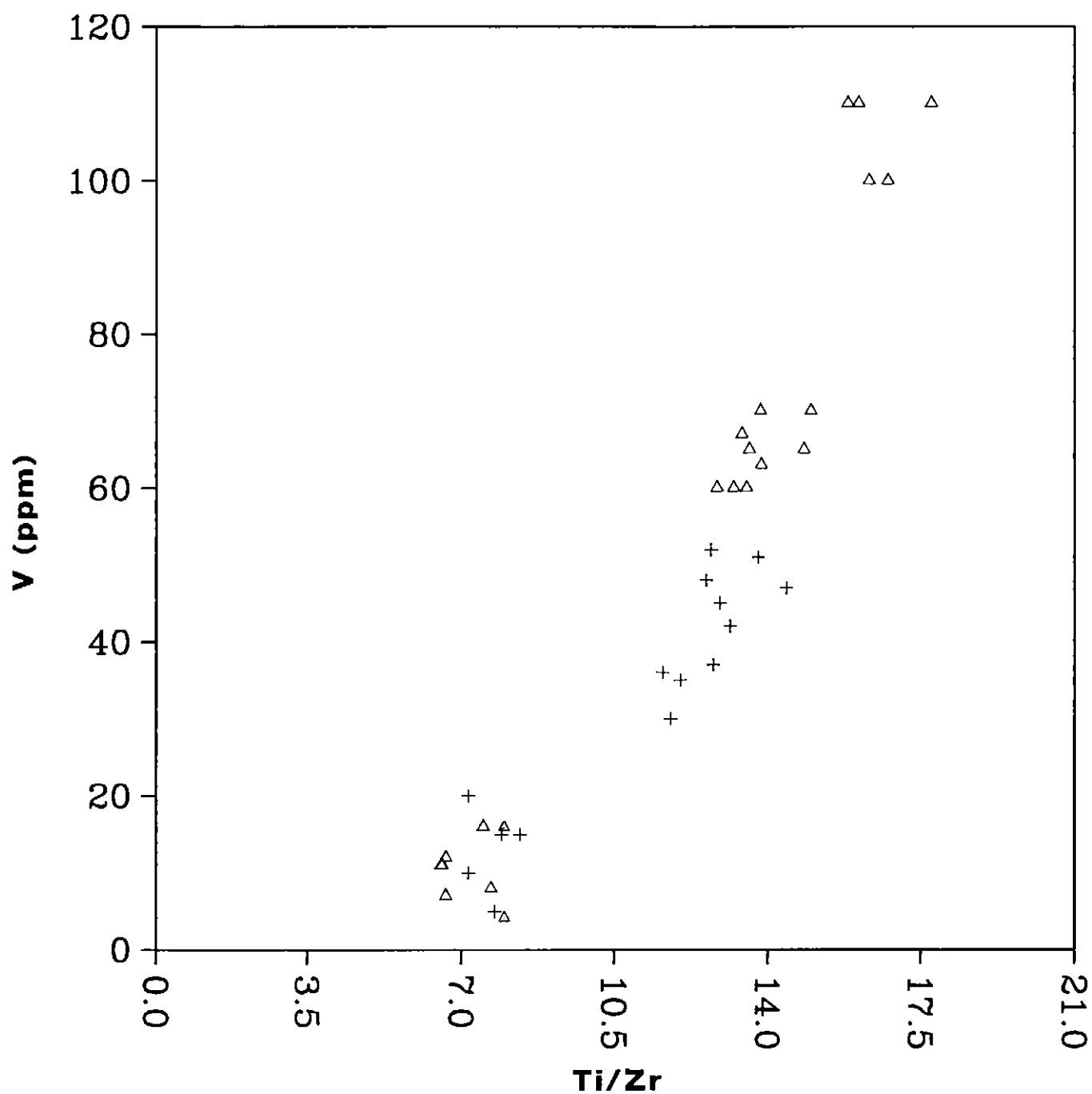


ROCK AND CORE SAMPLES
SiO₂ vs Ti/Zr

+ Hangingwall Epiclastics

O Mt. Black Volcanics

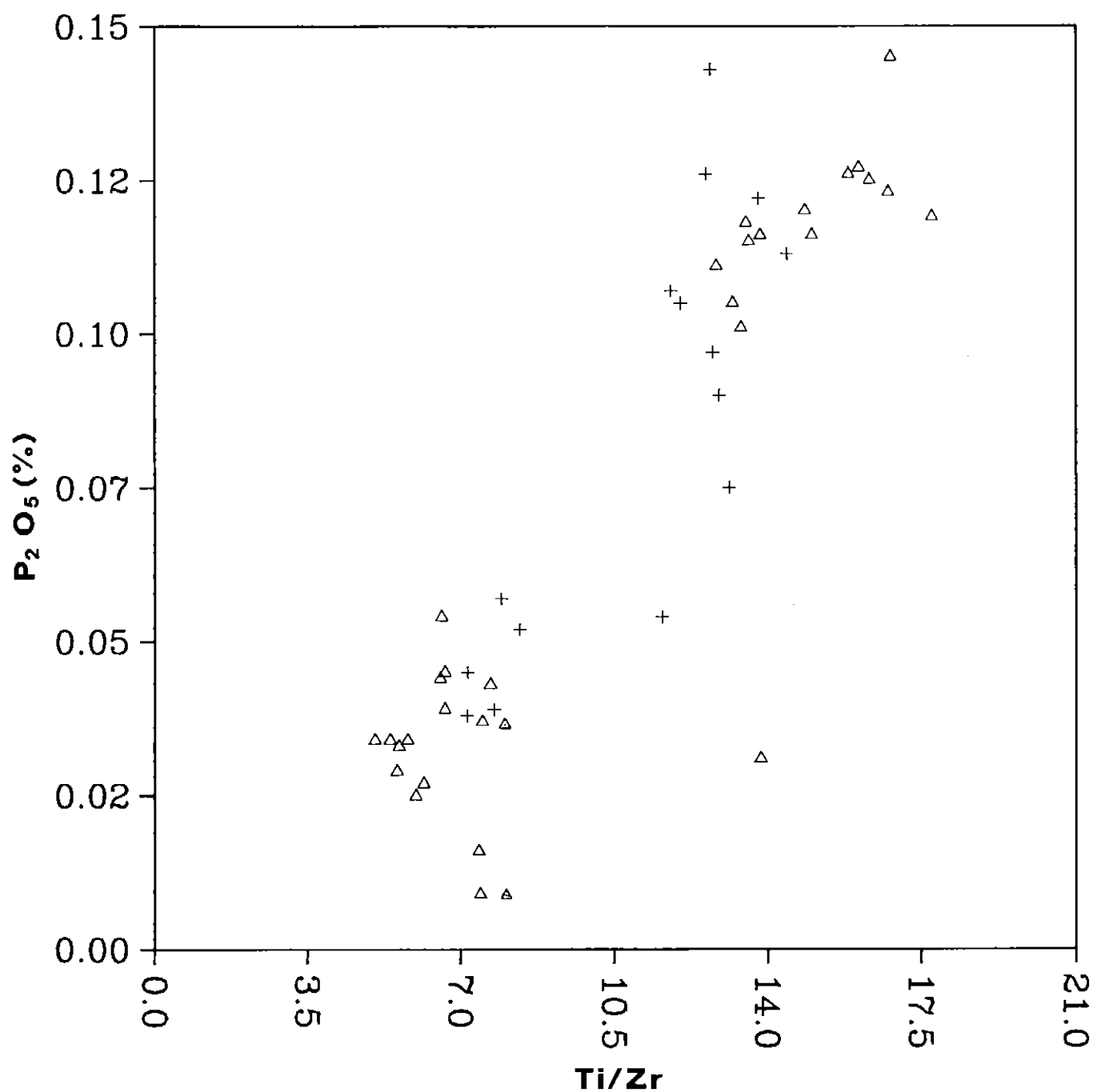
Mt BLACK EL 12/88



ROCK AND CORE SAMPLES
Ti/Zr vs V

- + Hangingwall Epiclastics
Δ Mt. Black Volcanics

Mt BLACK EL 12/88



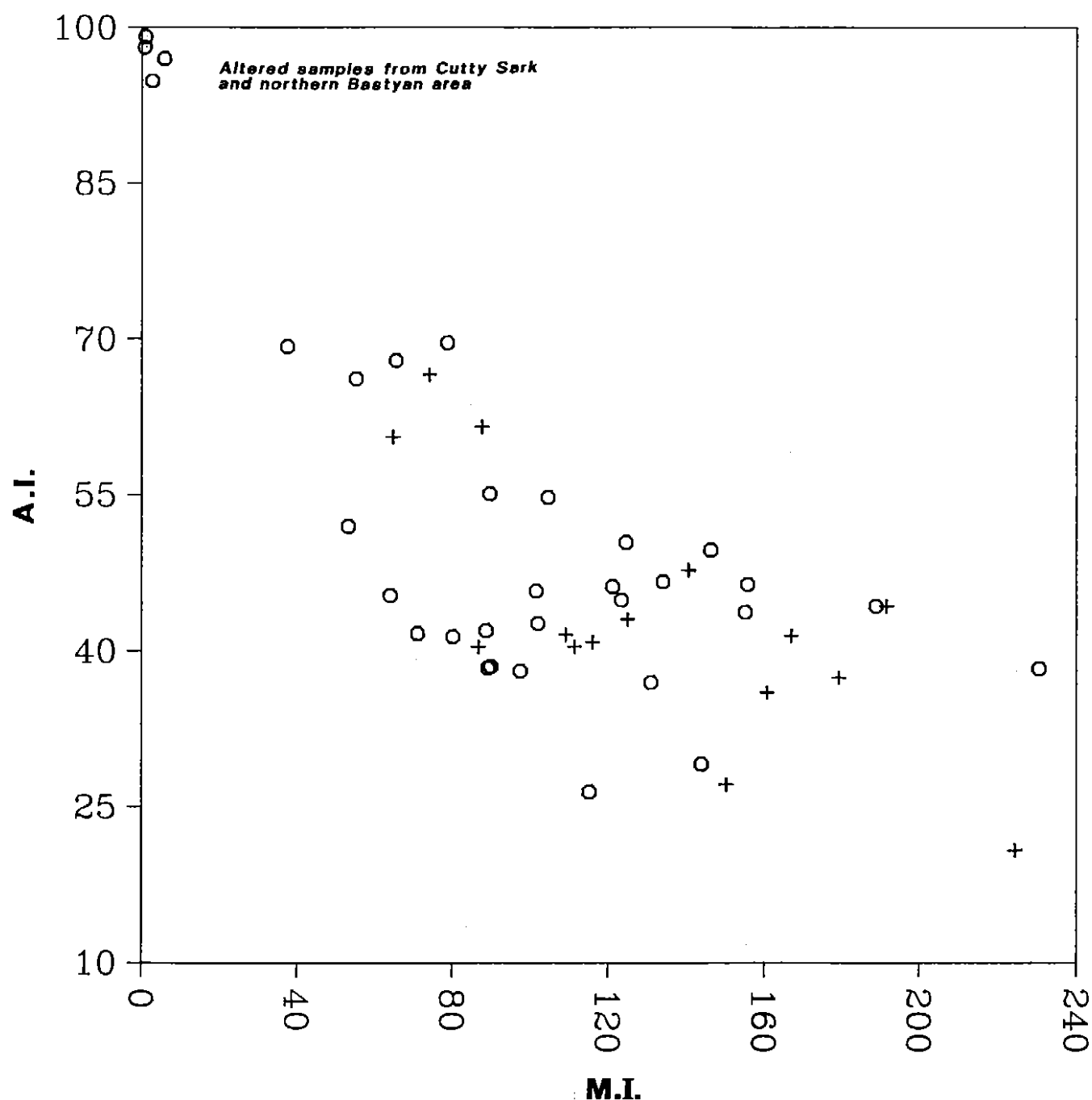
ROCK AND CORE SAMPLES

 P_2O_5 vs Ti/Zr

+ Hangingwall Epiclastics

 Δ Mt. Black Volcanics

Mt BLACK EL 12/88



ROCK AND CORE SAMPLES **Alteration Index vs McKay Index**

$$A.I. = \frac{100 \times (K_2O + MgO)}{(Na_2O + CaO + K_2O + MgO)}$$

$$M.I. = \frac{100 \times (Na_2O + CaO)}{(Fe_2O_3 + MgO)}$$

+ Hangingwall Epiclastics
 O Mt. Black Volcanics

Green (1990) uses the index: $10\,000 \text{ Rb} / \text{K}_2\text{O}$ to determine the level of Devonian alteration in the Rosebery area, with values of 70 or more being indicative of substantial Devonian input. The Mt Black EL samples all have values of between 27 and 71 (next highest 62), and an average of 44, indicating almost no Devonian alteration. The highest value is in the bottom of the deepest Austmin hole on Mt Black (MBD1, 295m).

In summary, the lithogeochemical results show the detexturing and alteration of the rocks at Bastyan is not related to a Cambrian hydrothermal system or to a Devonian intrusion (results confirmed by isotopic studies – see Section 7.5 below). It is also apparently not related to the structural deformation (Rothery pers comm, 1991).

7.5 Isotopic Studies

Eight outcrop samples of the Hangingwall Epiclastics and Mt Black Volcanics from around the Bastyan Dam were submitted to Dr Geoff Green of the Division of Mines for oxygen isotope analysis and evaluation. An additional three samples of sulphides from Langdon's working, the Cutty Sark showing, and sooty pyrite on the margin of the quartz–feldspar porphyry on the southern shore of Lake Rosebery at Bastyan, were submitted for sulphur isotope analysis.

Green's full report appears in Appendix 4. His summary of the results is as follows:

"Samples of Hangingwall Epiclastics and Mt Black Volcanics from the Bastyan Dam area have undergone minor syn–diagenetic hydrothermal alteration with little evidence of major overprinting Devonian effects. Whole rock $\delta^{18}\text{O}$ values range from +11.5 to +12.8‰. When corrected for quartz phenocryst content and mineralogy these results indicate a maximum temperature of alteration by a seawater–derived hydrothermal fluid of about 150°C, but more probably alteration occurred at temperatures around 100°C at moderate water/rock ratios. The lack of variation in the data and the similarity of results from the Hangingwall Epiclastics and Mt Black Volcanics suggest that the alteration is of regional character and there is no indication of a proximal in–situ massive sulphide accumulation.

The fine grained pyrite at the margin of the porphyry in the Hangingwall Epiclastics has a low $\delta^{34}\text{S}$ value of –2.9‰, clearly different from other sulphides in the area, and is probably related to local low temperature hydrothermal processes associated with the intrusion. Clastic sulphides in mass flow deposits in the area have distinctly different $\delta^{34}\text{S}$ values from pyrite from the Cutty Sark deposit and the bulk of sulphides at Rosebery. Isotopically they are most similar to sulphides from the Pinnacles area, but a different, undiscovered, source is at least equally probable."

The samples submitted for oxygen isotopes analysis were 031366, 031369 & 031372 from the Mt Black Volcanics; 031367, 031370, 031371, 031380 & 031381 from the Hangingwall Epiclastics. Those analysed for sulphur isotopes were 031353, 031376 and 031378. All samples except the last two were also petrologically examined, and all the oxygen isotope samples were also analysed for lithogeochemistry. The location of all samples is shown in Figure 12.

Important points raised by Green's work include:

- * The petrological and X-ray diffraction data confirm the generally low level of alteration indicated by the lithogeochemical results. There is no indication of major feldspar destruction.
- * What alteration there is, took place under uniform marine diagenetic conditions. There is no sign of the strong $\delta^{18}\text{O}$ gradients that exist around Kuroko deposits and from this Green concludes that none of the sampled sites lie within 500m laterally or 200m stratigraphically of an in-situ massive sulphide body.
- * Four samples of massive sulphide clasts from the Hangingwall Epiclastics at Bastyan, supplied to Green by the author in 1987, gave $\delta^{34}\text{S}\text{‰}$ values ranging from +7.3 to +10.5. This compares to the range of values from the Rosebery deposit of +7.1 to +19.8‰. Similarly, the clast values are mostly lighter than those from the massive sulphides in the Pinnacles area (5–6km north of Bastyan), which have values of +9.0 to +12.9‰. Green concludes: "the data suggest that the source of the clastic sulphides has yet to be established, although the Pinnacles area is not totally precluded".

7.6 Examination of Langdon's and Cutty Sark Workings

These old workings in the Mt Black Volcanics on the southern shore of Lake Rosebery were visited and sampled in late August 1991. The workings are shown on Figure 10 and the sample results are listed in Appendices 3, 4 & 5. Neither occurrence is regarded as being of economic significance.

7.6.1 Langdon's Working

This is a small old working located near the southern shore of Lake Rosebery, 2.5km ENE of the Bastyan Dam. The working occurs within an essentially unaltered, massive, fine pumiceous dacitic volcanoclastic. It comprises a 5m high tunnel (collapsed stope) some 20m long and 1–2m wide, on a strong fault fissure trending E–W and dipping north at 65°. There is a considerable amount of high grade coarsely crystalline sphalerite–galena in siderite gangue with attached chlorite–sericite altered volcanic wallrock, on the dump some 15m vertically beneath the tunnel and marking the site of a low-level adit.

From this it appears the Langdon's mineralization comprised a high grade sulphidic fissure lode about 20m long, 1–2m wide and 20m deep. Whether there was any actual production is not known. A picked dump sample assayed 23% Pb, 16% Zn, 470 g/t Ag and 0.01 g/t Au. From these metal ratios and the geological setting of the mineralization, it is fairly certain that Langdon's is of Devonian age.

Sphalerite from the dump sample was also tested for sulphur isotopes, giving a $\delta^{34}\text{S}\text{‰}$ value of +9.3. This compares with values for galena and sphalerite obtained from Langdon's by previous workers, of +11.7 and +12.6‰ respectively, and falls within the typical range of Western Tasmanian Cambrian VMS deposits (Green 1992, in Appendix 4.) While Green agrees the mineralization is probably of Devonian age, he considers the sulphur may be derived from a Cambrian source.

7.6.2 Cutty Sark Workings

These are a series of small adits and pits grouped in an area about 100 x 100m on a headland on the southern shore of Lake Rosebery, 900m east of the Bastyan Dam.

The mineralization is associated with patches (to about 50m across) of very strong chlorite (+ sericite–quartz) alteration within massive spherulitic dacite lavas. Within the altered patches there is disseminated pyrite and restricted zones of heavily disseminated to semi-massive pyrite with lesser chalcopyrite. The best mineralization sometimes occurs as breccia–fill in altered brecciated lava. Veining (generally quartz) is very minor.

Picked float from the dump of the main working assayed 4.8% Cu, 0.13% Pb, 0.05% Zn, 29 g/t Ag, 0.7 g/t Au and 0.3% Bi. Sulphur isotope analysis of pyrite from the same sample gave a $\delta^{34}\text{S}\text{‰}$ value of +18.1 which "falls at the top of the range of Rosebery values, and is similar to results from the barite lode but is clearly different from those of the clastic sulphides from the southern shore of Lake Rosebery." (Green 1992, in Appendix 4).

7.7 Geophysical Surveys

Geophysical surveys carried out on EL 12/88 in the 1991-92 year comprised 10.2km of gravity traverses on the previously-unsurveyed eastern side of Mt Black, a 3.3km ground magnetometer traverse across the Cutty Sark magnetic anomaly and a downhole EM survey of drillhole BY1 on the southern shore of Lake Rosebery at Bastyan. In addition, SG and magnetic susceptibility measurements were made on drillcore from holes BY2 and MBD1-4, to assist the interpretation of the gravity and magnetic surveys.

The gravity and magnetic surveys were evaluated by Consultant Dr David Leaman and the downhole EM by Richard Smith, Pasminco's Chief Geophysicist.

7.7.1 DOWNHOLE EM SURVEY - DRILLHOLE BY1 (RS Smith)

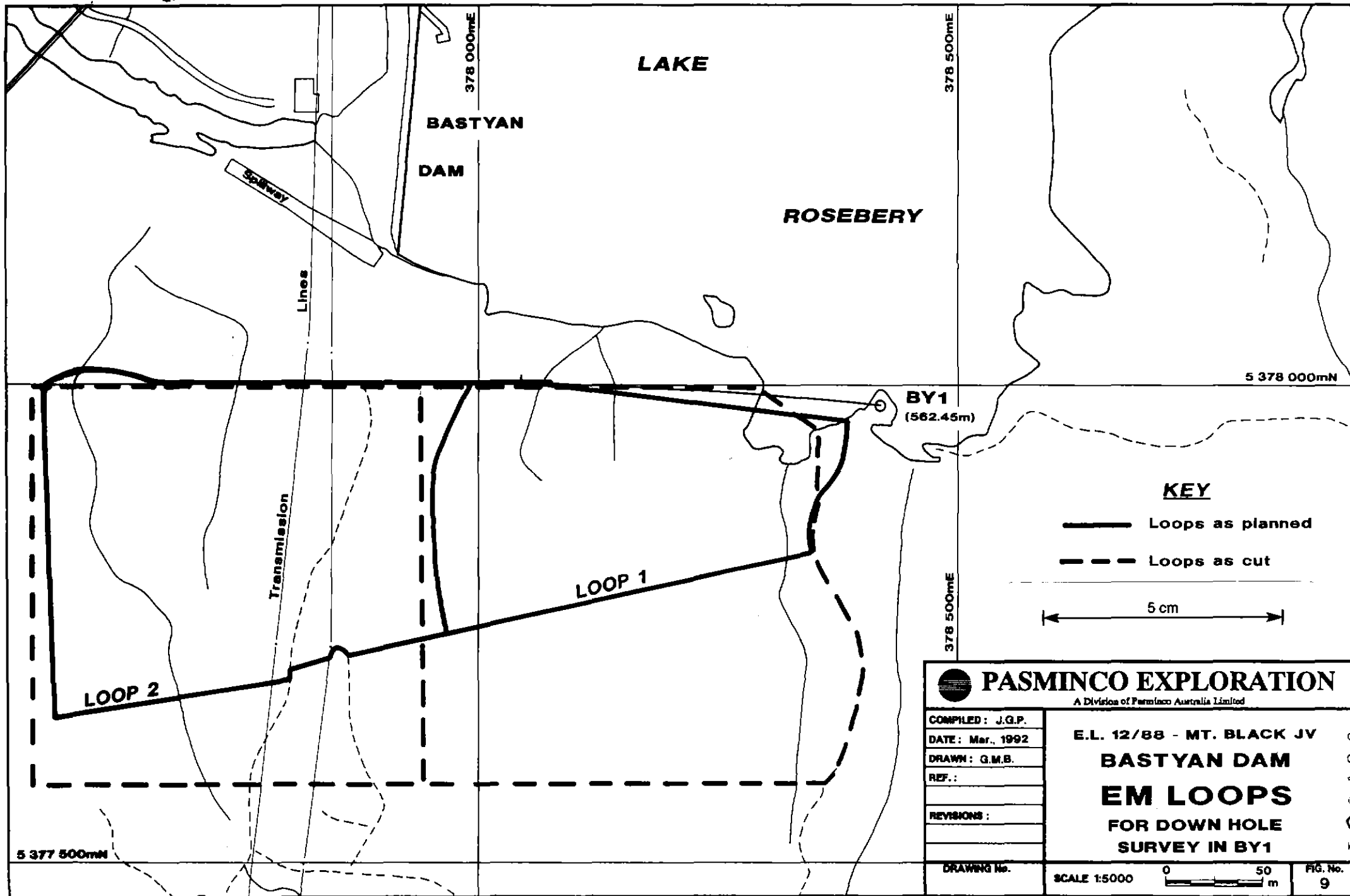
Two transmitter loops (1 and 2) were planned to survey hole BY1 on the Mt Black Licence. Although the loops were intended to be approximately 400 x 400m, the loops actually laid out were not as planned (see Figure 9). Fortunately, the loops laid have similar primary-field coupling and the resulting signal levels and data quality appears to be adequate.

Loop 1, the eastern most loop, is designed to couple poorly to bodies which are parallel to the interpreted bedding. The measured response shows a negative self response at the top of the hole superimposed on a rapidly decaying positive response. There are no other anomalous features in the data.

The primary field from loop 2 (the western loop) will couple well to bodies parallel to bedding. The measured data shows a smooth broad response profile. The only anomalous feature is an increase in response towards the bottom of the hole. Although this could reflect a conductive feature towards the bottom of the hole (possibly Dundas Group sediments), it could also be a consequence of a smaller negative self response near the bottom of the hole. If the increasing response is due to a body near the bottom of the hole, the body is not very conductive, the anomalous response having decayed away by 0.6 msec.

7.7.2 GRAVITY TRAVERSES EAST OF MT BLACK

Three detailed gravity traverses were completed in February 1992 over the eastern side of Mt Black. The traverses involved the reclearing and repegging of 10.2km of old EZ and Billiton east-west AMG gridlines at approximately 5375250mN, 5376500mN and 5377500mN, from Lake Rosebery and the Murchison Highway westwards to the general vicinity of the mountain crest. The traverse lines are shown on Figure 4 and in Leaman's report (Appendix 7).



PASMINCO EXPLORATION

A Division of Parnico Australia Limited

COMPILED: J.G.P.

DATE: Mar., 1992

DRAWN: G.M.B.

REF.:

REVISIONS:

DRAWING No.

E.L. 12/88 - MT. BLACK JV

BASTYAN DAM

EM LOOPS

**FOR DOWN HOLE
SURVEY IN BY1**

SCALE 1:5000

0 50 m

FIG. No.

9

062031

The gravity readings were taken at nominal station intervals of 200m. Some considerable discrepancies were detected between the peg coordinates and positioning measurements of the stations done by the gravity crew. The latter are regarded as accurate.

The survey showed that the gravity field on the eastern side of Mt Black is made up of a series of regular steps and plateaux. It is almost flat to the south of 5376500mN, with marked E-W steps at 5376500mN and 5379000mN, and a narrow negative anomaly immediately east of the mountain summit.

The E-W step at 5376500mN is probably a major structure: it coincides with the apparent northern termination of a sequence of more-mafic volcanics extending along the western side of the Henty Fault in the Sterling Valley area, and has a topographic expression in the form of a very large east-flowing drainage on Mt Black. A few kms further east the Murchison Gorge lies on this trend.

Leaman concludes that the gravity field implies a relatively uniform, possibly east dipping, slab of massive "normal" volcanics and that only the E-W transverse gravity gradients are anomalous and significant.

No features of immediate relevance to exploration are apparent in the gravity pattern.

7.7.3 EVALUATION OF CUTTY SARK MAGNETIC ANOMALY

In November 1991 a 3.3km ground magnetometer traverse was surveyed from near the collar of hole BY1 eastward to Langdon's working, on the southern shore of Lake Rosebery (see Figure 4). Readings were taken every 5m (total of 659 stations) and results corrected for diurnal drift. The magnetic readings and Consultant David Leaman's interpretation of them, appear in Appendix 8.

The traverse was designed to evaluate a very large aeromagnetic anomaly that extends north for about 5km from just east of Rosebery Mine to beyond Lake Rosebery. For the 1.5km this feature is within the EL area it has been loosely termed the Cutty Sark Anomaly because its peak axis lies within the Mt Black Volcanics close to these old workings.

To the south of the EL the anomaly coincides with a zone of chlorite-magnetite alteration within the Mt Black Volcanics, just above and parallel to the Mt Black Fault. This zone contains weak patchy copper-gold mineralization. It is probable the small Cutty Sark workings are the manifestation of this zone within the EL area even though no magnetite is associated

with them.

However, Leaman had previously argued that the magnetic anomaly source was deeply buried ultramafics (Leaman pers comm, 1991).

The magnetic traverse results show there is a substantial local magnetic response at the western end of the traverse, just east of the Mt Black Fault and approximately along strike of the known chlorite-magnetite zone mentioned above. But Leaman sees this response and other spikey features on the magnetic profile, superimposed on something of much longer wavelength offset further east and clearly from a deeper source.

Modelling leads Leaman to conclude this latter response is due to a thin slice of ultramafics dipping east at about 50°. In the model this feature projects to surface as the Mt Black Fault. Leaman is adamant that none of the exposed rocks can explain the broad anomaly and estimates they can only contribute about 10% of the observed effect.

However, it is fact that the anomaly coincides with the largest concentration of magnetite known in the outcropping Mt Black Volcanics. Leaman's modelling also shows the deeper response lies down the known dip of this zone. Whatever the deeper anomaly source, the near-surface magnetite zone is obviously related to it.

The magnetite zone and the magnetic anomaly itself do not appear to have economic potential.

7.8 Environmental Rehabilitation

During 1991-92 Austmin continued their monitoring of the rehabilitation of drillsite 5 (5377000mN, 381250mE) on Mt Black. Austmin's report is as follows:

7.8.1 VEGETATION MONITORING, SITE 5 – MT BLACK (A Craig)

During the report period two monitoring visits were undertaken by Austmin Resources NL environmental and botanical consultant, Mr Alan Gray. Site observation stations were monitored and other data was collected on the 28th September 1991 and 10-12th January 1992. A brief summary of the visits is as follows.

September 1991 visit:

All quadrants were examined and there were very few recruitments of seedlings and sprouting or losses noted. A very small increment in size of plants was also noted. The replants and

marked recruits outside the quadrants continued to show growth. Of the thirty additional *Athrotaxis* planted in April 1991 none were lost and all appeared to have become well established. Some cones were still present from the previous season's production by surrounding *Athrotaxis* trees. Most were empty showing seed has been distributed following cone maturity. The ground was quite waterlogged following heavy rain and winter thawing, but appeared to be draining positively.

January 1992 visit:

All quadrants were examined and the most noticeable additions were *Phyllocladus*, *Cyathodes* and *Gahnia*. Few new *Athrotaxis* seedlings were apparent. The next visit should show evidence of any *Athrotaxis* seeds which have germinated during the summer. All but a very few plants previously recorded have continued to thrive and show growth increment. There has been significant growth increment in nearly every case of replants and marked recruits outside the quadrants. Some *Athrotaxis* have almost doubled the previous recorded heights. Many more layerings were showing through the matrix and no erosion was evident.

The final site monitoring visit in the program was scheduled for May 1992. The visit has been postponed until December 1992 as it is thought the study would benefit from the monitoring of growth during a further Spring period.

7.8.2 BY2 DRILLSITE

The BY2 drillsite was placed on an old HEC vehicle track 20m from the northern shore of Lake Rosebery and about 8m above lake level. Site formation required only clearing of Ti-Tree scrub and slight enlargement of the old roadway, and was done using an excavator which kept disturbance to a minimum (see Plate 1).

A low bund was built around the site so that no drill effluent or rain runoff could escape from it and get into the lake. A small effluent holding sump was dug on the site and lined with plastic sheeting (see Plate 2). This was used for temporary storage only, with the effluent then pumped to a soak pit in glacial gravels near the HEC's transmission yard below the dam. Drainage in this area is away from the lake. Any greases or oils in the effluent were collected on "socks" of absorbent material floating on it and these taken away for proper disposal.

The BY2 drillsite at Bastyan has been only partially rehabilitated with the filling in of the sump and drainage pit. The site will be fully rehabilitated on completion of a downhole EM survey to be carried out in the near future. This survey requires that vehicle access be maintained to the site in the meantime.

PLATE 1
BY2 drillsite, Bastyan
March 1992.



Plate 2
BY2 drillsite,
Showing perimeter
bund and sump for
temporary effluent storage



8. DISCUSSION

The prospectivity of the Mt Black EL is based on its proximity to the Rosebery Mine. This major deposit is part of the most productive line of Pb–Zn–Au mineralization in the Mt Read Volcanics, running parallel to and just east of the Rosebery Fault. The line extends for 20km, incorporating the Rosebery (24mmt) and Hercules (3mmt) deposits, the Chester (2.5mmt) pyrite deposit and the major basemetal prospect at Pinnacles, as well as other less substantial basemetal and gold occurrences.

The EL covers 1.4km strike length of this mineralized line in the vicinity of the Bastyan Dam on the old Pieman River. The dam sits essentially right on the line and it is no coincidence that the most significant mineralization yet found on the EL was uncovered during its construction. This comprises rafts and clasts of high grade massive basemetal sulphides within the debris flows of the Hangingwall Epiclastics unit of the Rosebery Mine sequence. The rafts are up to 8.5m long and the clasts up to 2m across.

Exploration over the past couple of years has been directed at the immediate Bastyan area on the basis that this clastic sulphide material was probably locally derived from a nearby massive sulphide body (or bodies). However, holes drilled around the dam have been barren.

More significantly, it is now clear from the lithogeochemical and oxygen isotope data that neither the rocks intersected in the holes nor those outcropping around the dam, are hydrothermally altered to any degree despite appearances to the contrary. In this context it is important to note the conclusion from the sulphur isotope work (Green, 1992), that the clastic sulphides have signatures like those of the basemetal massive sulphide lenses in the Pinnacles area, 5km north of Bastyan .

While it has always been realised that the material in the Hangingwall Epiclastics has been transported southwards, it may be that the distance involved is greater than previously thought. The possibility is that the clastic sulphides at Bastyan were formed as part of the Pinnacles system and not as part of any mineralizing system within the Mt Black EL area.

However, some encouragement can be gained from the recent discovery of a zone of very strong hydrothermal alteration within the Mt Black Volcanics on the EL. This presently ill-defined zone of approximately 300m x 300m dimensions, outcrops about 500m north of the dam and close to the northern EL boundary. It appears separated from the main Bastyan area by a major NE trending fault (given that the rocks in BY2 just south of this structure are

not strongly altered). The altered zone is shown on Figure 10.

The only two lithogeochemical samples collected from this zone to date have Na_2O values of 0.09% and <0.05%, which are of the same order as values in the most intensely-altered parts of the Footwall Sequence under the Rosebery deposit (Purvis, 1991a). The intensity and type of alteration in the zone is confirmed petrologically, particularly by sample 031372 on the Pieman Road, which Green (1992) describes as displaying very strong Cambrian alteration effects.

The only other positive point to come from the 1991–92 work on the EL is the indication of the anticlinal fold within the Hangingwall Epiclastics in hole BY2. This fold opens up the possibility that the more-prospective lower parts of the Rosebery Mine sequence may occur at depth in the block north of the dam, including beneath the altered zone in the Mt Black Volcanics mentioned above.

This possibility is increased by the apparent steep easterly dip of the Rosebery Fault in hole BY2, which if not just a local anomalous warp, removes the threat of this thrust cutting off the volcanics at relatively shallow depth (as it does in the area south of the dam). The situation is shown in Figure 1.

It is worth noting that because of the moderate easterly dip of the rocks on the eastern fold limb and the shallow northerly plunge on the anticline, the Hangingwall Epiclastics exist at depth beneath the Mt Black Volcanics north and east of Bastyan, probably to beyond the northern EL boundary.

Results of other exploration on the EL to date are not encouraging. The gravity results east of Mt Black reflect a relatively uniform slab of massive essentially-unaltered volcanics evidently cut by large unmapped east–west structures. This uninteresting picture is confirmed by the monotonous geology in the four Austmin holes near the mountain's summit. The Cutty Sark magnetic anomaly is part of a huge magnetic feature extending north of Rosebery that has not been shown by drilling and sampling to date to have economic potential (although it is of geological interest as it bears on resolution of the overall structural setting of the Rosebery area).

The Cutty Sark and Langdon's basemetal occurrences are both too minor to warrant further attention, although of the two the former is the more significant type.

9. CONCLUSIONS

1. The northern Bastyan area, comprising about 0.5 sq km between the dam and the northern EL boundary, is the only part of EL 12/88 currently regarded as having significant mineral potential.
2. A zone of very strong Cambrian hydrothermal alteration has been discovered within outcropping Mt Black Volcanics in the northern Bastyan area and warrants further work to fully define and evaluate it. This alteration zone appears separated from the dam area by a major fault.
3. The anticlinal fold within the Hangingwall Epiclastics in hole BY2 indicates that prospective lower parts of the Rosebery Mine sequence could be present at depth in the area between the dam and the northern EL boundary, including beneath the aforementioned alteration zone.

This possibility is enhanced by the apparent steep easterly dip on the Rosebery Fault in BY2 which would remove the threat of this structure cutting off the volcanics at relatively shallow depths (as happens in the rocks south of the dam).

4. Lithogeochemical and isotopic studies suggest there is a possibility that the clastic sulphides at Bastyan were derived from the Pinnacles area 5km north of Bastyan, and not from a mineralizing system within the EL.
5. The results of gravity surveying east of Mt Black indicate the volcanics here are massive, uniform and unaltered, apparently similar to the monotonous barren lavas intersected in the four Austmin holes near the summit of the mountain.
6. The Cutty Sark magnetic anomaly within the Mt Black Volcanics coincides with a near-surface chlorite-magnetite zone and is possibly reflecting ultramafic rocks at depth. It is not regarded as having any economic potential.
7. The Cutty Sark and Langdon's basemetal showings are too minor to warrant further work.

10. RECOMMENDATIONS

It is recommended that the zone of very strong hydrothermal alteration in the northern Bastyan area be better defined and tested. This should be done by rock and soil sampling for base and precious metals, further lithogeochemical analyses, oxygen isotope and petrological studies, and detailed geological mapping.

Even if the above work proves negative, a deep drillhole (estimated at 800m length) is recommended to test for the lower units of the Rosebery Mine sequence possibly present at depth in the northern Bastyan area. This hole would be sited to test somewhere in the area between the northern end of the dam and the northern EL boundary.

As siting of the hole could be affected by the results of the surface work over the northern Bastyan alteration zone, the surface work should be completed first. It may well prove possible to drill test the alteration zone and the deeper prospective Rosebery sequence, with the same hole.

Apart from completion of the planned downhole EM survey of hole BY2, no other work can be recommended on the EL at this time.

11. REFERENCES

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APPENDIX 1
LOG OF DRILLHOLE BY2



PASMINCO EXPLORATION DIAMOND DRILL CORE RECORD

HOLE No. BY2

Page 1 of 13

LOCATION	WESTERN TASMANIA	OBJECTIVE TO TEST FOR THE IN-SITU SOURCE OF MASSIVE BASEMETAL SULPHIDE RAFTS AND CLASTS THAT OCCUR IN THE HANGINGWALL EPICLASTICS AT BASTYAN. THIS SOURCE POSTULATED TO BE A MASSIVE SULPHIDE BEARING UNIT, LYING BETWEEN THE BASE OF THE HANGINGWALL EPICLASTICS AND THE ROSEBERY FAULT, IMMEDIATELY NORTH OF THE DAM.							LOCATION/SURVEY DATA (AMG)								
PROJECT	MT BLACK EL 12/88								Grid	AMG	RL Collar m 167.6						
PROSPECT	BASTYAN DAM	Northing m	5 378 678.5	Bearing Collar 240°													
DESIGNED BY	J.G. PURVIS	Easting m	378 024.0	Dip Collar - 60°													
LOGGED BY	J.G. PURVIS	DH Survey Type	SINGLE SHOT EASTMAN CAMERA		Length Hole m 412.5												
RELOGGED		Depth m	Bearing	Dip	Depth m	Bearing	Dip										
COMMENCED	16.3.92	30	244°15'	-58°15'													
COMPLETED	15.4.92	60	245°45'	-55°													
DRILLED BY	EAST COAST DRILLING	90	247°	-54°													
DRILL RIG	LONGYEAR 38	120	247°30'	-53°15'													
		150	249°	-51°15'													
		180	250°45'	-50°15'													
		210	251°	-47°30'													
		240	251°30'	-45°													
		270	252°	-42°30'													
		300	251°30'	-41°													
		330	251°45'	-37°30'													
		360	252°	-36°30'													
		390	253°30'	-34°15'													
		412	255°30'	-32°													
SIGNIFICANT INTERSECTIONS									INTERSECTED.								
From m	To m	Interval m	Cu	Pb	Zn	Ag	Au	Comments									
311.35	312.4	1.05	437	1228	1558	2	<0.008	BEST INTERSECTION: SULPHIDE									
								VEINS IN ZONE OF CHLORITISATION									
								WITHIN HW EPICLASTICS.									
SIGNIFICANT CORE LOSS									POOR GROUND CONDITION ZONES								
From m	To m	% Lost	From m	To m	Condition												
No SIGNIFICANT LOSS			0	22.2	MODERATELY FRACTURED + BROKEN. 25% WATER LOSS ^{19-22.2m} IN												
				75.6	100% WATER LOSS IN FRACTURE.												
			365.65	366.6	ROSEBERY FAULT. PUG + CRUSHED ROCK.												
HOLE SIZE			HOLE CONDITIONS AFTER COMPLETION														
Size	Depth m	Collar	CEMENTED STEEL CASING WITH SCREW-ON STEEL CAP.														
HW	1	Steel Casing	HQ 0-3m.														
HQ	3	PVC Casing	40mm, UNSLOTTED, TO BASE														
NQ	412.5	Ground Water	WATER LEVEL STEADY AT 11.5m DOWNHOLE.														
		Wedge	- / CORE PHOTOGRAPHED AND STORED AT TULLAH COMPOUND.														
		Drill Pad	REHABILITATED AND REPLANTED														

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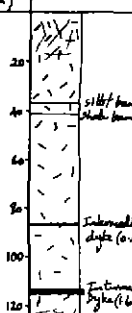
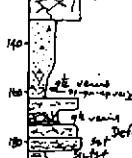
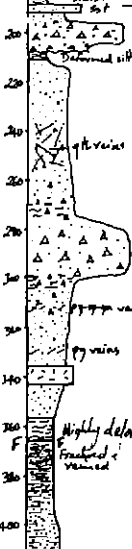
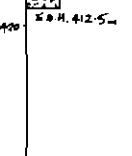
PASMINCO EXPLORATION SUMMARY DIAMOND DRILL CORE LOG

HOLE No. BY2

PROJECT: MT BLACK EL 12/88

Graphic Scale 1: 2,000

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From m	Interval m	Code	Description	Depth (m)	Graphic	From m	Interval m	Code	Description	Depth	Graphic
0 - 178.6m: MT BLACK VOLCANICS						FACING					
0 - 130.6m:			DACITE LAVAS Strongly bleached. Two 0.2m bands of tuffaceous sediments @ 38.7m & 41.5m. Minor to 2% py. Persistent sp-gn-cp in qtz-carb veins, locally 1-2% basemetal sulphides over 1-2m.	20 40 60 80 100 120							
130.6 - 162.5m:			DACITIC TUFF Apparent fine pyroclastic with feldspar xyls & rare tiny lithic frags. Strongly bleached. Minor to 2% py. Minor sp-gn veins.	140 160 180							
162.5 - 178.6m:			PARTLY-DEFORMED RHYODACITE LAVA Bleached & sericitised. Mod-strongly cleaved & finely cracked. Common qtz-carb veins. Basal contact a 100mm qtz vein (no sign of Mt Black Thrust usually in this position. Minor to 2% py.	180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500							
178.6 - 365.65m: HANGINGWALL EPICLASTICS						MT BLACK VOLCANICS					
178.6 - 334.9m:			ALTERED & DEFORMED CRYSTAL-LITHIC EPICLASTICS Sst to fine breccia. Bands of fine tuffaceous sediment mark the tops of debris-flow pulses. Gen minor py-sp-gn-arseno-cp in veins. Best: 3-4% py-sp-gn-cp-arseno, @ 311.35 - 313.65m.	300 320 340 360 380 400 420 440 460 480 500							
334.9 - 343.05m:			FELSIC LAVA? Silicified feldspar-phyric volcanic. 1-2% py, minor arsenopy.	500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800							
343.05 - 356.4m:			FINE CRYSTAL-LITHIC SANDSTONE Strongly altered & moderately cleaved. 1% py-sp-gn-arsenopy.	800 820 840 860 880 900 920 940 960 980 1000							
356.4 - 365.65m:			INTENSELY DEFORMED BANDED CARBONATE-QUARTZ-SERICITE ROCK Schist & cataclasite composed largely of calcite. Poss after vitric tuffaceous sediments. V minor py, trace sp-gn-cp.	1000 1020 1040 1060 1080 1100 1120 1140 1160 1180 1200 1220 1240 1260 1280 1300							
365.65 - 366.6m:			ROSEBERY FAULT Puggy crushed and broken rock - mainly black shale. Minor py.	1300 1320 1340 1360 1380 1400 1420 1440 1460 1480 1500							
366.6 - 412.5m: DUNDAS GROUP SEDIMENTS						HANGINGWALL EPICLASTICS					
366.6 - 412.5m:			CHAMBERLAIN SHALE Deformed black pyritic shale and fine grey quartzose sst. Some deformation poss soft-sediment type. Sst increasing with depth.	1500 1520 1540 1560 1580 1600 1620 1640 1660 1680 1700 1720 1740 1760 1780 1800							
END OF HOLE						DUNDAS GROUP SEDIMENTS					

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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

HOLE No. 8Y2

PROJECT MT BLACK EL 12/88

Graphic Scale 1: 500

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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 - 178.6m: MT BLACK VOLCANICS				0 - 22.2m: Limonite on fractures. Trace dissem pyrite (best assoc with chlorite alt). Rare sp-gn in qtz-carb veins.									
						0 - 130.6m: DACITE LAVAS				22.2 - 45m: Minor to 1% dissem>>veinlet pyrite (1-2% py in tuff band @ 38.7m). Rare py>cp in qtz-carb veins.									
						Lithology: Fawn with pink tinge in places & v minor greenish-grey intervals. Med gr, hard, massive, even-grained & uniform, feldspar-porphyritic volc. Felds av 1-2mm, in felsic groundmass. Felds commonly weakly lineated (& occasionally deformed) by cleavage. Some poss flow-banding in places. V minor tiny chloritised ferromag laths (prob hornblende). 38.6-38.75m: Band of pale grey TUFFACEOUS SILTSTONE, sharp contacts: upper 370/LCA, lower 300/LCA. 41.4-41.6m: Band of pale grey TUFFACEOUS SHALE, sharp contacts 370/LCA. Both sediment bands appear in place with normal depositional contacts, but no obvious change in character of dacite adjacent to them. INTERMEDIATE DYKES (fi-med gr with chilled selvages, bleached, cleaved & cut by the mineralized veins) @ 86.35-86.75m (upper contact 400/LCA, lower 450/LCA in opp sense), & @ 113.6-115.0m (upper 350/LCA same sense as cleav, lower irreg, minor fuchsite alt). Alteration: Weak oxidation to 22.2m - sl leaching & limonite on fracts. Most notable alt is strong bleaching, with assoc(?) pervasive mod-strong carbonatisation & weaker sericitisation. This appears to be overprinting earlier mod silica-albite alt. Overall, alt is fairly strong & locally strong enough to detexture the rock. Minor patchy chloritisation - mainly above 40m. Trace fuchsite below 59m. Carbonatisation dec to weak below 100m. Common qtz-carb veins, to 250mm, av 5mm. Structure: Gen weakly cleaved, becoming mod-strong below 121.5m. Cleavage: 450/LCA @ 10m & 44.5m, 300/LCA @ 25.7m & 68.5m, 500/LCA @ 81m, 400/LCA @ 98m, 550/LCA @ 113.5m & 122.5m. Gen unbroken, except above 22.2m, where mod fractured & broken with several small shears (esp 19-22.2m: 25% water loss here). 100% water loss in fracture @ 75.6m. Sl broken by fracts below 120m. Shears 300/LCA @ 11.9m & 29.7m. Shear 800/LCA (opp sense to cleav), @ 121.5m. Shear @ 126.2m: 700/LCA (same sense as cleav). Basal contact transitional but fairly abrupt, 400/LCA.	10												
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5 cm

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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

HOLE No. BY 2

PROJECT: MT BLACK EL 12/88

Graphic Scale 1: 500

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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				
						Alteration: Mod-strong bleaching, esp below 149.5m. Mod sericite-silica-albite alteration, with patchy weak carbonatisation & chloritisation. Albitisation mod 133 -149m, elsewhere gen weak or absent. In places felds are sillif or have silica reaction rims. Abund carb>>qtz veinlets (av <5mm) and common qtz>carb veins (av 50 -250mm). Latter most common in the bleached zones, ie: above 133m and below 149.5m. Structure: Mod to strong cleavage (prob after 1° attitude, although no sign of layering): 45°/LCA @ 134m, 50°/LCA @ 145m, 60°/LCA @ 157.5m, 55°/LCA @ 162m, SI broken by fract 151.5 -159m. Basal contact gradational. Sampling: 032779: 135.25 -136.25m. (A -Petrology, B -W.R.Geochem).												
						162.5 - 178.6m: PARTLY-DEFORMED RHYO-DACITE LAVA Lithology: Pale khaki-fawn. Hard. Fi-med gr. A moderately tectonically deformed feldspar-phyric volc similar to that above 130m except for presence of small qtz phenos. Abund feldspars to 2mm, av 1-2mm, and minor qtz phenos av 1mm or less. Finer-gr zones in interval 167 -173m are prob due to locally-stronger deformation, but may originally have been tuffaceous horizons. Alteration: Mod sericitised & bleached, with lesser sillif and trace assoc albitisation. Weak-mod carbonatisation, best expressed by myriads of tiny irreg carb veinlets, but also pervasive. Unit characterised by v common carb>qtz veins (gen <5mm), and numerous large (+50mm) barren qtz>carb veins below 168m (esp 168 -173.35m, where veins to 700mm). Minor chlorite assoc with some of these larger veins. Structure: 1° rock texture partly tectonically disrupted and modified, with moderate to locally-strong cleavage: 40°/LCA @ 164.5m, 50°/LCA @ 175m. Extensive fine cracking and local brecciation. Some detexturing, apparently due to shearing, in qtz-veined zone 167 -173m. Largely unbroken. Basal contact a 100mm unbroken barren qtz vein 90°/LCA. Sampling: 032780: 175.5 -176.5m (A -Petrology, B -W.R.Geochem).												
						178.6 - 208.05m: TUFFACEOUS SILTSTONE, CRYSTAL SANDSTONE & FINE CRYSTAL-LITHIC BRECCIA Lithology: Gen greenish-fawn. Pale pink 195 -200.5m. A downhole-coarsening debris-flow sequence, at top comprising intercalated deformed & cleaved feld>>qtz xyl sst & lesser tuffaceous siltstone, passing below 194m into cleaved feld=qtz xyl-lithic breccia												

5 cm

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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

HOLE No. BY 2

PROJECT MT BLACK EL 12/88

Graphic Scale 1: 500

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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				
						Breccia is coarsest 199-205m, with angular to subangular clasts to 30mm (av 5-8mm). Below 205m, breccia fines down to coarse sst at base. Lithics mainly strongly silica-albite alt fi gr or feld-porph felsic lavas. Small pumice frags noted at 201.5m. Alteration: Above 195m, mod sericite>chlorite-silica-carb alt. 195 -202m, strong silica-albite>sericite alt. Below 202m, mod sericite-bleaching>silica-carb-chlorite alt. Ubiquitous irreg veinlets, veins & patches of carb (dolomite? or ankerite?). Lesser reg veins of barren qtz (>>carb) to 350mm. Minor fuchsite alt 195.5 -196.5m. Structure: In the finer-grained (& originally bedded) section above 188.5m, very strong tectonic deformation of 10 layering & texture by brecciation & cleavage (incl local crenulation). Feld xyls commonly stretched & deformed in this zone. Deformation is less strong below 188.5m although there is still a fairly well-developed tectonic fabric (rocks here were originally more massive). Shears, all same sense as cleav & on or adjacent to lithological changes, (eg: sst to siltst): 50°/LCA @ 180.4m, 70°/LCA @ 182.9m, 35°/LCA @ 194m. Mod broken around lower two shears, elsewhere largely unbroken. Strongly cleaved: 55°/LCA @ 179.6m, 58°/LCA @ 184.7m, 40°/LCA @ 198.5m, 55°/LCA @ 203m. Basal contact irreg & highly deformed. <u>SAMPLING:</u> 032788: 180.75m (Petrology). 032789: 189.25m (Petrology).												
						208.05 - 211.35m: DEFORMED BLACK TUFFACEOUS SILTSTONE & MASSIVE FINE SANDSTONE Lithology: Dark grey and fawn. Sedimentologically, the fine-grained top on the unit beneath. Highly deformed & irreg intercalations of dark grey/black sericitic siltstone (with characteristic abund fine qtz>carb veins), and massive fine feld>qtz xyl sst (with relatively minor fine qtz-carb veining). Siltst predom in uppermost 2m. Below this, siltst largely confined to irreg small lumps in massive sst. Dark colour in siltst due to trace carbonaceous material. Sst comprises xyls & xyl frags <1mm in sericitic matrix after vitric component. Alteration: Both rock types mod-strongly pervasively carb alt (Mn-calcite? or dolomite?). Weak-mod sericitisation. V minor local silif. Structure: Originally bedded - this highly deformed by mod-strong cleavage @ 40-50°/LCA (bedding now oriented // cleav). Fold nose @ 209.25m. Sl coarsening of grainsize in sst towards basal contact. Basal contact deformed & essentially gradational.												
						211.35 - 258m: MASSIVE CRYSTAL-LITHIC SANDSTONE Lithology: Gen pale greenish-grey. Pinkish-fawn above 222m & 250 -254m. Med gr, hard, unbroken. Granular rock after massive structureless sst, apparently the upper half of a debris-flow of which unit beneath is the lower section.												

5 cm

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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

PROJECT MT BLACK EL 12/88

HOLE No. BY 2

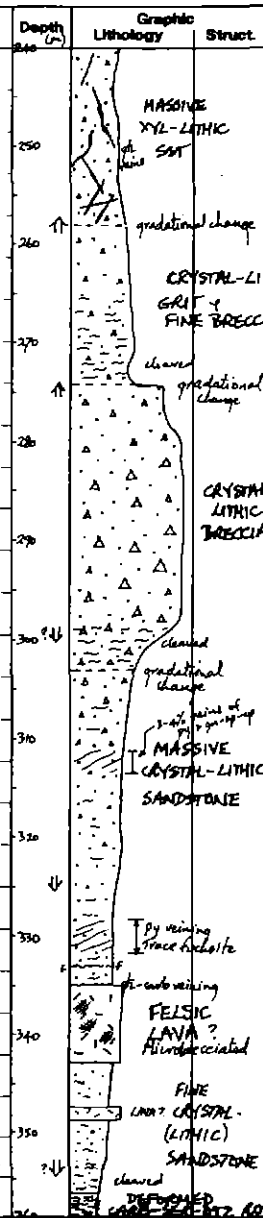
Graphic Scale 1: 500

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CORE RECOVERY				DESCRIPTION				CODES				
From m	Interval m	%	RQD	From m	Interval m	(incl LITHOLOGY, STRUCTURE & ALTERATION)		MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Made up largely of abund packed feld xyls & xyl frags (av <2mm), with lesser smaller qtz xyl grains, & minor lithic frags av 2-5mm, to 10mm. Identifiable lithics are silif finely feld-porph lavas. Alteration: 1° texture greatly obscured by alteration. Mod to strong silica-sericite-carb (-bleaching) alt throughout (strongest towards top & bottom sections of unit), with assoc albitisation above 222m & 250 -254m. Patchy chloritisation, mainly 224 -227m & 240.5 -242.5m. Mod pervasive carb alt, but most carb in abund thin irreg carb veinlets & veins typically <10mm. Carb has only mod reaction to HCl and weathers to yellow-orange colour (Mn calcite? or dolomite?). Lesser thicker more-reg qtz>carb veins, gen +10mm (to 250mm), becoming inc common below 236m. Structure: Rock is v even-grained until below 250m, where xyl grainsize coarsens v sl, with assoc inc in av size & number of lithic frags. Weak-mod cleavage (many xyls fractured by the tectonic fabric). Cleav: 35°/LCA @ 213m & 217.5m, 55°/LCA @ 230m, 45°/LCA @ 239m & 252m, 40°/LCA @ 245m. Basal limit arbitrary - a v gradational coarsening to rock type below. Sampling: 032781: 220.5 - 221.5m (W.R.Geochem).						
						258 - 303m: CRYSTAL-LITHIC BRECCIA Lithology: Pale pink to pale greenish-grey. Hard to v hard. An overall downward-coarsening debris flow pulse, with 3 recognisable parts that merge one into another: a) Upper section of xyl-lithic grt to fine breccia. Abund abraded xyl grains & frags of qtz & feld av 1-2mm, (qtz to 5mm), in fi gr silica-sericite matrix. Lesser lithic frags (silica-albite alt lavas), angular to subangular, av 5mm or less, to 15mm max. Lithics becoming inc abund & larger with depth. This sub-unit coarsens abruptly at 274.15m into: b) Gen open-frameworked xyl-lithic breccia, with abund angular to subrounded lithics (mainly silica-albite alt variable felsic lavas, also tuffaceous types incl rare mafic tuff), to 120mm, (av 15-30mm), & occ highly deformed clasts & small rafts of pale grey cherty siltst/shale to 300mm thick (mainly between 282.5 -285.5m). Lithics occur in qtz-feld xyl sst matrix (xyl grains av 1-2mm). c) Below 298.75m, breccia fines gradually downwards to xyl-lithic grt at base. Lithic frags are fewer & smaller (av <10mm, to 40mm). Both lithics & feld-qtz xyls commonly show sl signs of abrasion, with broken xyls & angular xyl frags. Occ large sl rounded qtz grains to 8mm. At 302.2m, 70 x 35mm shale frag with small feld xyls (growths?). Alteration: Mod to locally v strong silica>sericite-bleaching alt (+-albite or chlorite). Alt sufficient to partly obscure 1° texture. Common carb & qtz-carb veins (not as abund as in unit above). Minor pervasive carb alt. Persistent trace fuchsite below 274m. Structure: Rock partly deformed by mod lineation - apparently 1° flow texture overprinted by cleavage. This has partic deformed the siltst/shale clasts, suggesting they were unlithified when incorp into unit. Lineation strongest 265 -						

244	250	260	270	280	290	300	310	320	330	340	350	360

211.35 - 244.15m:	Ubiquitous minor to 1% dissemin. py.
258 - 303m:	Minor dissemin. pyrite. At 281m, 25mm clast of massive py. 15mm ditto @ 289.9m. Trace vein sp-gn below 280m. 10mm vein massive py @ 298.05m, 70°/LCA (opp sense to cleav).



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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

HOLE No. BY 2

PROJECT MT BLACK EL 12/88

Graphic Scale 1:

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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
						274.5m (the basal section of the liner upper part of the unit), and in basal 3-4m. Cleavage/1° lineation: 40°/LCA @ 267m, 281m & 296m. 35°/LCA @ 288m. Orientated core readings: @ 271.5m: cleav 38°/LCA (dip 80° to 266°M); @ 301.5m: cleav 43°/LCA (dip 84° to 260°M). Largely unbroken except for around fault 15°/LCA (same sense as cleav), centered @ 277.5m. Basal 'contact' rather arbitrary - no obvious base to debris-flow unit as it grades to unit below. Sampling: 032782: (W.R.Geochem) @ 272.25 -273.25m.								
						303 - 334.9m: CRYSTAL-LITHIC SANDSTONE Lithology: 1° texture very indistinct due to alteration & deformation. Pale creamy-fawn with greenish-grey intervals. Hard, massive, med gr granular rock with grainsize tending to dec below approx 323m. Abund qtz & feld xyl grains, av 1-2mm with occ qtz to 6mm (these gen subrounded). Few xyls are euhedral - most are sl rounded or fragmented, either by abrasion or corrosion & deformation. Much lesser lithic frags (mostly silica-albite alt felsic lavas), gen subangular, av <5mm, rarely to 35mm in upper part of unit. All in fi gr silica>sericite matrix. V rare pumice frags. Alteration: Mod to strong silica-bleaching>sericite-carb alteration. Minor chloritisation in places. Carb (Mn-calcite or dolomite?) largely in tiny veinlets or in larger irreg, occ banded, qtz-carb veins (to 120mm). Veinlets & veins most abund below 331.5m. Gen only minor pervasive carb alt. Trace tuchsite alt 328.5 -331.7m, assoc with zone of py veining. Structure: Mod cleaved: 33°/LCA @ 316m & 327m. Orientated core reading: @ 304.5m: cleav 35°/LCA (dip 76° to 263°M). Gen unbroken. Sl broken 330 -334.2m around fault 65°/LCA @ 333.2m. Basal contact indistinct due to irreg zone of qtz-carb veining.								
						Sampling: 032783: 327 -328m (W.R.Geochem). 032784: (Assay) @ 311.35 - 312.4m. 032785: (Assay) @ 312.4 - 313.65m.								
						334.9 - 343.05m: FELSIC LAVA? Lithology: 1° texture indistinct due to strong alteration. Pale creamy grey. Hard. Med gr. Massive & even-textured. Indistinct white feldspars, av 1-2mm, in silica-flooded groundmass. No qtz xyls or lithic frags noted. Alteration: V strongly silicified, with assoc strong bleaching-sericite-carb alteration. Carb (Mn-calcite or dolomite?), in v common tiny veinlets or larger veins (+qtz). Minor patches of pervasive carb alt. Minor chlorite veinlets around fault @ 342m. Structure: Unit is finely brecciated throughout by abund microfractures gen filled with carb or sericite. Weak cleavage. At 342m, 80mm chlorite-cemented fault breccia 70°/LCA. Basal contact indistinct due to zone of irreg qtz-carb veining.								
										303 - 311.3m: Minor pyrite, trace sp-gn. Mostly as veins to 10mm in opp sense to cleav. These veins often assoc with chlorite or qtz-carb veins.				
										311.35 - 313.65m: 3-4% py>gn-sp-cp>arseno-vein-style & assoc with zone of local chloritisation. Sulph veins gen in opp sense to cleav & often assoc with brecciated qtz-carb veins. Largest sulph vein is @ 311.4m: 20mm, 60°/LCA.				
										313.65 - 334.9m: Minor to 1% pyrite - dissem & vein-style as before. V minor gn & grey sulphide - prob a Bi or Ag sulphosalt. Best veins (all opp sense to cleav): 318m: 10mm py, 60°/LCA. 330.15m: 8mm py, 60°/LCA. 330.7m: 10mm massive py with trace cp, 70°/LCA. 331.1m: 5mm py, 75°/LCA, with minor grey sulph. (Several other py veins <5mm in zone 328.5 -331.5m). 333.2 -333.4m (assoc with fault): several veins 3-15mm of massive grey sulph.				
										334.9 - 343.05m: 1-2% persistent dissem py, with minor dissem & veinlet arsenopy.				

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HOLE No. BY 2

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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
						<u>Sampling:</u> 032786: (A -Petrology, B -Assay & W.R.Geochem), @ 336.5 -337.5m.								
						343.05 - 356.4m: FINE CRYSTAL (-LITHIC) SANDSTONE								
						<u>Lithology:</u> Pale creamy-lawn. Hard.								
						1° texture v indistinct due to strong alteration. Microfractured interval from 347.5 -348.8m appears similar to lava(?) unit above.				343.05 - 356.4m:				
						Fi-med gr massive granular rock, composed largely of feld xyl grains, av 1mm, to 2mm, with lesser & smaller qtz grains.				Minor to 1% py>sp-gn-				
						All in fi gr silica-sericite matrix, poss originally vitric.				arsenopy>cp, both dissem				
						Minor lithic grains, gen approx 2-3mm, rarely to 10mm. Lithics mostly felsic lavas (often pyritic).				& in veinlets.				
						Both xyls & lithics appear abraded & fragmented - few xyls are euhedral.								
						<u>Alteration:</u> Strong silica-sericite-carb-bleaching alteration.								
						Carb (Mn-calcite or dolomite?), in abund veinlets, diffuse vein-like patches, & veins (latter + qtz, to 120mm). Minor pervasive carb.								
						Rare trace fuchsite throughout.								
						<u>Structure:</u> Unbroken.								
						Mod cleaved, becoming more cleaved with depth.								
						Cleavage: 45°/LCA @ 344m, 40°/LCA @ 350m, 60°/LCA @ 355m.								
						@ 351.5m: shear 53°/LCA (same sense as cleav).								
						Grainsize dec over basal 2-3m.								
						Basal contact abrupt - along cleavage, 75°/LCA.								

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HOLE No. BY 2

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HOLE No. BY 2

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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

HOLE No. BY 2

PROJECT: HT BLACK EL 12/88

Graphic Scale 1:

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CORE RECOVERY, MAGNETIC SUSCEPTIBILITY + S.G. MEASUREMENTS

CORE RECOVERY										M.SUS										S.G									
FROM	TO	REC	IREC	DEPTH	M.SUS	DEPTH	WEIGHT	VOL	S.G	FROM	TO	REC	IREC	DEPTH	M.SUS	DEPTH	WEIGHT	VOL	S.G	FROM	TO	REC	IREC	DEPTH	M.SUS	DEPTH	WEIGHT	VOL	S.G
0	3	2.7	90.00	3	0.13				0.00	130.5	132.5	3	100.00	133.5	0.1				0.00	277.5	280.5	3	100.00	280.5	0.08	280	591	218	12.71
3	4.3	1.3	100.00	4.3	0.13				0.00	132.5	136.5	3.1	103.33	136.5	0.18				0.00	280.5	283.5	3	100.00	283.5	0.09				0.00
4.3	5.8	1.35	90.00	5.8	0.12				0.00	136.5	139.5	2.9	96.67	139.5	0.13				0.00	283.5	286.5	3	100.00	286.5	0.04				0.00
5.8	7.5	1.7	100.00	7.5	0.09				0.00	139.5	142.5	3	100.00	142.5	0.08				0.00	286.5	289.5	3	100.00	289.5	0.09				0.00
7.5	10.5	3	100.00	10.5	0.07				0.00	142.5	145.5	3	100.00	145.5	0.03				0.00	289.5	292.5	3	100.00	292.5	0.1				0.00
10.5	12.2	1.7	100.00	12.2	0.13				0.00	145.5	148.5	3	100.00	148.5	0.19				0.00	292.5	295.5	3	100.00	295.5	0.09				0.00
12.2	13.5	1.3	100.00	13.5	0.15				0.00	148.5	151.5	3	100.00	151.5	0.09				0.00	295.5	298.5	3	100.00	298.5	0.09				0.00
13.5	14	0.5	100.00	14	0.27				0.00	151.5	152.7	1.1	91.67	152.7	0.07				0.00	298.5	301.5	3	100.00	301.5	0.05				0.00
14	14.5	2.4	96.00	14.5	0.18				0.00	152.7	154.5	1.7	94.44	154.5	0.02				0.00	301.5	304.5	3	100.00	304.5	0.03				0.00
14.5	19.5	3.00	100.00	19.5	0.19				0.00	154.5	157.5	3	100.00	157.5	0.04				0.00	304.5	307.5	3	100.00	307.5	0.09				0.00
19.5	22.2	2.25	83.33	22.2	0.18				0.00	157.5	160.5	3	100.00	160.5	0.09	160	502	187	12.68	307.5	310.5	3	100.00	310.5	0.12				0.00
22.2	25.3	3.1	100.00	25.3	0.17				0.00	160.5	163.5	3	100.00	163.5	0.11				0.00	310.5	313.5	3	100.00	313.5	0.1				0.00
25.3	28.4	3.1	100.00	28.4	0.25				0.00	163.5	166.5	3	100.00	166.5	0.06				0.00	313.5	316.5	3	100.00	316.5	0.09				0.00
28.4	31.5	3.1	100.00	31.5	0.14				0.00	166.5	169.5	2.95	98.33	169.5	0.07				0.00	316.5	319.5	3	100.00	319.5	0.09				0.00
31.5	34.5	3	100.00	34.5	0.19				0.00	169.5	172.5	3	100.00	172.5	0.05				0.00	319.5	322.5	3	100.00	322.5	0.11	320	536	196	12.75
34.5	37.5	3	100.00	37.5	0.18	40	622	1255	12.44	172.5	175.5	3	100.00	175.5	0.1				0.00	322.5	325.5	3	100.00	325.5	0.1				0.00
37.5	40.5	3	100.00	40.5	0.2				0.00	175.5	178.5	3	100.00	178.5	0.04				0.00	325.5	328.5	3	100.00	328.5	0.1				0.00
40.5	43.5	3	100.00	43.5	0.14				0.00	178.5	181.5	3	100.00	181.5	0.09				0.00	328.5	331.5	2.95	98.33	331.5	0.06				0.00
43.5	46.5	3	100.00	46.5	0.19				0.00	181.5	184.5	2.9	96.67	184.5	0.09				0.00	331.5	333.7	2.15	97.75	333.7	0.12				0.00
46.5	49.5	3	100.00	49.5	0.19				0.00	184.5	187.5	3	100.00	187.5	0.18				0.00	333.7	336.7	2.8	93.33	336.7	0.06				0.00
49.5	52.5	3	100.00	52.5	0.16				0.00	187.5	190.5	3	100.00	190.5	0.14				0.00	336.7	337.5	0.8	100.00	337.5	0.06				0.00
52.5	55.5	3	100.00	55.5	0.21				0.00	190.5	193.5	2.85	95.00	193.5	0.42				0.00	337.5	340.5	2.9	96.67	340.5	0.09				0.00
55.5	58.5	3	100.00	58.5	0.21				0.00	193.5	196.5	3	100.00	196.5	0.1				0.00	340.5	343.5	3	100.00	343.5	0.06				0.00
58.5	61.5	3	100.00	61.5	0.13				0.00	196.5	199.5	3	100.00	199.5	0.05				0.00	343.5	346.5	3	100.00	346.5	0.11				0.00
61.5	64.5	3	100.00	64.5	0.15				0.00	199.5	202.5	3	100.00	202.5	0.05	200	704	1256	12.75	346.5	349.5	3	100.00	349.5	0.19				0.00
64.5	67.5	3	100.00	67.5	0.14				0.00	202.5	205.5	3	100.00	205.5	0.1				0.00	349.5	352.5	3	100.00	352.5	0.17				0.00
67.5	70.5	3	100.00	70.5	0.18				0.00	205.5	208.5	2.95	98.33	208.5	0.09				0.00	352.5	355.5	3	100.00	355.5	0.17				0.00
70.5	72.3	1.8	100.00	72.3	0.13				0.00	208.5	211.5	3	100.00	211.5	0.08				0.00	355.5	358.5	3	100.00	358.5	0.16				0.00
72.3	73.5	1.2	100.00	73.5	0.13				0.00	211.5	214.5	3	100.00	214.5	0.05				0.00	358.5	361.5	3	100.00	361.5	0.04	360	423	153	12.76
73.5	75.6	2.1	100.00	75.6	0.17				0.00	214.5	217.5	3	100.00	217.5	0.07				0.00	361.5	364.5	2.9	96.67	364.5	0.39				0.00
75.6	76.5	0.9	100.00	76.5	0.13				0.00	217.5	220.5	3	100.00	220.5	0.13				0.00	364.5	366.3	1.8	100.00	366.3	0.13				0.00
76.5	79.5	3	100.00	79.5	0.15				0.00	220.5	223.5	3	100.00	223.5	0.1				0.00	366.3	368.6	2.3	100.00	368.6	0.04				0.00
79.5	82.5	3	100.00	82.5	0.14	80	721	1262	12.75	223.5	226.5	3	100.00	226.5	0.11				0.00	368.6	370.5	1.7	89.47	370.5	0.04				0.00
82.5	85.5	3	100.00	85.5	0.14				0.00	226.5	229.5	3	100.00	229.5	0.07				0.00	370.5	373.5	3	100.00	373.5	0.34				0.00
85.5	88.5	3	100.00	88.5	0.18				0.00	229.5	232.5	3	100.00	232.5	0.15				0.00	373.5	376.5	3	100.00	376.5	0.05				0.00
88.5	91.5	3	100.00	91.5	0.22				0.00	232.5	235.5	3	100.00	235.5	0.18				0.00	376.5	379.5	3	100.00	379.5	0.04				0.00
91.5	94.5	3	100.00	94.5	0.13				0.00	235.5	238.5	3	100.00	238.5	0.06				0.00	379.5	382.5	3	100.00	382.5	0.17				0.00
94.5	97.5	3	100.00	97.5	0.17				0.00	238.5	241.5	3	100.00	241.5	0.1	240	480	175	12.74	382.5	385.5	2.9	96.67	385.5	0.03				0.00
97.5	100.5	3	100.00	100.5	0.24				0.00	241.5	244.5	3	100.00	244.5	0.05				0.00	385.5	388.5	3.1	103.33	388.5	0.08				0.00
100.5	103.5	3	100.00	103.5	0.12				0.00	244.5	247.5	3	100.00	247.5	0.04				0.00	388.5	391.5	3	100.00	391.5	0.04				0.00
103.5	106.5	3	100.00	106.5	0.03				0.00	247.5	250.5	3	100.00	250.5	0.05				0.00	391.5	394.5	3	100.00	394.5	0.09				0.00
106.5	109.5	3	100.00	109.5	0.13				0.00	250.5	253.5	3	100.00	253.5	0.06				0.00	394.5	397.5	3	100.00	397.5	0.1				0.00
109.5	112.5	3	100.00	112.5	0.11				0.00	253.5	256.5	3	100.00	256.5	0.06				0.00	397.5	400.5</								

PASMINCO EXPLORATION DIAMOND DRILL HOLE SUPPLEMENTARY DATA

PROJECT :

032772A Dacitic Dyke BY2, 40.2m

A fine to medium grained equigranular rock broadly dacitic in composition.

Mineralogy	%
Quartz	20
Plagioclase	59
Sericite	10
Chlorite	1
Carbonate	10
Secondary Fe Oxides	<1

This sample is dominated by interlocking aggregates of subhedral to euhedral plagioclase crystals (0.1 - 2 mm) with appreciable quantities of anhedral interstitial quartz. The plagioclase is twinned and displays weak concentric zoning. It also displays some alteration to sericite, particularly along fractures and patchy alteration to carbonate.

In addition, there are a few dispersed aggregates of chlorite which may be replacing original ferromagnesian phases, a few anhedral grains of pyrite (0.1 mm) and dispersed grains (0.1 - 0.15 mm) of secondary iron oxides possibly after magnetite microphenocrysts. The sericite frequently occurs in fine veinlets defining one moderate cleavage. The rock is traversed by several narrow (0.1 - 0.25 mm wide) veins rich in carbonate and quartz which also contain minor pyrite.

The medium grained character and interlocking textures displayed by this rock suggest relatively slow cooling as a moderate sized intrusive body. The presence of abundant plagioclase and moderate quantities of quartz with evidence for only a small quantity of ferromagnesian phases suggests a composition between dacite and andesite.

032772A Dacitic Lava BY2, 135-25m

A porphyritic plagioclase-phyric silicic (dacitic) lava with moderate sericitic and carbonate alteration.

Mineralogy	%
Plagioclase	60
Quartz	20
Sericite	10
Carbonate	10
Pyrite	<1
Secondary Fe Oxides	<1

Euhedral to subhedral plagioclase crystals (0.1 - 1.5 mm) are the only phenocryst phase present. These generally appear unzoned and display weak sericitic and patchy carbonate alteration. Most of the sericite and patchy carbonate alteration is fairly evenly dispersed throughout the fine grained (0.01 - 0.02 mm) groundmass. This is dominated by fine laths of plagioclase which are weakly aligned depicting original flow banding, and interstitial anhedral quartz. There is no petrographic evidence for amygdalae in this specimen.

The fine sericite occurs as interconnecting fine veinlets which are strongly aligned depicting a single cleavage. The carbonate occurs as disseminated individual grains (0.01 - 0.1 mm) and aggregates of grains.

The rock is also traversed by several veins (0.1 - 2 mm wide) rich in relatively coarse grained (up to 0.2 mm) quartz and minor carbonate and pyrite. The quartz in several of these veins occurs as recrystallised grains with curved margins which are elongated in the cleavage suggesting that they were introduced pre-deformation. In contrast, several other veins do not display evidence of recrystallisation during the major Devonian deformation.

The even distribution of euhedral to subhedral plagioclase phenocrysts in a fine grained silicic groundmass is best interpreted as indicating a lava of broadly dacitic composition.

032780A Rhyolitic/Rhyodacitic Lava BY2, 176.5m

A sparsely porphyritic rhyolitic lava which has experienced substantial sericitic and carbonate alteration.

Mineralogy	%
Feldspar	35
Quartz	30
Sericite	25
Carbonate	10
Pyrite	<1
Secondary Fe Oxides	<1
Zircon	trace

This rock consists of euhedral to subhedral partially resorbed phenocrysts of quartz (0.2 - 0.5 mm), and euhedral plagioclase phenocrysts (0.5 - 2 mm) in a strongly altered and recrystallised silicic groundmass. Twinning is still evident in some feldspar phenocrysts but others are almost completely replaced by fine intergrowths of sericite. These more altered phenocrysts may have been alkali feldspar. There are no chlorite-rich aggregates which might have indicated the presence of ferromagnesian phenocrysts.

The groundmass consists of recrystallised quartz and feldspar aggregates (typically 0.05 - 0.15 mm), but the feldspar has been substantially altered to sericite which has been recrystallised during deformation into fine intergranular veinlets which define one reasonably distinct cleavage. However, the rock is not strongly deformed as plagioclase twin lamellae are not bent, and quartz phenocrysts do not display undulose extinction or subgrain development or other features indicative of recrystallisation under high strain conditions. Some quartz-feldspar aggregates display a vague sector-type extinction suggestive of recrystallised spherulites. However, this is not an obvious or well-developed feature.

Patchy carbonate alteration occurs throughout the groundmass, but most of the carbonate occurs with introduced quartz in cross-cutting veins (0.05 - 0.5 mm wide). These veins clearly cut and post-date the cleavage. There are a few scattered grains of pyrite and zircon and some secondary Fe oxides.

The distinctly porphyritic character of this rock with euhedral quartz and feldspar phenocrysts evenly distributed throughout a silicic groundmass provides the best support for the interpretation that this was a lava of rhyolitic to rhyodacitic composition.

032786A Volcaniclastic sandstone/mass flow deposit BY2, 336.5m

Most likely a poorly sorted volcaniclastic sandstone composed of abundant angular feldspar grains in a fine, recrystallised feldspathic matrix.

Mineralogy	%
Plagioclase	75
Quartz	10
Carbonate	8
Sericite	4-5
Chlorite	<1
Pyrite	2-3
Leucokene after sphene	<1
Zircon	trace

This sample is composed of abundant angular to subrounded plagioclase crystals (0.3 - 2 mm) which sometimes occur in aggregates dispersed in a fine grained (0.01 - 0.1 mm) matrix composed predominantly of recrystallised xenoblastic plagioclase and subordinate quartz. The plagioclase grains generally display very weak sericite and clay alteration with occasionally more extensive patchy replacement by carbonate. The matrix feldspar is predominantly unaltered.

Most of the alteration is concentrated along distinct interconnecting fractures which imparts a brecciated appearance to the whole rock. The major alteration phases along the fractures are sericite and carbonate, but there are also aggregates of quartz with carbonate, and quartz with chlorite. Neither the sericite or the chlorite in these veinlets is strongly aligned suggesting that the alteration is post-deformation, or that this sample somehow was shielded from recrystallisation during deformation. The former interpretation is preferred as the character of this alteration (ie. not pervasive) differs from the sericitic alteration evident in the majority of other samples examined from this area. In many other respects this could be interpreted as a phenocryst-rich dacitic lava. The matrix is relatively fine grained and homogeneous and there is a lack of lithic clasts of discrete character. However, the evidence favouring a clastic origin for this sample includes the angular to subrounded character of the plagioclase grains and the lack of euhedral or partially resorbed phenocrysts.

Pyrite grains (0.02 - 0.1 mm) are disseminated throughout the rock and do not appear to be closely associated with the other alteration assemblages in the fracture-vein systems. There are also dispersed grains of leucokene after rutile or sphene through the matrix and a trace of residual zircon.

The poorly sorted and matrix supported nature of this rock suggests that it represents some sort of rapidly deposited submarine mass-flow unit. In addition, the absence of a variety of lithic clasts and angular nature of the grains suggest that it was probably locally sourced from a single parental rock type. This was most likely a fine hyaloclastite deposit of dacitic composition which included fragmented phenocryst material and abundant silicic ash.

PROJECT: MT. BLACK EL 12/88

PASMINCO EXPLORATION DIAMOND DRILL HOLE SUPPLEMENTARY DATA

HOLE No. BY 2

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PETROLOGICAL SAMPLE DESCRIPTIONS

032788 Volcaniclastic sandstone BY2, 180.75m

A clastic rock composed of siliceous (lentic fragments, detrital quartz and possible chlorite pseudomorphs after plagioclase set in a relatively fine grained siliceous matrix which has been extensively altered to sericite, carbonate and quartz.

Mineralogy	%
Quartz	44
Sericite	30
Chlorite	10
Carbonate	10
Pyrite	1

This is an extremely altered siliceous rock, in which the original textures are largely masked by alteration. However, there are several features which suggest that this rock is from part of the quartz-phyric hangingwall in the Rosebery sequence rather than the Mt. Black Volcanics. Firstly, there appear to be some relic subhedral crystals of quartz which retain partial resorption embayments. These occur with chlorite aggregates, some of which have a distinctive tabular form, that suggests they may be pseudomorphs of feldspar grains. In addition, there are several rounded xenoblastic aggregates of quartz (0.1 - 0.2 mm) which closely resemble recrystallised lithic fragments previously described from the hangingwall epidiorites. In a few instances, these occur adjacent to relatively fine grained (0.02 - 0.05 mm) xenoblastic matrix quartz that may represent a recrystallised siliceous ash component.

Much of the remaining matrix material has been extensively replaced by broad patches of sericite, and to a lesser extent, carbonate. The sericite displays two oblique directions of weak preferential alignment with one of these being dominant throughout the section. In addition, there has been significant addition of silica as veins and relatively coarse grained (0.2 - 1 mm) patches which are associated with the carbonate alteration.

In summary, although many of the primary textural features of this rock are obscured by alteration, the observable mineralogy and textures suggest it is part of the Rosebery hangingwall sequence.

032787A Dacitic Lava BY2, 364m

Probably a dacitic lava which has been deformed and extensively carbonate altered with subordinate sericite alteration.

Mineralogy	%
Quartz	65
Plagioclase	3-5
Carbonate	25
Sericite	5
Secondary Fe Oxides	<1

Relics of fractured, subhedral and twinned plagioclase phenocrysts (0.3 - 1 mm) are recognisable through the strong carbonate and sericite alteration in this rock. There are also a few relatively large grains of quartz (0.2 - 0.3 mm) with subidiomorphic forms which may be relic phenocrysts. However there are similar sized grains occurring throughout the matrix in aggregates which are related to quartz veining and are clearly secondary in origin.

The least altered portions of the groundmass consist of very fine grained (0.01 - 0.05 mm) aggregates of xenoblastic quartz with fine sericite and carbonate. Considerable portions of the groundmass have been replaced by aggregates of carbonate and quartz, and to a lesser extent, fine veinlets of sericite. Quartz and carbonate occur in irregular relatively coarse grained aggregates (0.1 - 0.3 mm) and also in cross-cutting veins (0.1 cm wide). The sericite alteration appears to be most developed in the more strongly sheared parts of the rock. In these areas the sericite shows two oblique directions of preferred orientation.

Despite the extensive quartz, carbonate and sericite alteration of this sample, the recognition of apparently subhedral plagioclase phenocrysts in a relatively homogeneous siliceous groundmass (least altered portion), suggests that this was originally a lava of dacitic composition.

032789 Very Altered Volcaniclastic Sandstone BY2, 189.25m

A strongly silica and sericite altered siliceous volcaniclastic rock with minor disseminated pyrite and quartz-carbonate veining.

Mineralogy	%
Quartz	63
Sericite	30
Carbonate	5
Chlorite	<1
Pyrite	2
Zircon	Trace

The primary textures in this sample are also very largely obscured by the effects of hydrothermal alteration. However, there are a few euhedral to subhedral quartz 'phenocrysts' (up to 1.5mm) remaining which display partial resorption embayments. In addition, there are a significant number of ovoid to rectangular aggregates (1-2mm) of xenoblastic quartz grains which appear to be pseudomorphs after feldspar crystals. Individual grains in these aggregates are relatively coarse (0.1-0.2mm), and are characterised by sutured margins.

The matrix is dominated by fine sericite, xenoblastic quartz, several aggregates of chlorite, carbonate and disseminated pyrite. The sericite often occurs in irregular patches with no strong preferred orientation, although some subparallel veinlets and patches characterised by platy alignment indicate the presence of a weak cleavage. The chlorite aggregates are closely associated with carbonate, and are probably a breakdown product of a primary phase. The quartz in the matrix appears to be relatively coarse grained (0.1-0.2mm) aggregated similar to those pseudomorphing feldspar crystals, but the matrix quartz is more intimately intergrown with sericite. The section is also traversed by several quartz veins (0.1-1.5mm wide), one of which contains significant carbonate.

Many of the recrystallised quartz aggregates in the matrix of this specimen resemble the relatively coarse grained recrystallised volcanic lithic fragments in sample 032788A. Although the matrix of this specimen does not display the same degree of heterogeneity as sample 032788A possibly because the alteration is more intense, it has closer mineralogical and textural affinities with 032788A than 032790A. Consequently, I favour the interpretation that this sample is also a siliceous epidioritic rock. The resorbed quartz phenocrysts are likely to occur within

porphyritic lithic fragments, and the quartz pseudomorphs after feldspar crystals are likely to be reworked clastic feldspar grains.

067057

APPENDIX 2
RE-LOGS OF AUSTMIN DRILLHOLES MBD1-4



PASMINCO EXPLORATION DIAMOND DRILL CORE RECORD

HOLE No. MBD1

Page 1 of 5

LOCATION	MT BLACK	OBJECTIVE TO TEST UTEM ANOMALY 6B AND BROAD SOIL GEOCHEMICAL ANOMALY.						LOCATION/SURVEY DATA (AMG)										
PROJECT	EL 12/88							Grid	AMG	POSITION ON PASMINCO TYPE PLAN	RL Collar m	562 (580)						
PROSPECT								Northing m	5 376 972	5 376 950	Bearing Collar	270°						
DESIGNED BY	AUSTMIN NL							Easting m	381 494	381 540	Dip Collar	-70°						
LOGGED BY								DH Survey Type			Length Hole m 295.5							
RELOGGED	J.G. PURVIS MARCH 1992	RESULT HOLE INTERSECTED SERIES OF THICK DACITE LAVA FLOWS, ALL OF IDENTICAL COMPOSITION. NO SULPHIDES ENCOUNTERED. AUSTMIN CONSIDERED UTEM RESPONSE DUE TO FAULTED ZONE 281-293m.						Depth m	Bearing	Dip	Depth m	Bearing	Dip					
COMMENCED	9.4.89							50	269°	-68°								
COMPLETED	20.4.89							100	272°	-67.5°								
DRILLED BY	TAS DIAMOND DRILLING							150	274°	-67°								
DRILL RIG								200	276°	-67°								
SIGNIFICANT INTERSECTIONS								250	278°	-67°								
								295	279°	-66.5°								
SIGNIFICANT CORE LOSS			POOR GROUND CONDITION ZONES															
From m	To m	% Lost	From m	To m	Condition													
HOLE SIZE			HOLE CONDITIONS AFTER COMPLETION															
Size	Depth m	Collar																
HQ	24	Steel Casing																
NQ	295.5	PVC Casing	TO 295.5m (40mm)															
		Ground Water																
		Wedge																
		Drill Pad																

067059

HOLE MB01

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000000

END OF HOLE

PROJECT :

**PASMINCO EXPLORATION
DIAMOND DRILL HOLE SUPPLEMENTARY DATA**

Page 4 of 5

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
MBD 1	4.5		3.17	NR WHOLE CORE
	6.0		4.36	
	7.4		3.35	
	8.8		4.16	
	10.5		1.20	
	11.3		1.04	
	12.0		1.73	
	15.0		.08	
	15.3		.16	
	22.5		3.26	
	24.0		3.75	NR WHOLE CORE
	25.1		2.56	NR SPLIT CORE
	28.5		2.57	"
	31.5		3.47	NR WHOLE CORE
	32.5		2.15	
	34.5		4.65	
	37.0		4.96	
	39.8		4.58	
	40.5		4.16	
	46.5		5.94	
	49.5		5.46	
	50.5		5.03	
	52.0		3.72	
	55.5		5.30	
	58.5		7.53	
	61.5		8.85	
	64.5		7.0	
	67.5		4.85	
	70.5		9.58	NR SPLIT CORE
	72.9		5.53	WHOLE CORE
	76.5		2.17	
	77.5		1.13	
	82.5		3.76	
	85.5		2.42	
	90.5		4.41	SPLIT CORE
	93.5		1.72	WHOLE CORE
	94.5		3.99	
	97.5		0.14	

DDH No	From	To	Reading	Comment
MBD 1	100.5		0.13	NR WHOLE CORE
	103.5		0.08	
	106.5		0.11	
	109.5		0.13	
	112.5		0.10	
	115.5		0.14	
	118.5		0.14	
	121.5		0.16	
	124.5		0.44	
	127.5		0.12	
	130.5		0.20	
	133.5		0.13	
	136.5		0.11	
	139.5		0.10	
	142.5		0.09	
	145.5		0.34	NR SPLIT CORE
	148.5		0.56	"
	151.1		0.53	NR WHOLE CORE
	154.2		1.93	
	157.3		0.72	
	160.7		0.22	
	163.5		1.27	
	166.0		0.46	
	169.0		1.64	
	173.0		0.27	
	176.0		0.14	
	180.5		3.88	
	183.5		1.98	
	184.5		1.95	
	187.5		0.66	
	190.5		1.54	
	193.5		2.26	
	199.5		4.99	
	202.5		3.84	
	205.5		2.07	
	208.1		0.36	
	211.5		2.43	
	214.5		0.64	

067062

PROJECT :

PASMINCO EXPLORATION DIAMOND DRILL HOLE SUPPLEMENTARY DATA

HOLE No. M B D 1

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MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
MBD 1	217.5		1.85	NR WHOLE CORE
	220.5		5.39	
	223.5		0.58	
	226.5		0.27	
	232.4		0.09	
	234.9		0.93	
	236.6		0.25	
	238.5		0.10	
	241.5		0.09	
	244.5		0.04	
	247.5		0.19	
	250.5		0.01	NR SPLIT CORE
	252.0		0.02	WHOLE CORE
	254.7		0.09	
	257.2		0.19	
	259.5		0.11	
	262.3		0.15	
	265.5		2.20	
	268.5		3.39	
	272.5		4.50	
	274.5		1.19	
	277.5		0.11	
	279.3		0.09	
	281.9		0.11	
	288.0		0.06	
	292.8		0.13	
E.O.H.	295.5		0.11	

S G READINGS

DDH No	DEPTH	DRY weight	WET weight	Volume	S G	Comment
MBD 1						
	SAMPLE	259		95		
	4.5 M	1266		1.84		NR WHOLE CORE
	40.0	394		1.48		NR WHOLE CORE
	80.0	102		2.25		"
	120.0	590		2.20		"
	160.0	590		2.21		"
	SAMPLE	259		95		"
	200.0	139		53		NR SPLIT CORE
	240.0	360		1.35		" "
	280.1	339		1.26		" "
	SAMPLE	259		95		

067063



PASMINCO EXPLORATION DIAMOND DRILL CORE RECORD

HOLE No. LOG - MBD2

Page 1 of 4

LOCATION		OBJECTIVE		LOCATION/SURVEY DATA (AMG)					
PROJECT	MT BLACK	TO TEST UTEM ANOMALY 10B, COINCIDENT IP ANOMALY, AND COPPER SOIL ANOMALY.		Grid	AMG	POSITION ON MAP/INSTRUMENT	RL Collar m	466 (480)	
PROSPECT	EL 12/88			Northing m	5 375 292	5 375 215	Bearing Collar	270°	
DESIGNED BY	AUSTMIN NL			Easting m	381 897	381 890	Dip Collar	-55°	
LOGGED BY				DH Survey Type		Length Hole m			209.7
RELOGGED	J.G. PURVIS MARCH 1992								
COMMENCED		RESULT		Depth m	Bearing	Dip	Depth m	Bearing	Dip
COMPLETED		SUMMARY: Monotonous sequence of dacitic volcanics. Apart from apparent juvenile clastic in top 49m, rest of hole essentially a single eruptive or intrusive lava unit cut by two major structures and minor mafic dykes. Rocks are non-magnetic. No sulphides. AUSTMIN ASCRIBED UTEM ANOMALY TO MAJOR FAULT ZONE @ 130-134m.		70	IN ROADS	-54°			
DRILLED BY				124	276°	-53°			
DRILL RIG				184	278°	-52°			
				209	279°	-51°			
SIGNIFICANT INTERSECTIONS									
From m	To m	Interval m	Cu	Pb	Zn	Ag	Au	Comments	
			95	50	160	<0.5	<0.008	MAXIMUM ASSAY VALUES	
SIGNIFICANT CORE LOSS									
From m	To m	% Lost	POOR GROUND CONDITION ZONES						
From m	To m	% Lost	From m	To m	Condition				
HOLE SIZE									
Size	Depth m	Collar	HOLE CONDITIONS AFTER COMPLETION						
HQ	30	Steel Casing	HQ 9-30m						
NQ	209.7	PVC Casing	To 203m (40mm)						
		Ground Water							
		Wedge							
		Drill Pad							

0670064

PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

PROJECT: MT BLACK EL 12/88

HOLE No. MBD 2

Graphic Scale 1: 1000

Page 2 of 4

CORE RECOVERY				DESCRIPTION				CODES					
From m	Interval m	%	RCD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						<u>0 - 49m: DACITIC VOLCANIC (PYROCLASTIC?)</u> Light brown. Soft. Highly fractured (shattered in places). Very strongly oxidized and clayey above 20m. Ox decreasing gradually with depth. Blotchy-textured feldspar-porphyrific volc with abund felds of varying sizes, av 1-2mm with some to 4mm. Rare small qtz phenos. Rock characterised by patchy textural variations, incl size & abund of felds, but best expressed by diffuse patches (gen <30mm) of pink silica-albite alteration, or less commonly chlorite alt. Some of these alt patches have different texture to the surrounding rock, incl occasional qtz phenos, and appear to be after indistinct frags of (rhyo-) dacitic lava. These frags display vague lineation in places (350/LCA @ 42m) - poss weak cleavage. Where lesser oxidised, rock is mod silica-albite-chlorite-sericite altered. Highly oxidized MAFIC DYKES @ 15.5 -17.5m, 19 -20m, 22.4 -23.1m, 25.5 -26.5m. Very gradational change at base.							
						<u>49 - 130m: RHYO-DACITE LAVA</u> Greenish-grey. Massive, med gr, uniform. Hard. Oxidized along fracts down to 80m. Fractured & broken below 124.5m, approaching fault at base. Feldspar-phyrific, with abund evenly-distributed altered felds av 1-2mm, to 3mm, in fi gr silica-albite groundmass. Lesser small qtz phenos av <1mm, these commonly sl rounded & with chlorite rims (absorption or vesicle-fillings?). Mod silica-albite-chlorite-sericite alteration. Trace epidotisation. Badly shattered down to 81m, esp 60-68m due to fault essent //LCA centered approx 67.3m.							
						<u>130 - 134m: MAJOR FAULT ZONE</u> Green (chloritised). Zone of highly crushed and puggy rock - same volc as above. Some qtz & calcite breccia-fill. Fault angle <350/LCA.							
						<u>134 - 167.9m: DACITIC LAVA</u> Greyish-green. Med gr. Basically, same feldspar-porphyrific lava as above 130m, but qtz xyls absent below approx 143m (no obvious rock-type change). Abund porph felds av 2mm, tending to become sl finer with depth. Unit characterised by apparent variable texture due to detexturing assoc with patchy stronger alteration, esp strong chloritisation in interval 147 -164m. Overall, mod-strong silica-albite-chlorite alteration. Broken by several faults above 141m (eg: 150/LCA @ 136.2m), and again around strong fault 550/LCA @ 163m. Base a major structural zone, marked by large barren qtz-albite vein 164.5 -166.5m (40 -550/LCA), with margins of brecciated, qtz-albite veined & silicified lava, upper margin 0.7m wide, lower 1.5m wide.							
						<u>167.9 - 209.7m: DACITE LAVA</u> Grey, with brownish tinge. Med gr, massive, uniform, hard. Essent same rock type as before. Feldspar-porphyrific volcanic, with abund felds av 1-2mm, to 3-4mm, in fi gr silica-albite altered groundmass. Small partly-leucoxenised flakes of biotite (?). Rare small hornblende laths. No qtz phenos. Overall, alteration moderate: silica-albite and lesser chlorite. Minor thin qtz-carb veins. No obvious flow banding or cleavage. Fractured and broken above 181.5m, and again 189.5 -191m. Green, fi gr, chloritic MAFIC DYKE 208.4 -209.15m, contacts 500/LCA.							

END OF HOLE

067065

HOLE No. MBD 2

PROJECT:

PASMINCO EXPLORATION DIAMOND DRILL HOLE SUPPLEMENTARY DATA

Page 4 of 4

MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
MB 2	24.0		0.21	HQ WHOLE CORE
	30.0		0.13	
	35.0		0.16	NQ WHOLE CORE
	40.5		0.18	
	76.5		0.20	
	79.8		0.15	
	82.5		0.23	
	88.4		0.18	
	93.7		0.15	
	96.2		0.19	
	106.5		0.21	
	109.6		0.26	
	112.5		0.15	
	115.5		0.12	
	118.5		0.15	
	120.5		0.23	NQ SPLIT CORE
	121.5		0.17	WHOLE CORE
	124.5		0.26	
	127.4		0.26	
	142.5		0.23	
	145.5		0.07	
	148.5		0.13	
	151.5		0.11	
	154.5		0.21	
	157.5		0.35	
	168.0		0.18	
	169.5		0.23	
	179.9		0.24	
	182.2		0.13	
	184.6		0.15	
	187.0		0.20	
	190.1		0.22	SPLIT CORE
	193.0		0.19	WHOLE CORE

DDH No	From	To	Reading	Comment
	196.0		0.18	
	199.0		0.17	
	202.5		0.19	
	206.3		0.16	
	208.5		0.39	
F.O.H	209.7		0.22	

S G READINGS

DDH No	DEPTH	DRY weight	WET weight	Volume	S G	Comment
MB 2	SAMPLE	259		95		
	2.9 m	1074		403		HQ WHOLE CORE
	40.5	216		79		NQ SPLIT CORE
	80.0	434		160		NQ WHOLE CORE
	120.0	409		142		"
	160.0	445		162		"
	SAMPLE	259		95		"
	200.0	360		133		"

067067



PASMINCO EXPLORATION DIAMOND DRILL CORE RECORD

HOLE No. - HOLE MBD 3

Page 1 of 4

LOCATION	MT BLACK	OBJECTIVE TO TEST UTEM ANOMALY 10A, AND COINCIDENT VLF EM ANOMALY, IF ANOMALY AND SOIL GEOCHEMICAL ANOMALY. SHALLOW SOURCE WAS ANTICIPATED.	LOCATION/SURVEY DATA (AMG)					
PROJECT	EL 12/88		Grid	AMG	POSITION ON ADJACENT MAPS	RL Collar m	579 (588)	
PROSPECT			Northing m	5 375 737	5 375 670	Bearing Collar	270°	
DESIGNED BY	AUSTRAIN NL		Easting m	381 588	381 595	Dip Collar	- 55°	
LOGGED BY			DH Survey Type				Length Hole m	169.1
RELOGGED	J.G. RUONIS MARCH 1992	RESULT SUMMARY: Hole entirely in single unit of unmineralized massive dacite lava or intrusive. AUSTRAIN COULD NOT IDENTIFY SOURCE OF UTEM ANOMALY.	Depth m	Bearing	Dip	Depth m	Bearing	Dip
COMMENCED	3.5.89		50	271°	-55°			
COMPLETED	13.5.89		100	273°	-53.9°			
DRILLED BY	TAS DIAMOND DRILLING		169	276°	-53°			
DRILL RIG								
SIGNIFICANT INTERSECTIONS								
From m	To m	Interval m	Cu	Pb	Zn	Ag	Au	Comments
			145	25	135	1.0	<0.008	MAXIMUM ASSAY VALUES
SIGNIFICANT CORE LOSS			POOR GROUND CONDITION ZONES					
From m	To m	% Lost	From m	To m	Condition			
HOLE SIZE			HOLE CONDITIONS AFTER COMPLETION					
Size	Depth m	Collar						
		Steel Casing						
		PVC Casing						
		Ground Water						
		Wedge						
		Drill Pad						

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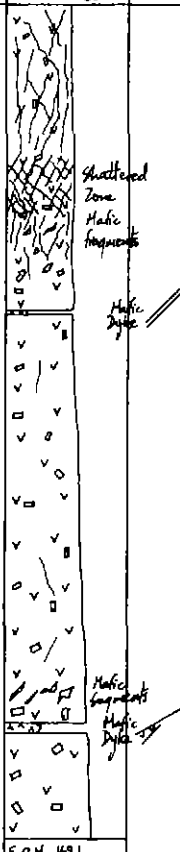
PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

HOLE No. MB 3

PROJECT: MT BLACK EL 12/88

Graphic Scale 1: 1,000

Page 2 of 4

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 - 169.10m: <u>DACITE LAVA/INTRUSIVE</u> Brownish-grey to 38m, then greenish-grey. Strongly oxidized to 7m, patchy oxidation to 50m. Med-coarse gr, massive, uniform, hard. Conspicuously feldspar-phyric volc, with highly abund leucocratic feldspar laths av 2mm, to 5mm. Felds tending to become larger and more numerous with depth. Minor small laths of chloritised hornblende. Groundmass fi gr silica-albite at top of hole, and chlorite>silica at depth. Below 43m (esp 43-57m & 135-145m), inclusions to 50mm of mafic rock of same composition as dykes (see below), incl irreg patches & 'threads' of v fi gr greenish-grey cherty silica - apparently chilled and silicified mafic selvage material. Mod silica-albite>>chlorite alteration to 38m, thereafter weak-mod chlorite>silica-albite alt, pervasive but also conc in irreg vein-like patches. Minor sericite and epidote. Mod fract & broken above 51m, incl shattered zone 32-42m (due to fract set 250/LCA centered 32-35m). 62.3-63.7m: badly broken MAFIC DYKE, 450/LCA. 145.6-147.6m: MAFIC DYKE, chloritic, med gr, non-magnetic, upper contact 600/LCA, lower 450/LCA.	10m 20m 30m 40m 50m 60m 70m 80m 90m 100m 110m 120m 130m 140m 150m 160m 170m			0-169.1m: Trace dissem pyrite. Small partly-leucoxenised opaques. Weakly magnetic above 50m.	MB, L			
						END OF HOLE								

5 cm

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HOLE No. MBD 3

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HOLE No. MBD 3

PROJECT:

PASMINCO EXPLORATION DIAMOND DRILL HOLE SUPPLEMENTARY DATA

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MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
MBD 3	2.80		0.11	ALL READINGS AT CORE BLOCKS
	6.00		0.15	11 Q
	9.00		1.47	
	10.50		2.41	
	13.5		0.14	
	13		0.85	
	22.5		5.32	NR WHOLE CORE
	28.5		0.11	
	31.5		0.09	
	34.5		0.13	
	37.3		1.90	
	40		0.17	
	44.5		0.25	
	45.5		0.10	
	52.50		0.20	
	58.50		0.22	
	65.50		0.38	
	62.20		0.20	
	65.3		0.22	
	68.1		0.27	
	70.5		0.23	NR WHOLE CORE
	74.6		2.24	
	77.7		0.15	
	79.3		0.69	
	82.4		1.56	
	84.5		0.01	
	87.5		0.24	
	90.3		0.23	SPLIT CORE
	93.3		0.21	WHOLE CORE
	96.3		0.21	
	100.5		0.59	SPLIT CORE
	102.5		0.18	WHOLE CORE
	106.5		0.15	
	109.0		0.19	
	112.5		0.16	

DDH No	From	To	Reading	Comment
MBD 3	113.2		0.21	
	116.1		0.18	
	119.1		0.19	
	122.1		0.35	
	127.5		2.20	
	130.1		0.24	NR SPLIT CORE
	134.0		0.29	WHOLE CORE
	139.5		5.64	
	142.5		0.20	
	145.4		0.24	
	150.8		0.23	
	153.8		0.29	
	156.9		5.30	
	160.0		0.19	
	163.0		0.31	
	166.0		0.20	
E.O. 11	169.0		0.21	

S G READINGS

DDH No	DEPTH	DRY weight	WET weight	Volume	S G	Comment
MBD 3						
	SAMPLE	259		95		
	9.0.1	877		327		NR WHOLE CORE
	39.9	391		147		NR WHOLE CORE
	80.2	350		153		NR SPLIT CORE
	120.0	302		129		" "
	160.0	173		63		" "
	SAMPLE	259		95		NR WHOLE CORE

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PASMINCO EXPLORATION DIAMOND DRILL CORE LOG

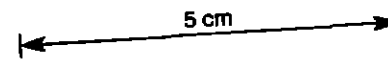
HOLE No. MBD 4

PROJECT: AT BLACK EL 12/88

Graphic Scale 1:1,000

Page 2 of 4

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 - 27.5m: DACITE LAVA/INTRUSIVE Pale brown. Mod soft & leached. Mod-strongly oxidized - dec with depth. Badly broken. Abund porphyritic felds, av 1-2mm, to 3-4mm. Minor small hornblende laths. Occ patches and frags to 80mm of mafic rock. Where lesser oxidized evident rock originally silica-albite-chlorite altered. Base marks limit of oxidation rather than any lithological change.										
				27.5 - 76.5m: PARTLY-DETEXTURED DACITIC VOLCANIC Greenish-grey to brownish-grey. Feldspar-porphyritic dacitic lava, with apparent textural variations due to alteration and zones of cleavage - these make rock look fi gr in places, but porph felds, av 1-3mm, present throughout. Minor small chloritised ferromags. Mod-strong silica-albite-chlorite alteration - strength varies. Cleaved zones start below 45m and are common below 52m - angles vary from 15 -45°/LCA. Some assoc between the cleaved zones and mafic dykes or veins of qtz-carb-chlorite. Gen cleaved & brecciated (not broken) below 71m, with chlorite veinlets. Rock cut by several MAFIC DYKES ranging from highly irreg and dismembered versions <50mm wide, up to 1.4m wide (35.35 -36.75m, 30°/LCA). Dykes are green, chloritic, fi-med gr & strongly magnetic. Strong chloritic fault at base										
				76.5 - 82.8m: QUARTZ-CHLORITE-MAGNETITE VEIN A major structural zone annealed with vein qtz & chlorite, which is fractured & brecciated (mainly above 79.5m) & with frags filled with magnetite-hematite and trace pyrite. Qtz-chlorite veins at base orientated 40°/LCA.										
				82.8 - 195.0m: DACITIC LAVA WITH MAFIC DYKES Dacitic lava/intrusive as before, cut by several sizeable mafic dykes which are strongly sheared towards base of hole. Dark grey-green with pinkish-brown patches. Massive med-coarse gr feldspar-porphyritic volc, with abund felds av 2mm, to 4mm, in fi gr silica-albite or chloritic groundmass. Mod-strong chlorite-silica-albite alteration, locally very strong. Strong chloritisation 82.8 -126m, with numerous diffuse veins & patches of massive chlorite (+qtz-carb)-magnetite/hematite & minor pyrite. Veins all less than 40°/LCA. Zone of massive chlorite 108.8 -109.8m (MAFIC DYKE? - identical to alteration chlorite). Overall, alteration decreases with depth below 135m. Mod cleaved below 149m: approx 50 -60°/LCA (all mafic dykes, faults & shears are // cleavage). Fault 35°/LCA @ 190m. Mod fractured & broken above 100m and 172.5 -182m. MAFIC DYKES (fi-med gr, green, chloritic & magnetic), as follows: 126.25 -132.75m: (15°/LCA, cut by chlorite-qtz-carb-magnetite veins). 149 -150.5m: Disrupted clots of mafic dyke material. 164.75 -166.75m: DOLERITE DYKE, upper contact 70°/LCA, lower 15°/LCA. 172.6 -175m: Both contacts strongly sheared 35°/LCA. 191.5 -195m: Major ductile shear zone (not broken), comprising deformed intercalations of dacite & mafic dyke material, 35°/LCA.										



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HOLE No. MBD 4

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HOLE No. MBD 4

PROJECT :

PASMINCO EXPLORATION DIAMOND DRILL HOLE SUPPLEMENTARY DATA

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MAGNETIC SUSCEPTIBILITY READINGS

DDH No	From	To	Reading	Comment
MBD4	3.40	0.8	0.80	HQ READINGS DONE AT ALL CORE BLOCKS
	12.00		2.01	
	21.00		0.47	
	23.00		0.90	NQ
	25.50		1.10	
	31.50		1.96	
	34.50		2.04	
	37.50		0.62	
	40.50		0.77	
	43.50		0.38	
	47.50		0.15	
	52.00		1.47	
	55.50		0.16	
	57.90		0.11	
	60.80		0.12	
	63.90		1.21	
	67.00		1.31	
	70.50		5.45	
	74.50		5.25	
	76.10		0.25	
	80.00		1.17	
	85.20		1.75	
	89.30		3.14	
	91.50		0.24	
	94.40		0.13	
	97.10		12.8 11.1	
	100.50		1.42	
	106.19		1.17	
	111.50		5.95	
	114.50		4.92	
	117.50		3.72	
	120.50		11.3	
	123.50		4.16	
	126.50		3.20	
	129.50		22.9	
	135.50		17.7	
	138.50		16.1	
	140		0.69	

DDH No	From	To	Reading	Comment
MBD 4	142.5		0.29	
	148.5		0.14	
	151.5		0.18	
	154.5		2.23	
	157.5		9.60	
	160.4		6.60	
	163.10		5.82	
	166.20		8.05	
	169.50		10.6	
	172.40		0.73	
	178.50		7.25	
	181.70		4.05	
	183.90		0.33	
	187.50		7.35	
	190.00		0.11	
	193.5		203	
	195.1		11.9	
ALL READINGS AT CORE BLOCKS				

S G READINGS

DDH No	DEPTH	DRY weight	WET weight	Volume	S G	Comment
MBD 4						
	SAMPLE	259		95		
	40.0m	162		60		NQ SPLIT CORE
	80.1	238		89		" "
	120.5	237		87		" "
	160.0	513		188		NQ WHOLE CORE
	SAMPLE	259		95		NQ " "

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APPENDIX 3
GEOCHEMICAL ROCK SAMPLE RESULTS



PASMINCO EXPLORATION GEOCHEMICAL ANALYSES RECORD

PROSPECT BASTYAN DAM AREASample Type RockPROJECT MT BLACK EL 12/88

Sample No.	Sample Type	Location (AMG)	METAL CONTENT (ppm unless specified)																										Bi	COMMENTS
			Cu	Pb	Zn	Ag	Au	As	Ba	Rb	Sr	V	Nb	Y	Zr	MnO ₂	SiO ₂	TiO ₂	Fe ₂ O ₃	MgO	CaO	K ₂ O	MgO	P ₂ O ₅	La ₂ O ₃	SO ₃				
031365	qc chips	5378515MN/377665ME	13	43	57	<0.5	<0.008	<2	482	72	127	37	12	28	259	13.93	73.3	0.55	3.63	0.11	3.24	0.17	1.70	0.097	1.69	0.18		Probable Hw Epiclastics. Very chloritic.		
031366	"	5378545MN/377960ME						8	919	178	60	70	10	20	204	14.64	70.6	0.51	3.59	0.17	3.28	0.58	0.60	0.116	3.09	0.02		MT Black Volcanics lava.		
031367	"	5378340MN/377835ME	72	20	27	<0.5	<0.008	10	1117	134	186	57	10	33	296	16.10	65.2	0.68	3.56	0.15	3.45	2.57	3.28	1.85	0.122	4.67	0.54	Altered Hw Epiclastics.		
031368	"	5378650MN/377805ME						<2	1037	172	57	63	13	21	234	14.80	72.8	0.54	3.59	0.04	1.74	0.19	3.28	0.53	0.03	2.27	0.04	MT Black Volcanics lava.		
031369	"	5378740MN/377600ME						3	780	151	45	67	13	17	233	15.33	69.7	0.52	4.36	0.15	1.98	0.10	3.44	1.23	0.101	2.67	0.08	Apparent feldspar - qtz porphyry intrusive.		
031370	"	5378335MN/377705ME						5	85	97	156	42	10	23	192	14.24	68.6	0.42	3.78	0.15	3.56	2.22	4.42	0.82	0.075	4.29	0.02	Altered Hw Epiclastics.		
031371	"	5378445MN/377565ME						<2	576	61	194	47	3	30	212	14.43	66.3	0.51	3.80	0.17	4.48	2.94	1.62	1.14	0.113	4.15	0.10	Altered Hw Epiclastics.		
031372	"	5378800MN/377750ME						<2	708	112	98	11	9	27	257	13.11	72.5	0.28	3.36	0.21	2.95	1.22	2.48	1.09	0.044	3.26	0.13	MT Black Volcanics - possible ignimbrite.		
031373	"	6379010MN/377645ME						3	763	174	8	16	15	27	248	13.45	72.9	0.31	4.67	0.06	<0.01	4.05	1.25	0.037	2.91	2.30	Altered siltstone - MT Black Volcanics.			
031374	"	5378860MN/380325ME						4	587	185	53	<5	17	30	302	13.82	75.7	0.31	2.41	0.02	2.52	0.02	4.40	0.027	2.12	<0.01	Pumiceous epiclastic silt. MT Black Volcs.			
031375	Dump Flout	5378890MN/380340ME						5	554	154	69	<5	14	33	261	12.34	77.6	0.26	2.19	0.03	2.13	0.53	0.36	0.025	1.82	0.16	Pumiceous altered, volcaniclastic (MBVs).			
031376	"	"	298	23.2%	15.8%	472	<0.008	0.010																			12	High grade ore in siderite gangue.		
031377	qc chips	5378425MN/378775ME						<2	470	159	13	<5	11	27	169	12.31	74.7	0.21	6.57	0.33	<0.01	3.27	0.56	0.009	2.32	0.06	Flas-banded felsic lava (MT Black Volcs).			
031378	Dump Flout	5378470MN/378770ME	4.8%	1307	463	29.1	0.680																				3050	Semi-massive pyrope in chloritic lava.		
031379	qc chips	5378465MN/378775ME						<2	426	131	6	<5	12	32	186	11.98	73.7	0.23	7.19	0.35	0.19	2.96	0.67	0.016	2.31	0.19	Chloritised dacitic lava (MT Black Volcs).			
031380	"	5378070MN/378005ME						4	1006	123	145	36	11	29	207	14.36	71.1	0.40	2.17	0.13	1.60	0.78	0.054	3.70	0.08	Altered Hw Epiclastics.				
031381	"	5378140MN/377815ME						3	1159	122	177	45	8	43	256	12.44	60.8	0.55	4.47	0.35	1.72	5.26	3.01	1.94	0.090	8.72	0.41	Altered Hw Epiclastics.		
031382	"	5378130MN/377830ME	35	38	53	<0.5	<0.008																					Pyritic altered Hw Epiclastics.		
032774	"	5378300MN/377725ME	104	952	84.28	2	<0.008																					Limonite - qtz vein material in Hw Epiclastics.		
032775	"	5378895MN/377805ME	8	9	27	<1	0.035	<2	880	270	8	11	15	20	320	14.99	73.3	0.35	2.55	0.25	0.09	5.07	0.63	0.054	2.71	0.36	9	Dacitic lava (MT Black Volcanics).		
032776	"	5378870MN/377790ME	54	38	107	2	0.035																					Pyritic altered MT Black Volcanics.		
ANALYTICAL METHOD:			AAS	AAS	AAS	AAS	F/A	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	AAS			
DETECTION LIMIT:			5	5	5	0.5	0.008	2	10	5	5	5	3	5	5	0.05	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.01	10			
SAMPLES 031365 - 031382: ANALYSED ANALABS CODEE + PERTH, OCTOBER 1991, PASMINCO EXPLORATION JOB N° 0165, ANALABS JOB N° 111310-60-08344.																														
ANALYTICAL METHOD:			AAS	AAS	AAS	AAS	F/A	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF			
DETECTION LIMIT:			2	3	2	1	0.008	2	10	5	5	5	3	5	5	0.05	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.01	5			
SAMPLES 032774 - 032776: ANALYSED ANALABS CODEE + PERTH, MAY 1992, PASMINCO EXPLORATION JOB N° 0185, ANALABS JOB N° 111310-60-08757.																														

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APPENDIX 4
OXYGEN AND SULPHUR ISOTOPE REPORT
BY DR G GREEN MAY, 1992

MINES CONSULTANCY SERVICES

Oxygen and sulphur isotope compositions of samples from the Bastyan Dam area and their implications for mineral exploration

A report for Pasminco Exploration and
J. G. Purvis and Associates Pty Ltd

Geoffrey R. Green

May 1992



TASMANIA DEPARTMENT OF MINES

Report on oxygen and sulphur isotope compositions of samples from the Bastyan Dam area

Geoffrey R. Green

1. Summary and Conclusions

Samples of hangingwall epiclastics and the Mount Black Volcanics from the Bastyan Dam area have undergone minor syn-diagenetic hydrothermal alteration with little evidence of major overprinting Devonian effects. Whole rock $\delta^{18}\text{O}$ values range from 11.5 to 12.8‰. When corrected for quartz phenocryst content and mineralogy these results indicate a maximum temperature of alteration by a seawater-derived hydrothermal fluid of about 150°C, but more probably alteration occurred at temperatures around 100°C at moderate water/rock ratios. The lack of variation in the data and the similarity of results from the hangingwall epiclastics and Mount Black Volcanics suggest that the alteration is of a regional character and there is no indication of a proximal *in situ* massive sulphide accumulation.

The fine grained pyrite at the margin of the porphyry in the hangingwall epiclastics has a low $\delta^{34}\text{S}$ value of -2.9‰, clearly different from other sulphides in the area, and is probably related to local low temperature hydrothermal processes associated with the intrusion. Clastic sulphides in mass flow deposits in the area have distinctly different $\delta^{34}\text{S}$ values from pyrite from the Cutty Sark deposit and the bulk of sulphides at Rosebery. Isotopically they are most similar to sulphides from the Pinnacles area, but a different, undiscovered, source is at least equally probable.

2. Background and Methods

Eight samples of rocks from the Bastyan Dam area were submitted by Mr J.G. Purvis for oxygen isotope analysis with the aim of determining the likelihood of a blind massive sulphide deposit in the area. Thin sections of six of the samples were supplied and thin sections of the remaining two samples were to be prepared. An additional three samples were submitted for sulphur isotope analysis.

Some of the samples submitted for oxygen isotope analysis were slightly weathered or iron oxide stained along fractures. Such material was removed by chipping or grinding before hand crushing and sieving to -120# +200# for isotope analysis. A portion of the sieved, sized material was analysed mineralogically by X-ray diffraction by Mr R.N. Woolley. Oxygen isotope and sulphur isotope measurements were performed by Dr G. Kuipers and Ms C. Cook respectively. Thin sections 031367A and 031380A were prepared by Ms J. Mackey and Ms J. Triffett. Petrography, data reduction and interpretation were carried out by the writer.

3. Petrography

Slide 84027 (Near Sample 031366A). ~~Hangingwall epiclastics.~~ *Mt Black Volcanics*

Poor thin section, plucked in places. However uniform snowflake texture in the groundmass indicates that the rock is a lava or intrusive. Feldspar phenocrysts are totally altered to fine grained

sericite + quartz $\pm$ iron oxides (rock somewhat weathered). Minor quartz veinlets. No quartz phenocrysts.

Slide 84032 (Same location as 031369A). Mount Black Volcanics.

Autoclastic plagioclase-quartz porphyry, groundmass has snowflake texture. Lava or shallow intrusive. Albites are very weakly partially altered to sericite and patchy, but generally weak, groundmass sericitisation and anastomosing cleavage development. Several pyrite euhedra to 0.1 mm, averaging 0.05 mm. One grain is fractured, some have quartz-chlorite pressure fringes. One angular 10 mm fragment of glomerocrystic albite with chloritic groundmass could be an accidental inclusion of andesitic intrusive. Another 3.5 mm fine grained pilotaxitic andesite lava clast. The presence of 2% phenocryst quartz is unusual for the Mt Black Volcanics, I prefer an intrusive origin for the rock.

Slide 031370A (Sample 031370C). Hangingwall epiclastics.

Typical coarse grained hanging wall epiclastic "crystal tuff" with albite and quartz crystals in the ratio of 3:1 comprise 60% of the section (*i.e.* 15% phenocryst quartz) on average 3 mm in diameter. Albite is very weakly studded with carbonate and sericite inclusions. Groundmass textures are obscured by alteration to a quartz-sericite-carbonate assemblage with some early sericite (probably originally clay)- quartz vein-like alteration.

Slide 031371A (Sample 031371C). Hangingwall epiclastics.

Similar to 031370A, but slightly coarser grained (4 mm) and less altered. About 20% quartz phenocrysts and 40% feldspar respectively. Pumice textures are preserved in places and groundmass albite has survived alteration. Patchy chlorite and carbonate alteration.

Slide 84033 (Site 031372A). Mount Black Volcanics.

Rock with feldspar $\gg$ quartz (one strongly strained embayed quartz grain 0.5 mm across); open framework, possibly epiclastic. Very unusual alteration of feldspars to very fine grained, randomly orientated chlorite + rhombic dolomite + minor sericite. Minor quartz is present in feldspar replacements adjacent to pre- or early syn-cleavage quartz veinlets. Alteration predates very strong cleavage development and chlorite and sericite in feldspar replacements are recrystallised to much coarser wisps parallel to cleavage at margins of grains. The groundmass consists of fine grained quartz, white mica, dolomite and chlorite with strongly developed cleavage. In places there is a hint of pumice textures, but because of the strongly developed cleavage, I am not confident about this. A few shard-like features are also present, but these are probably artifacts of the anastomosing cleavage. Traces of pyrite with quartz pressure shadows are present. Probably a tuff or epiclastic very strongly altered in the Cambrian.

Sample 031367A. Hangingwall epiclastics.

Finer grained, 1-2mm, and relatively quartz-poor (c.f. 031370, 031371, 031380) pumiceous epiclastic with approximately 30% albite and <1% quartz phenocrysts. One apatite microphenocryst. Recognisable bubble and tube pumice fragments, vesicular rims on feldspars, fine shards in the groundmass and a few dense rock fragments are present. Feldspar phenocrysts are moderately sericitised, some carbonate inclusions are also present locally. Groundmass consists of quartz+sericite+albite with patches of carbonate. A few very thin quartz $\pm$ carbonate microveinlets cut the rock.

Slide 031380A. Hangingwall epiclastics.

Epiclastic with about 20% each of plagioclase and quartz phenocrysts up to 5 mm in diameter, a very weakly pyritic siltstone clast in a fine grained groundmass with locally preserved delicate, undeformed shard outlines. A few wispy sericitised clasts may represent collapsed argillised pumice fragments, but it should be noted that collapse would have followed low temperature alteration to clay (i.e. there is no evidence that this is the deposit of a hot pyroclastic flow). Feldspar alteration is variable throughout the section from weak carbonation to strong sericitisation. Very minor quartz- fine grained chlorite- carbonate veining. Fine grained quartz- sericite alteration with minor chlorite occurs around the veinlets and there is weak and patchy carbonate alteration.

Section 84034 (Site 031381A). Hangingwall epiclastics.

Felsic epiclastic with well preserved pumice textures and some shard-rich patches. Pumices are coarse sand grade. Albite and quartz crystals 0.3 to 1.5 mm in size comprise 20% and 1% of the rock respectively. Patches of strong carbonate and sericite alteration and carbonate rhombs occur in the groundmass and albites are moderately to strongly altered to sericite $\pm$ carbonate. Alteration appears to be essentially Cambrian in age.

Section 031353A. Sooty pyrite from margin of Cambrian porphyry.

Two types of pyrite are present:

- (1) euhedral coarse grained (to 0.4 mm), frequently brecciated pyrite;
- (2) fine spongy framboidal to microcolloform pyrite.

Type 1 pyrite shows atoll texture in places and there is a strong indication that it is merely recrystallised Type 2 pyrite. No base metal sulphides, but traces of rutile are present. The matrix consists of muscovite and quartz, much of which heals fractures in pyrite and occurs as pressure shadows. Possibly diagenetic pyrite recrystallised during intrusion and subsequently brecciated or pyrite introduced during low temperature hydrothermal activity related to dyke emplacement.

Summary of Petrography

My overall impression of the suite is that the rocks have undergone low temperature diagenetic-hydrothermal alteration with no significant Devonian overprint. The most intense alteration (unusually for the Rosebery area) is in sample 031372A from the Mount Black Volcanics, in which the alteration style (chloritisation of feldspar phenocrysts) is in itself unusual. This sample is strongly sheared and is possibly close to a fault zone.

Excluding the two suspected intrusives the order of decreasing alteration is: 84033>84034>031380>031370>031367>031371.

4. Oxygen isotope investigation

The eight samples analysed for oxygen isotopes were also examined mineralogically by semi-quantitative X-ray diffraction (results quoted to $\pm 5\%$). This was necessary because whole rock oxygen isotope fractionation factors will vary significantly in a suite of rocks with different proportions of minerals with major contrasts in fractionation factors (e.g. quartz and chlorite). The data are listed below in Table 1.

TABLE 1: XRD mineralogical data

Sample No.	Quartz	Feldspar	Mica	Chlorite	Dolomite	Calcite
031366A	35	25	35	2	5	-
031367A	20	55	25	-	2	-
031369A	30	30	15	25	-	-
031370C	35	50	10	2	5	-
031371C	20	55	10	10	2	2
031372A	40	35	15	5	5	-
031380C	40	40	15	2	5	-
031381A	30	45	20	-	5	-

Because the kinetics of quartz-water oxygen isotope exchange is much slower than that of the other minerals it is necessary to recalculate raw data to remove the effect of the relatively inert phenocryst quartz before evaluating the alteration component in the results. It was assumed that quartz phenocrysts have a $\delta^{18}\text{O}$ value of 8‰, typical of felsic rocks. A spreadsheet program was written to calculate the temperature coefficients of the fractionation factors for the rocks. The effect of mineralogy was quite significant: $\Delta_{\text{rock-water}}$ fractionation factors (corrected for phenocryst quartz) at 100°C varied from 15.3‰ for the sample richest in chlorite (031369A) to 18.0‰ for sample 031372A. Maximum alteration temperatures assuming a hydrothermal fluid with a seawater $\delta^{18}\text{O}$ value of 0‰ and closed and open system water/rock ratios at 100°C were also determined assuming original whole rock $\delta^{18}\text{O}$ values of 7.5‰ (Table 2).

TABLE 2: Oxygen isotope data, calculated alteration temperatures and water/rock ratios

Sample No.	Meas. $\delta^{18}\text{O}$	Calc. $\delta^{18}\text{O}^{\text{a}}$	T ($^{\circ}\text{C}$, w/r= ∞) ^b	w/r (T=100 $^{\circ}\text{C}$) ^c
031366A	12.3	-	155	0.96 (0.67)
031367A	11.8	-	162	0.79 (0.58)
031369A	11.5	11.57	143	1.09 (0.74)
031370C	11.8	12.47	159	0.92 (0.65)
031371C	11.7	12.60	135	1.6 (0.95)
031372A	12.6	-	158	0.94 (0.66)
031380C	12.1	13.10	148	1.24 (0.80)
031381A	12.8	-	155	1.0 (0.71)

- a. Calculated from estimated percentage of phenocryst quartz assuming a $\delta^{18}\text{O}$ value of 8‰.
- b. Calculated at infinite water/rock ratio from mineral proportions measured by X-ray diffraction (Table 1), corrected, where necessary, for phenocryst quartz estimated petrographically and published oxygen isotope fractionation factors.
- c. Calculated under closed and open system (parentheses) conditions respectively using equations in Taylor (1979; see below).

Discussion

For a rock undergoing isothermal alteration in a closed system in which there is negligible transfer of water between the fluid phase and the rock, the $\delta^{18}\text{O}$ value of a rock after water-rock interaction can be expressed as (Taylor, 1979):

$$\delta^{18}\text{O}_r^f = \frac{\delta^{18}\text{O}_r^i + (\delta^{18}\text{O}_w^i + \Delta_w^r) w/r}{1 + w/r} \dots\dots\dots (1)$$

where the superscripts i and f refer to the initial and final conditions respectively, the subscripts r and w refer to the rock and water respectively. w/r is the atomic ratio of oxygen in the fluid phase to that in the rock, which is approximately equal to twice the water/rock mass ratio.

Δ_w^r , the oxygen isotope fractionation factor between rock and water, is a function of temperature and the mineralogical composition of the rock, and is given by the expression:

$$\Delta_w^r = \delta^{18}\text{O}_r - \delta^{18}\text{O}_w \dots\dots\dots (2)$$

Equation (1) can be recast in terms of the water/rock ratio:

$$\frac{w}{r} = \frac{\delta^{18}\text{O}_f - \delta^{18}\text{O}_i}{\delta^{18}\text{O}_w^i - (\delta^{18}\text{O}_f - \Delta_w^r)} \dots\dots\dots(3)$$

Under open system conditions, in which each aliquot of water makes a single pass through the system and does not have the opportunity to further interact with the rock, the above expression becomes:

$$\frac{w}{r} = \ln \left(\frac{(\delta^{18}\text{O}_w^i + \Delta_w^r - \delta^{18}\text{O}_f^i)}{(\delta^{18}\text{O}_w^i - (\delta^{18}\text{O}_f - \Delta_w^r))} \right) \dots\dots\dots(4)$$

For VMS systems where a considerable proportion of the water is discharged into the ocean, open system conditions (Eqn. 4) might prevail. Under conditions of burial diagenesis in which the fluid may have been in prolonged contact with the rock and recycled several times, the closed system case (Eqn. 3) might provide a better approximation. The assumption of isothermal water/rock interaction involved in the models is clearly somewhat naive, but it should be realised that whole rock oxygen isotope data reflect the *integrated history* of interaction and as such provide broad constraints on temperature of alteration and amounts of fluid involved.

Where the water/rock ratio is very large, such as in the hydrothermal feeder zone below a VMS deposit, equation (1) and the corresponding statement for an open system reduce to:

$$\delta^{18}\text{O}_f = \delta^{18}\text{O}_w^i + \Delta_w^r \dots\dots\dots(5)$$

In this case the final $\delta^{18}\text{O}$ value of the rock is a function only of the isotopic composition of the water, the mineralogy of the rock and the temperature of alteration and is independent of the original isotopic composition of the rock. Because the petrography indicates that negligible alteration occurred in the Devonian in the suite of samples analysed (with the possible exception of 031372A) and the marine setting of the hangingwall epiclastics is well established, the assumption of a seawater-derived hydrothermal fluid with a $\delta^{18}\text{O}$ value of 0‰ seems well justified. However because none of the samples appear to display extreme alteration (whole rock chemical analyses might provide a check of this, but the X-ray diffraction data do not give any indication of major feldspar destruction in any of the samples), the temperatures of alteration listed in Table 2, which were calculated from equation (5), can be regarded as *maxima* only. The moderate water/rock ratios calculated at an arbitrary temperature of 100°C seem more realistic.

Conclusions

Assuming alteration by a seawater-dominated hydrothermal fluid, the maximum possible temperature of alteration was around 150°C, but alteration more probably occurred at a lower temperature of about 100°C. Although I do not know the spatial distribution of the samples, the uniformity of the results, including samples from the Mount Black Volcanics, suggests that alteration took place under relatively uniform marine diagenetic conditions. In short there is no sign of the strong lateral gradients of whole rock $\delta^{18}\text{O}$ values that exist around Kuroko deposits (Green *et al.*, 1983). Consequently, there is no evidence of major *in situ* massive sulphide accumulation within, say, 500 metres laterally or 200 metres stratigraphically below any of the sample sites.

5. Sulphur isotopes

Data from the three samples submitted for analysis, together with samples from two massive sulphide clasts submitted to the writer by J.G. Purvis a number of years ago from a mass flow deposit on the southern shore of Lake Rosebery about 400 metres east of Bastyan Dam are tabulated below.

TABLE 3. Sulphur isotope data

Sample No.	Deposit	Mineral	$\delta^{34}\text{S}_{\text{CDT}}\text{‰}$
Shell 7948	Bastyan Dam East	Pyrite in MS clast	+8.5
Shell 7948	Bastyan Dam East	Sphalerite in MS clast	+7.7
Shell 7948	Bastyan Dam East	Galena in MS clast	+7.3
Shell 7949	Bastyan Dam East	Pyrite in pyritic clast	+10.5
031353B	Bastyan area	Sooty pyrite	-2.9
031376B	Langdon's working	Sphalerite	+9.3
031378B	Cutty Sark wkg	C.g. pyrite with chlorite	+18.1

The major feature of the data is the very different $\delta^{34}\text{S}$ value of the fine grained pyrite adjacent to the porphyry. Similar negative $\delta^{34}\text{S}$ values are characteristic of barren pyritic alteration zones in the Mount Read Volcanics such as Chester and Boco. More relevantly, they are also recorded from an analogous geological setting in the Mount Cattley area (Green, unpublished data) where a localised zone of alteration, including extreme Na depletion, is present in volcanic and sedimentary rocks adjacent to a dacite intrusive (Randell, 1988). Oxygen isotope data indicate that this alteration occurred at low temperatures (Green, 1989).

The sphalerite from Langdon's Prospect ($\delta^{34}\text{S} = 9.3\text{‰}$), as well as samples of galena and sphalerite from the same deposit analysed by Solomon *et al.* (1990) with values of 11.7 and 12.6‰ respectively, falls within the typical range of values from western Tasmanian Cambrian VMS deposits. Descriptions of this mineralisation indicate that it is probably Devonian in age, but the sulphur may have been derived from a Cambrian source.

The $\delta^{34}\text{S}$ value of +18.1‰ of the Cutty Sark pyrite falls at the top of the range of Rosebery values, and is similar to results from the barite lode (Green, 1983), but is clearly different from those of the clastic sulphides from the southern shore of Lake Rosebery. These values lie below and at the extreme bottom end of the range for sulphides from the Rosebery Mine (7.1 to 19.8‰. Excluding the lowest value, the next lightest Rosebery pyrite has a value of 8.6‰). Similarly the values are mostly lighter than those from the Pinnacles area (9.0 to 12.9‰; Anon., 1988). The data suggest that the source of the clastic sulphides has yet to be established, although the Pinnacles area is not totally precluded. Because there exists a body of lead isotope data on the Pinnacles area (Anon., 1988), lead isotope analysis of the clasts from Bastyan might enable further evaluation of this possibility. Unfortunately the oxygen isotope data do not provide any indication of the location of the parent hydrothermal vent.

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APPENDIX 5
PETROLOGICAL ROCK SAMPLE DESCRIPTIONS
(for Sample Locations see figure 12)

**Report To Pasminco Exploration :
Samples From Rosebery Hangingwall and
Mt Black Volcanics**

for Gerald Purvis

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

16th September 1991

Sample 031362A Feldspathic lithic sandstone

<i>Mineralogy</i> -	Plagioclase	-	35%
	Lithic clasts	-	25%
	Matrix	-	30%
	Sericite	-	3%
	Chlorite	-	3%
	Sphene	-	3%
	Mafic clasts	-	<1%
	Zircon	-	<1%

Description

This sample is an epiclastic rock rich in plagioclase crystal detritus, silicic lithic fragments and a silicic matrix. The plagioclase occurs as subangular to angular crystal fragments (0.5-3.0 mm) or aggregates of grains with characteristic albite twinning. The grains display a pervasive weak clay alteration, and patchy alteration to sericite.

The rock also contains a variety of rounded lithic fragments (0.5-2.0 mm). These are generally composed of fine grained recrystallised feldspar and quartz with some patches of chlorite, although some clasts contain plagioclase phenocrysts. There are also some slightly coarser grained xenoblastic feldspar-rich clasts. The relatively fine grained clasts are very similar to the matrix material and probably represent devitrified silicic volcanic ash. The matrix material also has a small amount of very fine grained chlorite and sericite scattered throughout. Rare clasts of more mafic volcanic material (0.5 mm diameter) were noted in the section. One contains a tabular plagioclase microphenocryst in a groundmass composed of chlorite and plagioclase laths.

The rock is traversed by several veins rich in chlorite, quartz and sericite, whereas fine anastomosing veinlets of sericite are more widespread throughout the rock. Rare rounded grains of zircon occur as an accessory phase, and aggregates of dark brown sphene (partly altered to leucoxene) are disseminated throughout the rock.

The epiclastic nature of this specimen is clearly apparent from the variety of fragmental components. The predominance of plagioclase and plagioclase-rich clasts, together with the absence of quartz as a precursor phenocryst phase, suggests that this rock was derived by reworking of andesitic to dacitic volcanoclastic material. The rare mafic clasts also indicate a subordinate more mafic volcanic source.

The sample has experienced low grade regional metamorphism (greenschist facies or lower), and has only experienced very weak hydrothermal alteration resulting in minor development of sericite-chlorite veining.

Sample 031363A Feldspathic-lithic sandstone

<i>Mineralogy</i> –	Plagioclase	–	30%
	Matrix & Lithics	–	52%
	Sericite	–	8%
	Fe-oxides (after pyrite)	–	8%
	Chlorite	–	1%
	Quartz	–	<1%

Description

This sample is composed of abundant subidiomorphic to angular plagioclase grains, a few angular quartz grains and fine grained silicic lithic fragments set in a very fine grained, altered quartz-feldspar-sericite matrix. The plagioclase is present as individual crystals or crystal fragments (0.5 - 2.0mm) which exhibit the characteristic albite twinning and some sericite alteration. Sparse angular grains of unstrained quartz (0.3 - 0.8 mm) occur with the feldspar.

In addition, two types of lithic clasts are present; one dominated by xenoblastic recrystallised plagioclase aggregates, and the other by very fine grained recrystallised quartz and feldspar, probably after silicic glass. The latter clast type has similar textures and mineralogy to the matrix material and they are often difficult to distinguish from the matrix because of the masking effects of superimposed alteration.

Fine sericitic alteration is widespread and frequently concentrated in a network of fine veinlets. There are isolated patches of relatively coarse grained sericite. This sample has also experienced significant pyritic alteration which has been entirely oxidised to Fe oxides and hydroxides. The Fe oxides and hydroxides occur in veins with minor chlorite and quartz, but pseudomorphs after pyrite are also disseminated throughout the rock. Fe staining of crystal detritus and matrix is common due to pyrite breakdown.

The textural and mineralogical characteristics of this sample are similar to 031362A except that this sample has been more extensively altered. The epiclastic nature of this sample is less obvious due to the alteration, but some lithic clasts are evident. The predominance of plagioclase feldspar and the relative scarcity of quartz again implies a dominantly dacitic or andesitic source material. The fine grained matrix probably represents recrystallised silicic glass after volcanic ash.

Sample 031364A Feldspathic-lithic sandstone

<i>Mineralogy</i> -	Plagioclase	-	30%
	Lithics	-	30%
	Matrix	-	30%
	Sericite	-	5%
	Chlorite	-	3%
	Sphene	-	1%
	Apatite	-	trace
	Zircon	-	trace
	Carbonate	-	trace
	Quartz	-	trace

Description

This sample, like the previous two, is dominated by subidiomorphic to angular grains of plagioclase (0.5 - 2.0 mm) which exhibit very minor sericite alteration, and a pervasive dusting of clay minerals. The lithic clasts in this sample are very similar in mineralogy and texture to the dominant varieties in the previous two samples (031362A, 031363A). The matrix is also similar, being dominated by fine grained recrystallised quartz and feldspar. This sample contains rare detrital grains of apatite, quartz and zircon.

The rock is traversed by fine veinlets of sericite and chlorite and quartz, and there are patchy aggregates of chlorite and sericite distributed throughout the section. Fine aggregates of sphene and some secondary Fe oxides probably after magnetite are often closely associated with chlorite-rich aggregates.

The comments regarding the origin and source components of 031362A and 031363A are also applicable to this sample. However, this rock is much less altered than 031363A, and is only weakly recrystallised.

Sample 031367A Feldspathic-lithic sandstone

<i>Mineralogy</i> –	Plagioclase	–	30%
	Lithics & matrix	–	60%
	Carbonate	–	8%
	Sericite	–	8%
	Pyrite	–	1-2%
	Quartz	–	trace
	Zircon	–	trace

Description

Subidiomorphic to angular plagioclase grains (0.5-2.0 mm) and sparse quartz grains (0.5 mm) occur with a variety of lithic clasts in a fine silicic matrix which has been patchily altered by sericite and carbonate, with minor disseminated sulphides.

The plagioclase grains display extensive sericite and carbonate alteration. Relatively large (up to 3 mm diameter) angular lithic fragments are composed either of fine grained recrystallised quartz and feldspar with some patchy recrystallised carbonate, or slightly coarser grained xenoblastic aggregates of plagioclase with subordinate quartz, and minor carbonate alteration.

The matrix is similar to the three preceding samples, and is dominated by fine grained recrystallised quartz and feldspar, most likely after fine silicic glass (ash). This sample also contains rare angular grains of detrital quartz, and zircon, with minor sphene and secondary Fe-oxides disseminated throughout the rock.

The sericite and carbonate alteration is pervasive and of moderate intensity. Sericite occurs as fine interconnected veinlets and patchy aggregates which have been recrystallised resulting in two weakly developed cleavages almost at right angles to each other. The carbonate alteration is patchy or occasionally in cross-cutting veins with quartz. The veins clearly post-date the cleavages, but it is uncertain if the carbonate alteration represents a post-deformation event or if some carbonate was simply remobilised at a late stage during the deformation. The pyrite occurs in irregularly distributed aggregates which are not clearly related to either the sericite or carbonate alteration.

This sample appears to have had a similar origin to the previous three samples, and has experienced more intense alteration than 031364A.

Sample 031370A Quartz-feldspar-lithic sandstone

<i>Mineralogy</i> –	Quartz	–	10%
	Feldspar	–	35%
	Sericite	–	10%
	Carbonate	–	3%
	Matrix & lithics	–	40%
	Sphene	–	<1%
	Pyrite	–	<1%
	Zircon	–	trace

Description

This sample is composed of abundant angular grains of plagioclase and quartz set in a recrystallised matrix dominated by fine grained quartz and feldspar with superimposed sericite and minor carbonate alteration.

Plagioclase grains (0.5-3.0 mm) mostly display the characteristic albite twinning and weak sericite and carbonate alteration. Angular quartz grains of similar size range have relict embayments indicating partial resorption and a high-level intrusive or volcanic origin. Some quartz grains exhibit significant subgrain development due to recrystallisation.

Small very fine grained lithic fragments have similar mineralogy and textures to the matrix and are often difficult to discern. The matrix is variably recrystallised with some very fine grained patches that grade into slightly coarser grained aggregates of the same phases. The matrix displays extensive sericitic alteration, which occurs as fine veinlets that define one weak cleavage, and which locally coalesce into more pervasive patches. Carbonate alteration occurs in more dispersed patches, and also in relatively coarse grained cross-cutting veins with quartz.

Other minor phases include, subidiomorphic to angular grains of zircon, granular sphene and Fe oxides (often associated with carbonate), and several dispersed aggregates of tiny pyrite cubes.

This sample differs from the previous four by the presence of a significant component of detrital quartz. However, the other major components (i.e. plagioclase, fine grained lithics, and silicic matrix) are essentially the same as in the other samples. The increased input of volcanic phenocryst quartz implies a more rhyodacitic to dacitic source, although there is no obvious alkali feldspar present. The alteration assemblage and style is similar to 031367A.

Sample 031371A Quartz-feldspar-lithic sandstone

<i>Mineralogy</i> -	Plagioclase	-	40%
	Quartz	-	8%
	Matrix & lithics	-	38%
	Chlorite	-	3%
	Sericite	-	5%
	Carbonate	-	5%
	Sphene	-	1%
	Zircon	-	<1%
	Pyrite	-	<1%

Description

This rock contains abundant detrital feldspar and quartz grains, and subordinate fine grained silicic lithic fragments in a mineralogically and texturally similar matrix which has experienced moderate sericite and carbonate alteration.

Angular plagioclase grains (0.5-4.0 mm) and quartz grains with relict embayments dominate the coarse clastic component. Rounded, fine grained silicic lithic fragments are variably recrystallised and difficult to discern from the mineralogically similar matrix. Some of the slightly coarser grained xenoblastic aggregates of plagioclase with minor quartz may be recrystallised pumice fragments by comparison with 031374A and 031375A, but the textural evidence is not apparent in this specimen.

The plagioclase grains exhibit weak sericitic and carbonate alteration, and most of the alteration is restricted to the matrix. The sericite occurs in fine interconnected veinlets, and the carbonate as cross-cutting veins and patchy aggregates. Chlorite is closely associated with the sericite veinlets, and fine aggregates of granular sphene occur with the chlorite-rich patches or carbonate. Minor pyrite (0.02-0.1 mm) occurs in isolated aggregates.

This sample is mineralogically and texturally similar to 031370A, but differs by having chlorite as an alteration phase in addition to sericite and carbonate. The comments regarding the origin and source of 031370A also apply to this sample.

Sample 031373A Siltstone (Quartz-sericite schist)

<i>Mineralogy</i> -	Silicic matrix	-	60%
	Sericite	-	35%
	Chlorite	-	5%
	Pyrite	-	<1%
	Sphene & oxides	-	<1%
	Zircon	-	trace

Description

This sample is composed of fine grained recrystallised quartz $\pm$ feldspar with abundant sericite, chlorite and minor pyrite, sphene and zircon. Occasional fine grained (0.05-0.1 mm) xenoblastic aggregates of quartz occur within an even finer grained silicic matrix which is probably dominantly quartz, but which may contain some relict feldspar. There are no phenocrysts or coarse clastic crystal debris present.

The rock has been extensively altered to sericite and chlorite. These phases define a prominent cleavage which has been folded on the scale of the section and resulted in the development of a new axial plane cleavage.

There are fine aggregates of sphene and secondary Fe oxides associated with chlorite-rich patches, a few rounded grains of zircon (up to 0.05 mm), and a few dispersed grains of pyrite (up to 0.1 mm) scattered throughout the rock.

There is no clear evidence which indicates a clastic origin for this sample, compared with the abundant crystal detritus and lithic fragments in the samples described above. However, the very fine grained character of the rock, and the close mineralogical and textural similarity it has to the matrix material in the sandstone samples described above suggests it may simply be a fine interbed between the more heterogeneous mass-flow deposits.

This rock has been quite strongly altered to sericite and chlorite, but with only minor addition of sulphide.

Sample 031374A Pumiceous-feldspathic sandstone

<i>Mineralogy</i> -	Plagioclase	-	10%
	Pumiceous matrix	-	80%
	Sericite	-	10%
	Fe-oxides	-	<1%
	Zircon	-	trace

Description

Subidiomorphic to angular, broken plagioclase grains occur in a matrix dominated by sericite altered pumice fragments of variable size. Although frequently fractured, the plagioclase grains (0.2-4.0 mm) exhibit only very minor sericite alteration. The matrix is dominated by abundant pumice fragments which typically are 0.5-1.0 mm diameter, and which are variably recrystallised to xenoblastic aggregates of quartz and feldspar. Many fragments exhibit a weak relict banding suggesting they were originally tubular pumice, whereas some other fragments have relict spherulitic textures suggesting they were originally composed of more massive glassy material. There also appears to be a fine recrystallised ash component to the matrix.

Small amounts of secondary Fe-oxides (probably after magnetite), and a few angular grains of zircon are scattered through the matrix. The matrix has experienced moderate sericite alteration which has not affected the plagioclase crystals. The sericite occurs as a network of fine veinlets which define a weak single cleavage in the rock.

This sample is an epiclastic rock derived by the erosion of silicic pumice and crystal debris. The rock is poorly sorted and probably represents some type of mass-flow deposit.

Sample 031375A Pumiceous-feldspathic sandstone

<i>Mineralogy</i> -	Plagioclase	-	5%
	Lithics & matrix	-	70%
	Sericite	-	20%
	Chlorite	-	2%
	Carbonate	-	2%
	Pyrite	-	1%
	Fe-oxides	-	<1%

Description

This sample is composed of abundant volcanic-derived lithic and pumice fragments, plagioclase crystal debris, and a fine recrystallised quartzo-feldspathic matrix which has experienced moderate sericite and carbonate alteration.

Angular and broken plagioclase grains (0.2-2.0 mm) are relatively less abundant than in many of the other sandstone samples described above. They show virtually no sericite alteration, but have a dusting of clay minerals and some display patchy alteration to carbonate.

Lithic fragments are generally rounded and include a variant composed of fine grained (0.1-0.2 mm) xenoblastic aggregates of feldspar with minor quartz. These may represent recrystallised pumice as several fragments have a relict banding suggestive of original tubular pumice. Much of the remaining matrix is composed of fine recrystallised quartz and feldspar which is probably after silicic ash.

Sericitic alteration has extensively affected most of the matrix, although there is one very fine grained portion of the section which appears to be only weakly sericitised. The sericite generally occurs as a mass of interconnected fine veinlets which define a very weak cleavage in the rock.

This sample is most similar in terms of mineralogy, textures, and lithic components to 031374A, and has probably had a similar origin as a mass-flow deposit derived from unconsolidated pumice material and crystal detritus.

Sample 031377A Spherulitic dacite lava (sericitised)

<i>Mineralogy</i> -	Quartz -	75%
	Sericite -	20%
	Chlorite -	3%
	Quartz phenocrysts -	<1%
	Secondary oxides -	<1%

Description

This sample is an extensively altered spherulitic silicic lava. Rare, partially resorbed quartz phenocrysts (0.5 mm) occur with subidiomorphic pseudomorphs of quartz aggregates after original plagioclase phenocrysts. In addition, there are some patches rich in chlorite and quartz which may represent the alteration products of original ferromagnesian phases. However, some of these chlorite-quartz aggregates have an ovoid form and more likely represent amygdales.

The majority of the groundmass is composed of sericite and quartz, with subordinate patches of chlorite. The quartz occurs as recrystallised grains (0.1-0.2 mm) after original spherulites. Some aggregates retain a weak radial structure which has been largely obscured by low grade metamorphic recrystallisation. The groundmass has been partially replaced by quartz, sericite, and to a lesser extent chlorite, in the form of interconnected fine veinlets. The rock is also traversed by occasional fine quartz veins.

The major textural features of this rock (i.e. spherulites and vesicles/amygdales) indicate it was erupted as a glassy lava. The presence of pseudomorphed plagioclase phenocrysts and rare quartz phenocrysts in a silicic groundmass suggests an original dacitic composition. However, this composition has been substantially modified by the hydrothermal alteration which resulted in the breakdown of plagioclase and replacement by silica, sericite and chlorite.

Sample 031379A Spherulitic dacitic lava

<i>Mineralogy</i> -	Quartz	-	75%
	Sericite	-	20%
	Chlorite	-	2%
	Fe-oxides	-	<1%
	Pyrite	-	<1%

Description

This sample is mineralogically and texturally very similar to 031377A. It is dominated by a sericite-quartz-chlorite altered silicic spherulitic groundmass, but contains a smaller proportion of phenocrysts. It contains rare embayed quartz phenocrysts, occasional silicified plagioclase phenocryst pseudomorphs, and a few relatively large (up to 3 mm long) chlorite-sericite-rich patches of uncertain origin.

The groundmass is very similar to 031377A except that this sample contains a few scattered euhedra of pyrite (up to 0.35 mm), and is traversed by occasional veins composed of chlorite with minor pyrite. Otherwise the level of sericitic and chloritic alteration is comparable.

The close similarity of this sample to 031377A implies a similar origin as a glassy lava.

PETROLOGICAL REPORT TO PASMINCO EXPLORATION
ON SAMPLES FROM
BASTYAN DAM, WESTERN TASMANIA

1st June 1992

by

Joe Stolz
20 Bath St.,
Battery Point,
Tasmania 7004.

032775A

Dacitic Lava

Mineralogy	%
Quartz	75
Sericite	25
Chlorite	<1
Pyrite	<1
Secondary Fe Oxides	<1

A feature of this sample is rectangular to rounded sericite-rich patches (0.5 - 2 mm) which also contain subordinate fine, recrystallised aggregates of quartz. They are interpreted as altered pseudomorphs probably after plagioclase feldspar phenocrysts. These pseudomorphed phenocrysts occur in a very fine grained (0.01 - 0.03 mm) pervasively altered groundmass of recrystallised quartz and sericite. The sericite is fairly evenly distributed throughout the groundmass and is strongly aligned defining a single distinct cleavage. There does not appear to be any relict feldspar in this specimen.

The rock is traversed by several narrow (0.1 - 0.2 mm wide) quartz veinlets and even narrower chlorite-rich veinlets. Some anhedral to subhedral aggregates of pyrite appear to be closely related with these quartz-rich veins. Oxidation of this pyrite has caused some Fe staining which is concentrated along the cleavage planes.

Despite the very altered nature of this rock, the fine grained and equigranular character of the groundmass, together with the fairly evenly dispersed subhedral plagioclase pseudomorphs supports the interpretation that this rock was a lava. The absence of phenocryst quartz and presence of plagioclase phenocrysts in a silicic groundmass suggests a broadly dacitic composition. There is no textural evidence for a fragmental origin for this rock.

032790A

Dacitic Lava

An altered sparsely porphyritic lava composed of sericitised feldspar phenocrysts, chloritised ferromagnesian phenocrysts and apatite microphenocrysts in a sericite-silica altered and recrystallised groundmass.

Mineralogy	%
Quartz	77
Sericite	20
Chlorite	3
Apatite	<1
Pyrite	<1
Fe oxides	<1

Rectangular to elongate patches (1-3mm) of fine sericite and subordinate chlorite may be pseudomorphs after original feldspar phenocrysts. These occur with chlorite-magnetite aggregates (probably after ferromagnesian phenocrysts), rare partially embayed quartz phenocrysts (0.6mm), and apatite microphenocrysts (0.1-0.3mm) in a recrystallised quartz-sericite groundmass.

Some of the sericite-rich patches have distinctive rectangular outlines, whereas others have become elongated in the cleavage direction. Some of the chlorite-magnetite aggregates also have a rectangular form suggesting they may be replacing original amphibole or biotite phenocrysts, but chlorite also occurs in narrow (0.1mm wide) veinlets with minor pyrite. There are several cross-cutting quartz veins (0.2-1 mm wide), but carbonate is notably absent from this specimen in contrast to specimens 032788A and 032789A.

The groundmass is fairly even grained and composed predominantly of xenoblastic quartz (0.03-0.1mm) with intergranular sericite which overall is significantly less abundant in this specimen compared with 032788A and 032789A.

The relic textures in this sample seem most consistent with the interpretation that it was a lava i.e. it consists of relatively sparse phenocrysts which are evenly distributed through a relatively homogeneous groundmass. The presence of apatite microphenocrysts is an important observation as these generally occur in dacitic to andesitic compositions rather than more silicic compositions which are characterised by lower P_2O_5 concentrations. The sericite-chlorite-rich patches are probably pseudomorphs after plagioclase phenocrysts, and hence a dacitic composition seems most likely.

In summary, 032790A is interpreted most likely as an example of Mt Black Volcanics, whereas 032788A and 032789A have mineralogical and textural features more consistent with the silicic volcanoclastics of the Rosebery Hangingwall sequence. This interpretation must be tempered by the higher level of uncertainty about the precursor to 032789A in particular, due to its very altered character.

APPENDIX 6
DOWNHOLE EM DATA – DRILLHOLE BY1

CRONE GEOPHYSICS & EXPLORATION LTD

BOREHOLE PEM

067107

Client	: Pasminco Exploration	Hole	: BY01
Grid	: Bastyan Dam	Tx Loop	: 1
Date	: Feb 8, 1992	File name	: by111.new
Time Base	: 10.00 ms	# Readings	: 55
Ramp Time	: 0.50 ms	Stn Units	: Metric
# Channels	: 8	Coil Area	: 6500 sq m
Sync Type	: Crystal	Polarity	: -
Loop Size	: ~~400m~~ ~~400m~~ ?	Receiver	: Digital #109
Current	: 4 Amps	Operator	: N.H.

Channel Times (used)

Ch	Start	End	Center	Ch	Start	End	Center	Ch	Start	End	Center
ED	-198	-99	-149	1	76	131	104	2	131	225	178
3	225	378	302	4	378	639	508	5	639	1075	857
6	1075	1809	1442	7	1809	3046	2428	8	3046	5121	4084

CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

5 cm

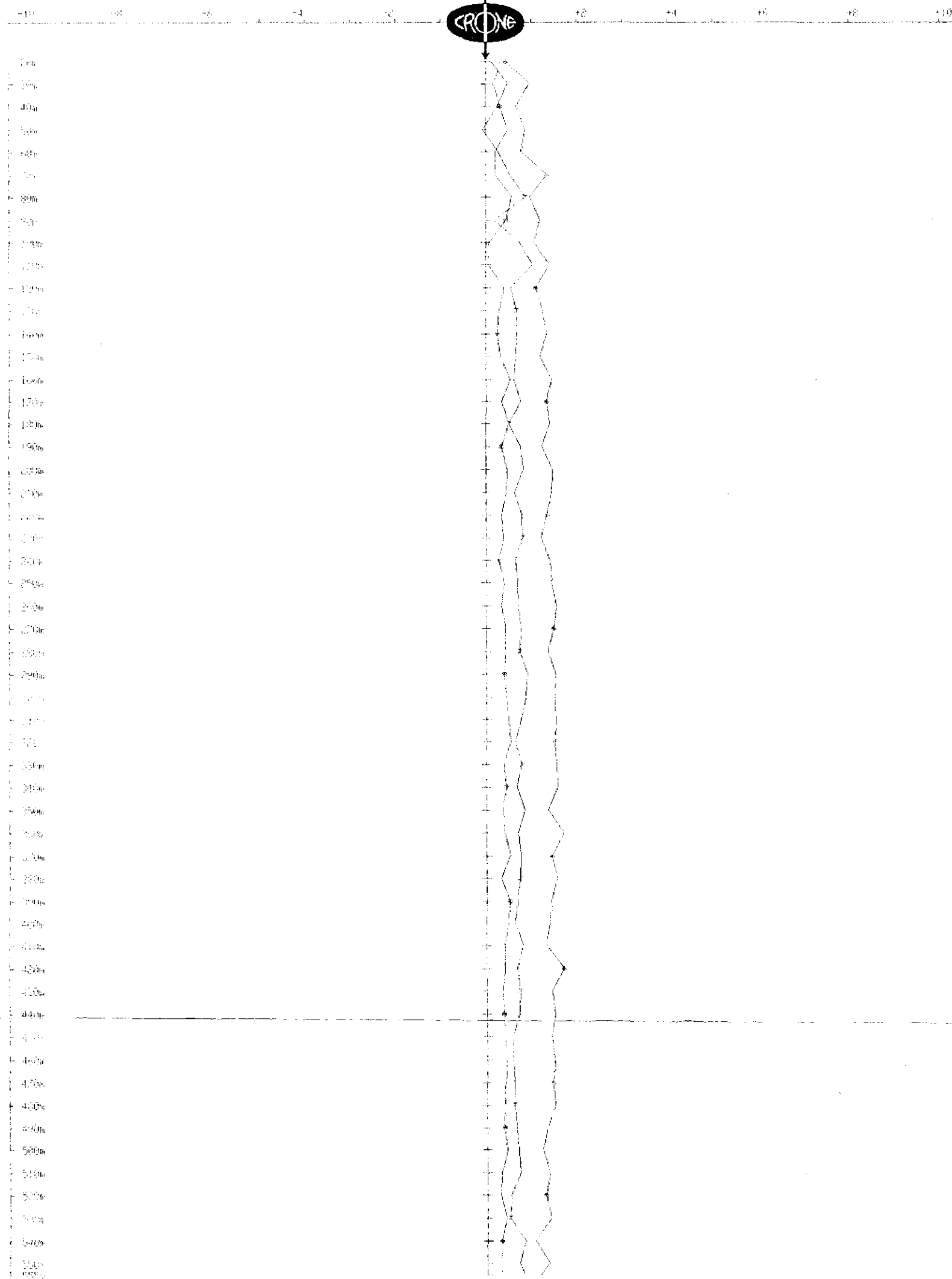
Client : Pasminco Exploration
Site : Bastyan Dam
Date : Feb 8, 1992

Hole : BY01
Tx Loop : 1
File name : by111.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels

Scale: 1:2000

Unit Scale: 1cm = 1



CRONE GEOPHYSICS & EXPLORATION LTD

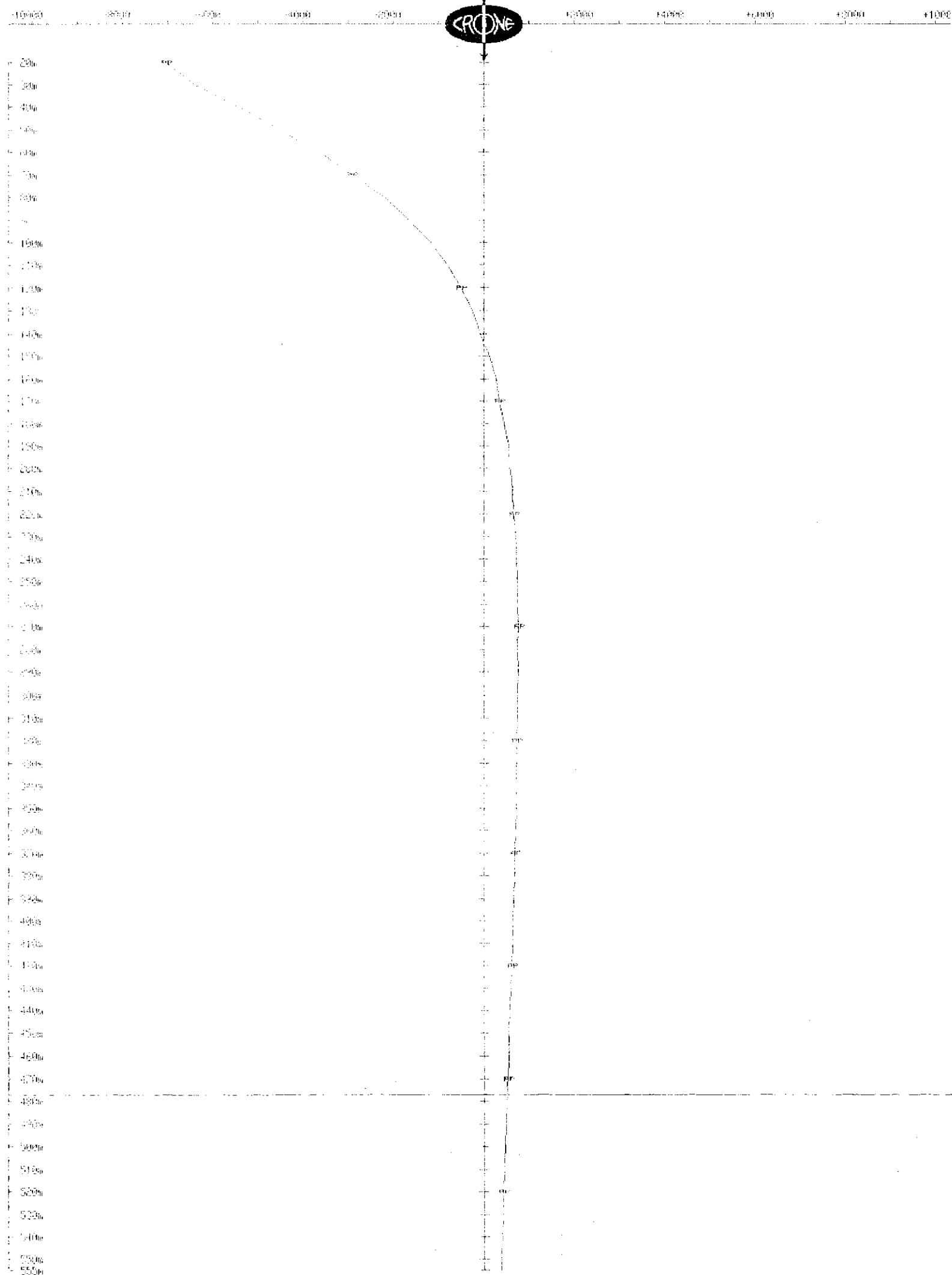
BOREHOLE PEM

5 cm

Client : Pasminco Exploration
Grid : Bastyan Dam
Date : Feb 8, 1992

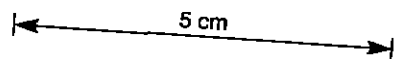
Hole : BY01
Tx Loop : 1
File name : by111.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels and PP
Scale: 1:2000 Unit Scale: 1cm = 1000



CRONE GEOPHYSICS & EXPLORATION LTD

BOREHOLE PEM



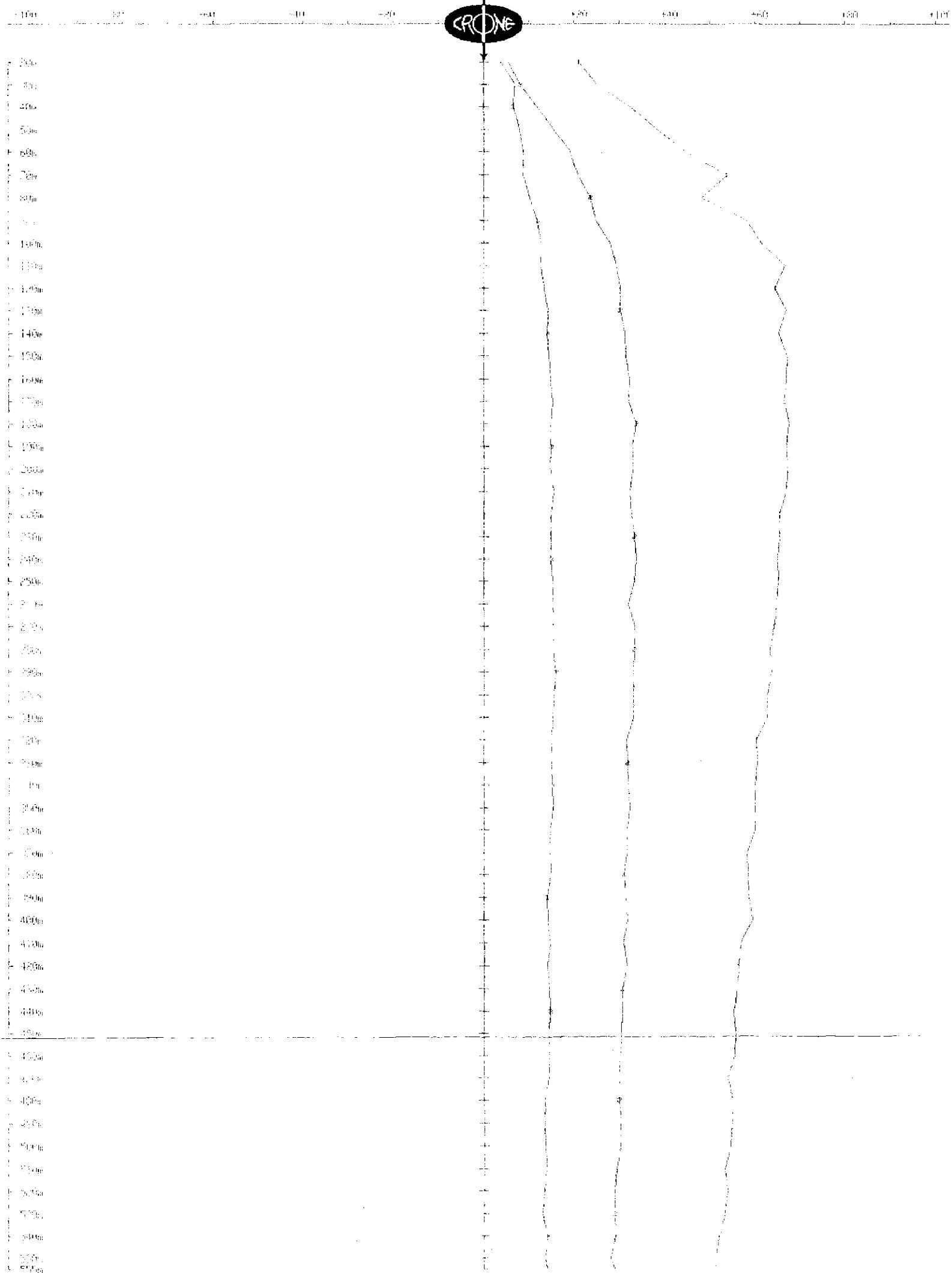
Client : Pasminco Exploration
 Grid : Bastyon Dam
 Date : Feb 8, 1992

Hole : BY01
 Tx Loop : 1
 File name : by111.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels

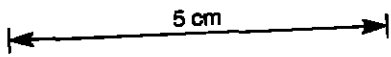
Scale: 1:2000

Unit Scale: 1cm = 10 m



CRONE GEOPHYSICS & EXPLORATION LTD

BOREHOLE PEM



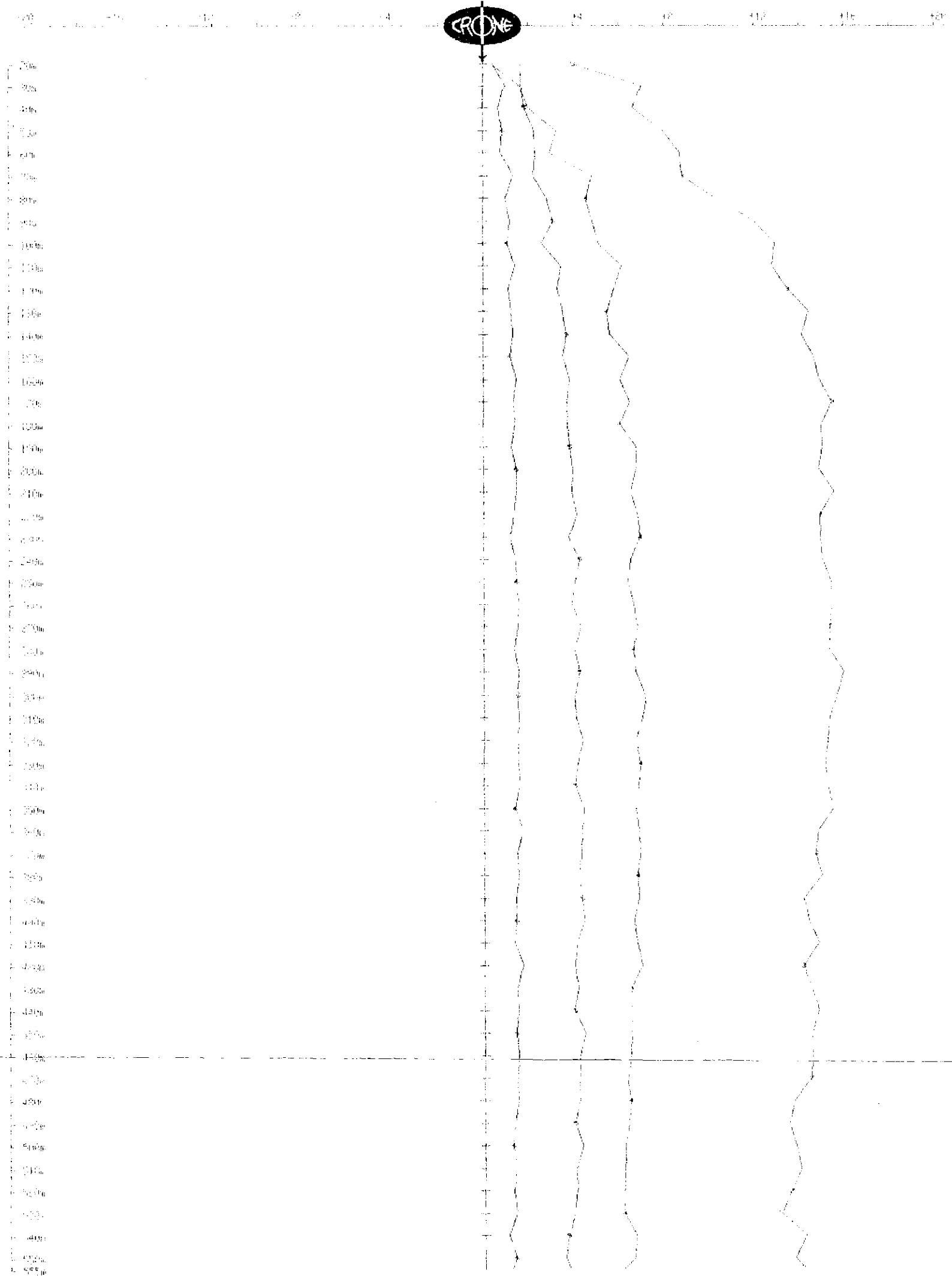
Client : Pasminco Exploration
Grid : Bastyan Dam
Date : Feb 8, 1992

Hole : BY01
Tx Loop : 1
File name : by111.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels

Scale: 1:2000

Unit Scale: 1cm = 2



CRONE GEOPHYSICS & EXPLORATION LTD.

BOREHOLE PEM

067112

Client : Pasminco Exploration
 Grid : Bastyan Dam
 Date : Feb 8, 1992
 Time Base : 10.00 ms
 Ramp Time : 0.50 ms
 # Channels: 8
 Sync Type : Crystal
 Loop Size :
 Current : 4 Amps

Hole : BY01
 Tx Loop : 02
 File name : by112.new
 # Readings: 55
 Stn Units : Metric
 Coil Area : 6500 sq m
 Polarity : -
 Receiver : Digital #109
 Operator : N.H.

Channel Times (usec)

Ch	Start	End	Center	Ch	Start	End	Center	Ch	Start	End	Center
PP	-198	-99	-149	1	76	131	104	2	131	225	178
3	225	378	302	4	378	639	508	5	639	1075	857
6	1075	1809	1442	7	1809	3046	2428	8	3046	5121	4084

CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

5 cm

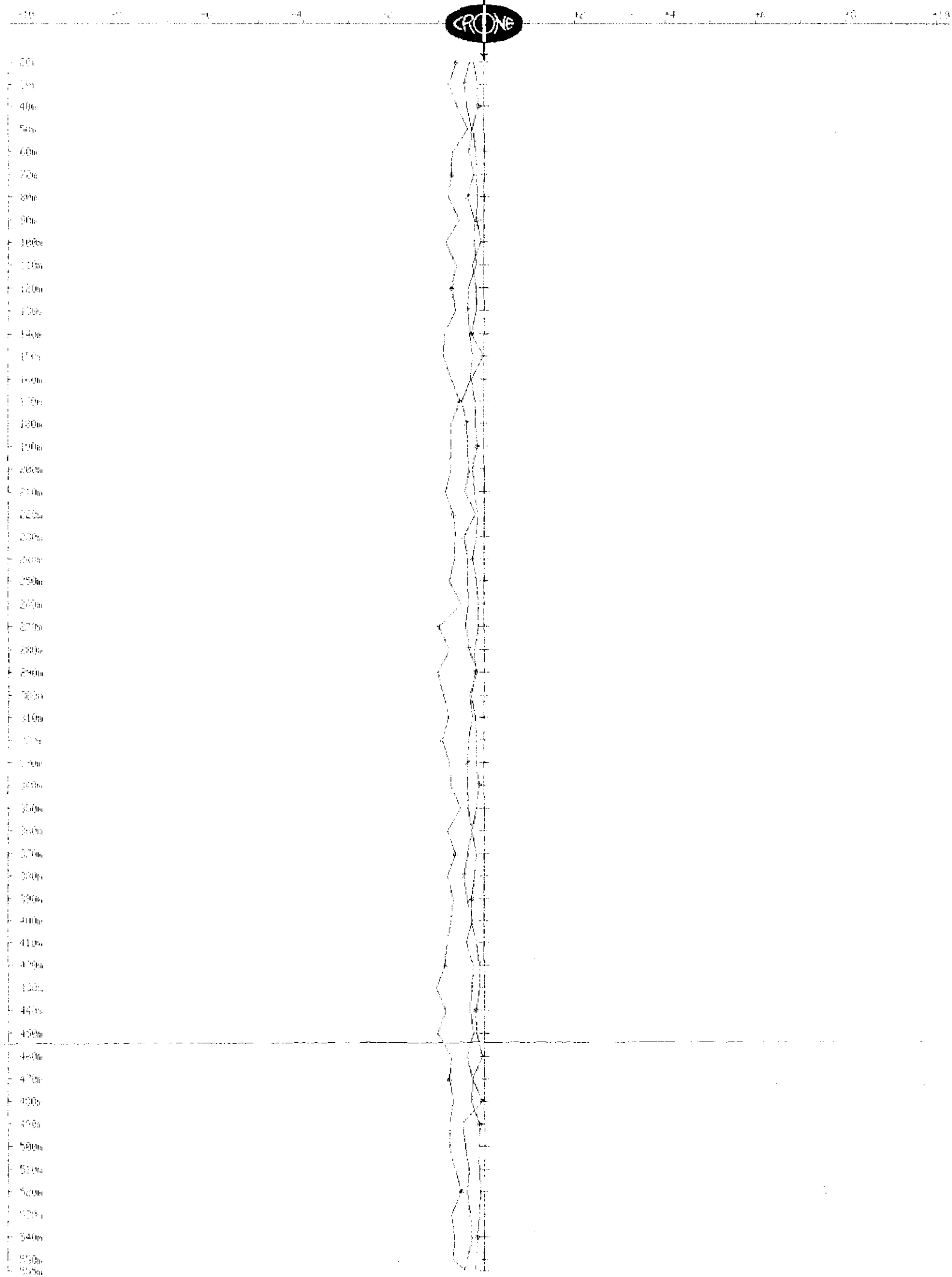
Client : Pasminco Exploration
Grid : Bastyon Dam
Date : Feb 8, 1992

Hole : BY01
Tx Loop : 02
File name : by112.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels

Scale: 1:2000

Unit Scale: 1cm = 1



CRONE GEOPHYSICS & EXPLORATION LTD

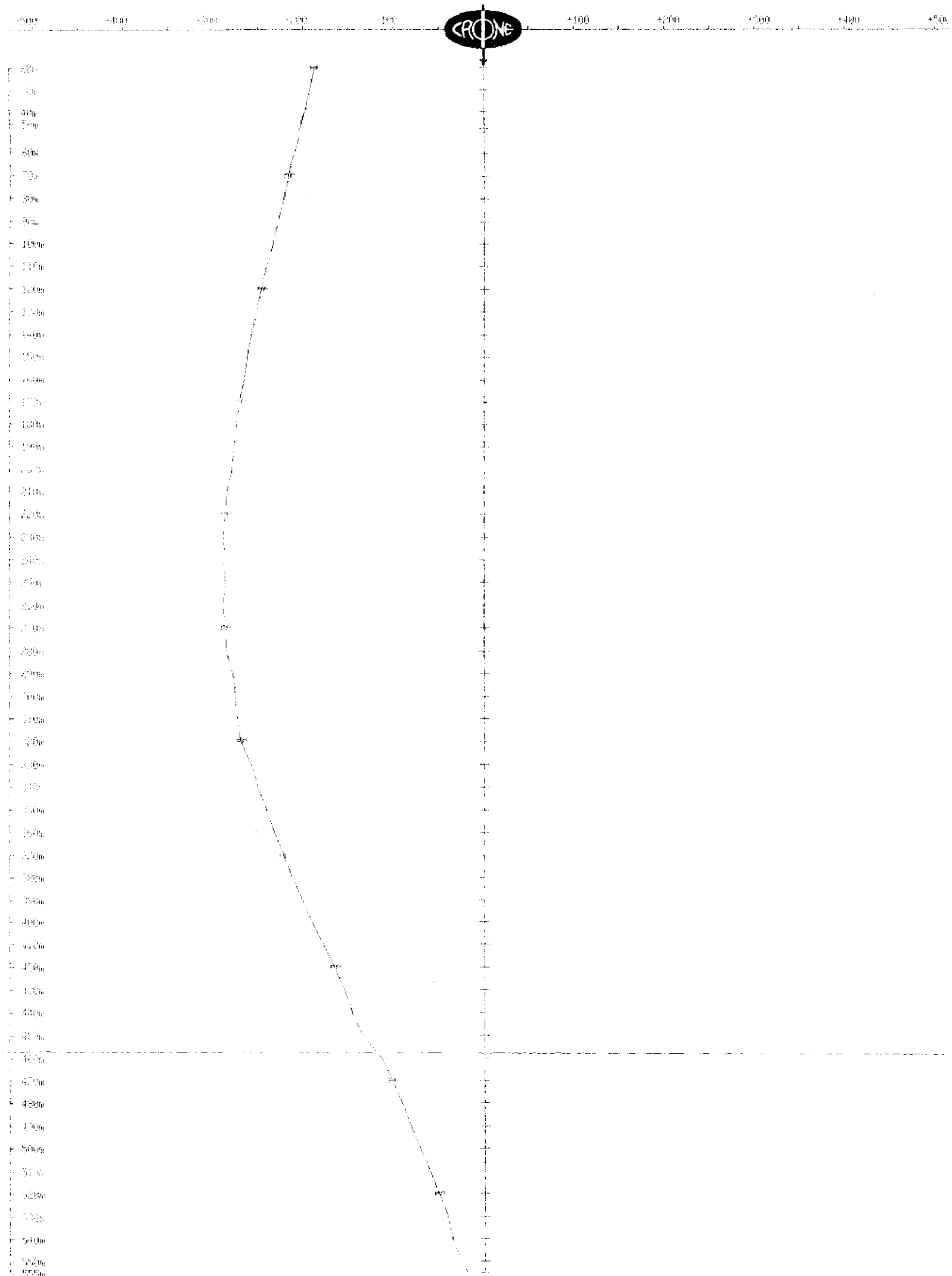
BOREHOLE PEM

5 cm

Client : Pasminco Exploration
Grid : Bastyan Dam
Date : Feb 8, 1992

Hole : BY01
Tx Loop : 02
File name : by112.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels and PP
Scale: 1:2000 Unit Scale: 1cm = 50



CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

5 cm

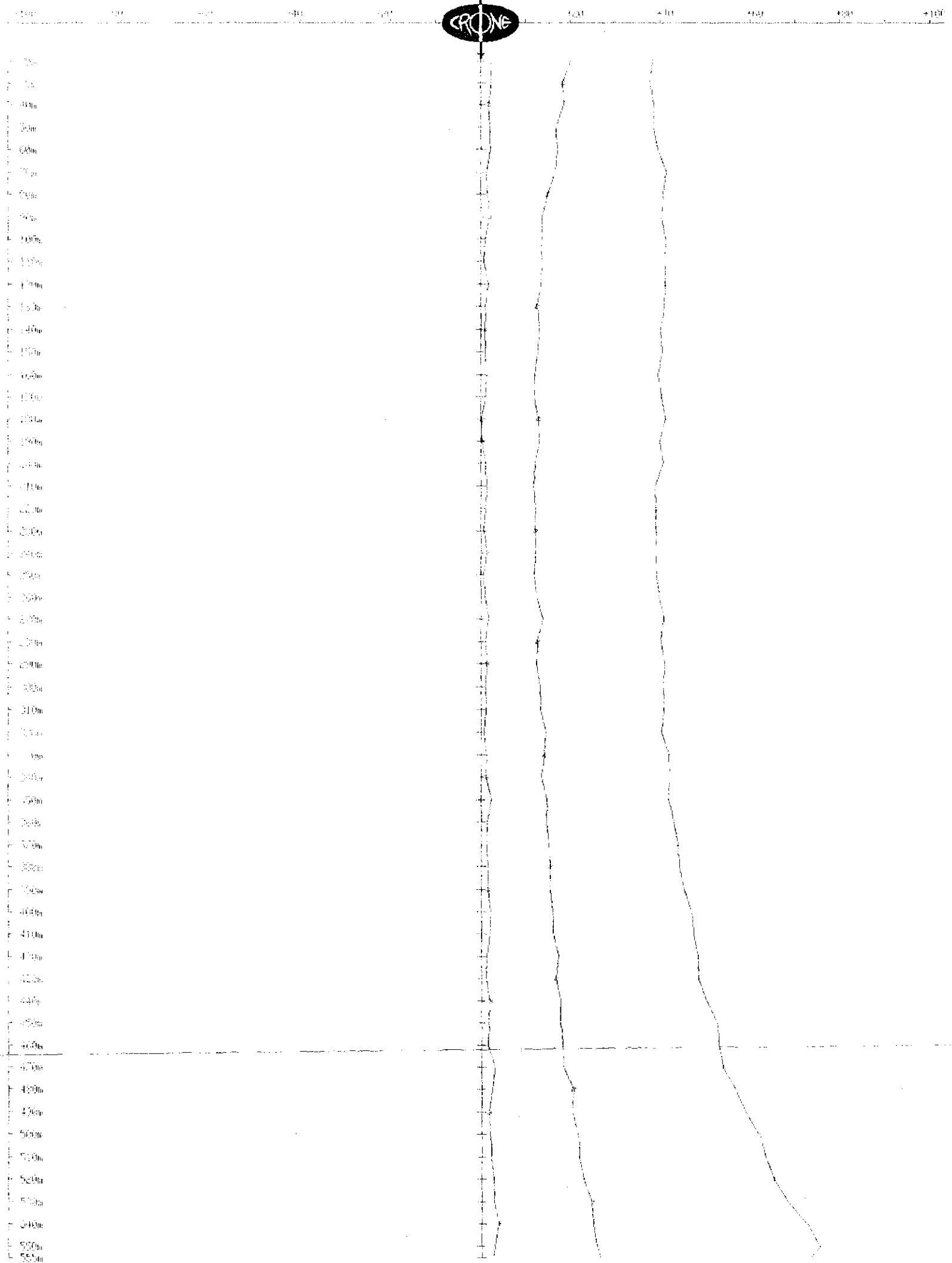
Client : Pasminco Exploration
Grid : Bastyon Dam
Date : Feb 8, 1992

Hole : BY01
Tx Loop : 02
File name : by112.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels

Scale: 1:2000

Unit Scale: 1cm = 10



CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

5 cm

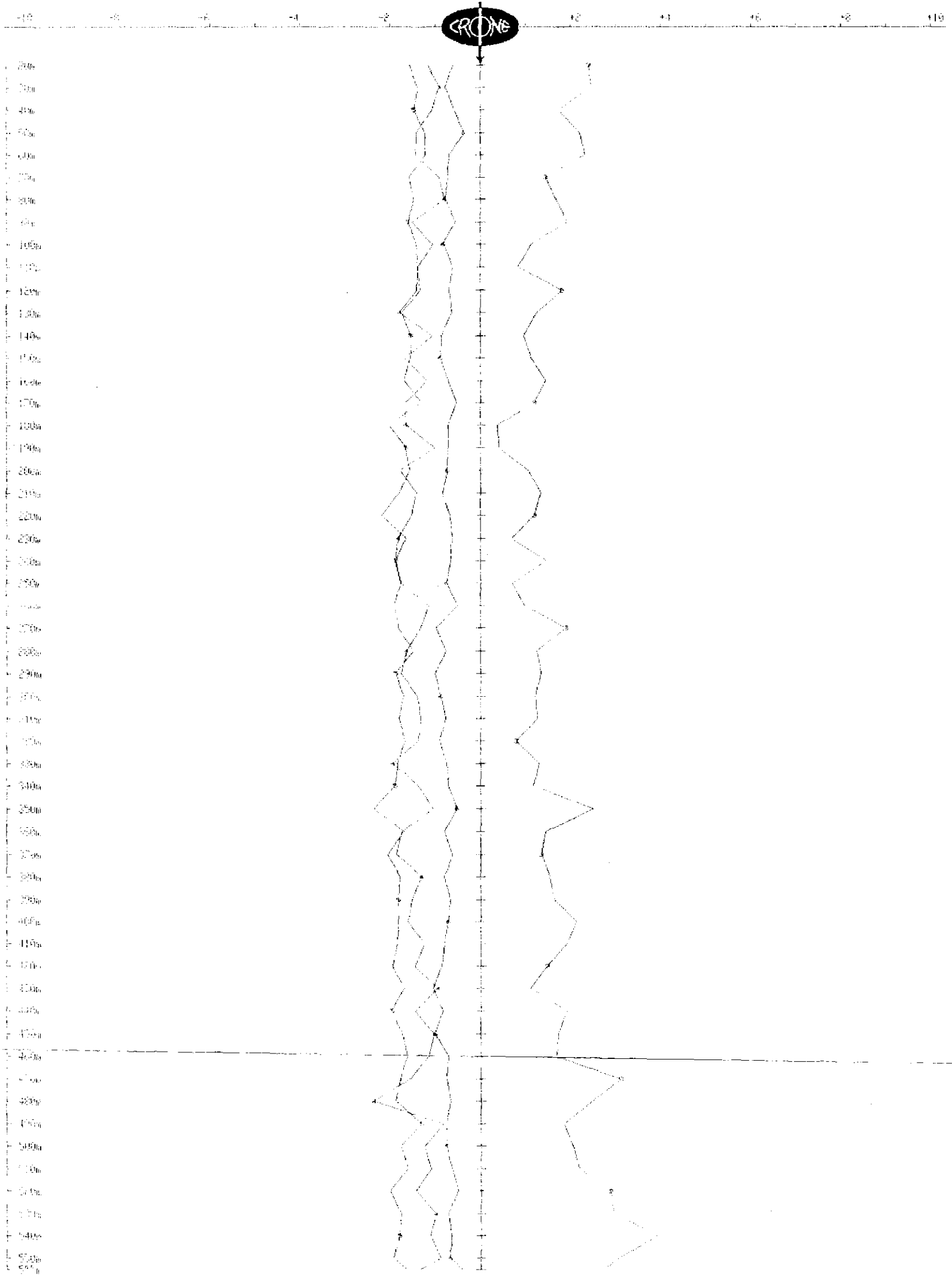
Client : Pasminco Exploration
Grid : Bastyan Dam
Date : Feb 8, 1992

Hole : BY01
Tx Loop : 02
File name : by112.new

Z COMPONENT dBz/dt nanoVolts/Amp-m² - 8 channels

Scale: 1:2000

Unit Scale: 1cm = 1



APPENDIX 7
CURRENT STATUS OF GRAVITY COVERAGE, MT BLACK AREA
20 APRIL 1992 - MEMO BY DR D E LEAMAN

LEAMAN GEOPHYSICS

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

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MEMORANDUM:

FROM: D.E. LEAMAN, LEAMAN GEOPHYSICS

TO: PASMINCO EXPLORATION. Attention: F. Fitzgerald
G. Purvis

RE: CURRENT STATUS:
GRAVITY COVERAGE MT BLACK AREA (EL 12/88)

Gravity coverage in the Mt Black region has been recently improved with the acquisition of three detailed profiles across the eastern slopes (including Mt Sale).

Prior to this survey increment observations were restricted to parts of the mountain top and the western slopes with a few stations in the Tullah area and very few elsewhere. Many of these isolated stations were suspect because they had been barometrically levelled with long time delays. Some positions were also uncertain.

Discussion of previous coverage, recommendations for improvements and a basic interpretation was provided by Leaman (1991).

Additional coverage was restricted to three lines for cost and access reasons. No further detail could be justified pending inspection of the results of this infill. The positions observed represent convenient re-opening of older survey lines at about 5375 000, 5376 500 and 5377 500 mN.

The survey infill was contracted to the Department of Mines gravity field team led and supervised by Dr. R.G. Richardson. The survey was completed in February 1992. The survey was hydraulically levelled with barometer comparisons and elevations and basic gravity reductions were provided by the contractor. All terrain corrections and checking was done by Leaman Geophysics.

The lines were tied to established base levels near Tullah (such as Lake Rosebery) and survey points high on Mt Black. The survey demonstrated that some of the irregularities in earlier surveys were related to survey errors on Mt Black. One line was re-levelled. Detailed station descriptions were also available for the first time and these have allowed better approximations of the terrain correction. Some uncertainty still attaches to some of these, near the crestral track, due to unsighted or ill defined cliffs near the present, and some older, traverses. There is no doubt, however, that the present compilation is a considerable improvement in both coverage and definition of the gravity field.

Bouguer anomalies are plotted in Figure 1. This diagram also shows the station coverage and survey vintages.

Careful positioning methods along the cut lines surveyed has also shown that these lines were not in the assumed locations. By linking the observed lines to surveyed positions, occasional satellite recoveries and other topographic and geographic features positional errors of up to 300 m were identified.

Close enquiry into observations made by the contractor, and review of the methods used to position or nominally define the lines has convinced me that the positions shown in Figure 1 mark the proper location of the traverses. There is little scope for any significant error in position of the gravity stations.

Figure 2 presents a compilation of residual Bouguer anomalies using the regional separation process known as MANTLE91. This removes crustal influences from the data set and provides a clearer focus on local effects.

The new compilation may be compared with that given by Leaman (1991). The relatively negative anomaly near the crest of Mt Black is confirmed but shown to be a quite narrow feature. The ill-defined field on the eastern side of the mountain has also been confirmed; the gravity field is almost flat south of 5376 500 mN with pronounced steps, trending nearly E-W at 5376 500 and 5379 000 mN. These regular steps and plateaux in the field correspond to the main body of volcanics west of the Henty Fault (and andesites) (see Figure 3).

This pattern in the gravity field either implies a relatively uniform slab of volcanics or a slab dipping east if the effect of granite is counteracted. In either explanation only the transverse gradients are anomalous and significant. The relatively positive contribution implied is consistent with massive and relatively normal volcanics. The anomalous effects occur at and west of the mountain crest axis where trends a little west of north are evident and persistent.

Few stations sample the andesites at the foot of the eastern slopes but there is a suggestion that the field is more positive across these rocks. This is also consistent with properties and lithology. The absence of this effect near 5375 000 mN would indicate that this material is truncated south of this northing or, allowing for the geological base map, considerably diminished in volume. The slight offset near 5376 000 mN would suggest that these rocks are variable in form in this zone.

Reference:

D.E. Leaman, 1991. Geophysical surveys, EL 12/88, Mt Black JV. Acquisition report (including preliminary interpretation). Report for Pasminco Exploration. July.

D. Leaman 20/4/92

5379N

-5.80 -6.0

X 0.4

067120

Z-9.6

Z-7.4

-6.8

X-7.4 X-5.2 X-2.1 X-8.1 X-7.3 X-8.1 X-7.4 X-6.9 X-7.1 X-7.1 X-6.1 X-7.0

Z-10.6

X-7.1 X-6.1 X-6.0 X-7.0 X-7.0 X-7.1 X-8

-9.4

-8.9

Z-8.5

-9.3

-10.5

Z-8.2

5317

N

-8.7

-8.8

-9.3 -9.8

-8.6

-10.0

-9.9

-10.1

-9.4

-10.4

-10.1

-10.4

-10.2

-10.3

-10.5

-9.9

-10.1

-10.3

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MT BLACK
EL 12/88

Key:

X = Stations
read 1991-92

5373

N

-12.9

-12.7

-12.5

-12.3

-12.1

-11.9

-11.7

-11.5

-11.3

-11.1

-10.9

-10.7

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31.3

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34.1

34.3

34.5

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35.1

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37.1

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37.7

37.9

38.1

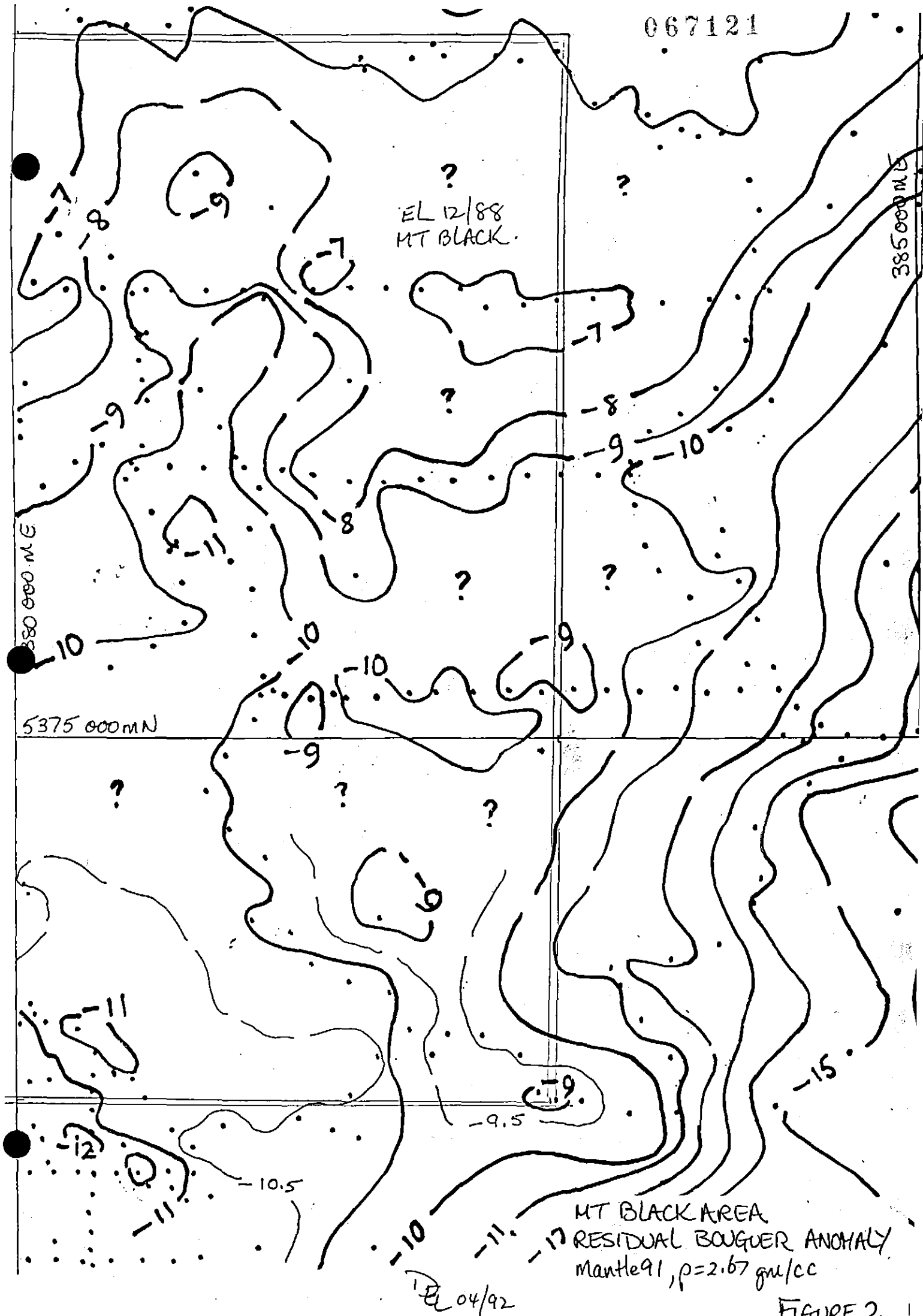
38.3

38.5

38.7

38.9</

067121



EL 12/88
MT BLACK.

380 000 M E

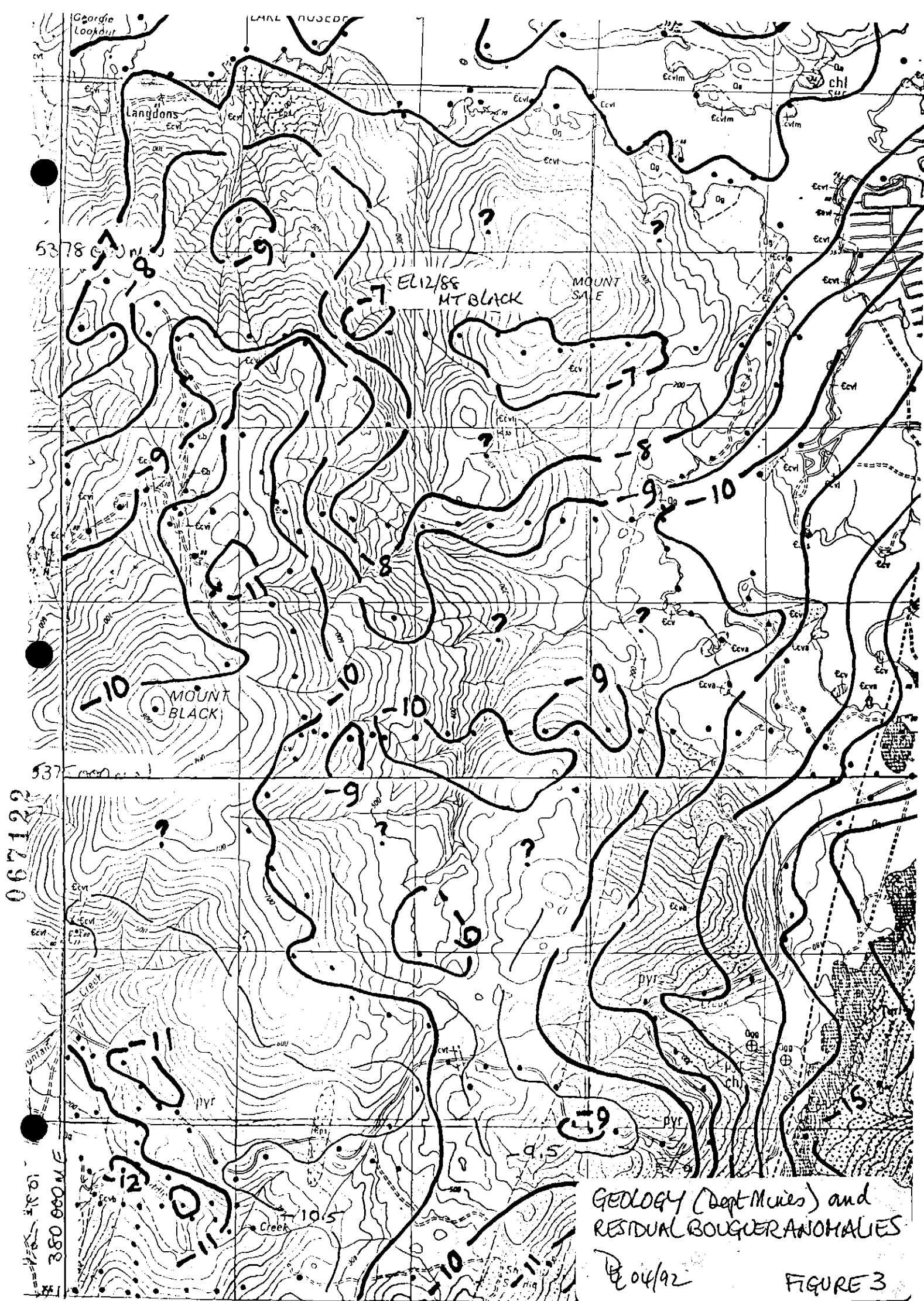
5375 000 MN

385 000 M E

MT BLACK AREA
RESIDUAL BOUGUER ANOMALY
Mantle 91, $\rho = 2.67 \text{ gm/cc}$

EL 04/92

FIGURE 2



APPENDIX 8
CUTTY SARK MAGNETIC ANOMALY-
INTERPRETATIONS BY DR D E LEAMAN
DECEMBER 1991

LEAMAN GEOPHYSICS

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

Registered office:

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Telephone: (002) 44 1233

Fax: (002) 44 6674

December 9, 1991

*****REVISED VERSION DECEMBER 16, 1991

Mr. F. Fitzgerald,
Exploration Manager,
Pasminco Exploration,
PO Box 886,
BURNIE TAS 7320

RE: Magnetometer traverse, Cutty Sark

Attention: J.G. Purvis

Dear Fergus,

This note outlines results of a ground magnetic traverse undertaken between the Bastyan Dam and Langdons prospect on the south side of Lake Rosebery. The actual position of the traverse is shown in the attached map.

Some 659 stations were observed with a station spacing of 5 m and the results corrected for diurnal drift.

I have projected all results onto an E-W profile in order to remove most of the distortions introduced by the erratic route traversed.

The profile was observed in order to evaluate the nature of the source of the large magnetic anomaly which dominates both drape and high level aeromagnetic presentations north west of Mount Black. It has been suggested that local features generated by exposed materials or volcanics at shallow depth might explain this feature although all my previous work has indicated a strongly mafic source of considerable size and depth range. In order to test these options the resulting profile was sub sampled after projection and modelled.

There is no doubt that a substantial local response is associated with the contacts (or andesite) near Hawkesbury but it, and all other spiky features, are clearly superimposed on something of very much longer wavelength. This cannot be generated by the exposed Mt Black Volcanics.

Figure 2 provides one solution; a relatively thin slice of intensely magnetic material (note the contrast required) dipping to the east at about 45 to 55 degrees. It is possible to change the geometry and contrast slightly and invoke mafic rocks but none of the exposed materials are candidates. Surface effects are easily discriminated.

The model provided accounts for the gradients observed and is consistent with known properties of the Mt Black Volcanics east of the andesite near Hawkesbury.

Now it can be argued that this solution, which happens (unintentionally) to lie along the projection of the Mt Black Thrust, could be explained by a thin magnetite-rich horizon, unit or structurally sheared member on one of

the thrust surfaces.

I find this an untenable solution for several reasons. Such a unit must approach surface, or be exposed, somewhere along the face of Mt Black or wherever the surface is exposed. Were it to do so such strong contrasts would lead to sizeable spikes in low level magnetics. These are nowhere observed. Even allowing for a patchy source this is a critical deficiency.

The second major problem is the extent of the anomaly and presumed source. The anomaly feeds northward, becoming deeper, until it joins the the large Bulgobac feature - of which it is clearly part. No simple unit in a single structure is likely to have the spread required.

Further, if the magnetite enrichment is associated with skarns then the entire source may be too far removed from granite anywhere - let alone kilometres to the north.

My preferred explanation is an ultramafic source. The problem with this, as modelled, is its depth range, location and dip. How does one get these materials up to the level of the Mt Black Thrust with an easterly dip?

I think the short answer is, one does not.

Figure 3 examines some other possibilities. These include the reality of the Rosebery Fault and additional volcanics. This forces any upper surface of a deep source (such as ultramafics) up to 1000 m deeper. When this is done it is simply not possible to match the gradients and amplitudes no matter how the sources are arranged. Two simple examples are shown. The models provide the general background levels but cannot equate the western gradient in particular. Inclusion of various deeper units, including Crimson Creek Formation does not greatly help, nor does a Huskisson style fold, although each of these variations does carry suggestion of truth.

Figure 4 presents a more complex variation which builds in some extreme, and generally only marginally supported volcanic contrasts, to build a whole picture. It shows that the volcanic and shallow elements can easily be explained with normal properties although the andesites are reversely magnetised. But the overall background, sourced from depth, is just not correct and cannot be fitted at either end of the profile.

If however, the Rosebery Fault is soled into the Mt Black Thrust - thus offering a shallower source top, the response immediately begins to be bowed as required. Perhaps, just perhaps, these thrust surfaces are folded and linked within Mt Black a little east of Rosebery - an explanation which might go a long way toward accounting for the splintering and dip variations which have caused debate about these surfaces.

There are of course a number of other implications which may well affect exploration if this is the case. There could well be a complex weave of detachments within the Rosebery wedge.

More important perhaps might be the observation that these might terminate or join not far east of Rosebery which would imply that the total displacement on the lower set of structures might nowhere exceed 1 or 1.5 km.

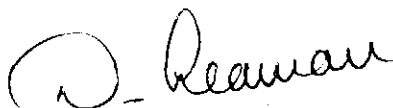
It was confidently asserted early in this memo that the anomaly could not be explained using the exposed volcanics. This option is considered in Figure 5.

This model is a local variation of models presented in my July report on Mt Black where it was suggested that variations within the Mt Black Volcanics were mappable. The model comfortably satisfies ALL major features of the observed data and with minor modifications could satisfy the spikes as well. It does this with the required curve fit parameters.

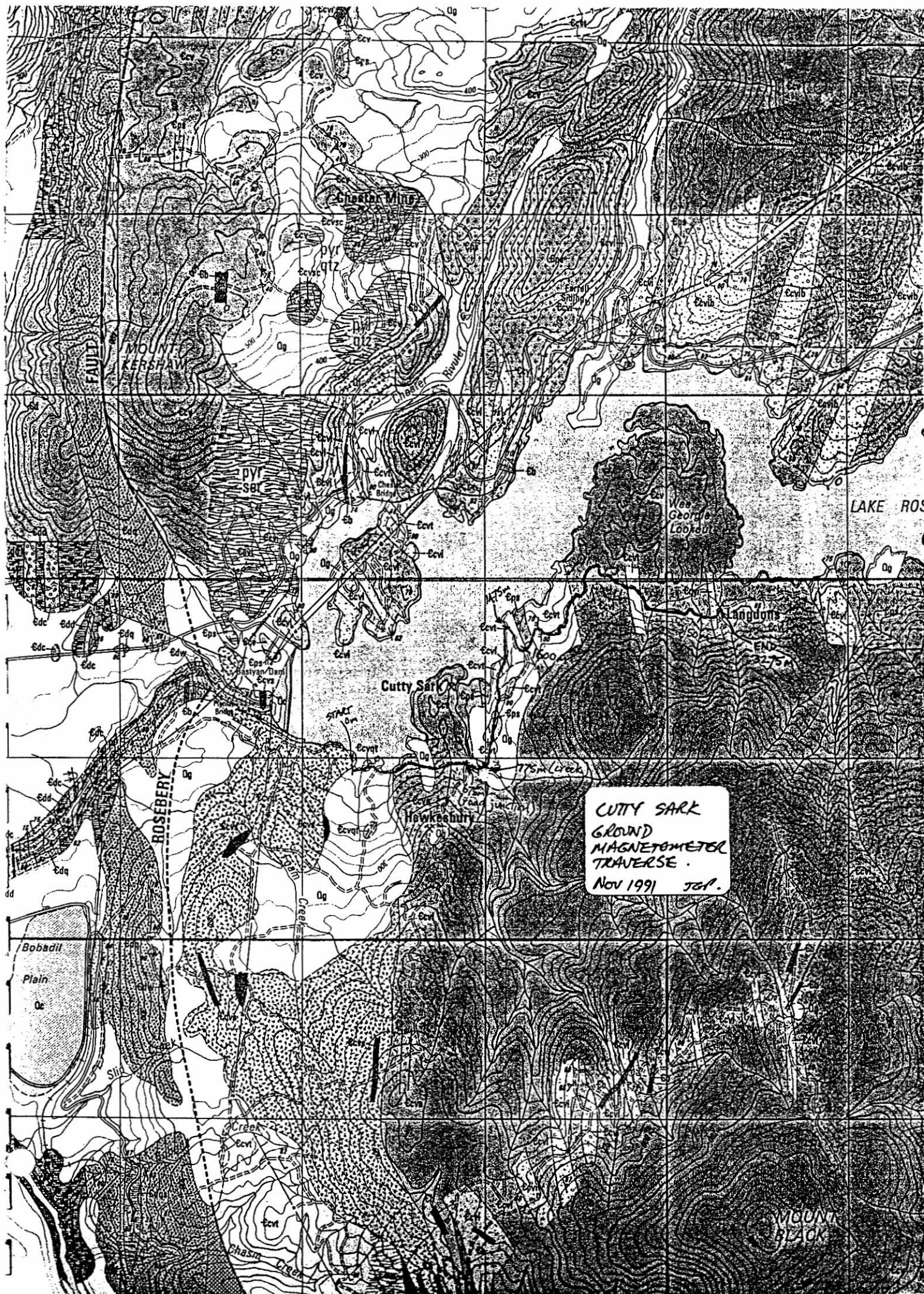
The problem, however, has been noted previously; the properties of the volcanics. The model requires all the volcanics to average 0.0003 cgs and for a key portion to bulk at more than 0.001 cgs. These are bulk figures which must apply to large volumes and no trade offs with thin but locally high contrast variations can be contemplated for such shallow sources. Unfortunately contrasts of this magnitude are just not known. Peak values are typically one half to one third the bulk minimum required by the model and a tenth of the peak required.

Until values of the correct magnitude have been observed in surface rocks over a wide area this model is nice, but just not credible. Could it be that the bulk of our properties have been derived from the definitely lower contrast volcanics west of Mt Black? A property compilation ON Mt Black is required.

So, the issue is not yet resolved but it might be time to take the Cutty Sark anomaly seriously and try to determine the source geometry. It may well put limits on the location and extent of the Rosebery Fault and this may transform our view of the setting and space available in the Rosebery area.

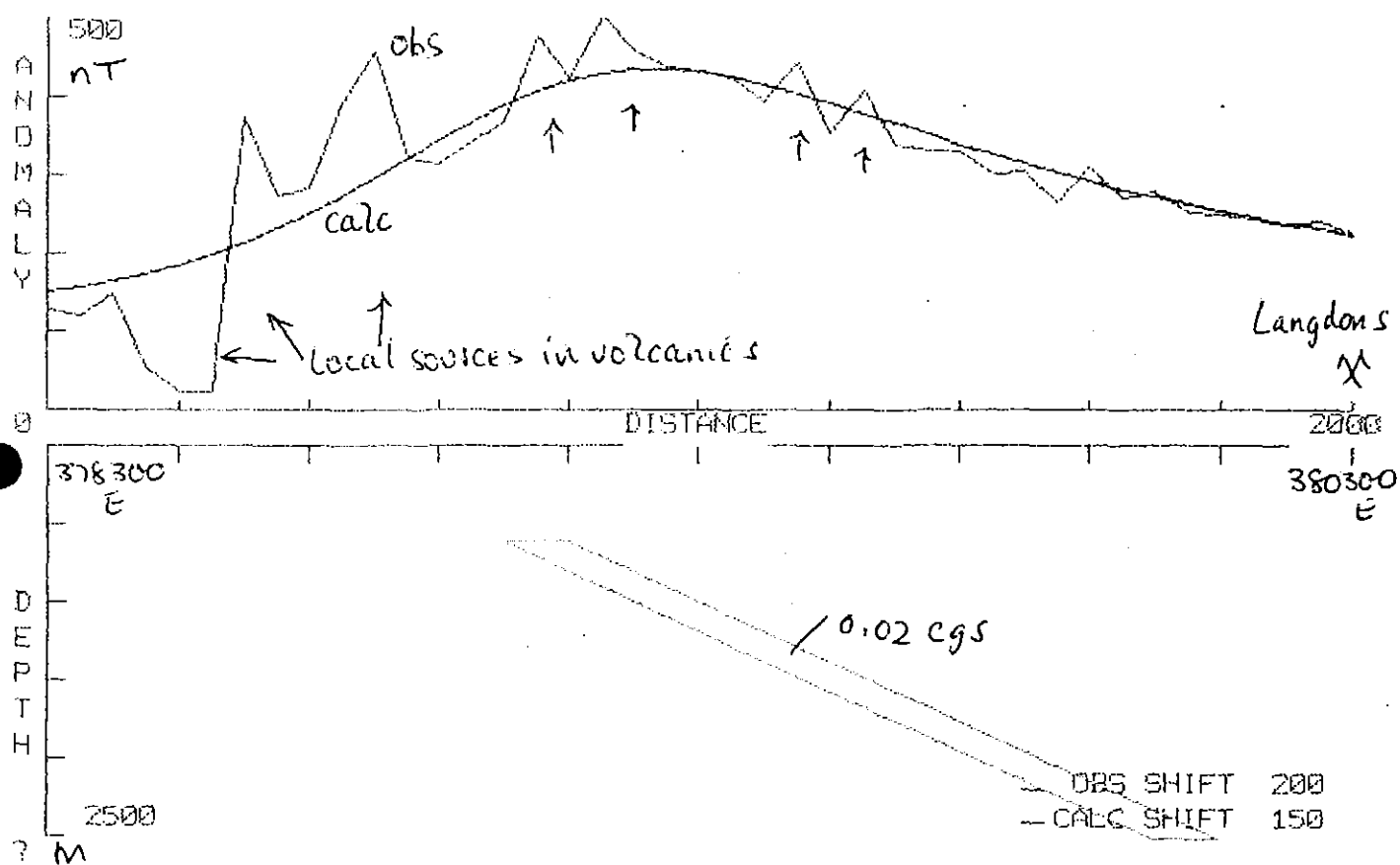


D. E. Leaman



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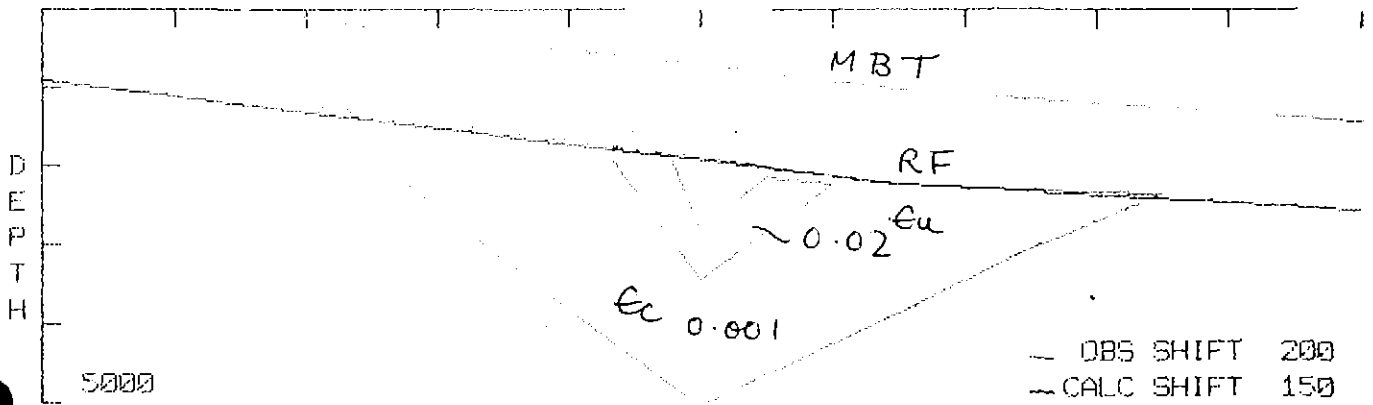
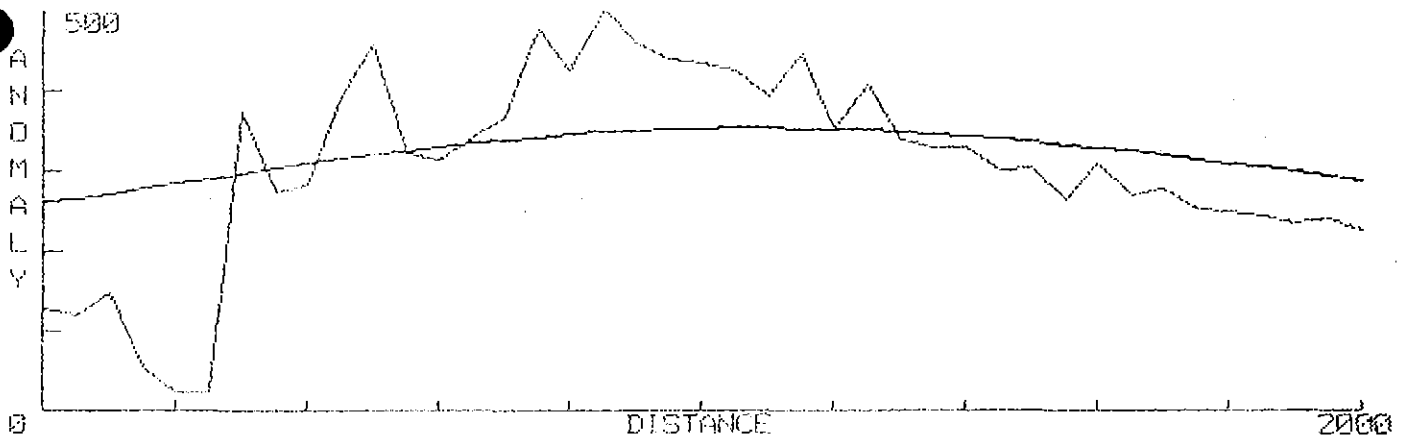
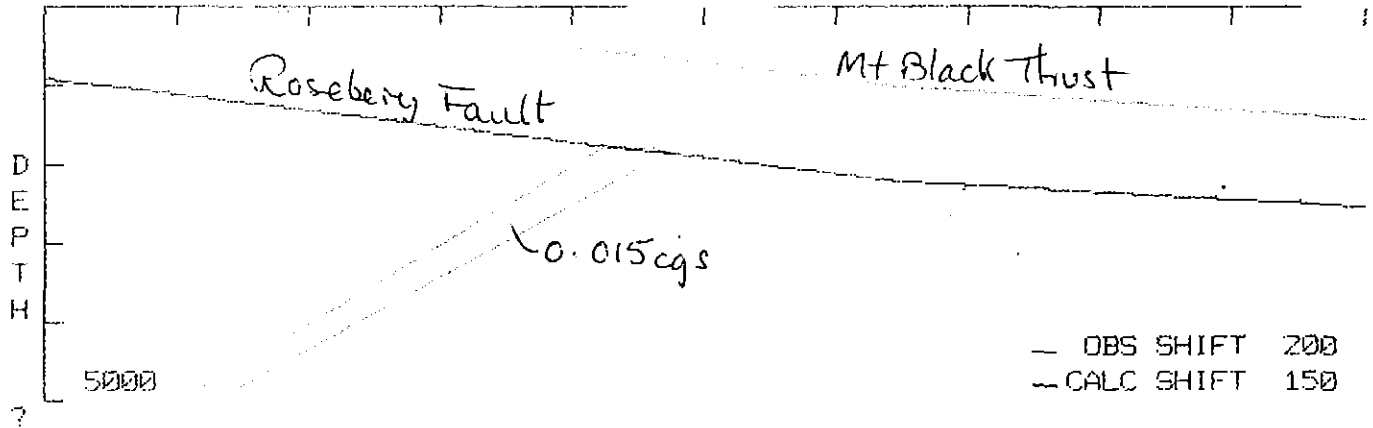
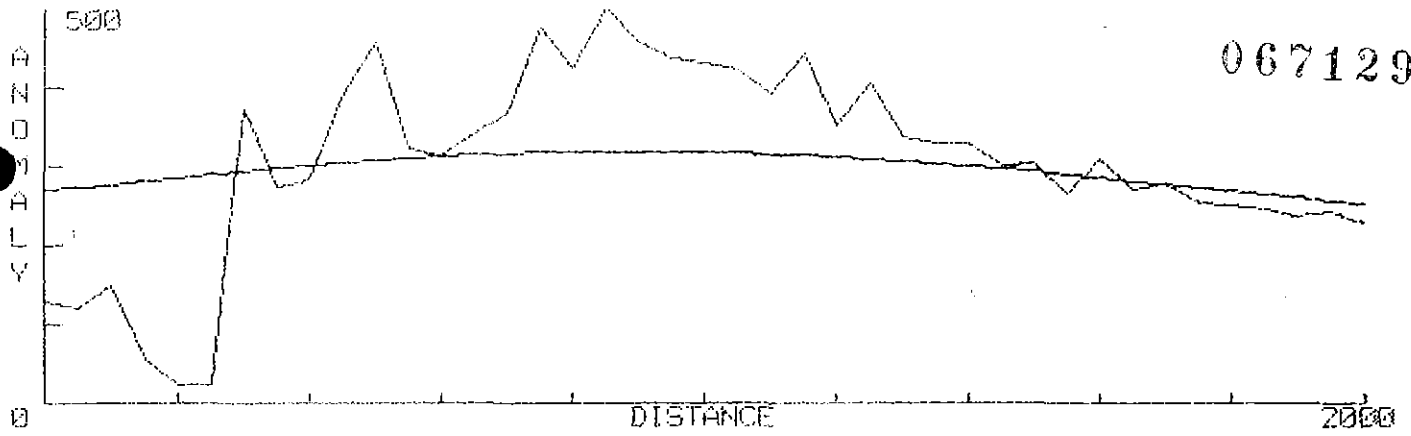


files: CUTTY
CUTTYMOD
CUTTYCAL

THE "CUTTY SARK" ANOMALY/ FIG 2

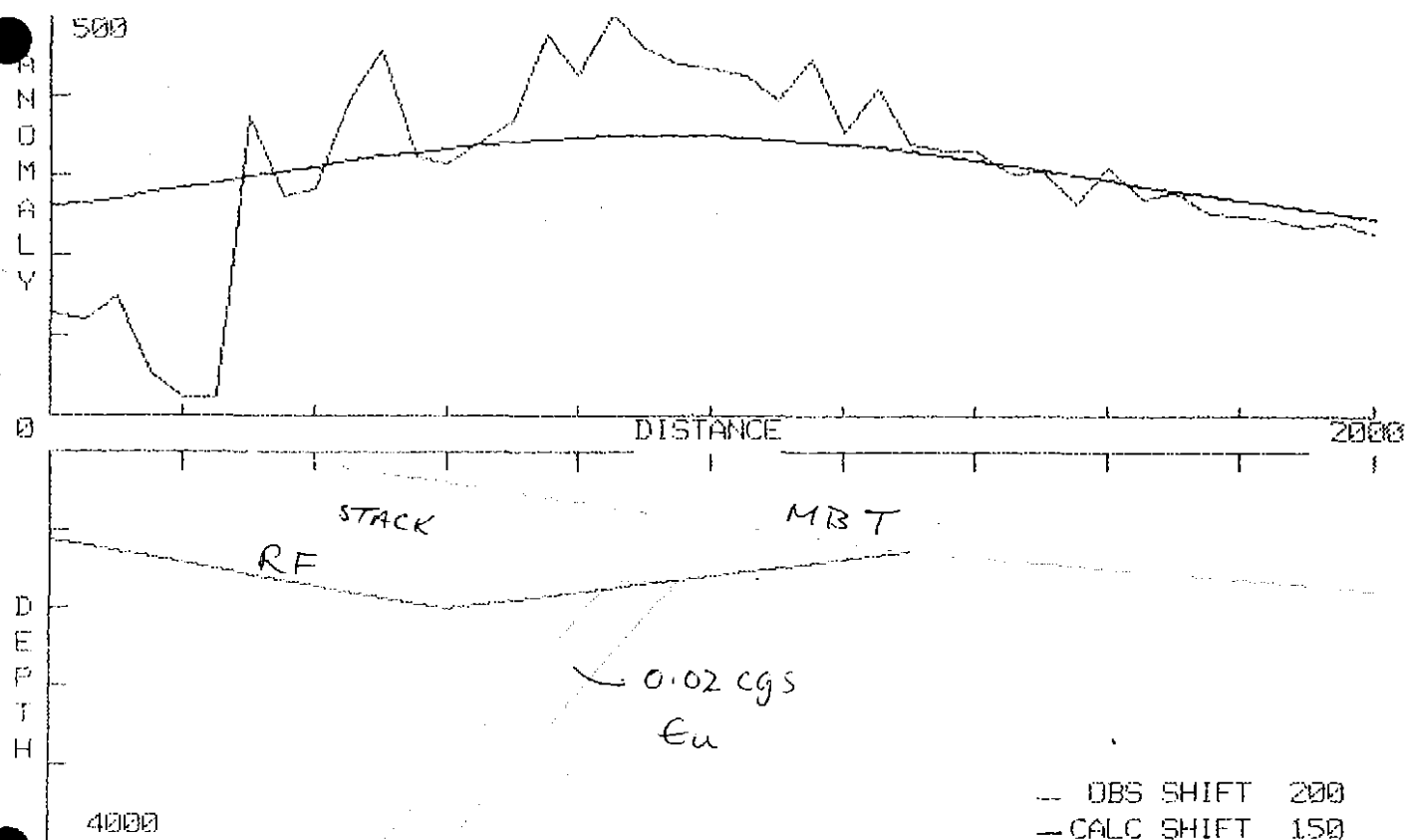
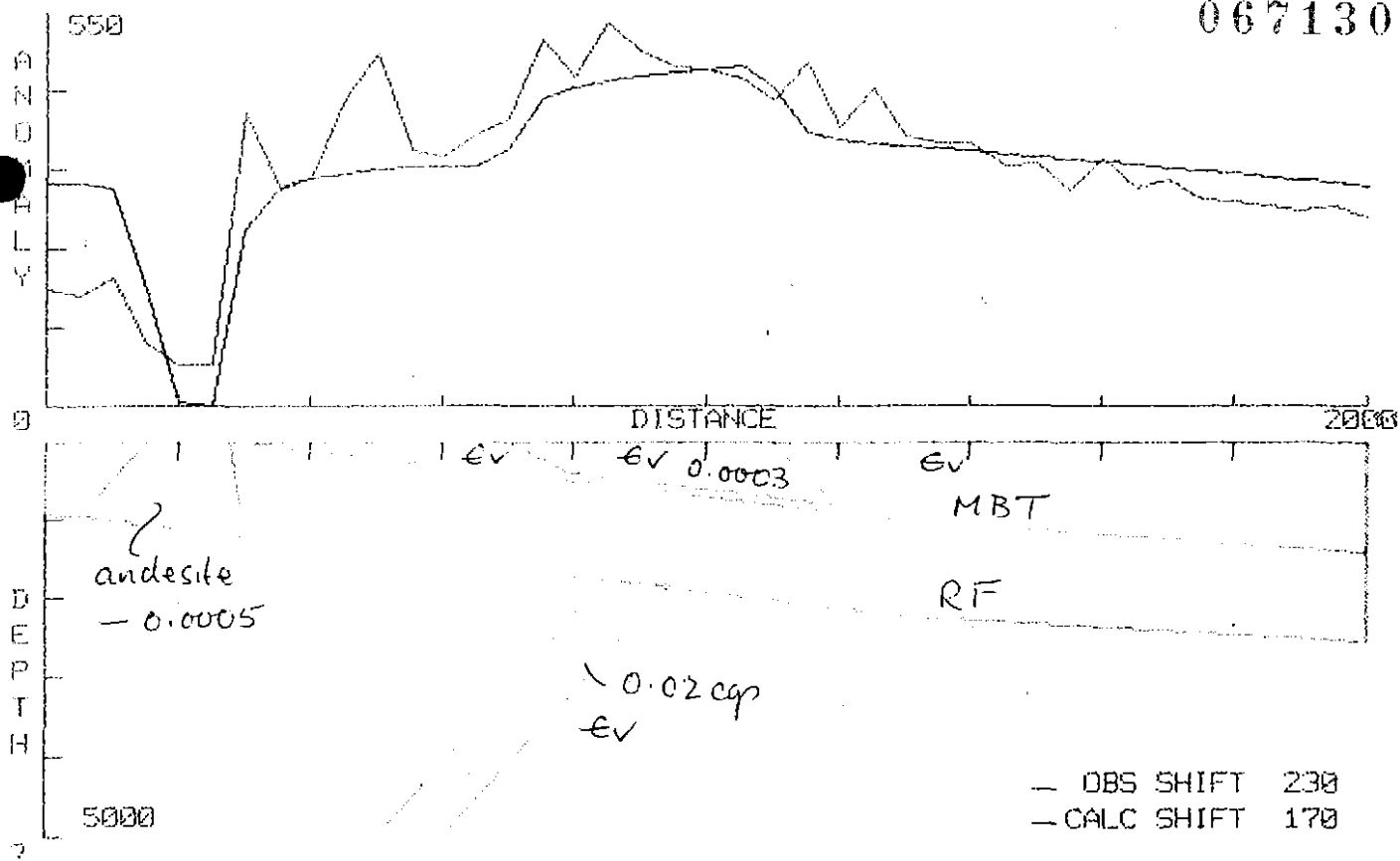
Dec 91

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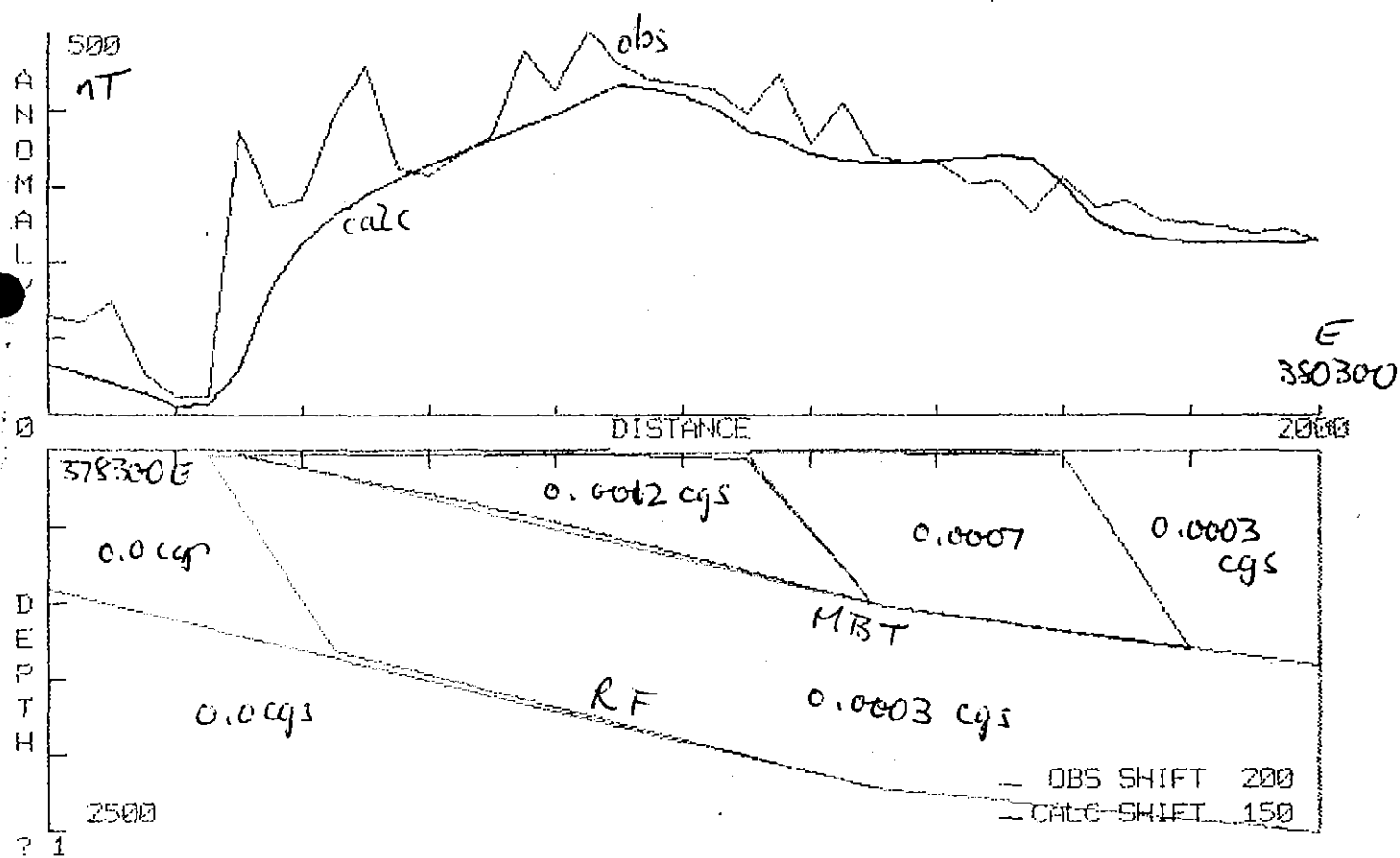


"CUTTY SARK" FIG 3

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"CUTTY SARK" FIG 4



m6.

"CUTTY SARK" FIG 5

LEAMAN GEOPHYSICS

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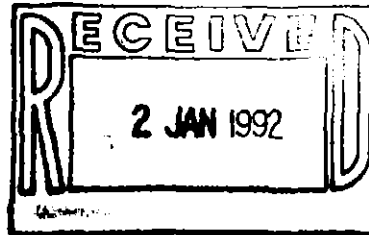
All correspondence to:

GPO BOX 320 D, HOBART, TAS. 7001

Telephone: (002) 44 1233

Fax: (002) 44 6674

067132



December 27, 1991

Mr. F. Fitzgerald,
Exploration Manager,
Pasminco Exploration,
PO Box 886,
BURNIE TAS 7320

Re: Cutty Sark profile

Attention: J.G. Purvis

Dear Fergus,

Following recent reviews of the Cutty Sark profile the issue of a magnetite-enriched horizon in the Mt Black Volcanics was raised as a possible source for the large anomaly. My recently supplied notes have tended to suggest that this was not a regionally valid solution but the matter was left open pending more information.

I have just completed a review of information in the Rosebery North extensions area (which has now been supplied to the mine should you wish to get a copy) and this topic raised its head once more.

But information does exist. The unit is thin and clearly very patchy. It is also not magnetic enough to generate the responses observed. I have now been able to show, using established properties (although one would always like a few more measurements specific to the argument), that the magnetite unit is unlikely to generate more than about 10% of the observed effect. I think it simply puts the crest on the response. The main source lies beneath the Rosebery Fault and must have ultramafic level contrasts. It also dips sub parallel with the inferred trough margin. Too much is taking shape, I think.

Also relevant to previous discussion is the suggestion that the Rosebery Fault changes dip and depth very rapidly in a narrow zone north of the mine and that this can be mapped by attacking the magnetic source underneath. (Recommended reading?)

Other conclusions about mineralisation and alteration are relevant to the Hercules review.

Regards,

Dr. D.E. Leaman

Catty Sack Magnetism

27/11/91

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(Bob Richardson).

PASBAS1.DAT (N.B. Has Files to 1900 - not stopped) - Base magnetometer
(Balance PASBAS1.DAT)

PASFLD1.DAT - Field magnetometer - 659 points. (Balance ~~PASFLD1.DAT~~)

PASFLD1-FLD (Bin). max 63327.6
min 61923.0

PASBAS1, BAS (Bin) max 62209.0 f-41 → 14-31
min 62188.6
avg 62195.93

Diurnal record - PASFLD1-FLD 9-00 → 14-00 660 samples
min 61912.4
max 63316.4
Avg 62375.78

Curry Lake 20/11/91.

Base station

	D ₁₂ 	Time 				m ₁₂
15	331	8:41:29	0	0.0	0.0	62207.0
15	331	8:46:29	1	0.0	0.0	62207.7
15	331	8:51:29	2	0.0	0.0	62208.4
15	331	8:56:29	3	0.0	0.0	62208.9
15	331	9:01:29	4	0.0	0.0	62209.0
15	331	9:06:29	5	0.0	0.0	62207.8
15	331	9:11:29	6	0.0	0.0	62207.2
15	331	9:16:29	7	0.0	0.0	62207.1
15	331	9:21:29	8	0.0	0.0	62206.2
15	331	9:26:29	9	0.0	0.0	62205.3
15	331	9:31:29	10	0.0	0.0	62204.2
15	331	9:36:29	11	0.0	0.0	62203.3
15	331	9:41:29	12	0.0	0.0	62202.3
15	331	9:46:29	13	0.0	0.0	62201.8
15	331	9:51:29	14	0.0	0.0	62200.4
15	331	9:56:29	15	0.0	0.0	62199.9
15	331	10:01:29	16	0.0	0.0	62200.0
15	331	10:06:29	17	0.0	0.0	62198.8
15	331	10:11:29	18	0.0	0.0	62198.1
15	331	10:16:29	19	0.0	0.0	62198.0
15	331	10:21:29	20	0.0	0.0	62198.0
15	331	10:26:29	21	0.0	0.0	62197.3
15	331	10:31:29	22	0.0	0.0	62197.5
15	331	10:36:29	23	0.0	0.0	62197.2
15	331	10:41:29	24	0.0	0.0	62196.5
15	331	10:46:29	25	0.0	0.0	62197.1
15	331	10:51:29	26	0.0	0.0	62195.7
15	331	10:56:29	27	0.0	0.0	62196.9
15	331	11:01:29	28	0.0	0.0	62197.0
15	331	11:06:29	29	0.0	0.0	62195.9
15	331	11:11:29	30	0.0	0.0	62195.7
15	331	11:16:29	31	0.0	0.0	62197.7
15	331	11:21:29	32	0.0	0.0	62196.8

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15	331	11:26:29	33	0.0	0.0	62195.1
15	331	11:31:29	34	0.0	0.0	62194.1
15	331	11:36:29	35	0.0	0.0	62192.9
15	331	11:41:29	36	0.0	0.0	62191.4
15	331	11:46:29	37	0.0	0.0	62190.9
15	331	11:51:29	38	0.0	0.0	62191.0
15	331	11:56:29	39	0.0	0.0	62189.9
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15	331	12:06:29	41	0.0	0.0	62189.2
15	331	12:11:29	42	0.0	0.0	62189.3
15	331	12:16:29	43	0.0	0.0	62189.4
15	331	12:21:29	44	0.0	0.0	62189.4
15	331	12:26:29	45	0.0	0.0	62189.7
15	331	12:31:29	46	0.0	0.0	62188.8
15	331	12:36:29	47	0.0	0.0	62188.6
15	331	12:41:29	48	0.0	0.0	62188.7
15	331	12:46:29	49	0.0	0.0	62188.6
15	331	12:51:29	50	0.0	0.0	62189.1
15	331	12:56:29	51	0.0	0.0	62189.4
15	331	13:01:29	52	0.0	0.0	62190.6
15	331	13:06:29	53	0.0	0.0	62191.4
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15	331	14:01:29	64	0.0	0.0	62191.8
15	331	14:06:29	65	0.0	0.0	62191.2
15	331	14:11:29	66	0.0	0.0	62192.2
15	331	14:16:29	67	0.0	0.0	62193.8
15	331	14:21:29	68	0.0	0.0	62194.1
15	331	14:26:29	69	0.0	0.0	62194.8
15	331	14:31:29	70	0.0	0.0	62195.5

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Curry Park 27/11/81

	Day	Time	Ref no	Raw	Field	Mys Mys
120	331	9:00:00	0	0.0	0.0	62180.4
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120	331	9:02:23	4	0.0	0.0	62203.4
120	331	9:02:48	5	0.0	0.0	62187.8
120	331	9:03:01	6	0.0	0.0	62178.8
120	331	9:03:15	7	0.0	0.0	62177.4
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120	331	9:03:48	9	0.0	0.0	62166.8
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120	331	9:05:03	13	0.0	0.0	62154.6
120	331	9:05:18	14	0.0	0.0	62191.6
120	331	9:05:38	15	0.0	0.0	62171.0
120	331	9:05:49	16	0.0	0.0	62202.4
120	331	9:06:00	17	0.0	0.0	62255.2
120	331	9:06:10	18	0.0	0.0	62169.8
120	331	9:06:20	19	0.0	0.0	62186.8
120	331	9:06:46	20	0.0	0.0	62198.0
120	331	9:06:57	21	0.0	0.0	62185.2
120	331	9:07:09	22	0.0	0.0	62186.0
120	331	9:07:20	23	0.0	0.0	62175.4
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120	331	9:08:03	26	0.0	0.0	62152.0
120	331	9:08:20	27	0.0	0.0	62139.0
120	331	9:08:32	28	0.0	0.0	62141.6
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120	331	9:15:47	52	0.0	0.0	62147.0
120	331	9:15:59	53	0.0	0.0	62172.0
120	331	9:16:08	54	0.0	0.0	62233.6
120	331	9:16:30	55	0.0	0.0	62312.4
120	331	9:16:41	56	0.0	0.0	62471.0
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120	331	9:17:13	59	0.0	0.0	62326.4
120	331	9:17:37	60	0.0	0.0	62406.8
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120	331	9:18:13	63	0.0	0.0	62298.2
120	331	9:18:25	64	0.0	0.0	62296.0
120	331	9:18:48	65	0.0	0.0	62520.6
120	331	9:19:10	66	0.0	0.0	63327.6
120	331	9:19:28	67	0.0	0.0	61923.0
120	331	9:19:54	68	0.0	0.0	62172.8
120	331	9:20:05	69	0.0	0.0	62224.4
120	331	9:20:28	70	0.0	0.0	62312.6
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120	331	9:22:04	76	0.0	0.0	62366.6
120	331	9:22:33	77	0.0	0.0	62324.6
120	331	9:22:45	78	0.0	0.0	62317.8
120	331	9:22:56	79	0.0	0.0	62273.0
120	331	9:23:15	80	0.0	0.0	62320.8
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120	331	9:23:40	82	0.0	0.0	62467.0
120	331	9:23:52	83	0.0	0.0	62427.6
120	331	9:24:00	84	0.0	0.0	62425.0
120	331	9:24:37	85	0.0	0.0	62414.6
120	331	9:24:57	86	0.0	0.0	62471.2
120	331	9:25:10	87	0.0	0.0	62446.8
120	331	9:25:23	88	0.0	0.0	62455.0
120	331	9:25:37	89	0.0	0.0	62441.2
120	331	9:25:57	90	0.0	0.0	62423.6
120	331	9:26:22	91	0.0	0.0	62401.8
120	331	9:26:37	92	0.0	0.0	62380.0
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120	331	9:28:27	95	0.0	0.0	62385.4
120	331	9:28:39	96	0.0	0.0	62414.8
120	331	9:28:52	97	0.0	0.0	62485.2
120	331	9:29:05	98	0.0	0.0	62470.6
120	331	9:29:15	99	0.0	0.0	62501.2
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120	331	9:30:38	104	0.0	0.0	62435.8
120	331	9:31:02	105	0.0	0.0	62414.4
120	331	9:31:15	106	0.0	0.0	62403.8
120	331	9:31:28	107	0.0	0.0	62390.8
120	331	9:31:47	108	0.0	0.0	62373.6
120	331	9:31:56	109	0.0	0.0	62364.4
120	331	9:32:19	110	0.0	0.0	62356.6
120	331	9:32:32	111	0.0	0.0	62351.4
120	331	9:32:52	112	0.0	0.0	62344.6
120	331	9:33:05	113	0.0	0.0	62335.0
120	331	9:33:14	114	0.0	0.0	62317.0
120	331	9:33:39	115	0.0	0.0	62366.4
120	331	9:34:06	116	0.0	0.0	62357.2
120	331	9:34:18	117	0.0	0.0	62344.0
120	331	9:34:31	118	0.0	0.0	62347.4
120	331	9:34:41	119	0.0	0.0	62349.6
120	331	9:35:01	120	0.0	0.0	62346.6
120	331	9:35:13	121	0.0	0.0	62353.4
120	331	9:35:27	122	0.0	0.0	62354.6
120	331	9:35:38	123	0.0	0.0	62351.0
120	331	9:35:50	124	0.0	0.0	62355.2
120	331	9:36:10	125	0.0	0.0	62355.0
120	331	9:36:23	126	0.0	0.0	62359.2
120	331	9:36:36	127	0.0	0.0	62368.2

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120	331	9:36:59	129	0.0	0.0	62369.4
120	331	9:37:19	130	0.0	0.0	62373.4
120	331	9:37:32	131	0.0	0.0	62375.4
120	331	9:37:44	132	0.0	0.0	62377.8
120	331	9:37:55	133	0.0	0.0	62381.4
120	331	9:38:04	134	0.0	0.0	62383.6
120	331	9:38:26	135	0.0	0.0	62386.0
120	331	9:38:45	136	0.0	0.0	62398.0
120	331	9:38:57	137	0.0	0.0	62399.0
120	331	9:39:07	138	0.0	0.0	62398.6
120	331	9:39:15	139	0.0	0.0	62397.8
120	331	9:39:36	140	0.0	0.0	62395.8
120	331	9:39:47	141	0.0	0.0	62398.8
120	331	9:39:58	142	0.0	0.0	62406.0
120	331	9:40:09	143	0.0	0.0	62414.4
120	331	9:40:20	144	0.0	0.0	62477.4
120	331	9:40:39	145	0.0	0.0	62425.2
120	331	9:40:51	146	0.0	0.0	62433.8
120	331	9:41:03	147	0.0	0.0	62443.8
120	331	9:41:14	148	0.0	0.0	62449.6
120	331	9:41:23	149	0.0	0.0	62460.6
120	331	9:41:43	150	0.0	0.0	62495.4
120	331	9:41:55	151	0.0	0.0	62480.2
120	331	9:42:07	152	0.0	0.0	62500.8
120	331	9:42:19	153	0.0	0.0	62492.0
120	331	9:42:34	154	0.0	0.0	62495.4
120	331	9:42:56	155	0.0	0.0	62491.8
120	331	9:43:08	156	0.0	0.0	62494.8
120	331	9:43:19	157	0.0	0.0	62506.8
120	331	9:43:29	158	0.0	0.0	62516.8
120	331	9:43:38	159	0.0	0.0	62517.6
120	331	9:43:58	160	0.0	0.0	62509.4
120	331	9:44:09	161	0.0	0.0	62501.4
120	331	9:44:20	162	0.0	0.0	62496.8
120	331	9:44:31	163	0.0	0.0	62494.4
120	331	9:44:40	164	0.0	0.0	62493.2
120	331	9:45:02	165	0.0	0.0	62488.4
120	331	9:45:13	166	0.0	0.0	62481.8
120	331	9:45:24	167	0.0	0.0	62480.2
120	331	9:45:35	168	0.0	0.0	62478.4
120	331	9:45:45	169	0.0	0.0	62499.0
120	331	9:46:03	170	0.0	0.0	62468.6
120	331	9:46:14	171	0.0	0.0	62473.2
120	331	9:46:26	172	0.0	0.0	62473.4
120	331	9:46:35	173	0.0	0.0	62470.6
120	331	9:46:45	174	0.0	0.0	62469.6
120	331	9:47:04	175	0.0	0.0	62469.2
120	331	9:47:14	176	0.0	0.0	62467.8
120	331	9:47:25	177	0.0	0.0	62466.2
120	331	9:47:36	178	0.0	0.0	62468.2
120	331	9:47:46	179	0.0	0.0	62468.0
120	331	9:48:05	180	0.0	0.0	62463.6
120	331	9:48:17	181	0.0	0.0	62461.0
120	331	9:48:29	182	0.0	0.0	62462.0
120	331	9:48:40	183	0.0	0.0	62463.4
120	331	9:48:49	184	0.0	0.0	62463.2
120	331	9:49:13	185	0.0	0.0	62459.4
120	331	9:49:25	186	0.0	0.0	62466.4
120	331	9:49:37	187	0.0	0.0	62453.0
120	331	9:49:50	188	0.0	0.0	62451.8
120	331	9:49:59	189	0.0	0.0	62452.2
120	331	9:50:58	190	0.0	0.0	62451.4
120	331	9:51:10	191	0.0	0.0	62449.2
120	331	9:51:24	192	0.0	0.0	62449.4
120	331	9:51:35	193	0.0	0.0	62448.6
120	331	9:51:44	194	0.0	0.0	62446.8
120	331	9:52:13	195	0.0	0.0	62449.4
120	331	9:52:24	196	0.0	0.0	62443.0
120	331	9:52:39	197	0.0	0.0	62436.2

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120	331	9:53:17	199	0.0	0.0	62438.4
120	331	9:54:08	200	0.0	0.0	62441.8
120	331	9:54:21	201	0.0	0.0	62443.8
120	331	9:54:39	202	0.0	0.0	62442.8
120	331	9:54:51	203	0.0	0.0	62440.8
120	331	9:55:06	204	0.0	0.0	62442.6
120	331	9:55:12	205	0.0	0.0	62443.4
120	331	9:55:32	206	0.0	0.0	62444.8
120	331	9:55:44	207	0.0	0.0	62450.2
120	331	9:55:55	208	0.0	0.0	62455.0
120	331	9:56:06	209	0.0	0.0	62452.4
120	331	9:56:26	210	0.0	0.0	62444.8
120	331	9:56:37	211	0.0	0.0	62446.8
120	331	9:56:49	212	0.0	0.0	62448.6
120	331	9:57:01	213	0.0	0.0	62451.4
120	331	9:57:13	214	0.0	0.0	62487.4
120	331	9:57:35	215	0.0	0.0	62590.6
120	331	9:57:45	216	0.0	0.0	62578.0
120	331	9:57:56	217	0.0	0.0	62536.0
120	331	9:58:07	218	0.0	0.0	62523.2
120	331	9:58:15	219	0.0	0.0	62516.2
120	331	9:58:33	220	0.0	0.0	62516.0
120	331	9:58:45	221	0.0	0.0	62508.2
120	331	9:58:56	222	0.0	0.0	62527.0
120	331	9:59:07	223	0.0	0.0	62545.0
120	331	9:59:18	224	0.0	0.0	62566.8
120	331	9:59:37	225	0.0	0.0	62596.8
120	331	9:59:48	226	0.0	0.0	62575.8
120	331	9:59:59	227	0.0	0.0	62539.6
120	331	10:00:21	228	0.0	0.0	62492.0
120	331	10:00:30	229	0.0	0.0	62479.8
120	331	10:00:50	230	0.0	0.0	62454.6
120	331	10:01:01	231	0.0	0.0	62466.6
120	331	10:01:11	232	0.0	0.0	62436.8
120	331	10:01:23	233	0.0	0.0	62451.0
120	331	10:01:31	234	0.0	0.0	62471.6
120	331	10:01:48	235	0.0	0.0	62453.0
120	331	10:02:04	236	0.0	0.0	62439.0
120	331	10:02:15	237	0.0	0.0	62473.6
120	331	10:02:28	238	0.0	0.0	62503.4
120	331	10:02:38	239	0.0	0.0	62495.8
120	331	10:03:09	240	0.0	0.0	62525.6
120	331	10:03:35	241	0.0	0.0	62536.4
120	331	10:03:47	242	0.0	0.0	62498.8
120	331	10:03:58	243	0.0	0.0	62516.0
120	331	10:04:09	244	0.0	0.0	62485.2
120	331	10:04:33	245	0.0	0.0	62475.2
120	331	10:04:44	246	0.0	0.0	62465.8
120	331	10:04:56	247	0.0	0.0	62468.2
120	331	10:05:07	248	0.0	0.0	62468.2
120	331	10:05:17	249	0.0	0.0	62477.6
120	331	10:12:32	250	0.0	0.0	62472.6
120	331	10:12:43	251	0.0	0.0	62467.0
120	331	10:12:54	252	0.0	0.0	62465.6
120	331	10:13:05	253	0.0	0.0	62466.4
120	331	10:13:19	254	0.0	0.0	62484.2
120	331	10:13:37	255	0.0	0.0	62501.0
120	331	10:13:50	256	0.0	0.0	62493.0
120	331	10:14:05	257	0.0	0.0	62480.2
120	331	10:14:29	258	0.0	0.0	62481.8
120	331	10:14:39	259	0.0	0.0	62474.0
120	331	10:14:58	260	0.0	0.0	62464.2
120	331	10:15:09	261	0.0	0.0	62459.0
120	331	10:15:19	262	0.0	0.0	62483.0
120	331	10:15:31	263	0.0	0.0	62467.0
120	331	10:15:40	264	0.0	0.0	62468.6
120	331	10:15:51	265	0.0	0.0	62469.2
120	331	10:16:04	266	0.0	0.0	62460.2
120	331	10:16:23	267	0.0	0.0	62467.8

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120	331	10:16:54	269	0.0	0.0	62476.6
120	331	10:17:12	270	0.0	0.0	62478.8
120	331	10:17:23	271	0.0	0.0	62475.8
120	331	10:17:36	272	0.0	0.0	62479.6
120	331	10:17:47	273	0.0	0.0	62476.0
120	331	10:17:58	274	0.0	0.0	62481.8
120	331	10:18:10	275	0.0	0.0	62469.8
120	331	10:20:01	276	0.0	0.0	62470.2
120	331	10:20:20	277	0.0	0.0	62469.8
120	331	10:20:31	278	0.0	0.0	62477.4
120	331	10:20:40	279	0.0	0.0	62482.8
120	331	10:21:02	280	0.0	0.0	62496.6
120	331	10:21:15	281	0.0	0.0	62485.4
120	331	10:21:26	282	0.0	0.0	62488.2
120	331	10:21:37	283	0.0	0.0	62492.2
120	331	10:22:01	284	0.0	0.0	62498.2
120	331	10:22:32	285	0.0	0.0	62502.4
120	331	10:22:44	286	0.0	0.0	62517.0
120	331	10:22:56	287	0.0	0.0	62556.4
120	331	10:23:06	288	0.0	0.0	62543.6
120	331	10:23:14	289	0.0	0.0	62518.4
120	331	10:23:35	290	0.0	0.0	62513.8
120	331	10:23:48	291	0.0	0.0	62505.0
120	331	10:23:59	292	0.0	0.0	62495.6
120	331	10:24:10	293	0.0	0.0	62482.6
120	331	10:24:18	294	0.0	0.0	62481.0
120	331	10:24:41	295	0.0	0.0	62482.6
120	331	10:24:56	296	0.0	0.0	62538.0
120	331	10:25:10	297	0.0	0.0	62520.2
120	331	10:25:24	298	0.0	0.0	62504.2
120	331	10:25:44	299	0.0	0.0	62500.8
120	331	10:26:08	300	0.0	0.0	62507.6
120	331	10:26:25	301	0.0	0.0	62502.8
120	331	10:26:40	302	0.0	0.0	62498.4
120	331	10:26:59	303	0.0	0.0	62492.6
120	331	10:27:36	304	0.0	0.0	62487.2
120	331	10:28:31	305	0.0	0.0	62484.4
120	331	10:28:48	306	0.0	0.0	62486.8
120	331	10:29:08	307	0.0	0.0	62484.4
120	331	10:29:24	308	0.0	0.0	62482.0
120	331	10:29:49	309	0.0	0.0	62473.6
120	331	10:44:28	310	0.0	0.0	62476.2
120	331	10:44:42	311	0.0	0.0	62471.2
120	331	10:44:55	312	0.0	0.0	62473.2
120	331	10:45:10	313	0.0	0.0	62473.4
120	331	10:45:27	314	0.0	0.0	62468.2
120	331	10:45:51	315	0.0	0.0	62464.6
120	331	10:46:06	316	0.0	0.0	62467.2
120	331	10:46:21	317	0.0	0.0	62461.2
120	331	10:46:38	318	0.0	0.0	62462.4
120	331	10:46:56	319	0.0	0.0	62458.6
120	331	10:47:27	320	0.0	0.0	62456.2
120	331	10:47:47	321	0.0	0.0	62457.2
120	331	10:48:16	322	0.0	0.0	62461.4
120	331	10:48:52	323	0.0	0.0	62464.8
120	331	10:49:02	324	0.0	0.0	62458.0
120	331	10:49:26	325	0.0	0.0	62453.6
120	331	10:49:41	326	0.0	0.0	62460.0
120	331	10:49:53	327	0.0	0.0	62463.0
120	331	10:50:07	328	0.0	0.0	62460.0
120	331	10:51:24	329	0.0	0.0	62445.6
120	331	10:51:53	330	0.0	0.0	62456.4
120	331	10:52:06	331	0.0	0.0	62453.2
120	331	10:52:19	332	0.0	0.0	62455.4
120	331	10:52:30	333	0.0	0.0	62451.4
120	331	10:52:40	334	0.0	0.0	62447.6
120	331	10:53:02	335	0.0	0.0	62449.0
120	331	10:53:14	336	0.0	0.0	62451.6
120	331	10:53:27	337	0.0	0.0	62451.4

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120	331	10:53:54	339	0.0	0.0	62450.8
120	331	10:54:14	340	0.0	0.0	62451.2
120	331	10:54:26	341	0.0	0.0	62451.6
120	331	10:54:38	342	0.0	0.0	62450.4
120	331	10:54:48	343	0.0	0.0	62451.6
120	331	10:54:56	344	0.0	0.0	62451.0
120	331	10:55:21	345	0.0	0.0	62438.2
120	331	10:55:38	346	0.0	0.0	62450.4
120	331	10:55:50	347	0.0	0.0	62450.4
120	331	10:56:02	348	0.0	0.0	62450.2
120	331	10:56:11	349	0.0	0.0	62452.2
120	331	10:56:30	350	0.0	0.0	62448.6
120	331	10:56:41	351	0.0	0.0	62456.0
120	331	10:56:54	352	0.0	0.0	62449.2
120	331	10:57:05	353	0.0	0.0	62453.0
120	331	10:57:13	354	0.0	0.0	62451.2
120	331	10:57:31	355	0.0	0.0	62442.8
120	331	10:57:42	356	0.0	0.0	62432.8
120	331	10:57:54	357	0.0	0.0	62434.8
120	331	10:58:06	358	0.0	0.0	62434.8
120	331	10:58:14	359	0.0	0.0	62435.4
120	331	10:58:34	360	0.0	0.0	62434.6
120	331	10:58:46	361	0.0	0.0	62437.0
120	331	10:58:58	362	0.0	0.0	62434.4
120	331	10:59:10	363	0.0	0.0	62435.4
120	331	10:59:19	364	0.0	0.0	62433.4
120	331	10:59:43	365	0.0	0.0	62434.2
120	331	10:59:55	366	0.0	0.0	62432.4
120	331	11:00:07	367	0.0	0.0	62433.2
120	331	11:00:16	368	0.0	0.0	62434.0
120	331	11:00:24	369	0.0	0.0	62433.2
120	331	11:00:45	370	0.0	0.0	62439.4
120	331	11:00:57	371	0.0	0.0	62432.2
120	331	11:01:08	372	0.0	0.0	62428.2
120	331	11:01:19	373	0.0	0.0	62428.4
120	331	11:01:30	374	0.0	0.0	62428.8
120	331	11:01:55	375	0.0	0.0	62424.2
120	331	11:02:07	376	0.0	0.0	62418.6
120	331	11:02:18	377	0.0	0.0	62418.6
120	331	11:02:28	378	0.0	0.0	62416.6
120	331	11:02:39	379	0.0	0.0	62420.0
120	331	11:02:59	380	0.0	0.0	62418.2
120	331	11:03:11	381	0.0	0.0	62422.0
120	331	11:03:22	382	0.0	0.0	62420.0
120	331	11:03:34	383	0.0	0.0	62423.4
120	331	11:03:44	384	0.0	0.0	62421.2
120	331	11:07:08	385	0.0	0.0	62422.6
120	331	11:07:19	386	0.0	0.0	62416.4
120	331	11:07:31	387	0.0	0.0	62412.2
120	331	11:07:42	388	0.0	0.0	62409.8
120	331	11:07:50	389	0.0	0.0	62410.8
120	331	11:08:11	390	0.0	0.0	62408.6
120	331	11:08:23	391	0.0	0.0	62404.0
120	331	11:08:35	392	0.0	0.0	62409.4
120	331	11:08:48	393	0.0	0.0	62409.2
120	331	11:08:59	394	0.0	0.0	62402.4
120	331	11:09:24	395	0.0	0.0	62412.6
120	331	11:09:37	396	0.0	0.0	62411.6
120	331	11:09:48	397	0.0	0.0	62411.0
120	331	11:10:01	398	0.0	0.0	62410.2
120	331	11:10:19	399	0.0	0.0	62403.6
120	331	11:10:42	400	0.0	0.0	62407.4
120	331	11:11:21	401	0.0	0.0	62406.6
120	331	11:11:33	402	0.0	0.0	62410.6
120	331	11:11:45	403	0.0	0.0	62409.0
120	331	11:11:53	404	0.0	0.0	62411.4
120	331	11:12:17	405	0.0	0.0	62408.4
120	331	11:12:27	406	0.0	0.0	62409.8
120	331	11:12:41	407	0.0	0.0	62412.2

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-120	331	11:12:56	409	0.0	0.0	62410.4
120	331	11:13:16	410	0.0	0.0	62410.2
120	331	11:13:28	411	0.0	0.0	62409.8
120	331	11:13:40	412	0.0	0.0	62409.4
120	331	11:13:51	413	0.0	0.0	62410.0
120	331	11:14:02	414	0.0	0.0	62407.4
120	331	11:14:31	415	0.0	0.0	62407.4
120	331	11:14:42	416	0.0	0.0	62407.6
120	331	11:14:53	417	0.0	0.0	62418.2
120	331	11:15:02	418	0.0	0.0	62420.6
120	331	11:15:10	419	0.0	0.0	62422.0
120	331	11:15:29	420	0.0	0.0	62412.2
120	331	11:15:41	421	0.0	0.0	62404.0
120	331	11:15:52	422	0.0	0.0	62404.4
120	331	11:16:03	423	0.0	0.0	62407.2
120	331	11:16:11	424	0.0	0.0	62406.6
120	331	11:17:50	425	0.0	0.0	62400.0
120	331	11:18:06	426	0.0	0.0	62412.0
120	331	11:18:21	427	0.0	0.0	62457.6
120	331	11:18:34	428	0.0	0.0	62406.8
120	331	11:18:42	429	0.0	0.0	62402.8
120	331	11:19:02	430	0.0	0.0	62403.8
120	331	11:19:13	431	0.0	0.0	62408.4
120	331	11:19:25	432	0.0	0.0	62412.6
120	331	11:19:37	433	0.0	0.0	62399.6
120	331	11:19:46	434	0.0	0.0	62394.8
120	331	11:20:07	435	0.0	0.0	62389.6
120	331	11:20:19	436	0.0	0.0	62389.0
120	331	11:20:31	437	0.0	0.0	62382.2
120	331	11:20:41	438	0.0	0.0	62384.8
120	331	11:20:50	439	0.0	0.0	62385.8
120	331	11:21:12	440	0.0	0.0	62383.6
120	331	11:21:25	441	0.0	0.0	62381.0
120	331	11:21:37	442	0.0	0.0	62382.4
120	331	11:21:48	443	0.0	0.0	62382.4
120	331	11:21:59	444	0.0	0.0	62385.0
120	331	11:22:18	445	0.0	0.0	62382.0
120	331	11:22:29	446	0.0	0.0	62379.4
120	331	11:22:40	447	0.0	0.0	62377.6
120	331	11:22:47	448	0.0	0.0	62377.8
120	331	11:22:55	449	0.0	0.0	62376.8
120	331	11:23:16	450	0.0	0.0	62376.4
120	331	11:23:27	451	0.0	0.0	62377.2
120	331	11:23:39	452	0.0	0.0	62375.0
120	331	11:23:50	453	0.0	0.0	62377.0
120	331	11:24:01	454	0.0	0.0	62373.4
120	331	11:24:19	455	0.0	0.0	62375.8
120	331	11:24:30	456	0.0	0.0	62371.8
120	331	11:24:41	457	0.0	0.0	62370.6
120	331	11:24:52	458	0.0	0.0	62371.6
120	331	11:25:00	459	0.0	0.0	62373.4
120	331	11:25:20	460	0.0	0.0	62375.2
120	331	11:25:30	461	0.0	0.0	62378.0
120	331	11:25:41	462	0.0	0.0	62376.0
120	331	11:25:50	463	0.0	0.0	62378.4
120	331	11:25:59	464	0.0	0.0	62377.8
120	331	11:26:17	465	0.0	0.0	62379.4
120	331	11:26:29	466	0.0	0.0	62380.0
120	331	11:26:40	467	0.0	0.0	62379.0
120	331	11:26:49	468	0.0	0.0	62378.6
120	331	11:26:57	469	0.0	0.0	62378.6
120	331	11:27:31	470	0.0	0.0	62381.0
120	331	11:28:57	471	0.0	0.0	62378.2
120	331	11:29:09	472	0.0	0.0	62376.4
120	331	11:29:20	473	0.0	0.0	62374.0
120	331	11:29:42	474	0.0	0.0	62380.0
-120	331	11:30:07	475	0.0	0.0	62375.0
120	331	11:30:19	476	0.0	0.0	62375.0
120	331	11:30:30	477	0.0	0.0	62376.8

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120	331	11:30:50	479	0.0	0.0	62388.2
120	331	11:31:09	480	0.0	0.0	62424.6
120	331	11:31:21	481	0.0	0.0	62421.6
120	331	11:31:32	482	0.0	0.0	62394.8
120	331	11:31:43	483	0.0	0.0	62392.2
120	331	11:31:53	484	0.0	0.0	62398.0
120	331	11:32:14	485	0.0	0.0	62393.4
120	331	11:32:27	486	0.0	0.0	62372.8
120	331	11:32:39	487	0.0	0.0	62363.2
120	331	11:32:48	488	0.0	0.0	62361.6
120	331	11:32:56	489	0.0	0.0	62360.8
120	331	11:33:24	490	0.0	0.0	62361.4
120	331	11:33:40	491	0.0	0.0	62362.4
120	331	11:33:52	492	0.0	0.0	62360.6
120	331	11:34:03	493	0.0	0.0	62361.2
120	331	11:34:14	494	0.0	0.0	62361.4
120	331	11:34:33	495	0.0	0.0	62361.0
120	331	11:34:46	496	0.0	0.0	62360.4
120	331	11:35:01	497	0.0	0.0	62363.0
120	331	11:35:13	498	0.0	0.0	62359.8
120	331	11:35:27	499	0.0	0.0	62361.2
120	331	11:35:49	500	0.0	0.0	62361.2
120	331	11:36:10	501	0.0	0.0	62357.0
120	331	11:36:29	502	0.0	0.0	62370.4
120	331	11:36:46	503	0.0	0.0	62355.0
120	331	11:37:09	504	0.0	0.0	62355.6
120	331	11:37:29	505	0.0	0.0	62355.8
120	331	11:38:32	506	0.0	0.0	62359.2
120	331	12:12:48	507	0.0	0.0	62349.6
120	331	12:13:04	508	0.0	0.0	62349.4
120	331	12:13:28	509	0.0	0.0	62348.6
120	331	12:13:53	510	0.0	0.0	62348.0
120	331	12:14:05	511	0.0	0.0	62348.2
120	331	12:14:19	512	0.0	0.0	62348.4
120	331	12:14:31	513	0.0	0.0	62343.6
120	331	12:14:39	514	0.0	0.0	62345.4
120	331	12:15:01	515	0.0	0.0	62347.8
120	331	12:15:14	516	0.0	0.0	62360.8
120	331	12:15:27	517	0.0	0.0	62344.2
120	331	12:15:46	518	0.0	0.0	62353.0
120	331	12:16:01	519	0.0	0.0	62343.0
120	331	12:16:27	520	0.0	0.0	62348.4
120	331	12:16:40	521	0.0	0.0	62334.0
120	331	12:16:54	522	0.0	0.0	62333.2
120	331	12:17:08	523	0.0	0.0	62332.8
120	331	12:17:24	524	0.0	0.0	62329.4
120	331	12:17:54	525	0.0	0.0	62325.2
120	331	12:18:08	526	0.0	0.0	62325.0
120	331	12:18:23	527	0.0	0.0	62324.4
120	331	12:18:38	528	0.0	0.0	62320.2
120	331	12:19:23	529	0.0	0.0	62328.2
120	331	12:19:43	530	0.0	0.0	62321.8
120	331	12:19:59	531	0.0	0.0	62326.6
120	331	12:20:14	532	0.0	0.0	62326.2
120	331	12:20:30	533	0.0	0.0	62325.8
120	331	12:20:42	534	0.0	0.0	62329.6
120	331	12:21:08	535	0.0	0.0	62333.4
120	331	12:21:24	536	0.0	0.0	62339.6
120	331	12:21:39	537	0.0	0.0	62330.0
120	331	12:21:55	538	0.0	0.0	62335.4
120	331	12:22:08	539	0.0	0.0	62322.4
120	331	12:22:36	540	0.0	0.0	62325.0
120	331	12:22:52	541	0.0	0.0	62321.8
120	331	12:23:18	542	0.0	0.0	62320.2
120	331	12:24:08	543	0.0	0.0	62317.2
120	331	12:24:27	544	0.0	0.0	62316.6
120	331	12:24:52	545	0.0	0.0	62318.4
120	331	12:25:04	546	0.0	0.0	62317.2
120	331	12:25:17	547	0.0	0.0	62316.6

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120	331	12:25:58	549	0.0	0.0	62324.2
120	331	12:34:31	550	0.0	0.0	62339.8
120	331	12:36:48	551	0.0	0.0	62365.2
120	331	12:37:32	552	0.0	0.0	62303.8
120	331	12:38:03	553	0.0	0.0	62194.0
120	331	12:38:16	554	0.0	0.0	62263.8
120	331	12:38:39	555	0.0	0.0	62196.0
120	331	12:38:54	556	0.0	0.0	62238.8
120	331	12:39:11	557	0.0	0.0	62268.0
120	331	12:39:41	558	0.0	0.0	62289.0
120	331	12:41:35	559	0.0	0.0	62302.4
120	331	12:42:07	560	0.0	0.0	62307.8
120	331	12:42:50	561	0.0	0.0	62318.6
120	331	12:43:17	562	0.0	0.0	62305.6
120	331	12:43:34	563	0.0	0.0	62307.8
120	331	12:44:10	564	0.0	0.0	62307.4
120	331	12:44:38	565	0.0	0.0	62310.0
120	331	12:44:59	566	0.0	0.0	62304.0
120	331	12:45:30	567	0.0	0.0	62296.8
120	331	12:46:00	568	0.0	0.0	62294.0
120	331	12:46:14	569	0.0	0.0	62285.8
120	331	12:46:36	570	0.0	0.0	62286.8
120	331	12:46:52	571	0.0	0.0	62331.2
120	331	12:47:05	572	0.0	0.0	62317.0
120	331	12:47:17	573	0.0	0.0	62299.6
120	331	12:47:29	574	0.0	0.0	62293.6
120	331	12:47:36	575	0.0	0.0	62293.0
120	331	12:48:00	576	0.0	0.0	62310.6
120	331	12:48:14	577	0.0	0.0	62309.8
120	331	12:48:29	578	0.0	0.0	62320.8
120	331	12:48:46	579	0.0	0.0	62316.8
120	331	12:49:07	580	0.0	0.0	62328.4
120	331	12:49:24	581	0.0	0.0	62319.8
120	331	12:49:40	582	0.0	0.0	62309.2
120	331	12:49:54	583	0.0	0.0	62303.0
120	331	12:50:06	584	0.0	0.0	62300.8
120	331	12:50:29	585	0.0	0.0	62303.0
120	331	12:50:52	586	0.0	0.0	62292.0
120	331	12:51:04	587	0.0	0.0	62290.2
120	331	12:51:17	588	0.0	0.0	62291.0
120	331	12:51:37	589	0.0	0.0	62290.4
120	331	12:52:00	590	0.0	0.0	62292.2
120	331	12:52:08	591	0.0	0.0	62291.2
120	331	12:52:20	592	0.0	0.0	62289.6
120	331	12:52:33	593	0.0	0.0	62288.4
120	331	12:54:42	594	0.0	0.0	62286.2
120	331	12:55:23	595	0.0	0.0	62284.4
120	331	12:55:42	596	0.0	0.0	62271.8
120	331	12:56:08	597	0.0	0.0	62203.4
120	331	12:56:18	598	0.0	0.0	62194.0
120	331	12:56:26	599	0.0	0.0	62189.8
120	331	12:56:45	600	0.0	0.0	62202.4
120	331	12:57:45	601	0.0	0.0	62305.8
120	331	12:57:58	602	0.0	0.0	62341.8
120	331	12:58:12	603	0.0	0.0	62271.4
120	331	12:58:24	604	0.0	0.0	62277.4
120	331	12:58:44	605	0.0	0.0	62279.0
120	331	12:58:56	606	0.0	0.0	62283.8
120	331	12:59:32	607	0.0	0.0	62281.4
120	331	12:59:43	608	0.0	0.0	62283.2
120	331	12:59:51	609	0.0	0.0	62284.0
120	331	13:00:30	610	0.0	0.0	62277.2
120	331	13:00:47	611	0.0	0.0	62280.0
120	331	13:00:58	612	0.0	0.0	62285.2
120	331	13:01:12	613	0.0	0.0	62280.6
120	331	13:02:12	614	0.0	0.0	62282.0
120	331	13:02:48	615	0.0	0.0	62276.8
120	331	13:03:00	616	0.0	0.0	62274.6
120	331	13:03:13	617	0.0	0.0	62275.0

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120	331	13:03:40	619	0.0	0.0	62276.2
120	331	13:04:02	620	0.0	0.0	62276.6
120	331	13:04:14	621	0.0	0.0	62276.8
120	331	13:04:39	622	0.0	0.0	62272.2
120	331	13:04:50	623	0.0	0.0	62272.0
120	331	13:04:59	624	0.0	0.0	62272.0
120	331	13:05:12	625	0.0	0.0	62272.6
120	331	13:05:23	626	0.0	0.0	62271.0
120	331	13:05:36	627	0.0	0.0	62272.2
120	331	13:05:47	628	0.0	0.0	62273.2
120	331	13:05:56	629	0.0	0.0	62269.2
120	331	13:06:15	630	0.0	0.0	62271.4
120	331	13:06:26	631	0.0	0.0	62270.8
120	331	13:06:37	632	0.0	0.0	62270.6
120	331	13:06:47	633	0.0	0.0	62268.8
120	331	13:06:57	634	0.0	0.0	62267.4
120	331	13:07:07	635	0.0	0.0	62274.6
120	331	13:07:36	636	0.0	0.0	62274.0
120	331	13:07:47	637	0.0	0.0	62276.2
120	331	13:07:57	638	0.0	0.0	62269.2
120	331	13:08:10	639	0.0	0.0	62265.2
120	331	13:08:29	640	0.0	0.0	62263.6
120	331	13:08:41	641	0.0	0.0	62263.0
120	331	13:08:52	642	0.0	0.0	62262.0
120	331	13:09:04	643	0.0	0.0	62269.0
120	331	13:09:15	644	0.0	0.0	62267.2
120	331	13:09:32	645	0.0	0.0	62267.4
120	331	13:09:43	646	0.0	0.0	62270.8
120	331	13:09:55	647	0.0	0.0	62270.8
120	331	13:10:21	648	0.0	0.0	62271.0
120	331	13:10:31	649	0.0	0.0	62269.6
120	331	13:10:48	650	0.0	0.0	62269.8
120	331	13:11:00	651	0.0	0.0	62268.4
120	331	13:11:10	652	0.0	0.0	62269.4
120	331	13:11:16	653	0.0	0.0	62270.6
120	331	13:11:52	654	0.0	0.0	62272.2
120	331	13:12:13	655	0.0	0.0	62266.0
120	331	13:12:27	656	0.0	0.0	62263.0
120	331	13:12:38	657	0.0	0.0	62262.0
120	331	13:12:48	658	0.0	0.0	62267.4
120	331	13:13:01	659	0.0	0.0	62255.0

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Dimensional Correlation

Curtis Lark

27/11/73

Mag 210.

Dim	Time	Mag	
20	331	9 0 0	0 621674
120	331	9 059	1 621781
120	331	9 121	2 621789
20	331	9 135	3 621759
20	331	9 223	4 621905
120	331	9 248	5 621750
120	331	9 3 1	6 621661
20	331	9 315	7 621647
120	331	9 328	8 621686
120	331	9 348	9 621543
20	331	9 4 7	10 621610
20	331	9 423	11 621382
120	331	9 439	12 621385
20	331	9 5 3	13 621424
20	331	9 518	14 621794
120	331	9 538	15 621589
120	331	9 549	16 621904
20	331	9 6 0	17 622432
120	331	9 610	18 621578
120	331	9 620	19 621749
20	331	9 646	20 621862
20	331	9 657	21 621734
120	331	9 7 9	22 621742
20	331	9 720	23 621636
20	331	9 729	24 621554
120	331	9 748	25 621451
120	331	9 8 3	26 621403
20	331	9 820	27 621273
120	331	9 832	28 621300
120	331	9 843	29 621144
20	331	9 9 6	30 621014
20	331	9 917	31 620863
120	331	9 929	32 620837
120	331	9 942	33 621079
20	331	9 954	34 621241
120	331	91015	35 621266
120	331	91032	36 621278
20	331	91047	37 621468
120	331	911 0	38 621455
120	331	91117	39 621265
20	331	91145	40 620711
20	331	91242	41 620783
120	331	91256	42 620776
120	331	913 9	43 620726
20	331	91331	44 621056
120	331	91358	45 621168
120	331	91416	46 621196
20	331	91430	47 620384
20	331	91443	48 620550
120	331	91454	49 620744
20	331	91523	50 620720
20	331	91536	51 621224
120	331	91547	52 621358
120	331	91559	53 621608
20	331	916 8	54 622224

20	331	91630	55	623012
120	331	91641	56	624599
120	331	91653	57	624217
20	331	917 3	58	623337
20	331	91713	59	623154
120	331	91737	60	623958
120	331	91749	61	623307
20	331	918 1	62	623427
120	331	91813	63	622873
120	331	91825	64	622852
20	331	91848	65	625098
20	331	91910	66	633169
120	331	91928	67	619124
120	331	91954	68	621622
20	331	920 5	69	622139
120	331	92028	70	623021
120	331	92042	71	624326
120	331	92054	72	624900

120	331	92129	74	623331
20	331	92150	75	623334
120	331	922 4	76	623564
120	331	92233	77	623145
20	331	92245	78	623078
20	331	92256	79	622630
120	331	92315	80	623108
120	331	92328	81	623137
20	331	92340	82	624571
120	331	92352	83	624178
120	331	924 0	84	624152
20	331	92437	85	624049
120	331	92457	86	624615
120	331	92510	87	624372
20	331	92523	88	624454
20	331	92537	89	624317
120	331	92557	90	624141
120	331	92622	91	623924
20	331	92637	92	623707
120	331	92754	93	623719
120	331	928 5	94	623674
20	331	92827	95	623765
20	331	92839	96	624059
120	331	92852	97	624763
20	331	929 5	98	624618
20	331	92915	99	624924
120	331	92952	100	624708
120	331	930 5	101	624760
20	331	93017	102	624637
120	331	93029	103	624415
120	331	93038	104	624273
20	331	931 2	105	624060
20	331	93115	106	623955
120	331	93128	107	623825
120	331	93147	108	623654
20	331	93156	109	623562

120	331	93219	110	623485
20	331	93232	111	623433
120	331	93252	112	623366
120	331	933 5	113	623270
20	331	93314	114	623090
20	331	93339	115	623585
120	331	934 6	116	623494
120	331	93418	117	623362
20	331	93431	118	623397
120	331	93441	119	623419
120	331	935 1	120	623390
20	331	93513	121	623458
20	331	93527	122	623470
120	331	93538	123	623435
20	331	93550	124	623477
20	331	93610	125	623476
120	331	93623	126	623518
120	331	93636	127	623608
20	331	93650	128	623635
120	331	93659	129	623621
120	331	93719	130	623662
120	331	93732	131	623682

20	331	93755	133	623743
20	331	938 4	134	623765
120	331	93826	135	623790
120	331	93845	136	623911
20	331	93857	137	623921
120	331	939 7	138	623918
120	331	93915	139	623910
20	331	93936	140	623890
20	331	93947	141	623921
120	331	93958	142	623993
20	331	940 9	143	624078
20	331	94020	144	624708
120	331	94039	145	624187
120	331	94051	146	624273
20	331	941 3	147	624373
120	331	94114	148	624432
120	331	94123	149	624542
20	331	94143	150	624890
20	331	94155	151	624739
120	331	942 7	152	624945
120	331	94219	153	624857
20	331	94234	154	624891
120	331	94256	155	624856
120	331	943 8	156	624886
20	331	94319	157	625006
120	331	94329	158	625106
120	331	94338	159	625114
20	331	94358	160	625033
20	331	944 9	161	624953
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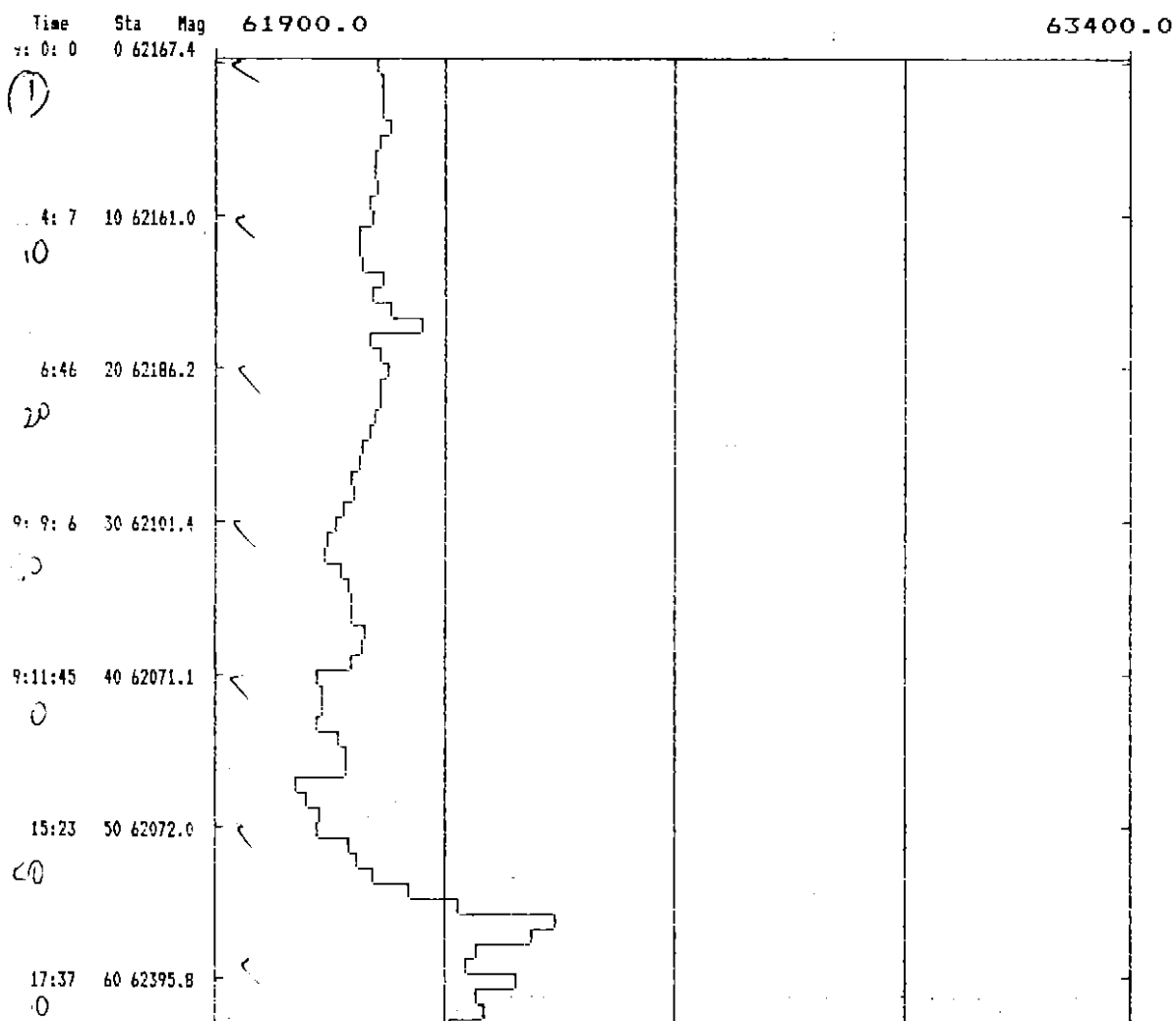
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Cuddy Lark 27/11/9,

D₁² - weekly corrected mag.

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Roll
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on track.

cut down trees

mt black v.

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Graph + Ht B V.

(repeated in
Spang (✓))

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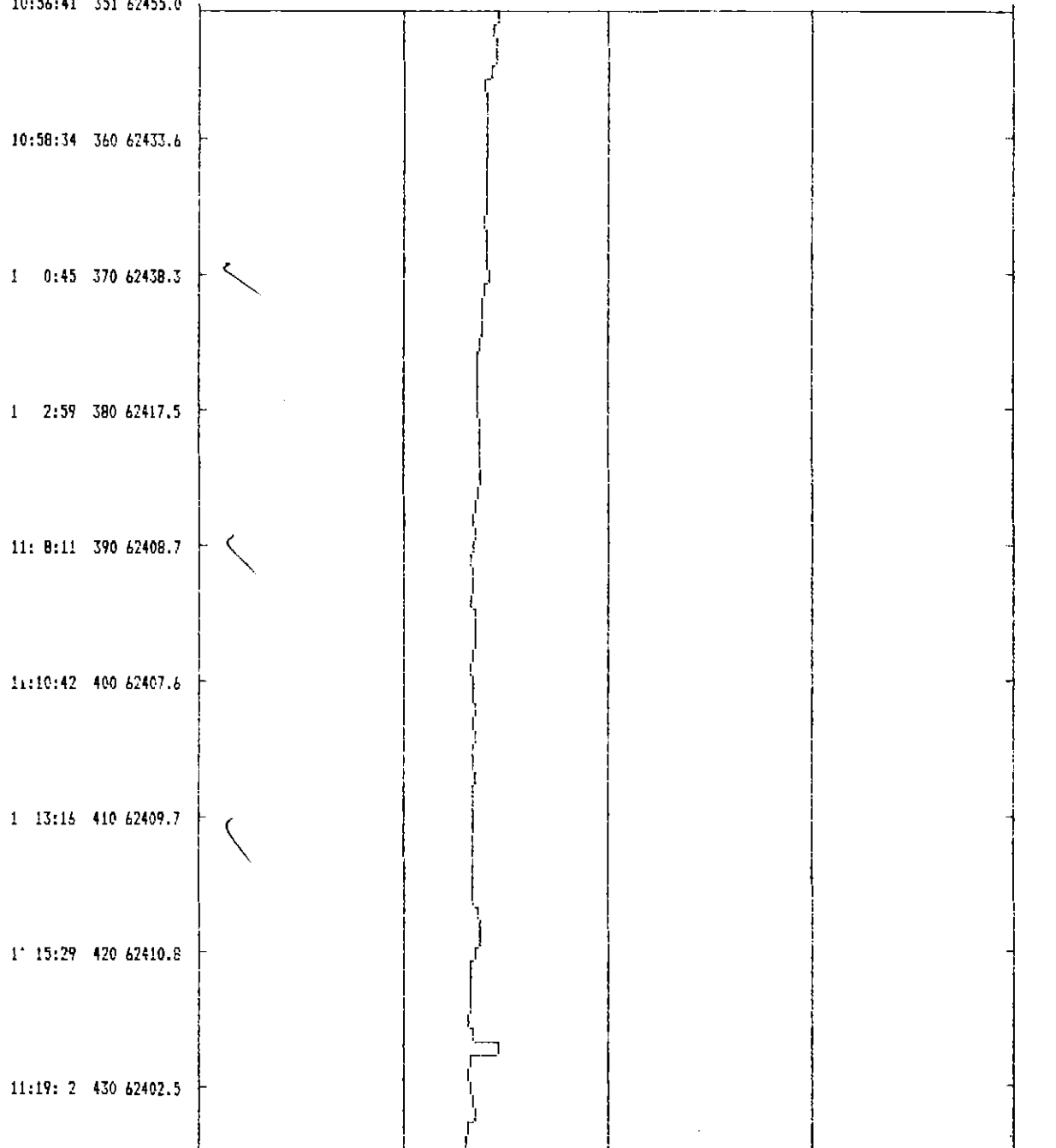
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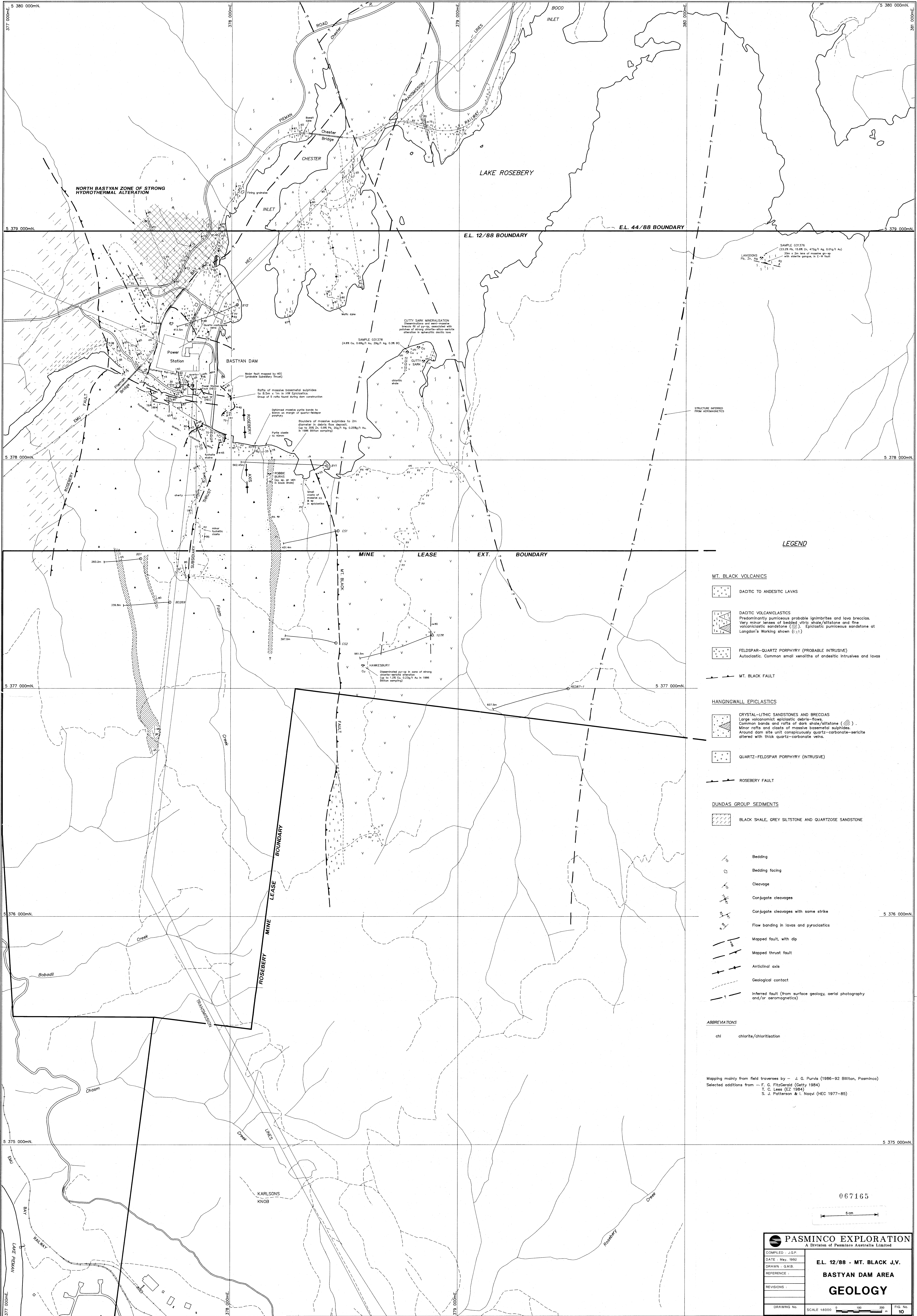
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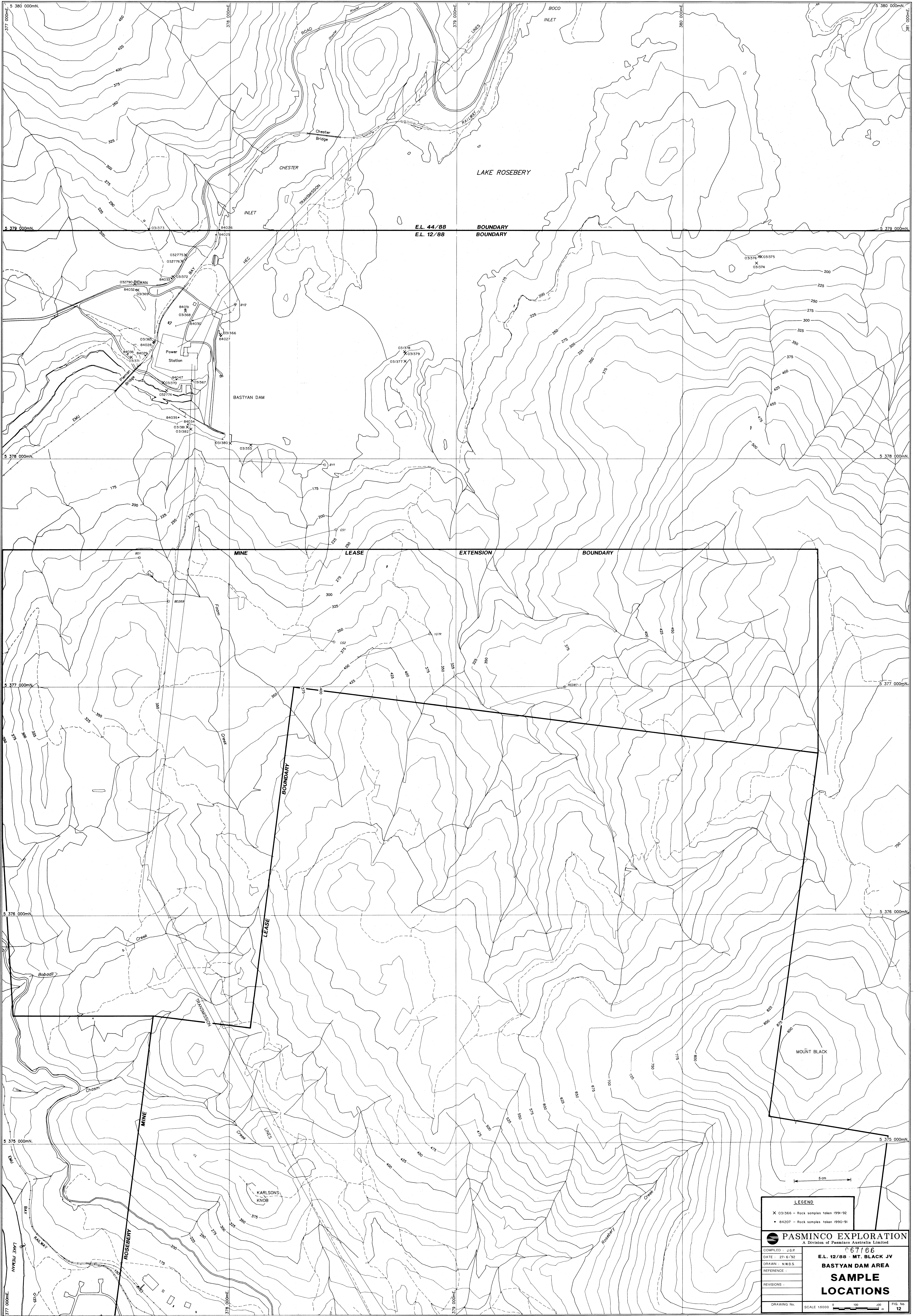
1 6:15 630 62276.0

13: 8:29 640 62268.3

13:10:48 650 62274.8

1 13: 1 659 62259.9





LEGEND

- X 031366 - Rock samples taken 1991-92
- 84207 - Rock samples taken 1990-91

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

7 67166

E.L. 12/88 - MT. BLACK JV
BASTYAN DAM AREA
SAMPLE LOCATIONS

COMPILED : J.S.P.
DATE : 27-6-92
DRAWN : A.W.S.
REFERENCE :
REVISIONS :

DRAWING No.	SCALE 1:5000	FIG. No. 12
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