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BILLITON AUSTRALIA  
NORGOLD  
LITTLE RIVER RESOURCES  
ROSEBERY EAST JOINT VENTURE  
Partial Relinquishment Report

NOTIFIED

OPEN FILE

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SUMMARY

Exploration within EL 1/62 has spanned 27 years and during the last four years, Billiton Australia, as manager of the Rosebery East Joint Venture, has explored within both the Central Volcanic Sequence and Henty Fault Zone. At the latter locality, a small (0.75<sup>M</sup> tonne) pyritic gold body is inferred from diamond drilling results but grades are erratic and sub economic. Other known mineralized prospects are known but the potential for a significant discovery is not considered to be very high.

It is recommended that two-thirds of the licence area (i.e. 6 sq km) be relinquished immediately. The remaining 3 sq km area is currently being explored as part of the Sterling Valley Joint Venture and contains two areas that have been incompletely tested and require further work.

## 1.0 LOCATION & ACCESS

The licence is situated on the West coast of Tasmania between the townships of Rosebery and Tullah and is transected by the Murchison Highway, a major arterial road (Fig. 1). Lake Rosebery occupies approximately 20% of the licence area and numerous old tracks service portions of the licence area. Topographic expression is dominated by the Tullah Flats, an area of glacial cover that occurs in the central portion of the licence whilst the eastern edge consists of rainforest covered steep slopes.

## 2.0 LAND TENURE

EL 1/62 may be considered in two adjoining parts, subject to two separate joint venture agreements. (Fig. 1). Part one, of 6 sq kms, is the subject of the Rosebery East JV between Billiton Australia, Norgold and Little River Resources. Part two, of 3 sq kms, forms the Sterling Valley JV, between Billiton Australia and Norgold. Billiton Australia is the Manager/Operator of both joint ventures.

The entire tenement, 9 sq kms, has been renewed by the Department of Mines for a 12 month period ending 22nd January, 1990. This renewal period represents the second extension of tenure granted to the joint venture since expiry of the licence on 22nd January 1988. It should be noted here that within the

tenement there are three exclusions to exploration tenure (Fig. 2) namely:

1. 1.5km<sup>2</sup> vested in the HEC
2. 0.2km<sup>2</sup> Murchison Highway State Reserve
3. 1.6ha Mining Lease.

Exploration within land vested in the HEC is possible but is subject to negotiations with the Authority.

It is now recommended that the portion of the licence which is the subject of the Rosebery East Joint Venture (i.e. 6 sq km) be relinquished (see Fig. 1). This relinquished portion is defined by bounding AMG co-ordinates, as follows:

NW Corner :	5378000N	384000E
NE Corner :	5378000N	386000E
SW Corner :	5375000N	384000E
SE Corner :	5375000N	386000E

### 3.0 GEOLOGICAL SETTING

The Henty Fault is a major structure within the Mt. Read Volcanics (MRV), and divides them into two series. (Fig.2). The MRV are part of the late Precambrian-Cambrian Dundas Trough, situated between the unmetamorphosed Precambrian Tyennan Block to the SE.

Within the MRV, the Central Volcanic Sequence represents a core of calc alkaline acid-intermediate volcanics and minor sedimentary intercalations. North and west of the Henty Fault, the CVS is in faulted (thrust) contact with the Dundas Group sediments to the west.

East and southeast of the Henty Fault the southern CVS is a complex association of felsic domes, flows, ignimbrites and pyroclastics. It is extensively overlapped by both the Tyndall Group and Owen Conglomerate. The Tyndall Group is a volcani-clastic sequence that only occurs east of the Henty Fault and its correlates are interpreted to extend from Queenstown to north of Hellyer. The sediments with minor intercalated tuffs of the Farrell Sequence (previously Farrell Slates), occur adjacent to the east side of the Henty Fault and are regarded as a part of the Tyndall Group or its correlates.

The Henty Fault is now known to extend for at least 60km and to have a deformation zone up to 1km wide. Both brittle and ductile effects are evident, and a complex multi-phase history seems likely. Over-thrusting of the Owen Conglomerate by Cambrian rocks has occurred at Mt. Farrell.

Within the area to be relinquished, four principal stratigraphic/structural features are present. From west to east these are:

- 1) Mt. Read Volcanics - massive intermediate lavas and volcanoclastics of the Central Volcanic Sequence. A general E-facing sequence is implied.
- 2) Henty Fault Zone - a well defined structure (strike 010° AMG, dip 65°W) whose deformation extends up to 1km in width.
- 3) Farrell Sequence - a complex interplay of shale, greywacke, arenaceous volcanoclastics and vitric ashes. Facing evidence is common but variable to the east and west.
- 4) Murchison Volcanics - quartz and feldspar phyric lavas and volcanoclastics included within the Tyndall Group.

#### 4.0 MINERALIZATION

The Farrell Sequence is a highly mineralized suite of rocks, with major production from the North Mount Farrell and New North Mount Farrell mines of Pb Ag and Zn. The Farrell lodes are steeply plunging massive sulphide veins, with high lead and silver, low zinc and no gold (recorded production: New North Mt. Farrell - 300,000t @ 15.5% Pb, 16.8oz/t Ag, 2.5% Zn; North Mt. Farrell - 432,000t @ 9.1% Pb, 9.5oz/t Ag).

At the Murchison Mines, about 3kms south of North Mt. Farrell, 300t of recorded production gave 40% Pb, 55oz/t Ag, 2.1g/t Au, plus Cu (<0.5%) and Zn (<15%). This mineralization is a narrow (<5m) fissure fill/replacement sulphide lode, plunging south at 50°.

The Sterling Valley Mine in former EL 4/73, is similar to the Murchison Mine, with relatively high tin and arsenic values. The mineralization is associated with strongly cleaved black shales.

Other Pb-Ag rich fissure occurrences are known in the area, eg Duttons, Green and Kings, Thomas Blocks etc., all within the Farrell Sequence.

Within the area to be relinquished, the "Farrell" style of mineralization is represented at Duttons Workings, Central Workings, Murchison Mine, Murchison Extended, South Murchison, Green and Kings, Thomas Blocks and in drill holes RED 86-1, MR 1, MR 2. (see Fig. 3).

Auriferous sulphide hosted mineralization is associated with the Henty Fault along its entire length (>4kms) and has been intersected in numerous drill holes. However, at two localities (viz Lakeside, Arsenic Zone) a drill indicated resource has been defined.

At Lakeside, Billiton has drilled nine diamond holes that have indicated a resource of 750,000 tonnes @ average grade 2.1g/t Au. (Fig. 4). This body of mineralization has an average width of 5.1 metres and has been outlined from a depth of 50-250 metres below surface. Gold mineralization is hosted by massive pyritic sulphide that occur in structurally controlled loci approximately 10m east of the main Henty Fault structure.

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## 5.0 EXPLORATION SUMMARY

Within EL 1/62, exploration has spanned 27 years during which time numerous explorers have tested various targets, most of which were within the Central Volcanic Sequence. Work on the HFZ was initiated by EZ Co. in the late 1970's, extended during the Getty Joint Venture (GODL) and added to by the current Rosebery East and Sterling Valley Joint Ventures. A list of references pertaining to this work is summarized below:

<u>Report No.</u>	<u>Company</u>	<u>Period/Title</u>	<u>Author</u>
131	EZ Co	Report on work undertaken to 30th June, 1979.	J.Mill
134	EZ Co	Report on work undertaken 30th June '79-30th June '80.	J.Mill et al
142	EZ Co	Progress Report on Activity, July 1980-June 1981.	I.McDonald
144	EZ Co	Progress Report on Activity, 1st July '81-15th Dec. '81.	I.McDonald et al
148	EZ Co	Progress Report on Activity, 15th Dec '81-4th May '82.	I.Mathieson et al

152	EZ Co	Review of Rosebery East JV April, 1982.	Milovanovic
158	EZ Co	Progress Report on Expl. Acitivity 5th May '82-20th Nov. '82.	I.Mathieson et al
T173	EZ Co	Progress Report on Expl. 4th May -15th Nov. 1983.	I.McDonald
	GODC	Rosebery East Expl. Progress Rep. Aug 1983 - June 1984.	F.Fitzgerald et al
	GODC	Rosebery East Expl. Progress Rep. July 1984-Dec. 1984.	F.Fitzgerald et al
	GODC	Rosebery East Expl. Progress Rep. Jan-Aug 1985.	J.G.Purvis
08.3412	BAUS	Progress Report on Expl. for the period ending 22nd Dec. 1986.	J.P.Randell et al
08.3910	BAUS	Progress Report on Expl. for the period ending 22nd Dec. 1987 and Relinquishment report for the Tenement.	J.P.Randell
08.2498	BAUS	Annual Report on work completed 23/1/87 to 22/1/88	D.B.Hall et al
08.4242	BAUS	Annual Report to 22/1/89.	D.B.Hall
08.4244	BAUS	Relinquishment Report.	D.B.Hall

A summary of the exploration completed by Billiton and significant results obtained is presented below in chronological order:

- 1986 - EZ drill holes resampled and assayed for gold by fire assay. A total of 15 holes were relogged, sampled and 560 samples assayed.
- a small Max-Min EM survey was conducted over the area north of drill holes MR 1, MR 2.
  - diamond drill hole RED 86-1 (235m) tested the Max-Min EM anomaly.

Significant results from this work were:

1. the recognition in MRP 233 of potentially economic gold mineralization that is in part refractory. This is evidenced by the dramatic upgrading of gold tenor by fire assay in comparison to aqua regia analytical techniques. The intersection in MRP 233 averaged 4m @ 3.32g/t Au.
2. the acknowledgement of scattered irregular gold mineralization along the length of the HFZ. In particular, the Murchison Mine locality appears to have a definite Au-As-Cu-Ag metal association.
3. further definition of a strike extensive (+700m) EM zone drilled by Getty (MR1, MR2) and Billiton (RED 86-1). The zone corresponds to a +10m wide quartz-carbonate stockwork that is both lead, zinc and gold anomalous.

viz MR1 best assay 3.3m @ 0.26g/t Au

MR2 best assay 12.9m @ 0.31g/t Au

RED 86-1 best assay 0.85m @ 0.15g/t Au 31% Pb  
3% Zn 670g/t Ag.

1987 - geological compilation at 1:5000 scale of previous mapping, drilling, mineralization.

- at Lakeside, seven diamond drill holes were completed for a total metreage of 1443m (RED 87-2,3,5,6,7,8,10). A total of 300 samples were collected for assay, 19 samples for petrology and 3 samples for scanning electron microscope study. Down hole IP was carried out on all holes.
- geophysical work at Lakeside included 2 lines dipole-dipole IP, UTEM surveying and a short mise-a-la-masse survey.
- north of Lakeside, one drill hole (RED 87-4), 328m) has tested an IP response (7 line kms surveyed). Resampling of old EZ drill holes continued and reassaying by fire assay Au. completed (275 samples).
- small ground magnetic, Max-Min EM and gravity surveys were completed north of Lakeside.
- four bulk stream sediment samples were collected as part of a much larger survey and analysed for gold by the bulk cyanide leach (BCL) method.
- at the Murchison Mine, drill core sampling and reassaying was completed (159 samples) in addition to limited rock chip sampling (7 samples) and stream sediment sampling (2 samples). Dipole-dipole IP surveying was also completed (5 lines, 2.5kms).

Several important results emerged from the 1987 programme viz:

1. The Lakeside mineralization is characterized by semi-massive to massive veins of pyrite-arsenopyrite-chalcopyrite (-tetrahedrite-galena-sphalerite) within a chloritized volcanoclastic arenite unit, approximately 10m east of the Henty Fault. The mineralized body has a strike in excess of 200 metres, down dip extent greater than 110 metres and is not closed off to the north or south.

The best intercept from the drilling programme was RED 87-3: 4.65m @ 5.9g/t Au, 7% As, 0.21% Sn, 34g/t Ag from 111m - 115.65m. Microprobe work indicates that the gold occurs as free grains of less than 15 micron diameter and has a fineness 860-870.

Minor Au-As mineralization occurs west of the Henty Fault Zone in a similar position to that of the Arsenic Zone within the Sterling Valley. Potential for significant mineralization at this stratigraphic position is therefore quite possible.

2. There is a strong indication that the arenaceous volcanoclastic unit that hosts the Lakeside mineralization is present as far north as Duttons and south to the Arsenic Zone. This unit may be a favoured host due to its brittle rather than ductile nature allowing more intense structural

preparation and remobilization of auriferous fluids.

3. Weak gold mineralization intersected in drill holes MRP 226, 227 on the northern edge of Lake Rosebery may indicate continuity of the Lakeside mineralization.
4. A 900m strike conductive zone occurs 200-300m east of the HFZ at a stratigraphic position tested by drill hole RED 86-1. Several untested anomalies occur along this zone.
5. The Murchison Mine mineralization is similar in style to that at Lakeside in that it is structurally emplaced, consists of massive sulphide pods and has a consistent gold tenor (2.5g/t Au). This line of mineralization is untested north and south of the mine.

1988 - At Lakeside, three diamond drill holes (RED 88-1,2,4) were completed for a total metreage of 936m. A total of 188 samples were submitted for assay (Au, Cu, Zn, Ag, Pb, As, Ba, Sn, W, Sb) and 13 samples were collected for petrological investigation. In addition, five samples were collected for lead isotope determination.

- Geophysical surveys at Lakeside have included trial UTEM (1.5kms), down hole EM logging RED 88-2, and surface Sirotem immediately south of the main body of mineralization (3kms). A single Max-Min EM line was also completed.

A selected suite of drill core samples was examined for petro physical characteristics to assist in the interpretation of IP, magnetic and EM surveys.

- North of Lakeside, drill hole RED 88-3 (179m) completed the spatial testing of the HFZ. Eleven samples were submitted for analysis and two samples for petrological description.
- On the Tullah Flats, re-establishment of an old grid was subsequently followed up by ground magnetics (9kms) and Max-Min EM (4.1kms).
- In the Murchison Mine area, a detailed grid was established over the old workings (11kms). Geological mapping and auger sampling was completed (217 samples) over much of the grid. Geophysical surveys included ground magnetics (11kms) and Max-Min EM (3.4kms).

Significant results from the 1988 programme are listed below:

1. Lead and sulphur isotopic determinations suggest that the Lakeside mineralization has a Devonian magmatic source and its emplacement is most probably related to a near surface (1km deep) granitic intrusion.

2. On the basis of nine drill hole intercepts an indicated resource of 750,000 tonnes @ 2.1g/t Au has been calculated for the Lakeside mineralized body.
3. UTEM has successfully delineated the known mineralization but does not suggest a deeper source attributable to additional mineralization. The Sirotem survey also did not suggest evidence of mineralization south of Lakeside.
4. An untested Max-Min EM anomaly occurs on the Tullah Flats at a stratigraphic position similar to that tested by MR1, MR2, RED 86-1.
5. The Murchison Mine mineralization is characterized by a series of en echelon south plunging massive sulphide lenses of obvious structural emplacement. Max-Min EM surveying has indicated the presence of several weak anomalies to the north of the mine that require testing.

## 6.0 CONCLUSIONS

After completion of almost four years of exploration along the Henty Fault within the area to be relinquished, the most significant prospect is that of Lakeside. Drilling to date has failed to produce one economic intercept in terms of gold grade or width and geophysical surveys (EM/IP), to which the

mineralization responds, indicate limited potential for additional mineralization immediately along strike. The possibility of additional mineralization at depth cannot be discounted but as this would necessitate future underground development, grades would need to be considerably higher (approx. 8-10g/t Au ave.).

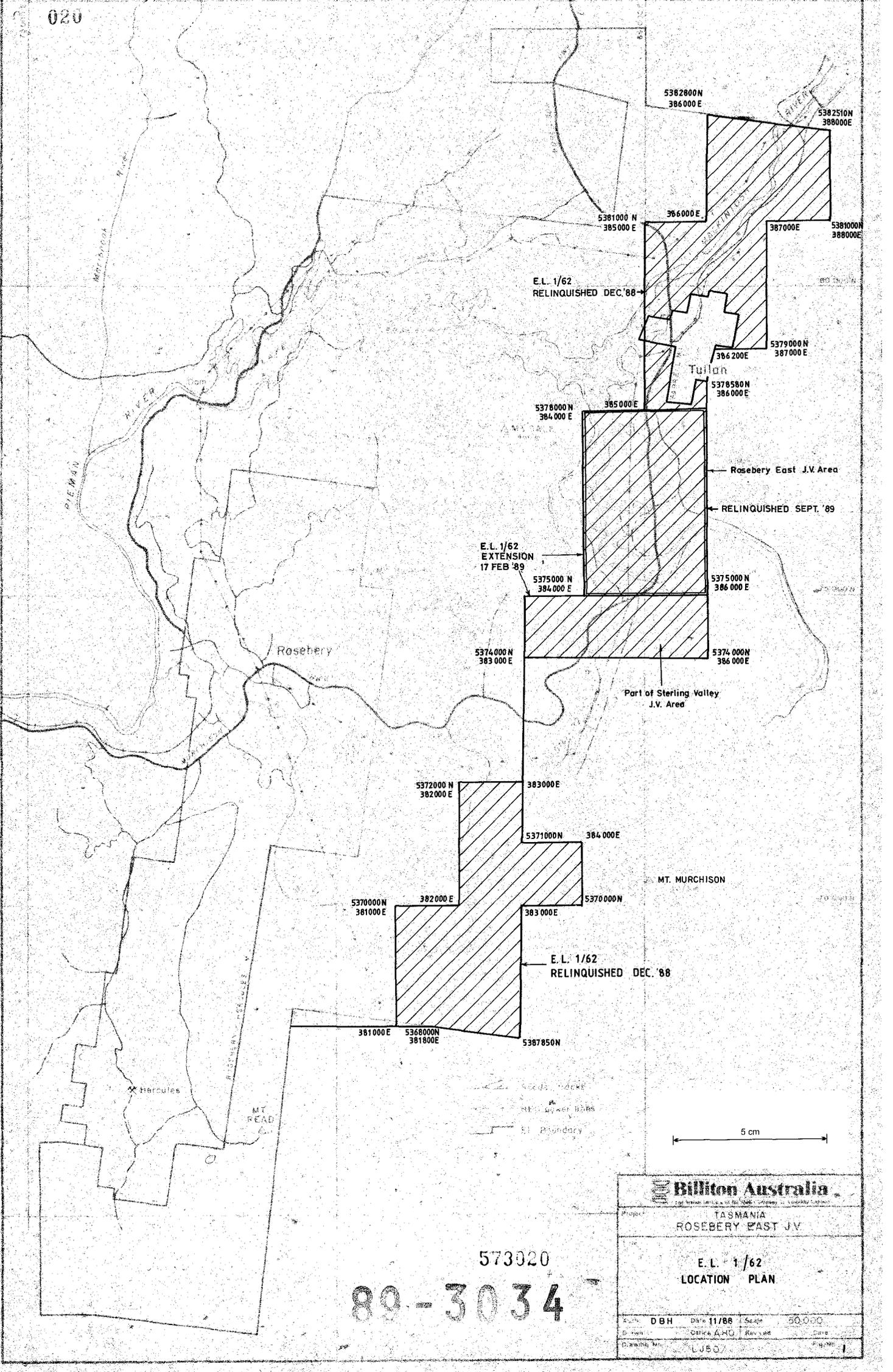
The Murchison Mine locality has not been adequately explored by either geophysical techniques or by diamond drilling. However, the nature of the observed mineralization as small discrete pods suggests that it is unlikely that a significant tonnage would be present.

The remaining geophysical targets occur within the Farrell Sequence and previous drilling would suggest that the source of these responses is most probably due to graphitic and/or pyritic shales. Scattered mineralization has been recorded in these response types but the potential for a significant body of mineralization seems less likely.

#### 7.0 RECOMMENDATIONS

It is recommended that the portion of EL 1/62 north of the Lakeside mineralization and contained within the Rosebery East Joint Venture area be relinquished immediately.

The remaining 3 sq kms of EL 1/62 should be retained for two reasons: firstly, it contains a small As-Au resource adjacent to the Henty Fault which has been inadequately tested down plunge and secondly, the eastern portion of this area is currently being explored as part of the much larger Sterling Valley Joint Venture. Targets have been defined already and require additional testing in the near future.



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**Billiton Australia**  
 Project: TASMANIA ROSEBERY EAST J.V.  
 E.L. 1/62 LOCATION PLAN

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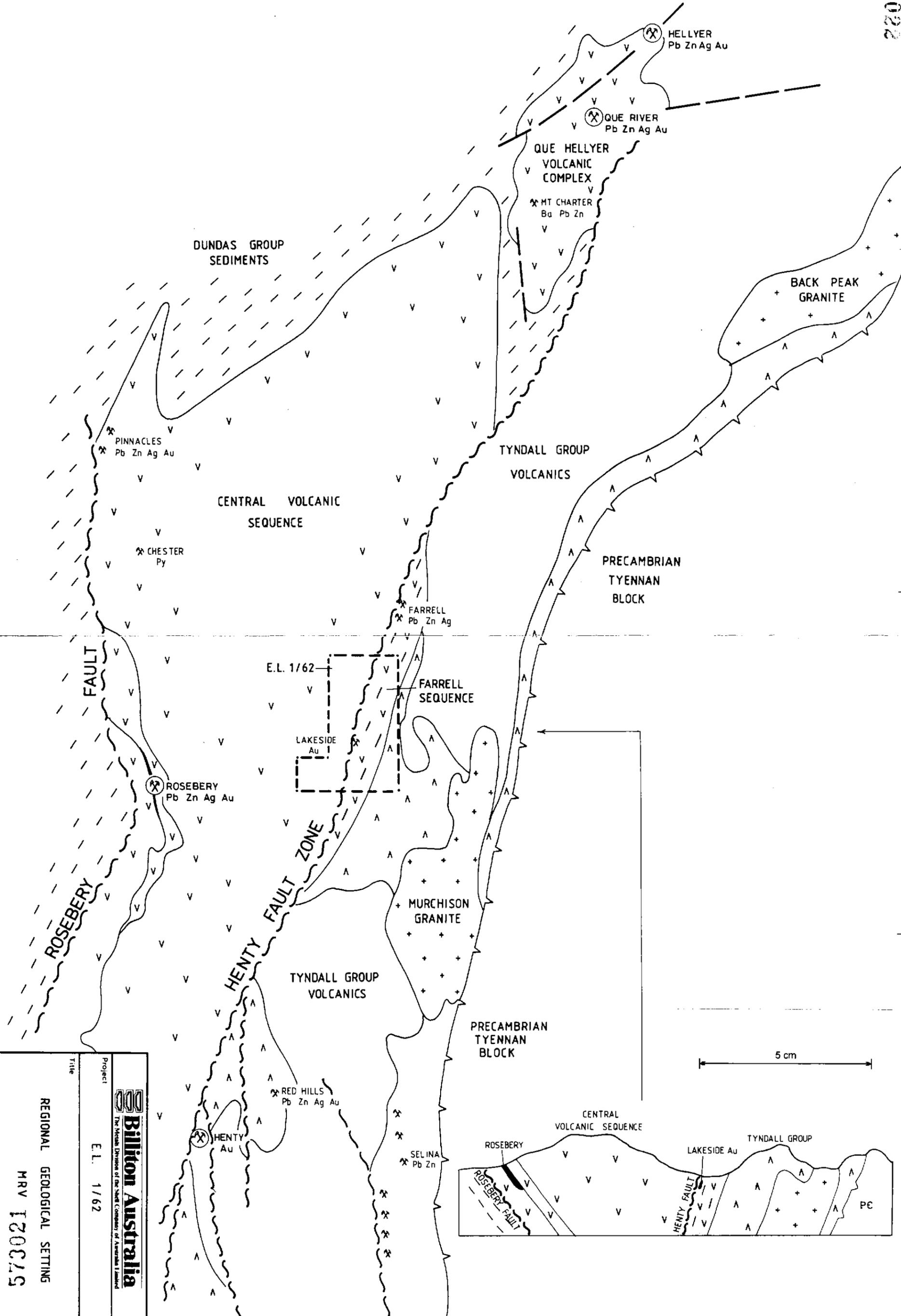
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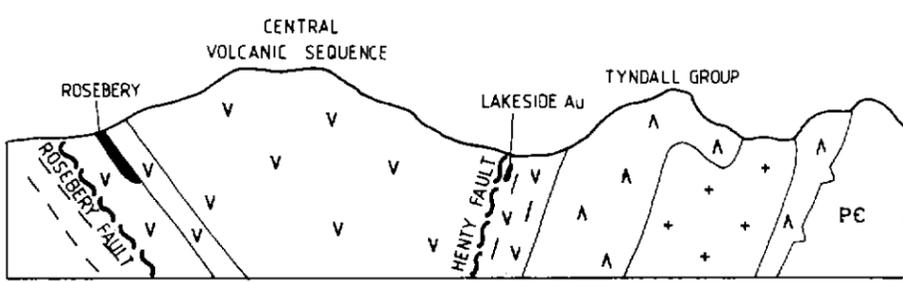
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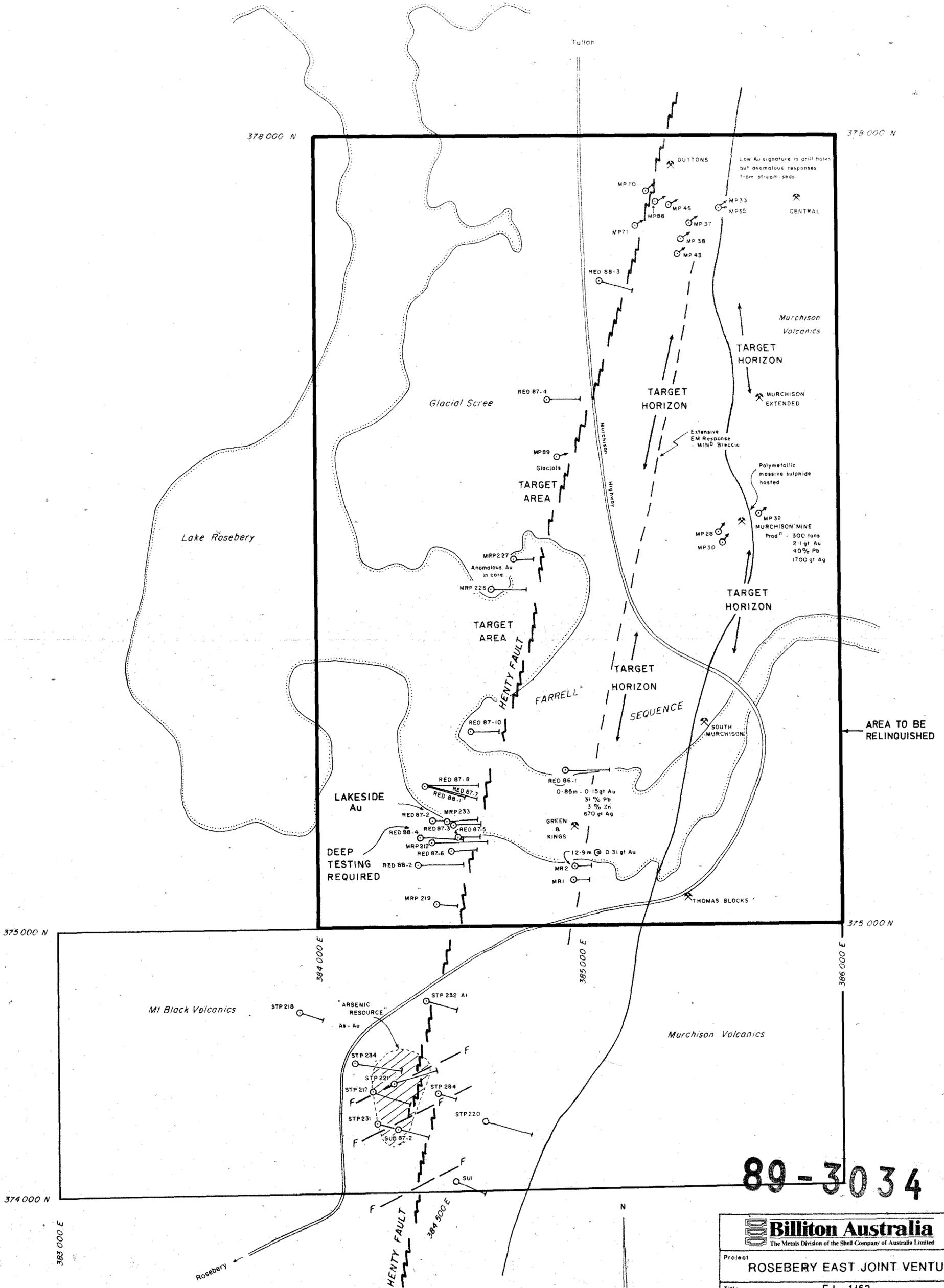
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<p><b>Billion Australia</b> The Metals Division of the Shell Company of Australia Limited</p>					
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Title	<p>REGIONAL GEOLOGICAL SETTING MRV 120C25</p>				



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<b>Billiton Australia</b> The Metals Division of the Shell Company of Australia Limited			
Project ROSEBERY EAST JOINT VENTURE			
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ROSEBERY EAST JV  
LONGITUDINAL PROJECTION  
LAKESIDE  
INDICATED RESOURCE

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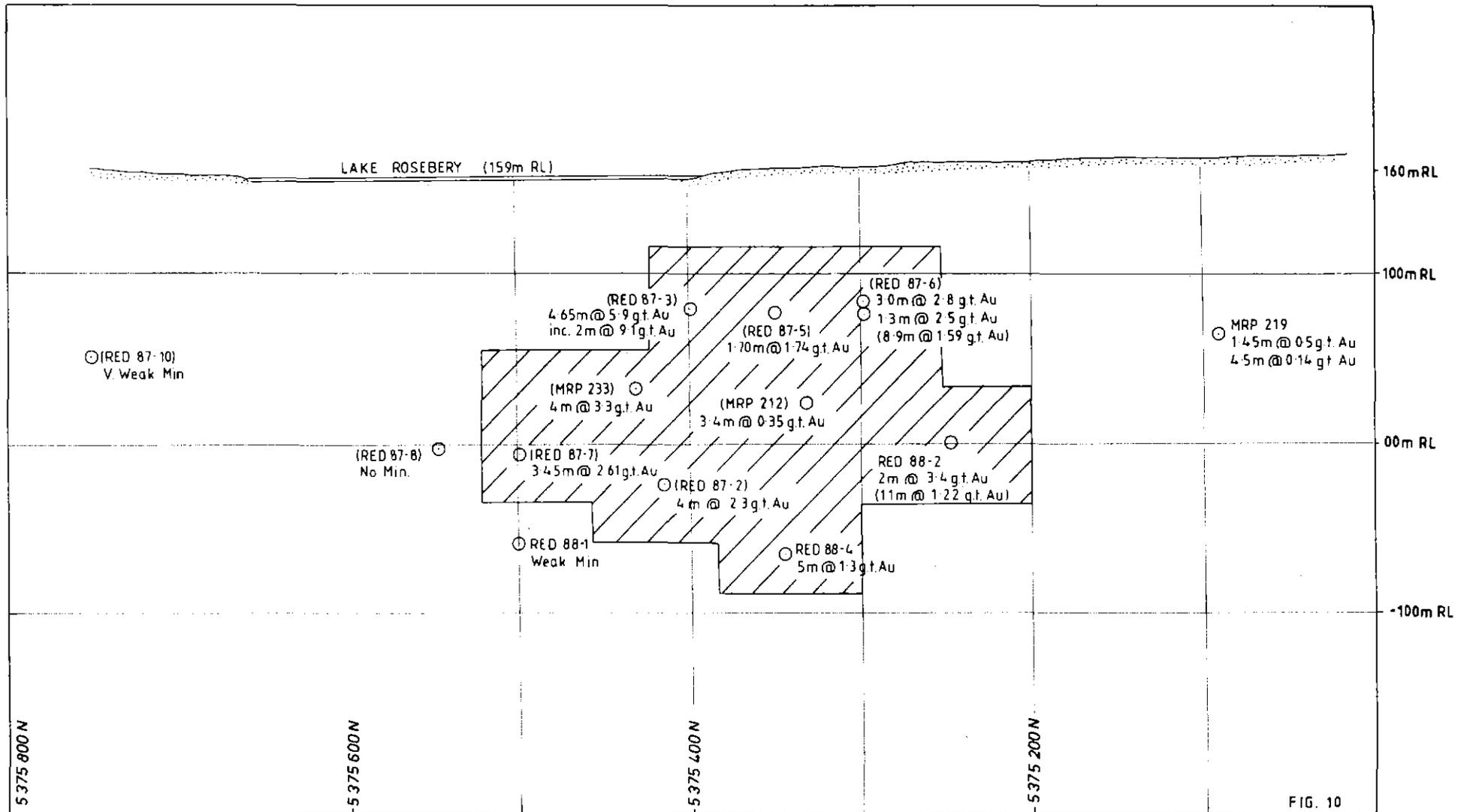


FIG. 4