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BILLITON AUSTRALIA

AUREOLE N.L.
AMERICAN HORIZON RESOURCES, INC.
FEDERATION RESOURCES N.L.

E.L. 58/88 - GOLDEN RIDGE JOINT VENTURE

Annual Exploration Report for the Period
7th April 1989 to 7th April 1990

Author : J.P. Randell

Report No : 08.4946

Date : March 1990

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1. INTRODUCTION

This report summarizes the results of exploration carried out by Billiton Australia on behalf of the Golden Ridge Joint Venture since the commencement date of 9th October 1989. As this is the first year of tenure of the licence, no previous exploration reports have been referred to.

2. LOCATION & ACCESS

The licence is situated in the north-east of Tasmania approximately 20 kms west of St. Helens and 70 kms east of Launceston. (Fig. 1). Access to the tenements is obtained via well maintained Forestry roads (eg Hogans Road) and thence by tracks in varying states of disrepair.

The topography is steep with numerous linear spines and deep gullies. Vegetation consists of dry sclerophyll forest, eucalypt regeneration and pine plantations.

3. LAND TENURE

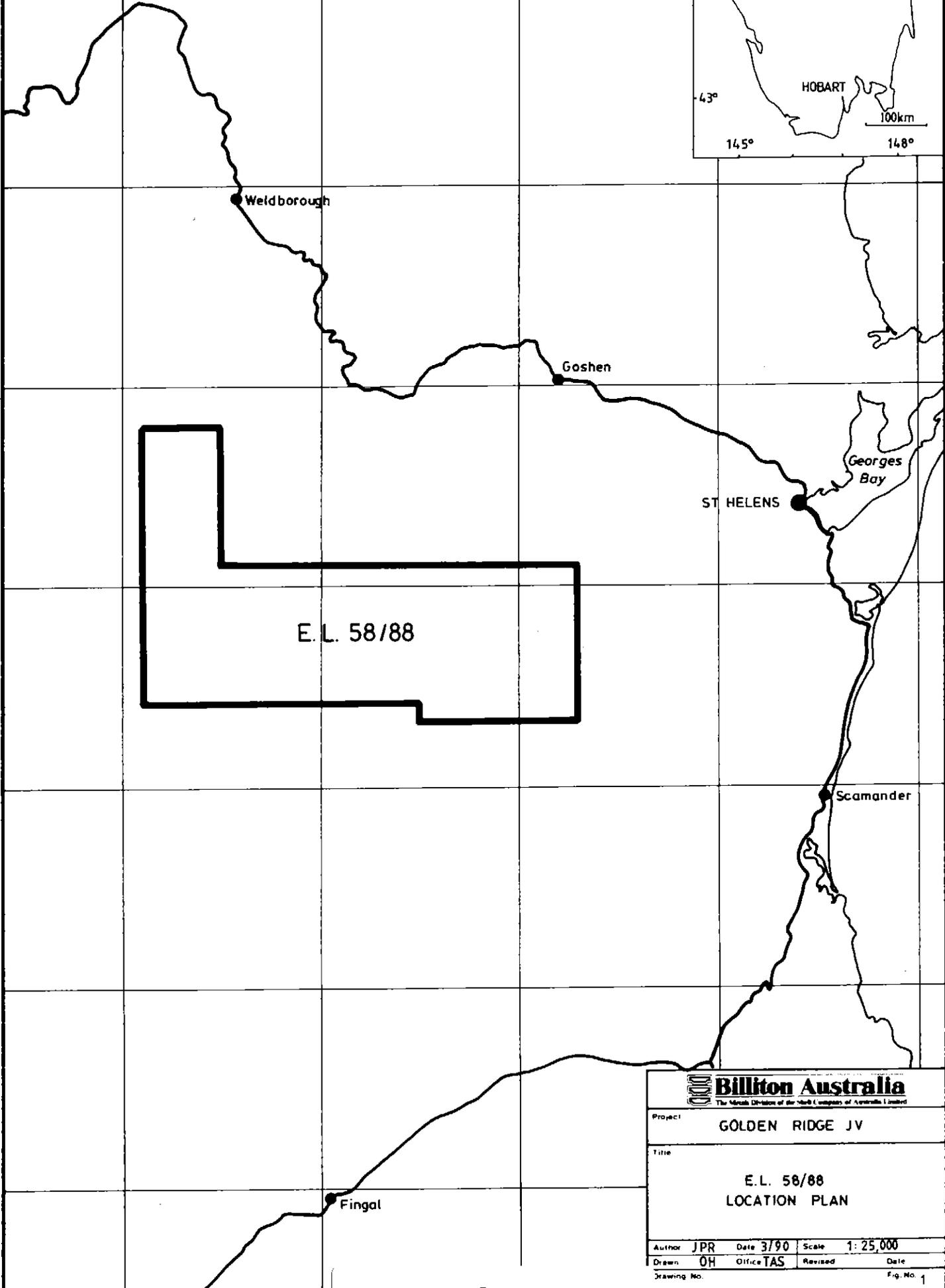
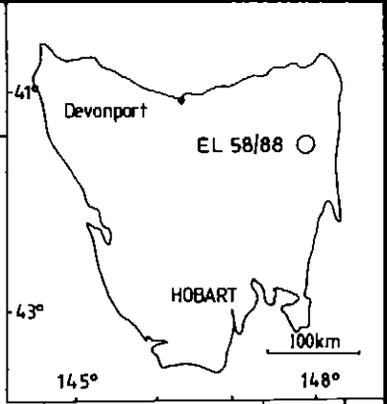
Exploration licence 58/88, of 189 sq kms, was granted on 7th April 1989 to a consortium consisting of:

Federation Resources N.L.	20% equity
American Horizon Resources Inc.	30% equity
Aureole N.L.	50% equity

Aureole N.L. was elected operator of this group.

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E. L. 58/88

Georges Bay

ST HELENS

Scamander

Fingal

Billiton Australia
The Metals Division of the BHP Companies of Australia Limited

Project: **GOLDEN RIDGE JV**

Title:
**E.L. 58/88
 LOCATION PLAN**

Author: JPR Date: 3/90 Scale: 1:25,000

Drawn: OH Office: TAS Revised: Date:

Drawing No. Fig. No. 1

5 cm

The Shell Company of Australia Limited, through its subsidiary Billiton Australia, farmed into the project on 9th October 1989 as manager of the joint venture.

Within the tenement a mining lease application is current and is yet to be formerly signed by the Minister. (MLA 43M/88 of 100ha, Oceania Tas P/L). This tenement is excluded from the joint venture (Fig. 2).

4. REGIONAL SETTING

The licence covers the southern ends of the Pyengana and Poimena Plutons (biotite-hornblende granodiorite and granite) of Upper Devonian age that have intruded Siluro-Devonian Mathinna Beds sediments (see Fig. 3). Around the margins of these plutons, a contact metamorphic zone characterized by moderate hornfelsing of the sediments occurs as a band up to 1 km wide.

A mineralization zonation is well known in the Scamander area and from east to west a gradation from Cu-Pb to Sn-W to Au-As is noted. The Golden Ridge locality defines this latter category and is represented by numerous shafts, adits and pits over a 4 km strike length wrapping around the margin of the Poimena Pluton.

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Throughout the North-East Province there is good evidence of a strong structural control to the emplacement and grade of the auriferous mineralization. At both regional and local scales a favoured NNW-SSE orientation is evidently the major directional control and this can be identified on all scales from Landsat imagery analysis to "walking the outcrop".

5. PREVIOUS EXPLORATION

The licence area was previously held as EL 24/82 by Oceania Tasmania but very little exploration has been carried out or at least reported. Their work appeared to be limited to minor rock chip and soil sampling around the old workings but no systematic work is evident.

Union Corporation (Aust) Pty. Ltd. carried out some stream sediment sampling within EL 21/80 during 1981 but apparently analysed the samples for Sn, W, Mo, Cu, Pb, Zn only.

Texins Development Pty. Ltd. through Geophoto Resources Consultants also completed a stream sediment survey with some follow up rock chip and soil sampling.

Other recorded work within the area relates to the initial mining activity surrounding the Hogans Track or Brilliant Creek Goldfields viz.

007

"Report on the Queen of the Earth Gold Mine and Neighbourhood" by W.H. Twelvetrees, 1900.

"Report on Gold Mines near Hogans Track" by W.H. Twelvetrees, 1899.

"Notes on the Trafalgar Leases - Upper Scamander District" by Q.J. Henderson, 1935.

"Report on the Geological Survey of the Country between Scamander and Mathinna" by Q.J. Henderson, 1939.

Unnamed Report by Q.J. Henderson, 1935.

6. MINERALIZATION

Within the tenement, several groups of workings occur that were prospected during the turn of the century for gold. The location of these workings is shown in Figure 3 and comments pertaining to each are presented below.

The New Carthage-Trafalgar workings occupy an area of 200m x 120m and are located on the margin of and within a granodiorite plug. They occur on the crest and flanks of a north south trending ridge and are typified by numerous small pits with larger shafts and small costeans. One adit of 25m length has been dug. The Trafalgar workings consist of 3 shafts only and although reasonable large no accessways are evident.

008

Where observed the mineralization style is characterized by thin (5-10cm) quartz lodes of variable orientation but it is apparent from the distribution of pits and costeans that the style is overall one of broad anastomosing quartz veins in a stockwork pattern.

The Queen of the Earth workings are dominated by extensive exploitation of a ~0.5m wide quartz vein over a strike length of 70-80m. Underground examination was not possible to any great degree both due to blockages in the main adit and unsafe stopes. These workings are located ~1.5km south of the Trafalgar-New Carthage occurrences and are interpreted to be structurally related. On Golden Ridge itself, numerous small pits occur and these line up with the named workings.

Along the crest of Golden Ridge are situated 3 groups of workings viz. Golden Ridge, New Golden Ridge and Brilliant. Between these workings are scattered numerous small pits over an area of 1.5km x 200m. Examination of material from these pits indicated the presence of a fine anastomosing quartz veinlet system within Mathinna Beds micaceous silts and sands.

The Golden Ridge workings themselves are centred on this area of scattered pits and consist of a single shaft and several costeans.

The New Golden Ridge and Brilliant workings occur along the same structural feature and are separated by a distance of 150m. At New Golden Ridge, two subparallel quartz veins (5-7cm width) are separated by 20m of sandy sediments that show a variable content of fine quartz veinlets in a stockwork arrangement. Evidence of mineralization occurs over a strike length of 70m.

The Brilliant workings consist of 2 adits that enable access to a ballroom of dimensions 26m x 15m. Numerous small headings have been developed with the aim of following thin ferruginous shears some of which contain thin quartz veinlets. The orientation of these shears is in several directions giving the impression of a wide stockwork system.

The Double Event workings were not located despite several attempts to find them amongst the thick scrub.

7. EXPLORATION COMPLETED 1989-90

As the joint venture has been in existence for only 5 months only a limited initial programme has been carried out to date by Billiton.

- a total of 103 rock chip samples (samples 16501-68, 16366-400) have been collected from the old workings and assayed for Cu Pb Zn Ag As Au (see Appendix 1).

- a total of 12 BLEG stream sediment samples (samples 16432-39 16477-80) have been collected from the vicinity of the old workings.
- a research grant has been issued to the University of Tasmania, Centre for Ore Deposit and Exploration Studies to carry out a structural and geochemical analysis of the mineralization setting.

8. EXPLORATION RESULTS

8.1 Rock Chip Sampling

The local geological setting of the Brilliant Creek Goldfield is shown in Figure 4 together with locations of rock chip samples. Sample descriptions are presented as Appendix 2.

There are five groups of workings located mainly within the contact aureole but also extending into the surrounding granite and sediments. The workings are named but it is of great interest that between these major workings are literally hundreds of small prospecting scratchings, usually of only several metres diameter. The area is one of steep topography due to the resistive nature of the hornfelsed micaceous sediments and gives rise to linear steep sided ridges. Within these ridges it is noted that linear spurs

of NNW-SSE orientation flank the ridges. These correspond to zones of more intense alteration and often define the orientation in detail of the individual workings.

Sampling of the workings has been carried out with the aim of determining the potential for widespread low grade mineralization outside of the main workings. This process has been hindered by the extensive development of scree on the hillslopes and the rubbly nature of the ridge spines.

The major areas of workings, except Double Event, have been sketched and rock chip samples (selected and composite) collected. The geological sketches and locations/results of the sampling are shown in Figure 5.

Sampling of New Carthage by BAUS attempted to determine the likelihood of wide spread mineralization but was hindered by the ubiquitous scree. Nevertheless, composite sampling over 10m intervals gave a best intersection of 20m @ 17gt Au. Several other samples averaged in the range of 1-4gt Au.

At Queen of the Earth sampling of the crown pillars failed to realize significant mineralization and sampling of dump material gave a maximum value of only 2.9gt Au.

012

Along Golden Ridge composite grab samples taken over approximately 50m intervals gave maximum assays of 2.6gt Au at Golden Ridge and 2.1gt Au between Golden Ridge and New Carthage.

At New Golden Ridge, assays of face samples from individual stopes were markedly anomalous with a maximum of 7.6gt Au. Composite grab samples over intervals of 10m gave maximum values of 1.38gt Au.

Composite grab samples over 5m intervals at the Brilliant mine gave a maximum assay of 2.8gt Au.

8.2 BLEG Stream Sediment Sampling

As part of a much larger regional survey within the North East Province, a total of 12 samples were collected from streams surrounding the Brilliant Creek Goldfield. At each site, shown on Figure 4, a 5kg BLEG, 2kg panned concentrate and 1kg -80# sample was collected and later assayed (see Appendix 1).

Results indicate a maximum BLEG anomaly of 5.5ppb Au from a sample taken downslope of the New Golden Ridge and Golden Ridge workings. Little more can be said at this stage pending results of a current EL based survey.

8.3 Research

Prior to Billiton's involvement in the tenement, Aureole N.L. had commenced funding a research programme at the Key Centre for Ore Deposit and Exploration Studies at the University of Tasmania. The research commenced in August 1989 and is concentrating on two aspects of the mineralization: firstly, the structural relationship between the emplacement of the plutons and the fracture controlled mineralized veins and secondly, the origin of the mineralizing fluids. The first quarterly report summarizing results of this research is presented as Appendix 3.

Work to date has included preliminary sulphur isotope analysis of twelve samples from Trafalgar and Queen of the Earth mines and several petrographic sections have been cut.

Preliminary conclusions from this work are:

(1) Arsenopyrite was deposited into veins at both mines from very isotopically homogeneous fluids.

(2) The sulphur in both mines is likely to have derived both from Devonian magmatic (0%) and Ordovician sedimentary sources (>0% ?), with Queen of the Earth containing the greatest proportion of sedimentary sulphur.

014

9. CONCLUSIONS

Exploration to date has essentially only confirmed the potential for discovery of large tonnage low grade gold mineralization surrounding the existing workings of the Brilliant Creek Goldfield.

The source of the gold mineralization is problematical and whether it is a particular phase of the granitoids in the area or the Mathinna Beds themselves is not known at this stage. Mineralization emplacement and subsequent upgrading is post-granite stoping and has preferentially occurred in zones of brittle rocks. In this case it is the contact metamorphosed granite rim that is the favoured host. Hornfelsing of the sediments has allowed brittle fracture to occur in response to regional deformation but it is of note that there is a preferred direction of structural weakness viz. N-S or NNW-SSE. Hence at Golden Ridge the hornfelsed rim strikes approximately E-W whilst the mineralization has focussed onto a series of subparallel shear zones. The moderate competency of these sediments has presumably allowed a crackle type fracture pattern to develop rather than single fissure (Queen of the Earth may be the exception).

10. RECOMMENDATIONS

There is a need to obtain bedrock samples along Golden Ridge and across the existing workings to evaluate the

015

consistency and grade of the mineralization. Costeaming is suggested as a useful method to obtain structural, lithological and geochemical information.

The BLEG stream sediment sampling method is recommended to screen the licence regionally for as yet undiscovered mineralization. The method has proved very useful elsewhere within the North East Province and initial results at Golden Ridge appear favourable.

Favourable results from the costeaming should be followed up by gridding, ground magnetics, BLEG soil sampling and R.C. percussion drilling.

APPENDIX 1

Rock Chip & Stream Sediment Sample Results

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Telephone: (08) 43 5722 Fax: (08) 234 0321 Telex: LABCOM AA89323

MT24
345.

Mr. Jeff Randell
Billiton Australia Ltd
30 Mersey Main Road
Spreyton
Devonport
TAS 7310 Australia

Job Number: 9AD1300

Your Reference: 11701
Number of Samples: 107
Extra Samples : 0

Date Received: 02-AUG-1989
Date Reported: 22-AUG-1989

This report comprises a cover sheet and pages 1 to 11

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source. Please address any enquiries to Mr. Trevor Francis.

GOLDEN RIDGE
ROCK CHIPS

Approved Signature:

for

Dr. John Kikkert
General Manager - Adelaide.
CLASSIC COMLABS LTD

MM Mr Jeff Randell Tasmania

Report Analyte Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficient Sample for Analysis.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media



Job: 9AD1300
O/N: 11701

018

ANALYTICAL REPORT

SAMPLE	Au
16477	<10
16478	<10
16479	10
16480	<10
UNITS	ppb
SCHEME	BLEG1

516020



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Job: 9AD1300
O/N: 11701

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ANALYTICAL REPORT

SAMPLE	Au Avg	Au Dp1	Au Dp2	Au Dp3	Cu	Zn	Ag
16366	0.31	0.28	0.35	--	24	54	<1
16367	0.40	0.40	--	--	4	5	<1
16368	6.2	5.2	7.2	--	10	48	1
16369	1.08	0.82	1.35	--	3	8	<1
16370	0.06	0.06	--	--	7	32	<1
16371	0.06	0.06	--	--	8	28	<1
16372	0.02	0.02	--	--	6	30	<1
16373	<0.01	<0.01	--	--	<2	18	<1
16374	0.01	0.01	--	--	5	25	<1
16375	0.01	0.01	--	--	7	26	<1
16376	<0.01	<0.01	--	--	2	7	<1
16377	7.6	6.6	8.6	--	16	14	1
16378	0.52	0.41	0.64	--	14	20	<1
16379	L.N.R.	L.N.R.	--	--	L.N.R.	L.N.R.	L.N.R.
16380	0.50	0.50	0.52	--	35	64	<1
16381	0.05	0.05	--	--	10	76	<1
16382	2.9	2.6	3.2	--	46	38	<1
16383	0.56	0.56	--	--	13	50	<1
16384	0.58	0.58	--	--	8	50	<1
16385	0.09	0.09	--	--	14	60	<1
16386	0.28	0.25	0.30	--	3	56	<1
16387	0.05	0.05	--	--	19	56	<1
16388	0.16	0.16	--	--	22	52	<1
16389	0.08	0.08	--	--	36	58	<1
16390	0.01	0.01	--	--	8	66	<1
UNITS SCHEME	ppm FA1	ppm FA1	ppm FA1	ppm FA1	ppm AAS1	ppm AAS1	ppm AAS2



0 020

ANALYTICAL REPORT

SAMPLE	Au Avg	Au Dp1	Au Dp2	Au Dp3	Cu	Zn	Ag
16391	5.4	5.6	5.2	--	11	42	4
16392	28	24	32	--	22	35	26
16393	0.07	0.07	--	--	11	54	<1
16394	0.11	0.07	0.14	--	7	44	<1
16395	0.01	0.01	--	--	10	46	<1
16396	0.02	0.02	--	--	16	44	<1
16397	0.01	0.01	--	--	6	36	<1
16398	<0.01	<0.01	--	--	17	54	<1
16399	0.02	0.02	--	--	14	50	<1
16400	0.01	0.01	--	--	16	64	<1
16501	0.02	0.02	--	--	14	60	<1
16502	0.04	0.04	--	--	12	54	<1
16503	0.16	0.14	0.17	--	20	38	<1
16504	<0.01	<0.01	--	--	20	50	<1
16505	<0.01	<0.01	--	--	19	58	<1
16506	<0.01	<0.01	0.02	--	13	45	<1
16507	<0.01	<0.01	--	--	12	62	<1
16508	<0.01	<0.01	--	--	15	54	<1
16509	0.82	0.76	0.90	--	19	38	1
16510	0.03	0.03	--	--	30	58	<1
16511	18.4	17.4	19.2	--	24	56	7
16512	0.64	0.64	0.64	--	74	82	<1
16513	1.15	1.34	0.98	--	46	55	1
16514	0.84	1.02	0.64	--	17	48	<1
16515	0.25	0.25	--	--	17	32	<1
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	FA1	FA1	FA1	FA1	AAS1	AAS1	AAS2



Job: 9AD1300
O/N: 11701

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ANALYTICAL REPORT

SAMPLE	Au Avg	Au Dp1	Au Dp2	Au Dp3	Cu	Zn	Ag
16516	0.02	0.02	0.01	--	19	54	1
16517	<0.01	<0.01	--	--	18	68	<1
16518	<0.01	<0.01	--	--	14	52	<1
16519	<0.01	<0.01	--	--	16	68	<1
16520	0.04	0.04	--	--	17	56	<1
16521	3.2	3.1	3.4	--	14	30	1
16522	0.08	0.08	--	--	12	20	<1
16523	0.52	0.50	0.54	--	19	42	<1
16524	0.03	0.03	--	--	16	44	<1
16525	0.01	0.01	--	--	11	42	<1
16526	0.02	0.01	0.03	--	17	68	<1
16527	<0.01	<0.01	--	--	10	48	<1
16528	0.21	0.21	--	--	12	38	<1
16529	4.4	3.8	5.0	--	20	110	1
16530	0.02	0.02	--	--	16	105	<1
16531	0.03	0.03	--	--	10	94	<1
16532	0.01	0.01	--	--	18	150	<1
16533	0.02	0.02	--	--	19	74	<1
16534	<0.01	<0.01	--	--	11	62	<1
16535	0.04	0.04	--	--	13	90	<1
16536	0.42	0.38	0.46	--	34	175	9
16537	0.02	0.02	--	--	20	70	<1
16538	0.05	0.05	--	--	10	22	<1
16539	0.02	0.02	--	--	10	19	<1
16540	0.01	0.01	--	--	8	10	<1
UNITS SCHEME	ppm FA1	ppm FA1	ppm FA1	ppm FA1	ppm AAS1	ppm AAS1	ppm AAS2



022

ANALYTICAL REPORT

SAMPLE	Au Avg	Au Dp1	Au Dp2	Au Dp3	Cu	Zn	Ag
16541	0.04	0.04	--	--	11	44	<1
16542	0.13	0.13	--	--	11	12	<1
16543	0.41	0.33	0.48	--	8	22	<1
16544	<0.01	<0.01	--	--	6	13	<1
16545	0.02	0.02	--	--	6	9	<1
16546	0.30	0.20	0.40	--	7	7	<1
16547	0.01	0.01	--	--	8	10	<1
16548	<0.01	<0.01	--	--	8	19	<1
16549	<0.01	<0.01	--	--	10	19	<1
16550	<0.01	<0.01	--	--	10	20	<1
16551	0.03	0.03	--	--	19	48	<1
16552	2.9	2.5	3.4	--	8	14	<1
16553	0.08	0.08	--	--	14	58	<1
16554	0.04	0.04	--	--	6	30	<1
16555	0.04	0.04	--	--	9	36	<1
16556	0.06	0.06	--	--	9	34	<1
16557	1.38	1.30	1.48	--	13	42	<1
16558	0.10	0.10	--	--	7	6	<1
16559	<0.01	<0.01	--	--	8	7	<1
16560	<0.01	<0.01	--	--	6	3	<1
16561	<0.01	<0.01	--	--	14	38	<1
16562	<0.01	<0.01	--	--	24	64	<1
16563	2.6	2.4	2.7	--	36	115	32
16564	0.03	0.03	0.02	--	20	72	<1
16565	2.1	2.3	1.88	--	20	28	<1

UNITS SCHEME	ppm FA1	ppm FA1	ppm FA1	ppm FA1	ppm AAS1	ppm AAS1	ppm AAS2
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023

ANALYTICAL REPORT

SAMPLE	Au			Cu	Zn	Ag
	Avg	Dp1	Dp2			
16566	0.04	0.04	--	14	44	<1
16567	0.05	0.05	--	11	26	<1
16568	0.01	0.01	--	15	35	<1
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	FA1	FA1	FA1	AAS1	AAS1	AAS2



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ANALYTICAL REPORT

SAMPLE	As	Pb	Ba
16366	9	96	520
16367	5	20	65
16368	64	44	135
16369	13	13	65
16370	8	22	360
16371	4	7	250
16372	8	18	220
16373	8	10	165
16374	10	19	140
16375	5	20	75
16376	11	14	135
16377	42	10	175
16378	9	16	560
16379	L.N.R.	L.N.R.	L.N.R.
16380	20	20	440
16381	17	20	590
16382	11	24	430
16383	16	15	530
16384	20	25	520
16385	4	14	550
16386	45	16	580
16387	7	24	490
16388	11	17	510
16389	8	28	520
16390	54	28	520
UNITS	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1



Job: 9AD1300
O/N: 11701

023

ANALYTICAL REPORT

SAMPLE	As	Pb	Ba
16391	1200	220	620
16392	5000	510	790
16393	42	28	530
16394	40	24	470
16395	32	28	460
16396	320	38	480
16397	82	28	490
16398	490	16	500
16399	105	32	540
16400	350	22	490
16501	48	65	500
16502	36	24	560
16503	58	28	520
16504	56	38	590
16505	34	24	550
16506	50	16	430
16507	25	19	530
16508	98	17	470
16509	3200	48	410
16510	330	30	490
16511	3550	3000	730
16512	320	42	770
16513	5500	35	650
16514	250	17	540
16515	590	26	650
UNITS	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1



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ANALYTICAL REPORT

SAMPLE	As	Pb	Ba
16516	135	115	560
16517	110	62	490
16518	54	19	490
16519	28	20	580
16520	40	26	570
16521	125	300	550
16522	50	22	510
16523	62	25	810
16524	58	32	650
16525	28	22	570
16526	32	20	610
16527	26	22	550
16528	105	52	400
16529	2400	720	820
16530	40	46	440
16531	54	52	390
16532	60	105	410
16533	78	125	320
16534	70	66	380
16535	330	65	380
16536	8500	610	480
16537	92	46	790
16538	85	12	110
16539	440	17	300
16540	160	17	200
UNITS	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1



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Job: 9AD1300
O/N: 11701

027

ANALYTICAL REPORT

SAMPLE	As	Pb	Ba
16541	1080	38	250
16542	800	78	270
16543	7100	50	380
16544	64	9	240
16545	670	28	250
16546	1140	32	310
16547	35	15	280
16548	40	12	240
16549	72	340	240
16550	240	28	320
16551	800	15	560
16552	540	36	130
16553	280	40	410
16554	20	26	290
16555	12	11	360
16556	18	11	500
16557	88	32	340
16558	9	10	280
16559	13	14	210
16560	4	13	160
16561	12	15	350
16562	14	16	410
16563	9800	3000	250
16564	165	46	350
16565	730	54	260
UNITS	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1



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Job: 9AD1300
O/N: 11701

028

ANALYTICAL REPORT

SAMPLE	As	Pb	Ba
16566	210	48	155
16567	35	8	75
16568	28	36	370
UNITS	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1

305 South Road, Mile End South, South Australia, 5031
Telephone: (08) 43 5722 Fax: (08) 234 0321 Telex: LABCOM AA89323

029

Mr. C. Creogh
Billiton Australia Ltd
30 Mersey Main Road
Spreyton
Devonport
TAS 7310 Australia

Job Number: 9AD0915

Your Reference: 08469/MT24/CJC Date Received: 06-JUN-1989
Number of Samples: 235 Date Reported: 28-JUN-1989
Extra Samples : 0

This report comprises a cover sheet and pages 1 to 13

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source. Please address any enquiries to Mr. Trevor Francis.

Variations between results on the +80# portions have been noted. The reasons are probably two fold.

1. There is still coarse gold present even after mixermilling.
2. We had very little material to perform the duplicate work (which will throw less emphasis on the duplicate results).

Approved Signature:

for 

Dr. John Kikkert
General Manager - Adelaide.
CLASSIC COMLABS LTD

GOLDEN RIDGE
STREAM SEDS
* BLEG
* - 80#
* P.C.

Report Analyte Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficient Sample for Analysis.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media

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Job: 9AD0915

O/N: 08469/MT24/CJC

030

ANALYTICAL REPORT

SAMPLE	Au
16426	<0.05
16427	<0.05
16428	<0.05
16429	1.15
16430	0.35
16431	<0.05
16432	0.35
16433	0.50
16434	0.10
16435	<0.05
16436	0.30
16437	0.50
16438	2.5
16439	0.20
16440	0.05
16441	0.10
16442	0.15
16443	<0.05
16444	<0.05
16445	0.05
16446	0.20
16447	0.05
16448	0.05
16449	0.35
16450	0.15
UNITS	ppb
SCHEME	BLEG2

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Job: 9AD0915

O/N: 08469/MT24/CJC

031

ANALYTICAL REPORT

SAMPLE	Cu	Zn	Ag	Pb	As	Ba	Au
16428	4	50	<1	10	8	300	0.01
16429	7	38	<1	7	6	250	8.6
16430	3	16	<1	20	68	45	0.02
16431	8	52	<1	6	3	90	0.01
16432	2	30	<1	6	9	210	0.05
16433	4	24	<1	14	11	250	0.01
16434	2	28	<1	8	7	260	<0.01
16435	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
16436	2	15	<1	26	5	290	0.01
16437	<2	16	<1	22	4	340	0.52
16438	2	24	<1	10	9	250	0.02
16439	5	48	<1	5	7	160	0.04
16440	<2	22	<1	20	15	330	0.02
16441	<2	12	<1	40	<2	270	0.01
16442	<2	14	<1	48	5	360	0.01
16443	<2	19	<1	9	6	290	0.45
16444	3	46	<1	9	<2	50	0.02
16445	<2	17	<1	3	7	75	0.01
16446	<2	17	<1	12	8	170	0.01
16447	<2	22	<1	16	8	180	0.14
16448	<2	10	<1	12	8	175	0.01
16449	3	30	<1	6	4	45	0.03
16450	<2	7	<1	8	7	150	0.42
16451	<2	7	<1	3	5	50	0.05
16452	<2	8	<1	4	5	65	<0.01
UNITS SCHEME	ppm AAS1	ppm AAS1	ppm AAS2	ppm XRF1	ppm XRF1	ppm XRF1	ppm FA1



032

ANALYTICAL REPORT

SAMPLE	Cu	Zn	Ag	Pb	As	Ba	Au
16410 -80#	2	22	<1	12	11	240	0.04
16412 -80#	5	26	<1	16	3	170	0.23
16413 -80#	4	42	<1	22	7	460	0.01
16414 -80#	3	38	<1	22	5	580	<0.01
16415 -80#	3	36	1	24	4	490	<0.01
16416 -80#	8	32	1	22	7	480	<0.01
16417 -80#	5	22	<1	24	7	520	0.02
16418 -80#	7	28	<1	15	5	490	0.02
16419 -80#	6	40	<1	24	6	480	0.01
16420 -80#	4	30	<1	16	6	400	0.01
16421 -80#	3	22	<1	16	4	250	0.02
16422 -80#	3	30	<1	17	7	370	0.01
16423 -80#	10	56	1	28	14	230	<0.01
16425 -80#	10	76	1	22	7	310	0.02
16426 -80#	5	28	<1	11	7	160	0.01
16427 -80#	12	46	1	18	10	260	0.01
16428 -80#	10	84	1	14	8	260	0.02
16429 -80#	3	17	1	9	9	95	1.92
16430 -80#	4	30	<1	10	5	165	0.05
16431 -80#	11	92	<1	18	7	310	0.01
16432 -80#	5	42	<1	28	50	480	0.02
16433 -80#	9	44	1	20	9	330	0.02
16435 -80#	5	50	1	42	10	380	0.01
16436 -80#	4	34	1	24	10	360	0.01
16437 -80#	4	34	<1	15	16	290	0.14

UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS2	XRF1	XRF1	XRF1	FA1

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Job: 9AD0915

O/N: 08469/MT24/CJC

ANALYTICAL REPORT

SAMPLE	Cu	Zn	Ag	Pb	As	Ba	Au
16438 -80#	5	42	1	19	10	240	0.01
16439 -80#	8	62	1	30	22	330	0.01
16440 -80#	<2	19	<1	54	5	440	0.01
16441 -80#	<2	34	1	54	7	430	0.01
16442 -80#	5	46	2	17	9	370	0.02
16443 -80#	6	52	1	15	7	150	0.01
16444 -80#	11	96	1	15	6	135	<0.01
16445 -80#	2	17	1	12	8	310	<0.01
16446 -80#	3	18	1	14	6	300	<0.01
16447 -80#	2	20	1	15	5	290	<0.01
16448 -80#	4	22	2	4	5	90	<0.01
16449 -80#	9	64	2	10	12	180	<0.01
16450 -80#	<2	17	1	9	9	115	0.08
16451 -80#	2	20	1	13	8	175	<0.01
16452 -80#	<2	28	1	9	6	120	<0.01
16453 -80#	15	64	1	20	6	390	0.01
16454 -80#	6	64	1	11	11	310	<0.01
16455 -80#	38	210	2	28	11	310	<0.01
16456 -80#	9	70	3	11	8	480	<0.01
16457 -80#	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
16458 -80#	20	88	<1	13	9	370	<0.01
16459 -80#	13	90	<1	22	7	550	<0.01
16460 -80#	12	84	<1	26	7	410	<0.01
16461 -80#	12	74	<1	58	12	300	<0.01
16462 -80#	9	66	<1	18	8	280	<0.01
UNITS SCHEME	ppm AAS1	ppm AAS1	ppm AAS2	ppm XRF1	ppm XRF1	ppm XRF1	ppm FA1

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Job: 9AD0915

O/N: 08469/MT24/CJC

034

ANALYTICAL REPORT

SAMPLE	Cu	Zn	Ag	Pb	As	Ba	Au
16438 -80#	5	42	1	19	10	240	0.01
16439 -80#	8	62	1	30	22	330	0.01
16440 -80#	<2	19	<1	54	5	440	0.01
16441 -80#	<2	34	1	54	7	430	0.01
16442 -80#	5	46	2	17	9	370	0.02
16443 -80#	6	52	1	15	7	150	0.01
16444 -80#	11	96	1	15	6	135	<0.01
16445 -80#	2	17	1	12	8	310	<0.01
16446 -80#	3	18	1	14	6	300	<0.01
16447 -80#	2	20	1	15	5	290	<0.01
16448 -80#	4	22	2	4	5	90	<0.01
16449 -80#	9	64	2	10	12	180	<0.01
16450 -80#	<2	17	1	9	9	115	0.08
16451 -80#	2	20	1	13	8	175	<0.01
16452 -80#	<2	28	1	9	6	120	<0.01
16453 -80#	15	64	1	20	6	390	0.01
16454 -80#	6	64	1	11	11	310	<0.01
16455 -80#	38	210	2	28	11	310	<0.01
16456 -80#	9	70	3	11	8	480	<0.01
16457 -80#	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
16458 -80#	20	88	<1	13	9	370	<0.01
16459 -80#	13	90	<1	22	7	550	<0.01
16460 -80#	12	84	<1	26	7	410	<0.01
16461 -80#	12	74	<1	58	12	300	<0.01
16462 -80#	9	66	<1	18	8	280	<0.01
UNITS SCHEME	ppm AAS1	ppm AAS1	ppm AAS2	ppm XRF1	ppm XRF1	ppm XRF1	ppm FA1

APPENDIX 2

Rock Chip Sample Descriptions

APPENDIX 2

ROCK CHIP SAMPLE DESCRIPTIONS

<u>SAMPLE NO</u>	<u>LOCATION</u>	<u>DESCRIPTION</u>
16366	New Golden Ridge - 10m composite	Strongly carbonated quartzitic sediment, trace - 2% pyrite.
16367	Ditto, face sample over 1.5m in costean.	Mod. ferruginous siltstone with 5-7cm quartz lode.
16368	Ditto, face sample over 0.75m	Quartz vein (3-4cm) in slightly ferruginous quartzitic sediment.
16369	Ditto, face sample over 0.9m	Quartz vein (3-5cm) in siltstone.
16370	Ditto, composite sample downslope 0-10m.	
16371	" " " " 10-20m.	
16372	" " " " 20-30m.	
16373	" " " " 30-40m.	
16374	" " " " 40-50m.	
16375	" " " " 50-60m.	
16376	" " " " 60-70m.	
16377	" face sample over 1m.	Thin quartz veinlets over 5cm in siltstones.
16378	Brilliant, face sample over 1.5m.	Minor ferruginous shears in siltstones.
16379	" " " " "	Ferruginous sheared siliceous siltstones
16380	" " " " "	Sheared ferruginous siltstones.
16381	" " " " 2.0m	Sheared siliceous siltstones.
16382	" " " " 5m.	
16383	" " " " "	
16384	" " " " "	
16385	" " " " "	
16386	" " " " "	
16387	" " " " 1m.	Siliceous siltstones, minor thin shears.
16388	" drive sample over 6m.	
16389	" " " " "	Siliceous siltstones with minor ferruginous shears.
16390	New Carthage, composite over 10m, 0-10m.	
16391	" " " " " 10-20m.	
16392	" " " " " 20-30m.	
16393	" " " " " 30-40m.	
16394	" " " " " 40-50m.	
16395	" " " " " 50-60m.	
16396	" " " " " 60-70m.	
16397	" " " " " 70-80m.	
16398	" " " " " 80-90m.	
16399	" " " " " 90-100m.	
16400	" " " " " 100-110m.	

<u>SAMPLE NO.</u>	<u>LOCATION</u>	<u>DESCRIPTION</u>
037 16501	New Carthage, composite over 10m,	0-10m.
16502	" " " " "	10-20m.
16503	" " " " "	20-30m.
16504	" " " " "	30-40m.
16505	" " " " "	40-50m.
16506	" " " " "	50-60m.
16507	" " " " "	60-70m.
16508	" " " " "	70-80m.
16509	" " " " "	80-90m.
16510	" " " " "	90-100m.
16511	" " stope sample over 1m.	Quartz vein 7-10cm in ferruginous micaceous greywacke.
16512	" " adit face sample over 1.5m.	Strongly ferruginous sheared carbonated silty sediments.
16513	" " backs sample 1.5m.	Ferruginous sheared and siliceous sediments.
16514	" " traverse across ridge	0-10m.
16515	" " " " "	10-20m.
16516	" " " " "	20-30m.
16517	" " " " "	30-40m.
16518	" " " " "	40-50m.
16519	" " " " "	50-60m.
16520	" " " " "	60-70m.
16521	" " " " "	70-80m.
16522	" " " " "	80-90m.
16523	" " " " "	90-100m.
16524	" " " " "	100-110m.
16525	" " " " "	110-120m.
16526	" " " " "	120-130m.
16527	" " " " "	130-140m.
16528	" " " " "	140-150m.
16529	" " " " "	150-160m.
16530	Golden Ridge, composite sample along track	0-10m.
16531	" " " " "	10-20m.
16532	" " " " "	20-30m.
16533	" " " " "	30-40m.
16534	" " " " "	40-50m.
16535	" " " " "	50-60m.
16536	" " costean sample over 4m.	Ferruginous milky sheared greywacke.
16537	Queen of the Earth, lode in creek.	Ferruginous siliceous quartz veined sandstones.
16538	" " " lode in pit.	Weakly ferruginous milky quartz knob.
16539	" " " face sample 1.2m.	Ferruginous sandstone, quartz veined.
16540	" " " wall sample 0.6m.	Weakly ferruginous siliceous siltstones
16541	" " " pillar sample 0.6m.	Weakly ferruginous siliceous siltstones
16542	" " " pillar sample 1.1m.	Siliceous quartz veined ferruginous sandstone.
16543	" " " pillar sample 1.3m.	
16544	" " " traverse up hill from creek	0-10m.
16545	" " " " "	10-20m.
16546	" " " " "	20-30m.
16547	" " " " "	30-40m.
16548	" " " " "	40-50m.
16549	" " " " "	50-60m.

<u>SAMPLE NO.</u>	<u>LOCATION</u>	<u>DESCRIPTION</u>
038 16550	Queen of the Earth, adit face sample.	Ferruginous siliceous shear.
16551	" " " adit face sample.	
16552	" " " dump sample from adit.	Ferruginous quartz in silicified sediments.
16553	" " " small pits 150m above creek.	Ferruginous and carbonated siliceous sediments.
16554	New Golden Ridge, traverse across workings	0-10m.
16555	" " " " "	10-20m.
16556	" " " " "	20-30m.
16557	" " " " "	30-40m.
16558	" " " " "	40-50m.
16559	" " " " "	50-60m.
16560	" " " " "	60-70m.
16561	Between New Golden Ridge & Golden Ridge.	Fine anastomosing quartz veinlets in sandstones.
16562	" " " " further to east.	
16563	Traverse around Golden Ridge.	Fine quartz veinlets with some ferruginous micaceous siltstones.
16564	Ditto, 100mE of Golden Ridge.	Fine quartz veinlets, some ferruginous micaceous sediments.
16565	Ditto, 100mE of 16564.	Fine quartz veinlets in micaceous sandstones.
16566	Traverse along ridge at intersection of Queen of the Earth - Trafalgar.	Rare quartz veinlets in micaceous sandstones.
16567	Ditto, further east.	Buck quartz. Minor quartz veinlets in micaceous sandstone.
16568	Ditto, down ridge above Trafalgar.	Quartz veining in sediments.

APPENDIX 3

Quarterly Progress Report Golden Ridge Project

QUARTERLY PROGRESS REPORT
GOLDEN RIDGE PROJECT

Author: G.J. Davidson,
Centre for Ore Deposit and Exploration Studies

February 1990.

Sponsors: Aureole Resources
: Billiton Australia

Circulation: R.R. Large, M.R. Roach (CODES)
G. Randell (Billiton Australia, Devenport).
K.Morrison (Aureole Resources).

041

Work To Date

In the period of slide preparation for Queen of the Earth and Trafalgar mines, investigation has concentrated on analysing the sulphur isotopic variation of each mine, and also on background research. As noted in the minutes of the brief sponsors meeting (8/2/90), other work on the study area in the quarter comprised Michael Roachs' investigation of rock properties, intended to enhance his geophysical analysis.

To assist the speedier processing of samples and data, a research assistant (Naomi Deards, commenced 19/2/90) has been recruited, to be partly funded by the project. Excess funds are available for this because GJD has moved on to a federally funded fellowship.

Preliminary Sulphur Isotope Results

Twelve samples, 6 from each mine, were analysed for their $\delta^{34}\text{S}/\delta^{32}\text{S}$ ratios using the CSL Micromass spectrometer. With the exception of one pyrite grain from Trafalgar, only arsenopyrite was used for the study, mainly analysing the centres of single coarse crystals. The rationale behind this investigation was primarily to identify the likely source of sulphur (was it magmatic or metamorphogenic?), and to seek differences between the mines which might be genetically significant.

Table 1 *Sulphur Isotope data from Golden Ridge*

<i>Number</i>	<i>Value ‰</i>	<i>Mineral</i>	<i>Sample Type</i>
Queen of the Earth			
HR17A	4.92	arsenopyrite	In place
HR17B	5.69	arsenopyrite	In place
HR27/1A	5.97	arsenopyrite	Dump sample
HR27/1B	6.47	arsenopyrite	Dump sample
HR27B	4.46	arsenopyrite	Dump sample
HR27C	5.80	arsenopyrite	Dump sample

Arithmetic Mean: 5.55‰ Range = 2.01 ‰

Trafalgar			
T1	3.75	arsenopyrite	Dump sample
T2	3.62	arsenopyrite	Dump sample
T3	3.04	arsenopyrite	Dump sample
T4	4.19	arsenopyrite	Dump sample
T5	4.47	arsenopyrite	Dump sample
T6	4.33	pyrite	Dump sample

Arithmetic Mean: 3.90‰ Range = 1.43‰

042

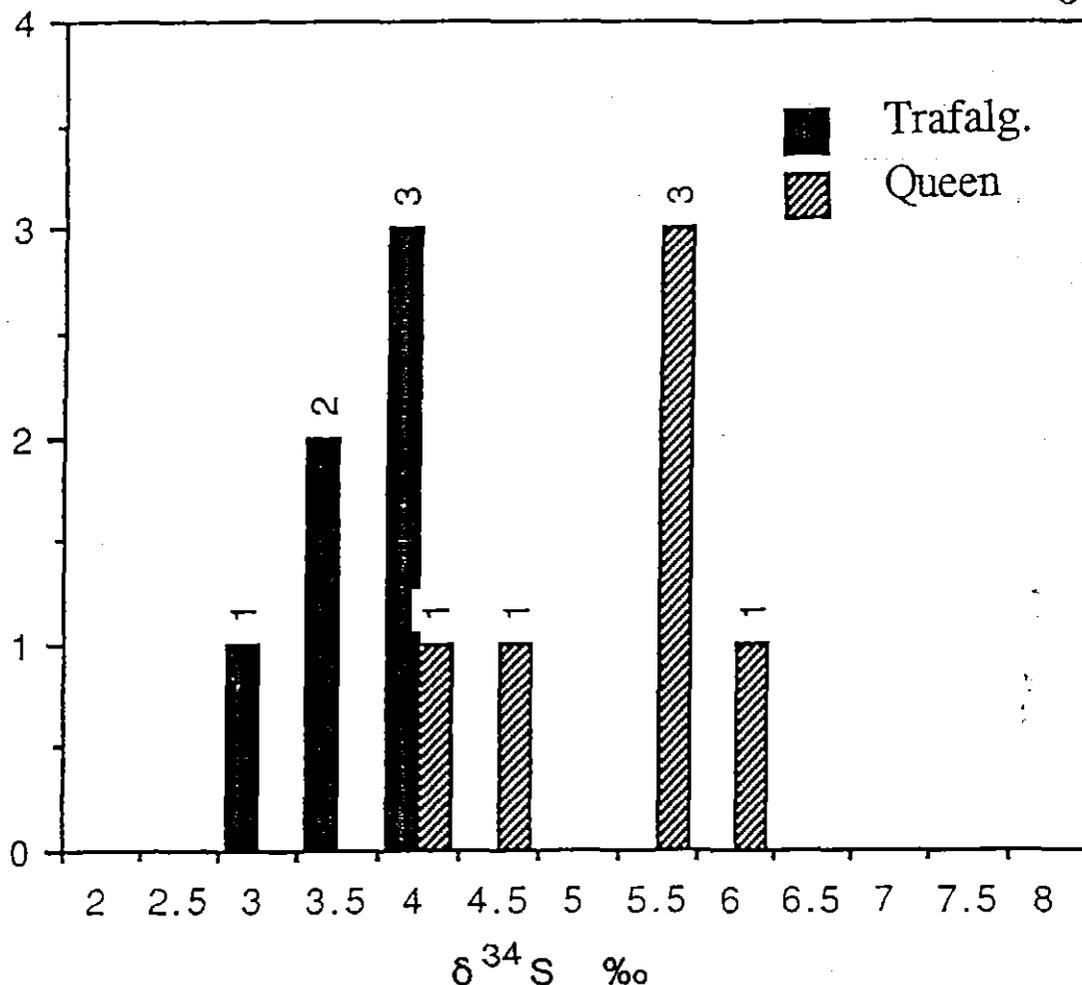


Figure 1 A histogram of sulphur isotope data from the Trafalgar and Queen of the Earth mines.

Data from each mine clusters closely around the respective arithmetic mean, with a spread of only 2.01‰ at Queen of the Earth, and 1.43‰ at Trafalgar. Samples within a centimetre of one another from the same vein at Queen of the Earth (HR17A & B) differed by 0.77 ‰. The mean value for each mine was displaced positively from the average mantle value of 0 ‰, a value commonly also found in felsic magmas. Notably, Trafalgar arsenopyrite (mean 3.90‰) is closer to the expected granite signature than that from the Queen of the Earth (mean 5.55‰). Figure 1 illustrates that the 1.65‰ separation of these means is not a statistical artifact, but a meaningful indication of the addition of isotopically heavier sulphur at Queen of the Earth.

Preliminary conclusions from this work are therefore:

- (1) Arsenopyrite was deposited into veins at both mines from very isotopically homogeneous fluids.
- (2) The sulphur in both mines is likely to have derived both from Devonian magmatic (0‰) and Ordovician sedimentary sources (>0‰ ?), with Queen of the Earth containing the greatest

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proportion of sedimentary sulphur. This would be consistent with the leaching of sedimentary sulphur by fluids moving away from the granite/sediment contact along a shear, and depositing Au, As and S at Queen of the Earth distal to the granite.

Point (2) must be tested by determining the composition of sulphides within the granite, and those within sediment. In addition, attempts will be made to further constrain the sulphur isotope composition of the ore fluids by obtaining sulphides from the Trafalgar mine.

Petrographic Textures

Only a few sections are available to date, and these are all confined to Queen of the Earth. The quartz lode is surprisingly deformed in thin-section, compared to the poorly-sorted quartz siltstone host. Original 3 to 4 mm long quartz fibres transverse to the vein wall, now have crenulate crystal boundaries, are strongly undulose, or recrystallised to new polygonal sub-grains. Arsenopyrite is the only sulphide, confined mainly to thin seams within the quartz, particularly at the vein margin. The brecciation of some arsenopyrite, together with new growth of cementing arsenopyrite, suggests that sulphides were growing prior to and during active deformation.

No gold has yet been observed.

Primary fluid inclusions up to 12 μm across are still present in the least-deformed quartz, consisting solely of liquid-vapour types, but with a wide variation in the liquid to vapour ratio. The very fine nature of other deformation-related inclusions will probably preclude an analysis of their temperature of deposition.

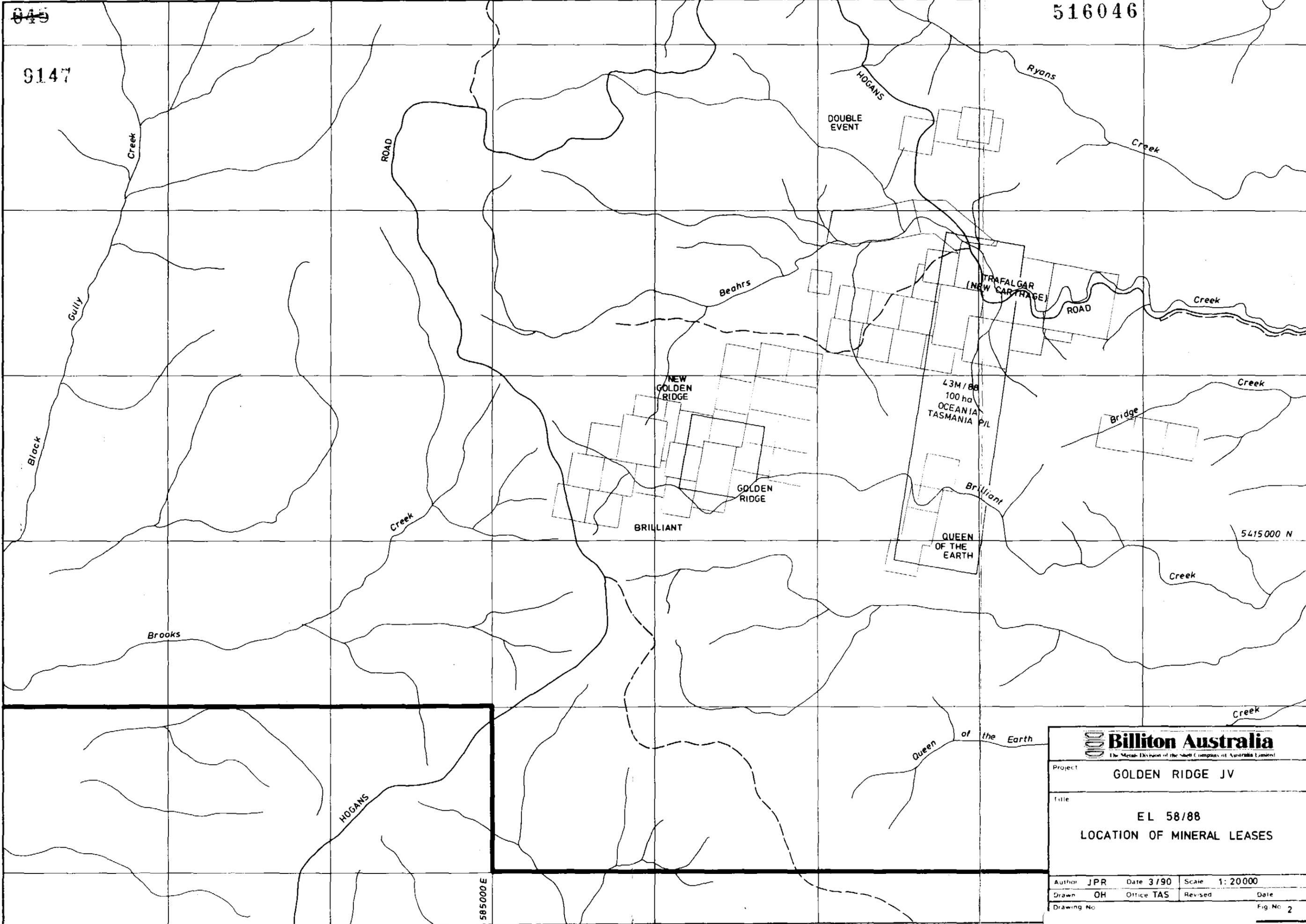
044

EXPENDITURE

Period: 14/10/89 to 14/2/90

Initial Quarterly Grant: \$5000

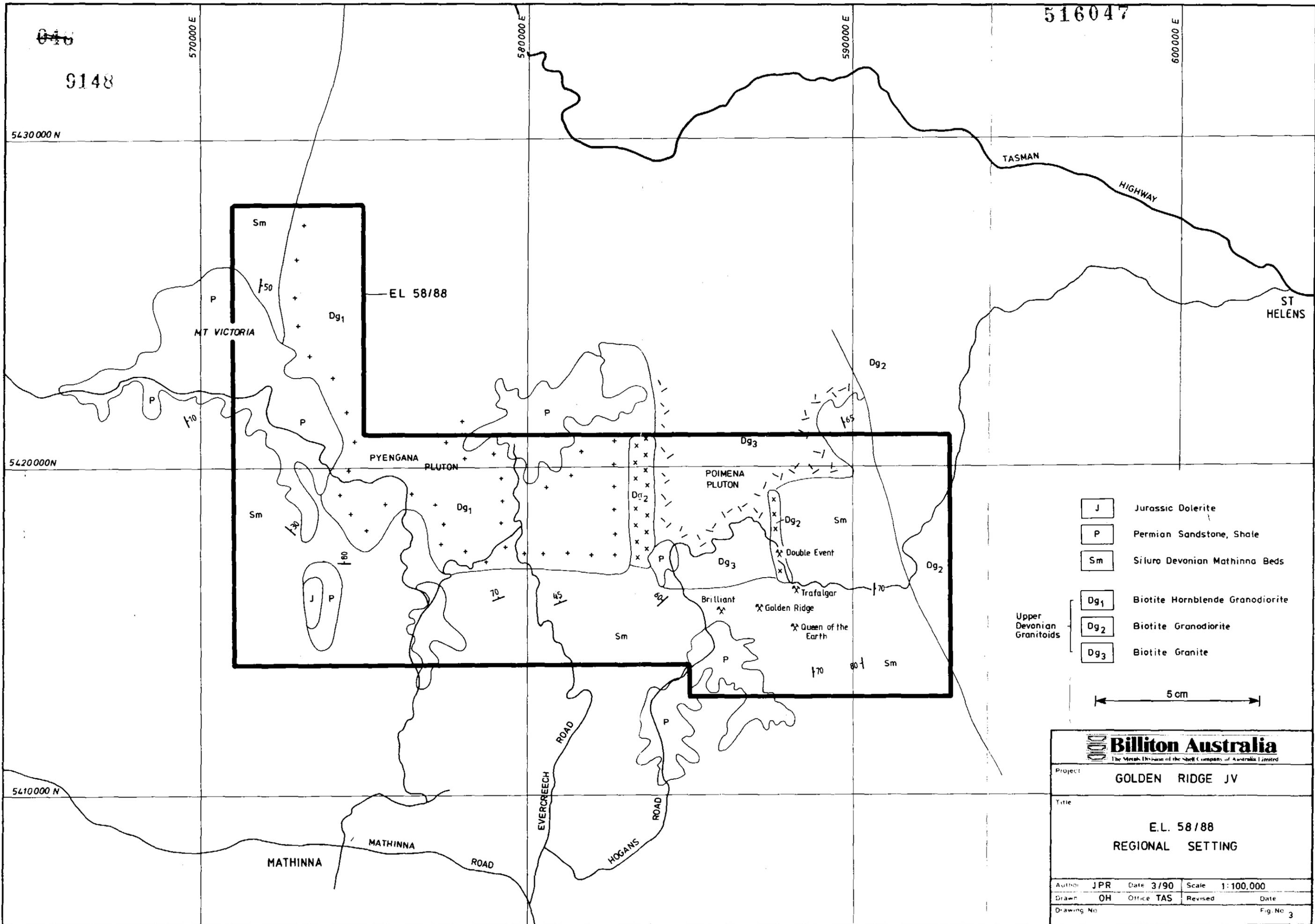
Salaries:	\$1288.24
Maintenance (e.g., postage, stationery)	\$ 29.10
Travel (e.g., fuel, vehicle hire)	\$ 107.52
Total	<u>\$1424.86</u>



Billiton Australia
 The Metal Division of the Shell Companies of Australia Limited

Project	GOLDEN RIDGE JV		
Title	EL 58/88 LOCATION OF MINERAL LEASES		
Author	JPR	Date	3/90
Scale	1:20000		
Drawn	OH	Office	TAS
Revised		Date	
Drawing No		Fig No	2

5 cm



516047

9148

5430000 N

570000 E

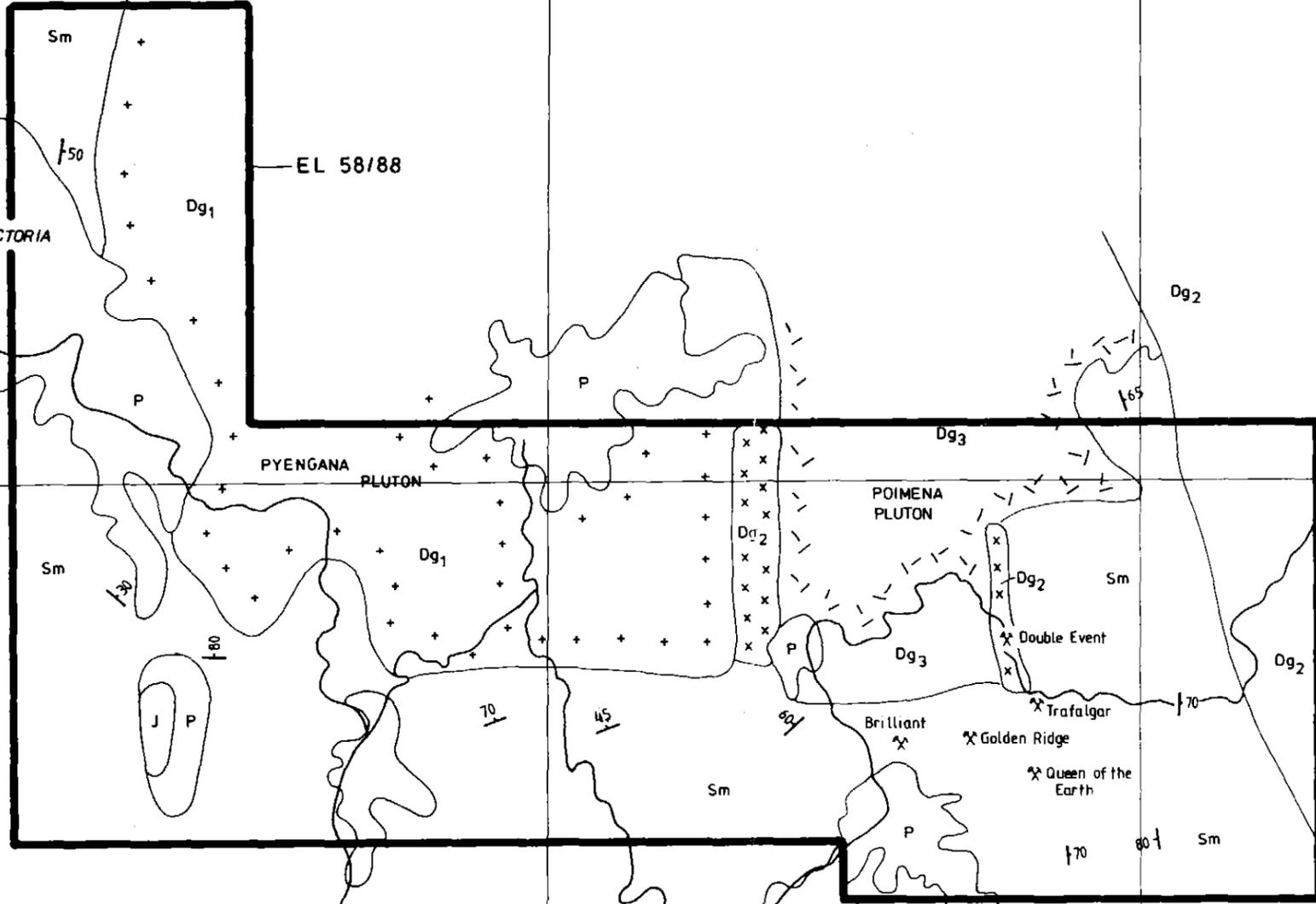
580000 E

590000 E

600000 E

TASMAN
HIGHWAY

ST
HELENS



5420000 N

5410000 N

- J Jurassic Dolerite
- P Permian Sandstone, Shale
- Sm Siluro Devonian Mathinna Beds
- Upper Devonian Granitoids:
 - Dg1 Biotite Hornblende Granodiorite
 - Dg2 Biotite Granodiorite
 - Dg3 Biotite Granite

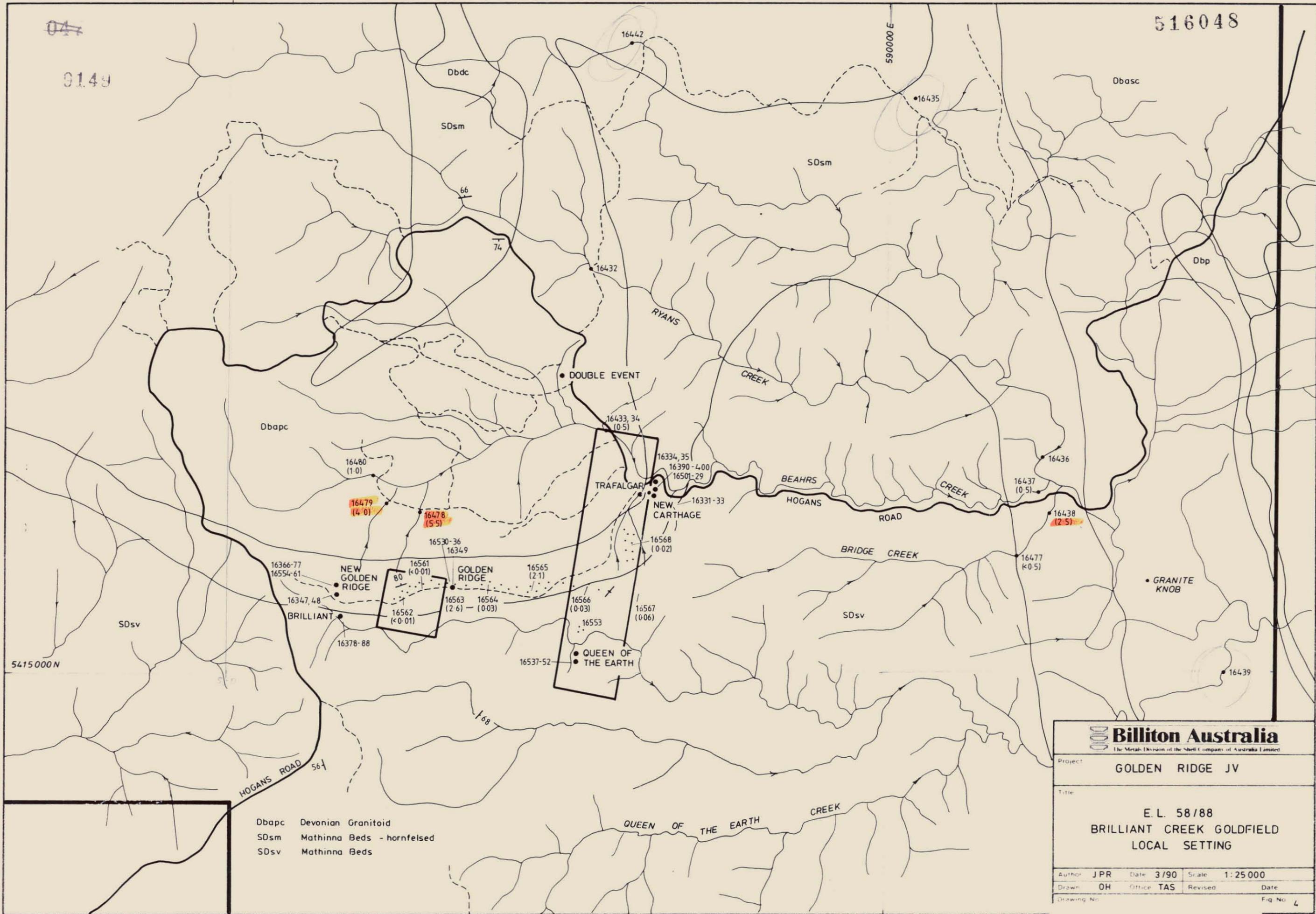
5 cm

Billiton Australia
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Project		GOLDEN RIDGE JV	
Title		E.L. 58/88 REGIONAL SETTING	
Author	JPR	Date	3/90
Scale	1:100,000		
Drawn	OH	Office	TAS
Revised		Date	
Drawing No.		Fig. No.	3

04

9149



Dbapc Devonian Granitoid
 SDsm Mathinna Beds - hornfelsed
 SDsv Mathinna Beds

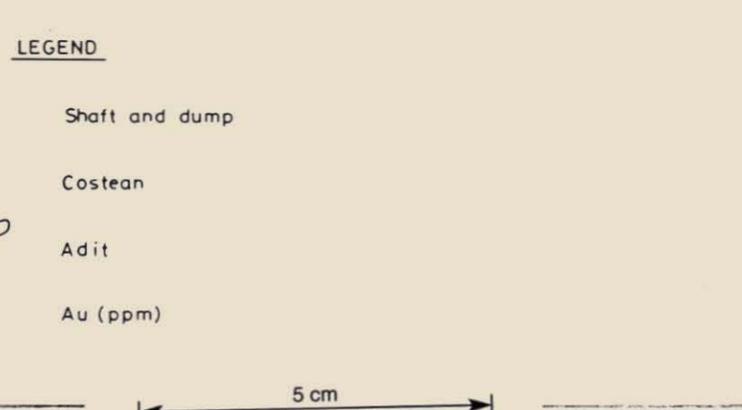
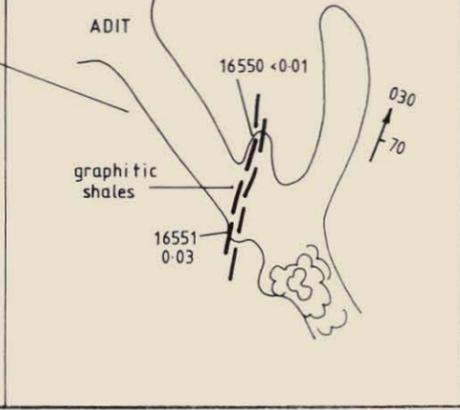
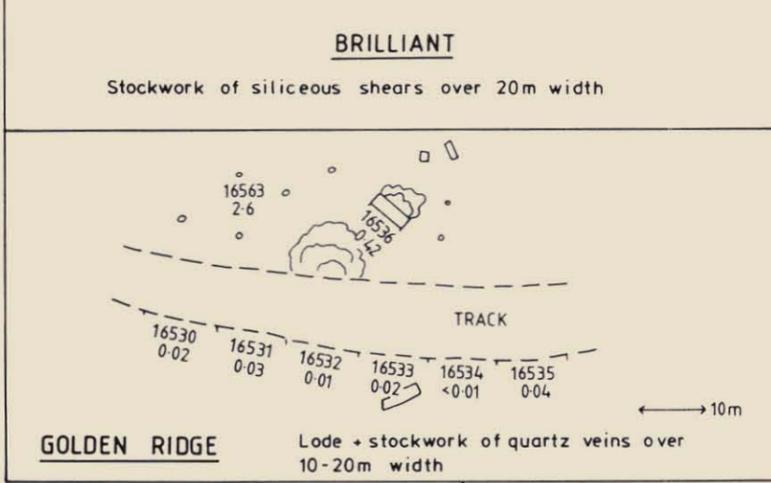
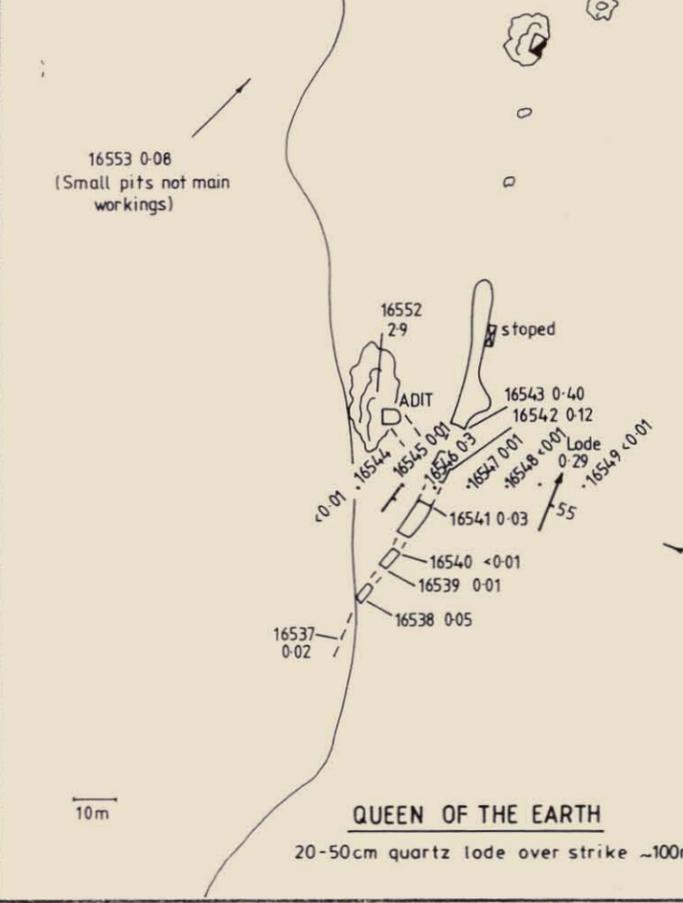
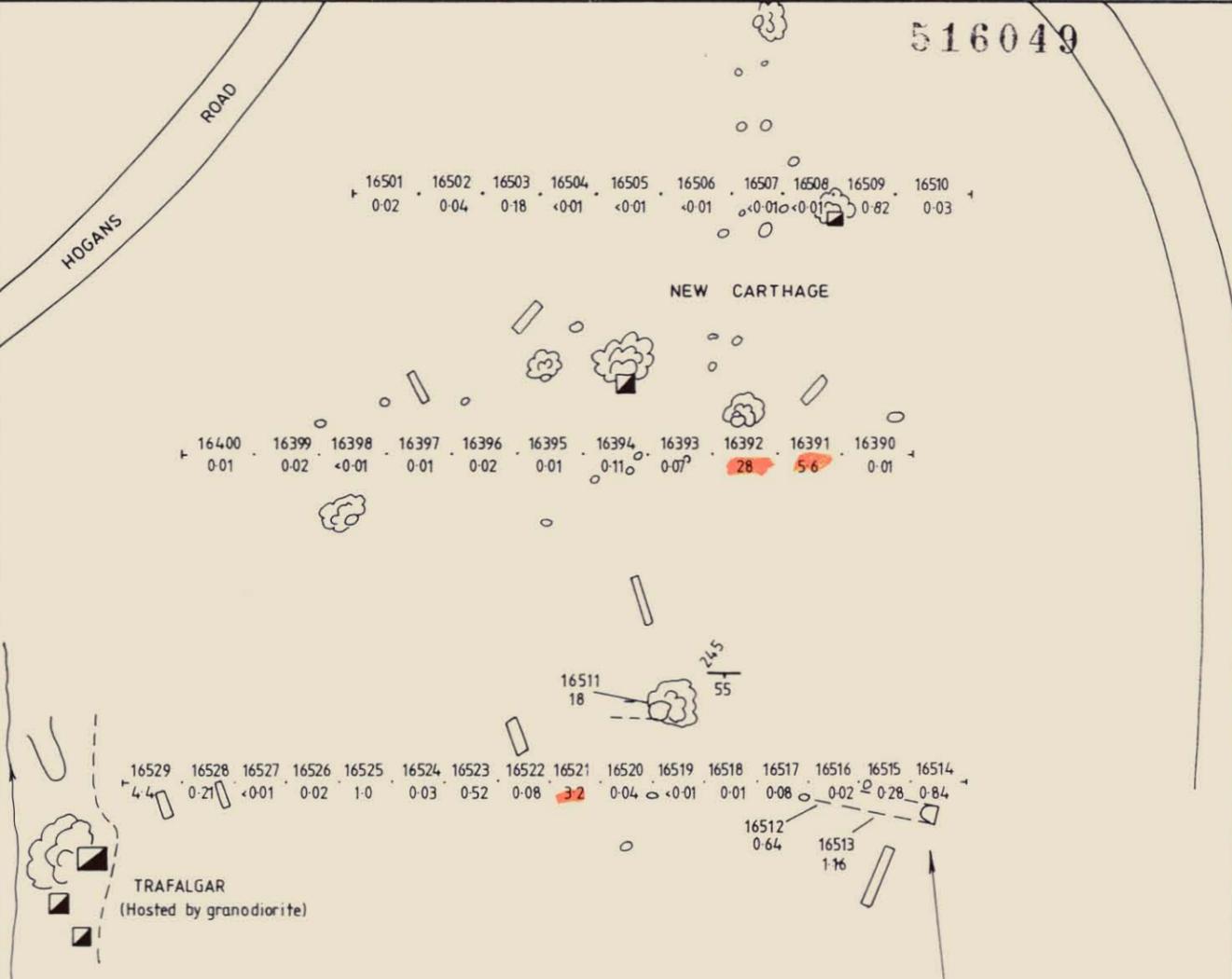
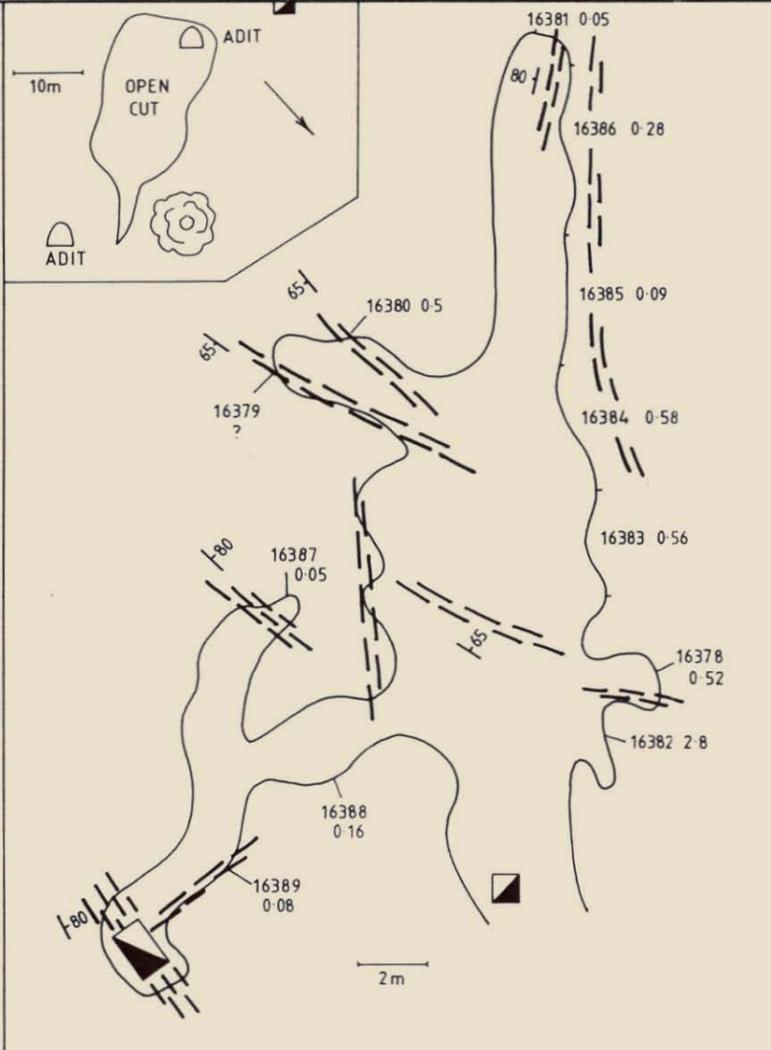
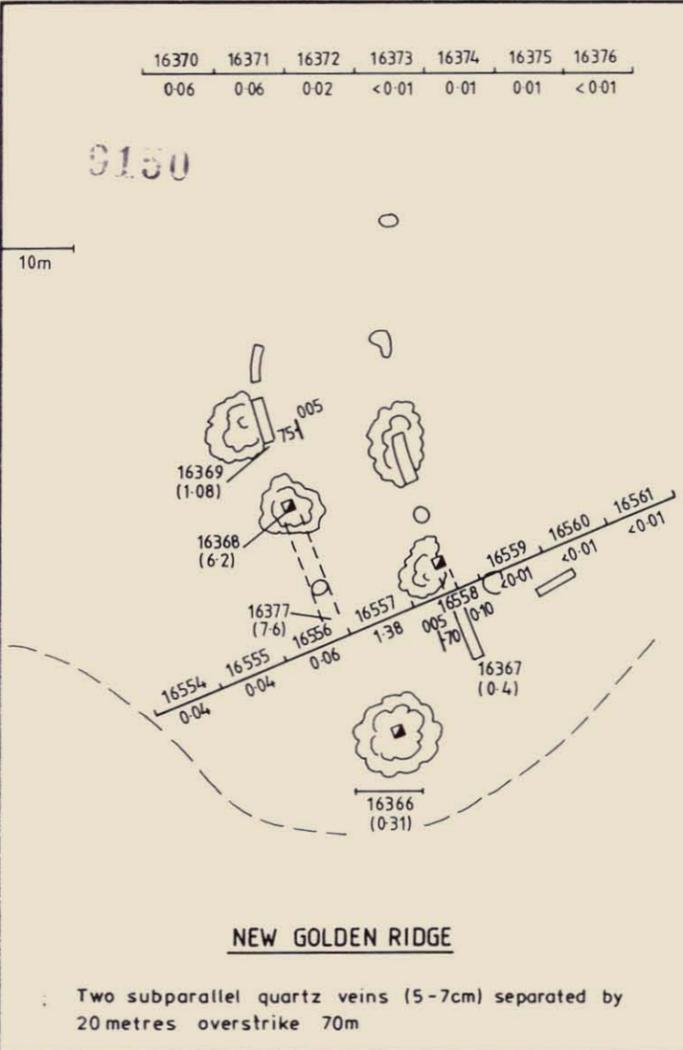
Billiton Australia
 The Metals Division of the Shell Company of Australia Limited

Project: **GOLDEN RIDGE JV**

Title: **E.L. 58/88
 BRILLIANT CREEK GOLDFIELD
 LOCAL SETTING**

Author	JPR	Date	3/90	Scale	1:25 000
Drawn	OH	Office	TAS	Revised	Date
Drawing No.					Fig No. 4

5 cm



Billiton Australia The Metals Division of the Shell Companies of Australia Limited		
Project GOLDEN RIDGE JV		
Title E.L. 58/88 SKETCHES OF MINE WORKINGS AND ROCK CHIP RESULTS		
Author JPR	Date 3/90	Scale
Drawn OH	Office TAS	Revised
Drawing No.		Fig No. 5