

REPORT ON
THE LEFROY GOLDFIELD
EXPLORATION LICENCE 35/81
(encompassing Mining Leases at Lefroy and Back Creek)

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TIHELE PTY LTD

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1. INTRODUCTION

This report covers an appraisal of Exploration Licence 81/35 held by Cuprite Investments Pty Ltd and a number of Mineral Leases and Mineral Lease Applications currently held by Epoch Minerals Exploration NL (now Epoch Mining NL) which are covered by the exploration licence. This appraisal was made on behalf of Tihele Pty Ltd who has entered into an agreement to purchase the abovementioned tenements, subject to a number of exclusions and royalty agreements.

It was considered prudent that a complete assessment of the area be made in all respects so that Tihele (new to the Tasmanian exploration scene) would have complete appreciation of all factors likely to affect future exploration and development plans. A range of activities was carried out by the author which encompasses extensive field work as well as the following:

- (a) Contact with Mines Department personnel in Hobart and Launceston.
- (b) Contact with other parties engaged in, acquainted with, or peripheral to the project in hand.
- (c) Collection of copies of relevant published data, including those on 'closed file', together with mining tenement, topographical and geological maps, and stereo-pair air photos. Also, the Mines Act, etc.
- (d) Inspection of accessible creek and gully exposures.
- (e) Inspection of available rock exposures in road cuttings and more recent workings.
- (f) Examination of the ground at Back Creek previously worked for alluvial gold.
- (g) Inspection of the areas in Sludge Creek and Chum Creek pitted by Epoch Minerals Exploration, from which a resource had been derived.
- (h) Inspection of Epoch Minerals Exploration's trial alluvial mining operation (of 1986) situated 1.5 km SE of Lefroy.
- (i) Examination of the sites of the principal hard-rock mines of the late 1800's, including material on the waste dumps and discarded battery sands and slimes.
- (j) Discussions with the principals of Cuprite Investments Pty Ltd, who have commenced vat-leaching of battery sands at an existing mill-site at the northern end of Consolidated Lease 97M/80.

(k) Drafting of application for renewal of EL 35/81 and liaison with Mines Department in this regard.

That portion of EL 35/81 falling within the Low Head Artillery Range, (about 11 sq km) was not inspected because the Army Authorities in Hobart and Canberra refused to authorise entry to this prohibited zone.

Generally speaking, field inspection work was impeded by thick vegetation cover over much of the area and sub-surface drift cover which has been incised to only limited depth by the low-energy creeks.

2. LOCATION AND ACCESS

Lefroy is situated in north-east Tasmania 12 kilometres east of Georgetown at geographical co-ordinates 41°06'N : 146°59'E. It lies about 9 kilometres south of Bass Strait (Plan 1).

It is reached from Launceston or Georgetown by first-class bitumen highway. The Bridport Highway gives good access to the southern side of the tenements of interest and the second-class bitumen road to Beechford gives convenient access to the western side of the tenements. The Back Creek dirt road north from Piper's River hamlet gives access to the eastern part of the tenements of interest, including the Back Creek deep lead prospects. Otherwise, access roads are mostly single dirt tracks of poor standard, often overgrown with vegetation or impassable due to logging and firewood extraction.

3. TOPOGRAPHY AND VEGETATION

The township of Lefroy and the main hard-rock mineralised area occupy an area of about 3 km by 3 km bounded by ranges of hills to the west and south which rise 100 m or more above township datum, and the eastern side is also partially bounded by hills. Two important reef-lines, the Land o' Cakes and Volunteer lines, lie along the valley immediately south of the hills commanding Lefroy parallel with and close to the Bridport Road. The Lefroy Field is drained by the Slum, Chum and Blanket Creeks in a northerly direction whence flow passes into the Curries River and so into the sea at Beechford. Most of the area east of Lefroy is drained by gullies and creeks of very low gradient, the flow passing north-westwards into Curries River.

In the south-east portion Back Creek rises at the base of the hills east of Lefroy and carries north-eastwards and then northwards, passing clear of the area of interest about 1.5 km south-east of the Back Creek deep-lead zone.

The aforementioned hills rise to about 150 m above the general level and some steep slopes are evident. Otherwise the country is either gently

rolling or rather flat. Creeks are rarely more than 4 m - 5 m wide or incised to greater than 1.5 m. There is no evidence of any land-slips or scour.

Generally speaking the hills have light eucalypt, shrub and native herbage cover, plus a great deal of bracken. The low-lying land is usually densely vegetated with bracken, prickly shrubs, sword-grass and scrubby eucalypts. The creeks are very heavily vegetated with sword-grass, prickly shrubs and dense tea-tree; underfoot there is a mat of rotting vegetation and fallen trees which serve to protect against erosion at times of flood.

In low-lying areas the density of the vegetation renders access on foot virtually impossible.

4. LAND TENURE

Clearing of freehold blocks for stock grazing and fodder crops is mainly confined to strips alongside the Lefroy-Beechford road, and similar strips along the Georgetown-Bridport road and the Piper's River-Weymouth road. Within the zone of interest this privately-held land probably amounts to about 3,000 hectares, of which half or more would be owned by Mr Gerald Archer, a prominent Launceston grazier and breeder based at "Landfall Homestead", 8 km north of Launceston on the Georgetown Highway.

The balance of land in the district would appear to be crown land, including that portion of the Low Head Artillery Range included in Exploration Licence 35/81. Most of the crown land can be regarded only as scrub, most of the eucalypt stands being fit only for chipping.

5. LEFROY RAINFALL CONDITIONS

Department of Meteorology records of rainfall observations at Lefroy are available for the period 1913 to 1976. Excluding gaps in observations 1947/49 and 1955/62, the records cover 51 years. Georgetown records over the period 1968/78 show very similar patterns to those covering Lefroy.

The records provide the following information:

- (a) Mean annual rainfall = 887 mm.
- (b) Median annual rainfall = 857 mm. (Median irons out exceptional rainfalls).
- (c) Mean number of raindays per annum = 124.

The plots in Table I show the following:

- (a) Lowest monthly rainfall occurs in January (41 mm) and highest monthly rainfall in July (111 mm).
- (b) Average precipitation per rainday is in a narrow range of 6.2 mm to 8.5 mm, that is, throughout the year a rainday produces much the same

quantity of rain and monthly total rainfall is a reflection of the number of raindays per month.

(c) Raindays per month through the year is in the range 6 to 15.

(d) Lefroy appears not to be subject to frequent abnormal rainfall conditions. The least disturbed conditions occur during the months of May, June, July and August.

The highest monthly rainfalls recorded are 363 mm in August 1939 and 356 mm in September 1962. Throughout the 51 years, there are another nine monthly recordings of 200 mm or more, or say double the normal July average of 111 mm.

These moderate rainfall conditions are reflected in the ample vegetation cover seen throughout the area and the lack of scour in creek-beds even in a few sections of quite high gradient.

6. REGIONAL GEOLOGY AND MINERALISATION

(a) Geology

The basement rocks in the area are strongly cleaved siltstones, sandstones, slates and phyllites of the Mathinna Beds (Siluro-Devonian). The sequence trends NW and dips generally to the SW. The major auriferous lodes are associated with a succession of cleaved siltstone and sandstone beds, with minor slate, having a structural thickness of about 2,400 m. (Figure 1). Tertiary gravels, conglomerate and siltstone overlie the Mathinna Beds in the Lefroy area, though it rarely outcrops.

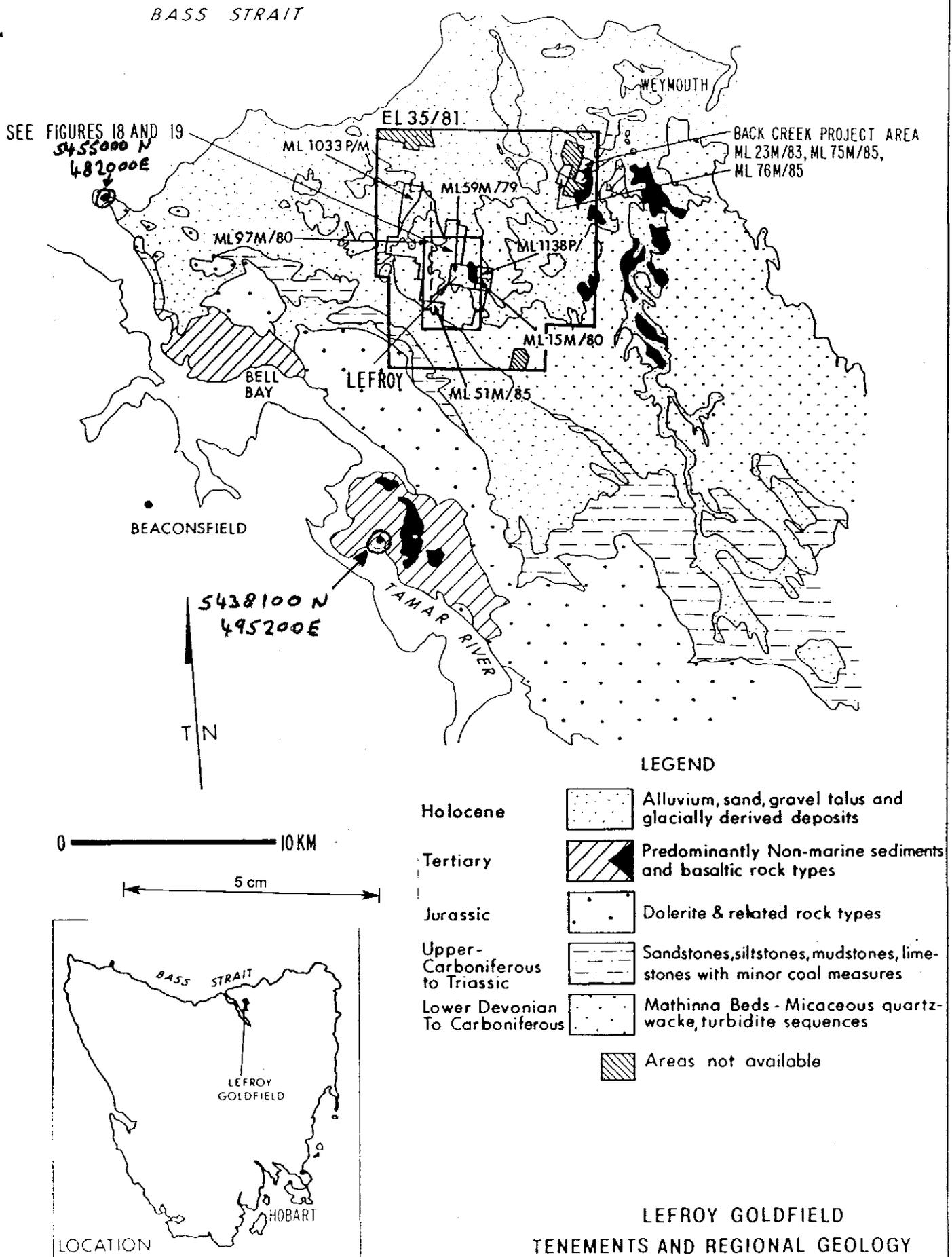
This Tertiary sequence is covered by two flows of Tertiary basalt which are in turn overlain by further gravel, conglomerate, siltstone and clay ascribed to Tertiary-Quaternary.

Evidence of folding in the Mathinna Beds is limited by the poor exposure. The sediments generally strike at 310° - 340° mag and dip W at varying angles. In the vicinity of lodes the beds are somewhat disturbed. The sequence is not demonstrably overturned generally but an instance of overturned siltstone and slate does occur on the Georgetown road.

Faulting is prevalent throughout the Lefroy area. Surface exposure is poor but previous reports on underground workings has provided data indicating three predominant fault sets.

The auriferous lodes themselves fill a series of strong fractures across which there has been displacement. The fractures are sub-parallel with a bearing of 70° - 80° mag and generally dip to the south, although in the central part of the field, ie New Native Youth, lodes dip steeply to the north. The fractures have dips varying vertical- 65° .

In places the fractures exhibit signs of repeated movement, with the



formation of slickensides and crushing of quartz to fault rubble and pug. Several generations of quartz may be present due to repeated openings of the fracture. In places, the fracture has two distinct walls up to 60 m apart, with the intervening siltstone and slate strongly deformed and vein quartz introduced along small tension fractures.

(b) Economic Geology

(i) Lodes

Gold production from Lefroy hardrock mines is estimated at 166,000 ounces, almost all of which was mined prior to 1900. No estimation is available for tons milled. Contemporary reports suggest that ore grades much less than 20 dwts per ton were regarded as unpayable and it must be assumed that tonnage milled was of the order of 200,000 tons. This assumes that the auriferous quartz in mullocky lodes was selectively hoisted and the high grade requirement relates to the narrow widths of the auriferous quartz and extensive development work entailed.

The lodes occur in E-W fractures within the NW-trending sediments, the fractures being formed preferentially due to difference in competence between the sedimentary successions. Broadhurst (1935) suggests that the E-W lode fractures were tension fractures first formed in the sequence and that the NW-SE and NE-SW conjugate shear fractures followed. (Figure 2). The lode fractures can be traced at surface for about 1.6 km and in depth to 380 m. Though quartz has been followed to this depth, throughout the field there is a drastic reduction of grade below 100m-120m depth. In many of the small mines, grades petered out at 30 m depth despite continuance of quartz-filled channels.

The quartz in the lodes is of two types - vitreous white quartz, commonly in fault zones and small fractures, which is non-auriferous, and vughy quartz associated with stibnite and cervantite, with lesser pyrite, chalcoppyrite and arsenopyrite which is auriferous. An association of gold with sulphides has been established.

The auriferous quartz commonly occurs either on the hanging-wall or footwall of the fractures. The ore-shoots in the principal producers appear to have been stoped for strike lengths of up to 180 m to depths of about 120 m, the shoots generally pitching west. Stoped shoots represent only a portion of total strike length of known lode-line.

(ii) Alluvial

Alluvial gold recovered from the Lefroy Field is estimated at 5,000 ounces. This was obtained, in the main, from the 'Lefroy Deep Lead' zone immediately SW of the outcrop of the basalt flow at Slum Creek/Upper Blanket Creek.

Continuation of the lead under the basalt was demonstrated in the Rock Shaft, Golden Era and East Pinafore workings, where some coarse water-worn gold was recovered. Drillholes have also probed the sub-basaltic lead. Alluvial gold worked elsewhere in the Lefroy district seems to have been of minor importance.

The Back Creek Field is estimated to have produced 9,000-10,000 ounces of gold in four leads, namely the White, Red, Blackman's and Cardigan leads. All trend approximately SE and White and Red Lead plunge under basalt cover.

In the heads of the leads are several minor lode-gold occurrences which are unlikely to have given rise to large well-waterworn boulders seen now in the leads.

Three series of boreholes have been put in to probe the sub-basaltic leads, totalling 14 holes. Interpretation of the results made in 1969 by B Marshall led to the conclusion, "the prospects of obtaining gold are unlikely to improve downstream, (of the 1932 drill series of three holes across a narrow gorge section of basalt flow about 0.65 km downstream of White Lead) nor is it likely that any thick auriferous gravel deposits are to be found upstream."

7. DETAILED PROPERTY INVESTIGATIONS

(a) Introduction

A number of investigations were carried out within the tenements to ascertain factors relevant to hardrock and alluvial gold mineralisation within the exploration licence. A preamble of investigations are given below with detailed observations recorded in the ensuing sections.

(b) Examination of Drainages (Refer to Appendix I and Plan 1)

In order to obtain some idea of the potential alluvial resources, all creek and gully which could be conveniently reached were examined. Considerable difficulty was experienced through lack of tracks, the condition of the existing tracks and the generally heavy vegetation cover.

Information obtained on alluvial gravel and other potentially economic formations lying on basement, eg silts and clays, was somewhat limited. The creeks and gullies were found to be generally not well incised into their flood-plains.

(c) Examination of Rock Outcrop (Refer to Appendix II and Plan 1)

The principal source of this information was road cuttings, of which there were few of significant height of exposure.

The spoil left at surface from the Epoch pitting campaigns provided some information; otherwise old pits seldom showed any basement exposure.

(d) Sample Collection (Refer to Appendix III and Plan 1)

A number of rock and other samples were collected as examples of material present at various localities.

Included were several samples of battery sands which may warrant laboratory testing.

Where indicated and convenient, samples of washdirt were panned at site, quantity per pan being about 2.5 litres, or 400 pans per cu m.^{*} Most of these are not reported herein. * ie loose cu m, or 520 pans/bcm

(Note that in b, c and d above the map 1000 m grid has been lettered and numbered to provide convenient location grid references employed in the appendices. The separate locations marked on the map for drainages are numbered in the 'C' series and rock outcrop under the 'R' series. Samples taken bear designations marked on samples or sample bags and generally have in addition the appropriate 'C' or 'R' map marking.)

(e) Inspection of Alluvial Potential

Apart from examination of drainages for grassroot potential, traverses were made over the Sludge Creek, Chum Creek and Back Creek areas, where work in the recent past by Epoch has resulted in statements on economic potential.

Reconnaissance confirmed that the pitting reported was in fact done and information on the quality of that work compiled by observation and eliciting the statements of outside parties who observed the Epoch work as it progressed.

As part of this appraisal, the Epoch trial mining at Poverty Gully (R22 I 7) was inspected and the results of this operation obtained from a connected party.

(f) Inspection of Hardrock Potential

Traverses were made over the principal mineralised lines to gain an idea of disposition, types of rock and mineralisation as a correlation with descriptions in old reports, tailings resources, etc. Prospecting trenches and pits, and some shaft locations were picked up and, if possible, examined.

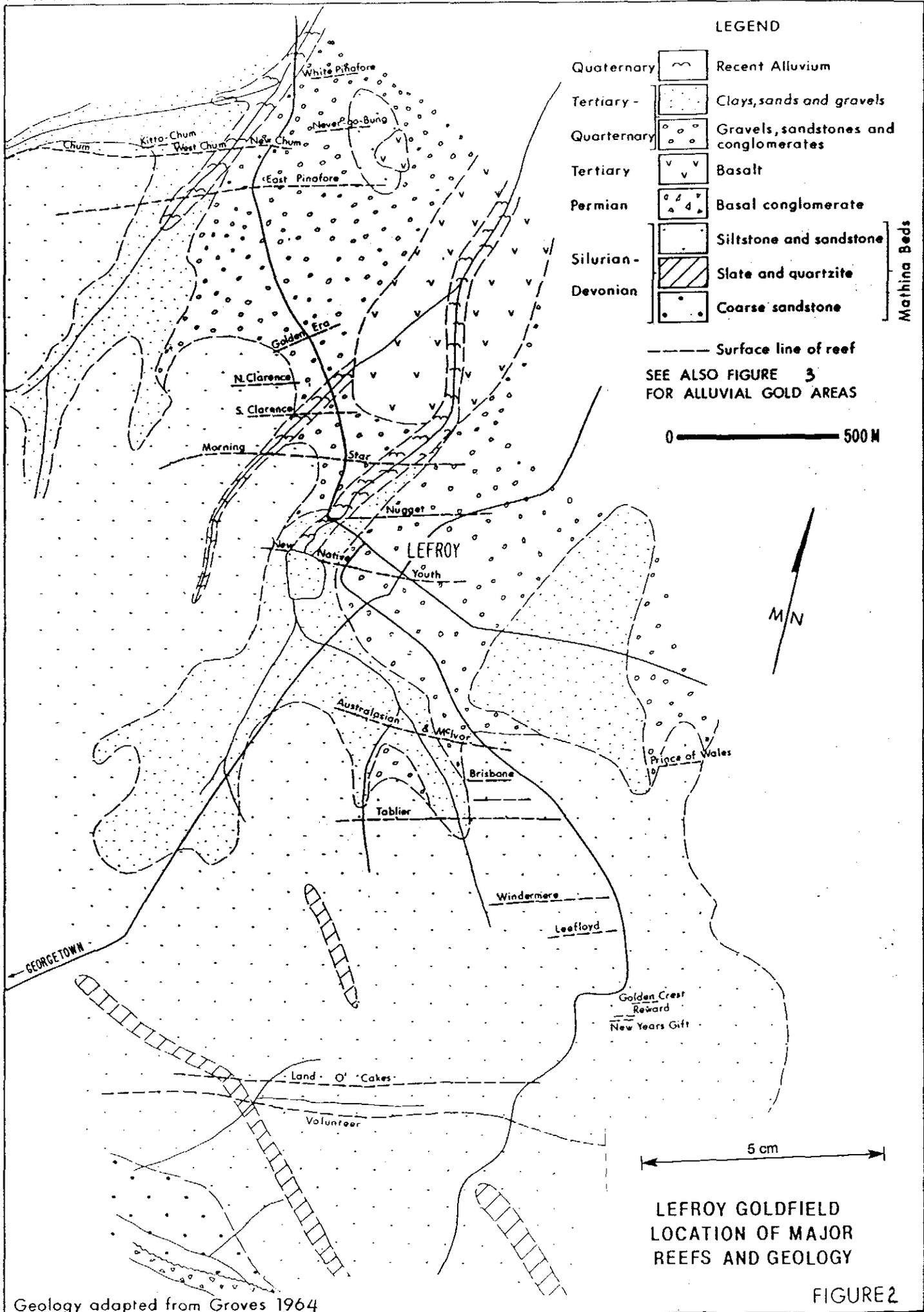
8. DETAILED REVIEW OF GOLD POTENTIAL IN THE LEFROY DISTRICT

(a) Lode Gold at Lefroy (Figure 2)

The salient facts which emerge from the data and observations are:

(i) The mines were generally situated on low-lying land largely rimmed by hills.

(ii) The auriferous lodes are mainly confined to a thick (2,400m) siltstone sequence in the central part of the area.



Geology adapted from Groves 1964

FIGURE 2

(iii) This sequence was susceptible to formation of fractures (tension-fractures into which auriferous quartz was introduced).

(iv) The fractures dip from 65° to vertical for up to 1 km on strike, which is generally E-W.

(v) About 25 lines of lode have been prospected or worked, about five of these giving rise to substantial productions.

(vi) The gold occurs in quartz where the latter is associated with sulphides-stibnite, pyrite, arsenopyrite. Much of the 'buck quartz' present is barren.

(vii) The faults along the fracture lines frequently lie between walls 60 m apart, these so-called 'formations' comprising sheared country rock in which the material is pulverised, gouge, horses of country rock and veins of quartz which may or may not be gold-bearing.

(viii) Commonly on one or both walls of the formation are narrow veins of auriferous quartz - often high-grade.

(ix) Vein thicknesses range from a few centimetres to 0.3 m. Exceptionally, widths were as much as 2.5 m.

(x) There was a tendency for the lodes to split at the western and eastern end of the lode lines and for values to die out where the fractures extended into the 'harder country'.

(xi) Grades of ore milled range as high as 4 ounces per ton and on the incomplete data it would appear that average grade milled was not far short of 1 ounce per ton.

(xii) In a few of the mines there appears to have been stoping over the full length of the strike within the respective mining lease length. Most, however, stoped over only a portion of the available strike though development was carried out over most of the length and crosscuts were also put in. Shoots followed down appear to have a generally westerly fairly steep pitch.

(xiii) Throughout the field, gold values consistently died out at about 120 m depth. Several mines sank to 380 m and carried out development on the persistent fracture planes but virtually no makes of auriferous quartz were picked up.

(xiv) During the period February 1935 to August 1938, 17 boreholes totalling 3,160 m of drilling was carried out by the Tasmanian Mines Department, as under:

Chum Line	3	holes	(deepest 396m)	total 1071m
Morning Star	4	"	" 193m	" 652m
Golden Era	4	"	" 140m	" 509m
West Volunt.	2	"	" 262m	" 499m
Land o' Cakes	4	"	" 183m	" 429m

These holes variously probed gaps between mined shoots and the fracture at depth below workings.

The drillers' logs report only a very few quartz intersections per hole and all are evidently very thin veins. Some multiple veins evidently reflect 'formations' traversed. Over the whole drilling campaign no significant grades (in present-day terms) were reported from those sections assayed. Assays of sulphides recovered from drilling sludge were also not significant.

(xv) It is recorded that sulphides on occasion carried very high gold grades (23 ounces per ton in one instance) but it is believed that the lodes carried only low percentages of sulphides and contribution to total gold in the ore milled would not have been high. Though the quartz presently seen in the dumps derives from the deepest workings on particular lines, very little sulphide was noted by the writer. Also, no gold whatsoever was detected in numerous pieces of quartz examined.

The following conclusions are drawn from the information available:

- * The areal extent of prospective lode occurrences has been delineated.
- * Auriferous shoots occur along portions only of the E-W faults through emplacement mechanisms which have not been determined; hence no prediction of location of repetition can be made.
- * Underground prospecting in the past has been reasonably thorough.
- * Drilling may be no more successful than the extensive programme carried out in the 1930's. (* ie a new drilling campaign.)
- * The deposits are shallow, that is, to a depth of only 120m or so.
- * The nature of the mineralisation is such that mining costs would be very high.

(b) Waste Dumps at Lefroy

Generally speaking, the volume of waste now present at the sites of old mines is considerably less than would have been expected from the extent of mining shown on plans and sections. Part of the waste may have been used for road base construction in modern times and it is suspected that stope filling would have disposed of significant waste quantities underground.

The quartz content of dumps inspected was quite low. It is likely that quartz was selectively picked and hoisted when wide 'formations' were being mined as some of the stone was high-grade and widths narrow. On

the dumps, the largest reef-quartz piece found indicated a vein width of only 20 cm.

It is concluded that treatment of waste dumps via screening out the fines for milling is unlikely to prove an economic proposition.

(c) Battery Sands and Slimes at Lefroy

Battery sands are presently being treated by Cuprite Investments Pty Ltd by a specially-devised vat-leach process which scalps the easily-recovered gold to return a little over 1 gm of gold per tonne. In the process, much of the gold content remains locked up in the spent vats but it would probably be recoverable in a standard C.I.P. mill. Such mill, however, would have a considerably higher capital cost than the vat-leach now in use.

(d) Alluvial Gravels within the Lefroy Mining Leases

To June 1985, Epoch Exploration had dug close to 500 pits in the Lefroy area, over 400 of which were sited within the mining leases. The latter mainly covered the Sludge Creek, Chum area and upper Blanket Creek. The work resulted in an alluvial resource estimated at 200,000 bank cubic metres at a grade of 0.5 gm gold/bank cubic metre. Average wash thickness was 0.8 m, overlain by 1-2 metres of overburden. The widths of these deposits averages 25-30 metres, most of the values being in current drainages.(Figure 3).

Inspection of the reports prepared by Epoch Exploration confirms that the results have been set out, and the resources assessed, in the customary manner. Partial detailed checking by the writer between widths, lengths and grades on plans and tabulations with resource computations, indicates that generally correct interpretations of the data have been made. Pit spacings along lines were appropriate but in some instances lengths between lines and single pits in lines renders the resource somewhat speculative. Sampling limitations in such narrow deposits are inevitable and the above-quoted deficiencies are not of such magnitude as to much affect the volume and grade predicated if more rigorous selection were applied.

Of somewhat more concern is the nature of the sample itself. Pits were dug through the alluvium to basement, wash and overburden identified and thicknesses measured, and then a sample for treatment was taken. This in each case amounted to a measured quantity equivalent to only 0.036 bcm. Each sample was wet-screened to remove +6 mm gravel and the gravity concentrates finally reduced by hand-panning and fire-assayed in those cases where significant visible gold was present. The question arises, "How representative of the relevant wash sample would a

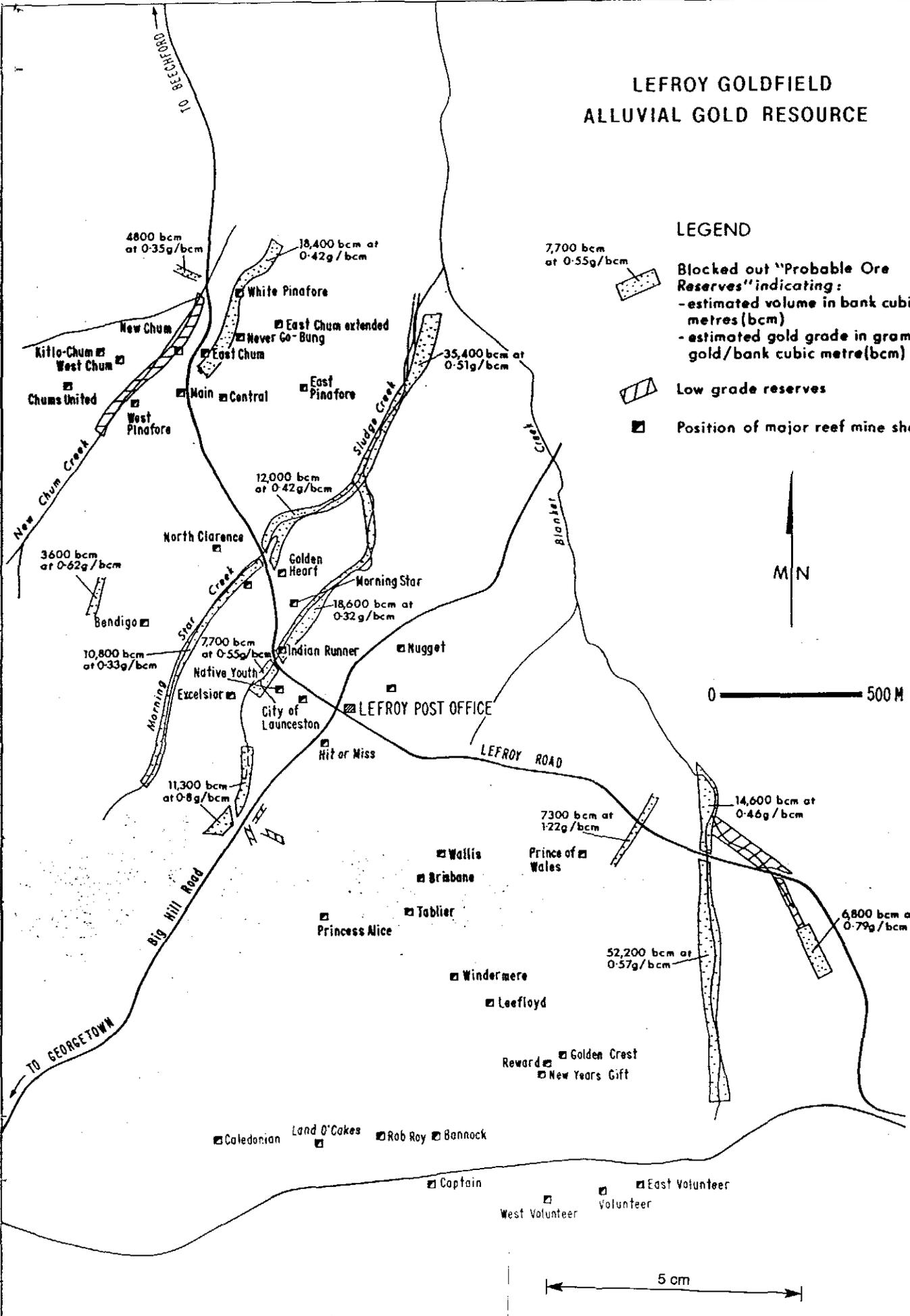
LEFROY GOLDFIELD ALLUVIAL GOLD RESOURCE

LEGEND

Blocked out "Probable Ore Reserves" indicating:
 - estimated volume in bank cubic metres (bcm)
 - estimated gold grade in grams of gold/bank cubic metre (bcm)

Low grade reserves

Position of major reef mine shaft



Data from Murdoch, 1985.

FIGURE 3

0.036 cu m be?"

At the stated 0.5 gm/cu m average grade, the treated sample would carry 0.018 gm of gold. The Epoch reports give no statement concerning the distribution of gold throughout the wash or any particulars of screening analysis of physical gold recovered from the programmes. However, in some cases duplicate samples were treated as a check on variability of results obtainable from the same sample (see Table I).

The tabulation examines a range of values in gms/cu m in appropriate groupings from high to low. The figures are set out as per the reported milligram recoveries made within those ranges for original and respective duplicate sample. With the exception of the critical 0.49-0.30 gm/cu m range, the percentage differences between original and duplicate milligram recoveries are surprisingly small. These results afford confidence in the grades so reported. The range 0.49-0.30 gm/cu m shows rather poor agreement in a small population and a consistent bias in six out of seven samples; it is not known whether this is chance, or some other technical bias in the sampling system. On balance it is reasonable to accept that the values which have been reported on such small treatment samples are correct. By inference, the gold particles must be very small and distribution within the washdirt fairly uniform.

The writer panned quite a number of samples and of those which carried gold, the colours were of very uniform size and under 18X magnification could be seen as rough gold having width and height as well as length; ie particles had 'body' in spite of very small size. Seven such colours weighed totalled 5 milligrams, or 0.0007 gm each. Hence washdirt at 0.5 gm/cu m would contain 714 colours per cu m.

Subsequent to the pitting programme, Epoch opened up a trial mining operation. Reference to resource computations suggests that the grade at this location, based on prior pittings, was 0.30 gm/bcm. However, based on scant information, it appears that approximately 611 grams of gold was recovered from 3,689 metres, ie 0.17 grams/cubic metre. However, it is not certain whether the volume treated refers to "bank" or "loose" cubic metres.

Based on a swell factor of say 33%, volume of wash treated would be 2774 bcm and the grade would have been 0.22 gm/bcm.

If, however, the 'metres' quoted were in fact bank cu metres, the grade obtained would have been 0.17 gm/bank cu m. (This is believed not to be the case.)

TABLE I

DATA ON VARIABILITY OF DUPLICATE SAMPLE ASSAYS FROM EPOCH PITTING

Data extracted from "Report on Third Stage of Alluvial Exploration at Lefroy"
(this programme entailed 349 holes - not all assayed)

5.1 Table 1 - Gold Assay Results (Note that only a part of the sample assays were checked by duplicates. All originals having duplicates are included below)

Samples Assaying over 1gm/cu m.

<u>Original(m.g.)</u>	<u>Duplicate (m.g.)</u>	
64.94	2.81	Mean of Originals 32.56 m.g
29.56	96.05	Mean of Duplicates 45.25 m.g.
3.17	36.90	Difference 12.69 m.g.
<u>97.67</u>	<u>135.76</u>	<u>% Difference 39%</u>

Assays 0.99 - 0.50 gm/cu m.

<u>Original</u>	<u>Duplicate</u>	
19.89	24.19	
18.87	27.02	
25.09	31.51	
23.01	29.30	
19.21	27.41	
18.70	12.79	
6.90	26.57	Mean of Originals 17.39
6.72	19.36	Mean of duplicates 17.63
18.05	4.19	Difference 0.24
15.44	29.37	<u>% Difference 1.4%</u>
19.37	12.17	
<u>191.25</u>	<u>193.88</u>	

Assays 0.49 - 0.30 gm/cu m.

<u>Original</u>	<u>Duplicate</u>	
16.50	12.99	
4.20	17.69	
4.58	13.77	
3.30	13.91	
3.17	11.43	Mean of Originals 6.26
4.30	12.43	Mean of duplicates 14.19
7.78	15.10	Difference 7.93
<u>43.83</u>	<u>99.32</u>	<u>% Difference 127%</u>

Assays 0.29 - 0.10gm/cu m

<u>Original</u>	<u>Duplicate</u>		
4.84	1.29		
5.24	3.72	4.77	4.21
3.94	0.99	4.66	1.57
5.49	5.08	2.90	0.37
3.50	3.46	0.34	9.39
8.70	9.17	2.29	6.74
5.39	1.85	1.32	4.83
3.70	1.83	6.62	1.78
7.55	1.19	2.82	5.80
8.55	11.16	<u>120.58</u>	<u>107.29</u>
6.60	4.95		
3.92	2.69		
6.85	6.98		
4.10	6.32		
12.39	4.12		
4.10	7.80		
		Mean of Originals 5.02	
		Mean of Duplicates 4.47	
		Difference 0.55	
		<u>% Difference 12.3%</u>	

TABLE I (cont.)

Assays Under 0.10 gm/cu m.

<u>Originals</u>	<u>Duplicates</u>		
1.30	2.50		
1.30	2.81		
1.09	1.70		
2.50	3.21		
3.10	1.13		
3.30	3.00		
2.70	0.72		
1.46	0.81		
1.46	0.81		
2.37	2.58	Mean of Originals	1.92
0.40	0.54	Mean of Duplicates	1.84
1.46	2.81	Difference	0.08
3.09	2.24	<u>% Difference</u>	<u>4.3%</u>
1.30	0.90		
<u>26.83</u>	<u>25.76</u>		

Total number of sample pits with duplicated assays 59
Total Gold contained in Originals 0.480 gms
Total Gold contained in Duplicates 0.562 gms

Overall % Difference 17%

It is stated in the Epoch report that it was established by weighment that one bank cubic metre of washdirt weighed approximately 2,000 kg. Hence, the statement that the grade was 0.17 gms per tonne infers that recovery grade in the trial mining operation was 0.34 gms/bank cubic metre, which is at variance with the figure of 0.22 gm/bcm derived above.

On the available information there is not very good correlation between the resource as estimated from pits and the recovery obtained from working a portion only of the estimated resource. It was claimed that in excavating the wash the supervisor insisted that the excavator driver not extract a skim of basement as well, and recoveries of gold were therefore reduced. Examination of the remaining stockpile by the writer lends some credence to this view.

It would seem that the most prospective areas of alluvium within the mining leases have been already pitted but it is believed that some further resource remains to be delineated. Such additions, however, are not likely to be very extensive.

The quoted resource is regarded as reasonably firm in quantity and grade. Minor deductions in respect of road reserves, etc are to be expected and recovery of the gold in a commercial plant would be a challenge on account of the nature of the material.

(e) Deep Lead Alluvials, Lefroy

Ground cover and previous mining disturbance is such that no clear picture of the margin of the basalt flows can be gained at site. However, the following information is contained in contemporary reports and subsequent commentaries on the deep lead:

(i) A fairly extensive sheet of basalt fills the valley floors of the Sludge and Blanket Creeks - largely overlain by Tertiary/Quaternary deposits.

(ii) The extent of old gravels in the vicinity of the Siluro-Devonian/basalt contact which the old miners could get at was quite small but "the returns have been fairly good".

(iii) Montgomery considers that the deep lead is the sluice into which the contents of the small leads (ie alluvial gold bearing creeks) have been channelled and that the old drainage channels must have been much larger than they are now. The field was full of proved auriferous reefs and an immense amount of denudation must have gone on under Tertiary conditions - steep ridges and deep gullies.

(iv) A certain amount of sub-basaltic alluvial wash was worked

from shafts:

- * / ^{East Pinafore.} Shaft was sunk to 191 ft in basalt and diamond drill brought in. This traversed further basalt and alluvial detritus, bottoming in wash at 236 ft depth. The shaft was deepened and some alluvial extracted but work was abandoned in face of water problems and poor siting of shaft in respect of lead mining. Some 'fairly good wash' was obtained - unspecified.
- * Golden Era. Shaft workings exploited some channel alluvium at 185 ft below surface. Very large rounded quartz and sandstone boulders with satisfactory pan prospects - coarse heavy gold, with residues including iron pyrites in the lower section of wash. Wash irregular (presumably distribution) and included lignite. Work carried on under very great difficulties and had to be abandoned.
- * Golden Heart. Stream bed investigated in underground workings. Coarse gravel containing 13 dwts/ton (19 g/t) with subsidiary gold in vein-quartz pebbles and boulders. Production and persistence of this working not recorded.
- * Pinafore Company. (Sited 10 chains - 200 m - north of the Morning Star Shaft.) 28 ft of boulder gravel containing slugs of gold up to 2½ dwts (3.7 gm). Work unpayable due to immense boulders.
- * Morning Star Mine. Alluvials investigated but no gold found.

(v) Drilling campaigns in 1883, 1892 and 1936 resulted in definition of basalt, alluvium and basement relationships over a north-south trend of about 1,400 m to a position where the Sludge Creek runs into the Blanket Creek, and to a maximum width in the east-west direction of about 600 m.

Fourteen holes were drilled through basalt, and one or more horizon of alluvium or sedimentary deposit, into basement, basement horizon depths ranging from 67 m to 98 m.

D Groves prepared a composite plan/section of the drilling which shows:

- * That in the southern area of drilling, Holes Nos 1/83, 2/83, 3/83, alluvium was overlain by a single thick flow of basalt.
- * That the rest of the area carries two flows of basalt with alluvium between the flows. In one hole there are two additional small flows.

- * The postulated centre of the pre-basalt drainage surface falls northwards by 20 m in about 850 m of length, which is a comparatively gentle slope.

A trace of gold was found in Hole 4/83, and in Hole 15/37 the interval 260-262½ ft returned 2½ dwts per cu yd (by assay) - that is, 4.8 gm/bcm. This latter hole was situated close to the postulated centre of the pre-basalt drainage, ie probably close to the gutter. It serves to demonstrate that gold values persist for about 900 m length of the gently-sloping pre-basaltic gutter, (not necessarily a single gutter).

Gold was not recovered from the other drill-holes, which is not at all surprising as apparently diamond drills were used throughout the work. Judging from the hole sections, the best potential for gold is in the alluvials lying on basement. Upper sediments, including those between basalt flows, largely appear to be clays deposited during sea-level still stands in the succession of sediment and basalt deposition.

(vi) In 1983, CRA Exploration Pty Ltd reported on exploration of the deep lead and provided the following information:

- * The basalt caprock was mapped by use of magnetometer to locate basalt-induced magnetic 'edge-effects', (61,000 m of magnetic traverse).
- * This was followed by two trial gravity trials to test the effectiveness of the technique in determining sub-surface basalt geometry. It was claimed that the initial results were encouraging.
- * It was concluded that use of combined gravity and ground magnetics offer the best potential for correctly siting lines of cable-tool drill-holes. (These holes to be first opened out in basalt by large-diameter percussion drill - such as Schramm.)
- * CRA concluded that the lead has the potential to hold economically interesting quantities of gold-bearing gravels, and observed that further exploration would be high cost.

(vii) The comparatively gentle slope of the pre-basaltic basement surface now covered by basalt may be contrasted with the very steep slopes of the basement in the pre-basaltic streams adjacent to the Pinafore Company and Morning Star mines. The Pinafore alluvial workings were 70 m below surface, indicating a mean slope of basement surface at the point of 1 in 5, whilst at the Morning Star the slope was 1 in 2.

The conclusions drawn from this information are:

- * The deep lead system has an excellent potential for gold mineralisation.
- * The drilling suggests that interesting grade extends northwards for a trend length in excess of 1 km, with gutter length within the drilled area considerably more than 1 km.
- * The richest ground would be at the southern end, (end of Sludge Creek).
- * Exploration prior to mining would be very costly and would not necessarily provide reliable information on grade, or width of payable gutter.
- * If mined underground, thick sections of alluvial waste above auriferous wash to be extracted would create immense technical problems and very high costs.
- * The deposit is also a difficult opencut proposition, for similar reasons.

(f) Alluvials at Back Creek

Four shallow leads were worked in the 1860's for an aggregate of about 9,000 ounces of gold. The Cardigan and Blackman's leads were sluiced and may be considered as worked-out. The longest lead, Red Lead, was worked mainly by pitting White Lead, apart from one 200 m length which has been sluiced out. The upper 350 m has been worked by pitting whilst the lower 300 m has been mainly sluiced out, though there is also remaining ground which has only been pitted.

In much of the pitted ground the density of pitting is variable; some is heavily pitted and some has sparse distribution of pits. Many of the pits appear not to have been belled out to extract washdirt - presumably because grades did not match the required grades of the day.

Epoch Mining NL has suggested that "reserves should be in the order of 100,000-200,000 cu m." A first pass investigation reveals that:

- (i) Areas 1, 2, 3, 4, 6 and 7 have virtually not been pitted.
- (ii) Areas 2 and 6 are not in Tihele control.
- (iii) Of only 16 pit assays reported, six are not in Tihele ground.
- (iv) Of the ten remaining pit assays, one reports 1.22 gm/bcm, and five of the balance fall in the range 0.32-0.46 gm/bcm.
- (v) These six single pits lie on a north-east trending line from a point midway between the Red and White leads passing through just

east of the centre of White Lead over a length of about 450 m, ie transverse to the lead trend-lines.

A new lead working of interest occurs at reference R19 C10 but this is not under Tihele control.

Ground to the north of the NE corner of Tihele's area of interest was not examined on the ground but might have potential.

It is concluded that further work has to be done in order to fully substantiate Epoch's figures.

(g) Alluvials within the Exploration Licence

To date, exploration within the exploration licence area has been limited and generally unsuccessful. However, large areas remain to be checked even though these could not be regarded as very prospective for alluvial discovery.

There can be little doubt that the district's principal gold source has been the belt of lodes on which the Lefroy hard-rock mines were situated. Since Siluro-Devonian times a column of this formation, of unknown height, has been eroded. Much of the gold content probably ended up under basalt in the Lefroy deep lead, and some would have been reworked at shallow depth to remain in current drainages with more recently formed alluvial gold deposition. (In passing, it might be pertinent to observe that the present Lefroy lodes worked to 120 metres or so may represent the root of an original much thicker column which has been removed. No auriferous lode system continues to indefinite depth and explanations for cutoff of values, such as 'secondary enrichment', may merely be begging the question.)

The principal gold mineralisation at Lefroy is bounded by hills to the west and south and in part by hills to the east, thereby inducing a broadly northward and north-westerly drainage pattern which confines shed gold generally to streams within the mining leases.

Considering the principal areas with the EL, the picture is as follows:

(a) South of the Georgetown to Bridport Road, approximately on gridline I, there is no significantly mineralised hinterland to feed the drainage and accumulations of detritus therein do not appear to be extensive.

(b) On the southwesterly slopes of the ridge covering the west and south-west side of Lefroy township and discharging into the Curries Dam, not much alluvium is present and any gold may have already passed into this 'protected environment'.

(c) The western side of the Curries River carries no known reef situations which could have shed gold into the River and its flats.

(d) The portion of the EL falling within the Low Head Artillery Range appears not to have a mineralised hinterland, or as far as is known, extensive alluvials likely to be prospective for alluvial gold deposits.

(e) That portion of Blanket Creek north and north-west of the junction of Chum Creek with Blanket Creek may be prospective, as well as the short length of Curries River (less than 1 km) to the point where the Artillery Range southern boundary is reached.

(f) The area north of the Back Creek road as far as the Artillery Range boundary and between Blanket Creek in the west and the Back Creek Goldfields in the east, the prospects for alluvial gold have been checked by a series of Epoch pits sited on each of the principal, even though minor, drainages. Except for one insignificant value at Moonlight Flat (Ref. C14 D 6) nothing of interest was uncovered.

(g) South of the Back Creek road lies an area of some 20 sq km drained north and northwesterly to the Blanket Creek or easterly towards the north flowing sections of Back Creek. Some of this country is low-lying and some has low hills. All is very heavily vegetated and there are few access tracks. Most of the area has no favourable mineralised hinterland and cannot be regarded as very prospective.

(h) Along and just north of Back Creek, that is, north of the Bridport road from Grid 7 to Grid 10, the flood plain of the creek suggests the possible presence of alluvial gravels with a chance that the eastern end of the Volunteer line of lode may have shed some gold into the system. Most of this is, however, private land. Note also that gold from Native Industry 65M/78 may have shed gold into this system. It must be concluded that no great hope can be held out for important alluvial gold discoveries within the exploration licence area.

9. PROPOSED EXPLORATION

Exploration will be directed as follows:

(a) Shallow Alluvials

Obviously the shallow alluvial resource at Lefroy is more easily exploited than the deep leads and although grades will be lower, these deposits should be the initial target. Further evaluation work at Back Creek is required.

(b) Deep Leads

The deep leads will be more difficult to explore due to the problem of

extracting a bulk sample from beneath the basalt. Unless very large diameter holes can be sunk to the wash, there is no point in drilling to assess grades. It may be possible to sample the upper lead if outcrops around the edge of the basalt are accessible or to reach it by sinking a drift past the basalt edge to reach the wash, having determined its presence by drilling. It is recorded that water flows in the leads caused abandonment of mining in the past.

Proposed expenditures by the company will be directed at substantiating the Epoch Minerals Exploration NL resource at Lefroy as well as delineating further reserves within the exploration licence and it is thought that an expenditure of \$100,000 during 1987 and 1988 should be adequate in determining the full potential of all of the tenements.

(c) Reefs

A detailed assessment of the reef potential will be made. Potential for further high grade shoots as well as near-surface bulk low grade gold deposits is considered to be reasonable. Expenditure of \$50,000 during each of 1987 and 1988 should be adequate in outlining the most prospective hardrock targets within the tenements.

10. EXPENDITURES

Expenditures incurred during the period in question were \$8,651.76, details of which are as follows:

Consulting Fees	6,300.00
Air Fares	371.00
Motor Vehicle Hire	680.00
Fuel	103.00
Food/Accommodation	963.62
Taxis	95.00
Photocopying/Literature	104.04
Phone/Postage	26.30
Miscellaneous	<u>8.80</u>
	\$8,651.76
	=====

APPENDIX I

CREEK AND GULLY EXPOSURES

APPENDIX I

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<u>LOCATION POINT</u>	<u>Width(m)</u>	<u>Inclsed(m)</u>	<u>Overall Width(m)</u>	<u>Remarks</u>
C 1 J3	2	0.5	N.A.	Reasonably steep dry gully. Heavily overgrown with shrubs and ferns. Pale brown bleached sandy silty clay. No scour.
C 2 K3	-	-	-	Not a creek or gully but a low gradient trend in pasture land.
C 3 K4	-	-	-	Drainage cut in pasture land approximating gully on map. Pale brown bleached sandy silty clay. Section 1m wide, 0.7m deep.
C 4 K4	-	-	-	Depressed area about 200m x 150m which could carry alluvium. Scrub-covered. Dry. At surface l.b.s.s.c.
C 5 I3				Junction of two creeks passing under road via 2x6ft culverts. North-flowing creek 10 m wide incised 1.7m. West-flowing creek 2m wide incised 0.7m. Both heavily vegetated and dry. Opposite side of road (north) drainage channel cut in soft well-foliated Mathinna bedrock. Creek walls show lbssc with very little gravel in the bottom. Low volume potential.
C 6 I3	5	1.5	Neg.	Drainage under Big Hill Road carried in 3x3½ft culverts. Heavily vegetated. lbssc and clay. Gravel negligible.
C 7 I8	2	1.0	150	In creek and on brow of crossing (3ft culvert) clayey humic soil. Over 16m in standing water is a length of exposed 2" and down consolidated gravel. Thickness at least 0.4m.
C 8 I8	2	1.0		Eddie creek crossing of Bridport road. 6m x 1.3m culvert. Minor alluvial potential.
	3	1.3	150	Adjacent Back Creek. 10 cm of surface soil, 1.2m sandy silty subsoil. No significant gravel. Slight water flow. At a stock crossing cobbles and boulders of basalt and slabs of competent Mathinna are embedded about 5 cm below paddock surface and in the adjacent paddock two embedded large basalt boulders are present. This may be tramp material but they appear to be insitu. At this point Back Creek is not in the centre of its flood-plain.
C 9 H9	4	1.9	250	Scour basin apstream of bridge 10m x 4m wide. Top 2m of section is lbssc. below 0.5m of crossbedded gravel showing above standing water which is itself perhaps 1.2m deep. Gravel angular to sub-rounded. Downstream section of creek smaller. 50 m downstream there is also some gravel exposure in the section - discontinuous and of larger particle size than in the scour basin. (i.e. up to 10 cm, average 3 cm.) Gravel is consolidated and carries little clay, where present.
C 10 H9	4	1.5	150	At crossing, exposure is lbssc. May be very rotted Mathinna in bottom. Timber bridge piers washed out and hanging on bearers above. Bottom contains only recent flood sands. No flow. Upstream some recent gravel accumulation in bottom, exposure lbssc. Further upstream and downstream of bridge inaccessible due blackberry and other vegetation.
C 11 G11	3	1.0	50	Exposure is lbssc only. Downstream impassable due to tangled mass of vegetation and fallen timber. Dry bed shows a little clay and rotting vegetation. Upstream a little clearer but similar with much moss cover. Soft and spngy underfoot.
C 12 G5	3	1.5	250	Centre of low valley. Creek examined downstream of road crossing. Over a length of 130 metres the section shows lbssc, some flood sand and gravel in the bottom and intermittent thin 'runs' of float gravel within the lbssc at varying horizons. Slow trickle of water.
C 13 D6				Minor drainage gully. Small gutter 1m x 1m. Low lying. Mass of ferns, shrubs and a few scrubby eucalypts. Exposure predominantly lbssc with some minor fine gravel. Rotting vegetation in gutter.
C 14 D6				Minor drainage gully. Epoch pit with half metre exposure and another 20m away. Probably Nos A01 and A02. Piles of pit contents show Lbssc and fine sand and silt, with rotted Mathinna, including some white phyllite. No significant alluvial volume present.
C 15 D7				Gully 50m from road and parallel with road 50m wide. Epoch pit ? A08. Sample mainly find sandy silty material with a little gravel, some up to 10 cm size.
C 16 E7				Gully crosses track. Partly filled Epoch pit AB2A. Fine silty micaceous material, occasional fine grained angular gravel with some Mathinna. A little away from the pit is light brown granular porous soil suggestive of underlying basalt, possibly a remnant.
C 17 D8				Shallow dry gully. At 30 cm depth a stiff grey/buff silty clay showing in culvert. Similar elsewhere with skin-deep surface fine sand. Valley (very shallow) 150 m wide densely scrub-vegetated.

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- C 18 D8 Gulley 30m wide incised about 4m below general level. Dry but drains over road surface. Water channel 1m wide incised 30 cm. Exposure lbssc with no gravel. Upstream and downstream hopelessly overgrown prickly shrubs, slender, to 3m. On hill above creek one small pebble of basalt. Exposed in gully crossing, embedded in lbssc are boulders and pebbles of basalt. Road northwards impassable without vehicle damage.
- C 19 E8 Epoch pit site - AA1A and AA2A. Largely fine sand with a little angular quartz to 7 cm. Also Mathinna and one piece of this basement tagged by quartz. Basement includes rotted grey phyllite.
- C 20 D9 Road on ridge plateau. Superficially seems to be a lot of scattered surface gravel but this is a veneer over lbssc.
- C 21 C10 Epoch pit site - BK1A. Bottom material kaolinised silt, some brownish through iron-staining. Only a very little gravel content.
- C 22 C10 Small gully. Another Epoch pit - BL1A. Similar to the material in C 21
- C 23 D10 Dry shallow gully, water course 1m wide, few cm deep. Epoch pit, number obliterated. Much like C 21, showing rotted phyllite basement.
- C 24 D9 On Bill Tom's Gully. Epoch pit BN2A. Bottom very fine siliceous silt with very little gravel. Top of section lbssc. Very thick vegetation. Endeavoured to find the leat impoundment but could find only a low (50 cm) embankment which would retain only a small quantity of water. Located another Epoch pit DN16 or DN1C. 0.5 m of top section of unfilled portion shows lbssc, with a few fragments of angular gravel at 0.5m depth. Sample material at grass similar to C 23.
- C 25 C3 At bridge over Curries River. Bridge width 5m, creek width 2m incised 1.5m. Downstream 1.5m wide incised 0.5m, deposit of recent sand and gravel and fallen rotten timber. Upstream lbssc in exposure but no gravel. Scrub and timber thick but taller than downstream. At bottom of stock crossing of creek a small quantity of Mathinna up to 7cm size and one boulder of basalt, which, however, may have been placed there to minimise scour. Bridge abutments substantial. No flood plain; creek passes through narrow declivity.
- C 26 C3 Creek passes under substantial bridge. Upstream creek has been dug out to form a cleanwalled channel 1m deep, 1m wide at bottom. Depth of standing water 0.3m. Over 100m length no gravel in exposure - all lbssc. Downstream a very small trickle present in natural creek incised 1m. It meanders and is lost in a band of trees and scrub. C25 and C 26 for drainage over a flood-plain perhaps 150m wide. Downstream in valley is pasture and forest/scrub, upstream newly planted pasture grass.
- C 27 A3 At causeway over Curries River at western boundary of the Low Head Artillery Range. 10 x 2ft culvert pipes carried the river flow - at this time entirely dry. Flood plain about 130 wide, upstream narrows but downstream 150m wide. Downstream creek is 3m wide, incised 1m, and marked by thick tall (6m) teatree thickets. Section shows lbssc with recent sand and gravel in the bottom. Near the causeway is brown sandy soil mixed with Mathinna fragments and pebbles and boulders of basalt. 50m east of causeway is a small patch of consolidated insitu gravel above creek level; this is white quartz which is well-waterworn and presumably a remnant, possible of marine origin. 100m east of causeway is a cover of about 0.5m of dunal sand. A little further up the hill are nodules of basalt in a reddish-brown porous hungry soil which is probably of basaltic origin. A plateau over the rise is thickly covered with bracken and probably a capping of dunal sand. Fragments of Mathinna and basalt were scattered on the surface near the above-quoted basalt soil.
- C 28 B3 This point is about 200m east of the bitumen road on Currie's Creek. Mechanical widening of the creek had just been carried out. All of the shallow exposure over a length of 100m or more was a brown silty clay underlain by mottled brown and grey clay. Further afield up and down stream there is no natural gravel - widths being about 3m and depth 0.5m. Heavy vegetation and fallen trees. Floodplain width 30m.

C 29 C4

Creek is 3m wide incised 1m and runs in a curve at this point. Dry. Exposure is lbssc overlain by what appears to be say 0.3m of dunal sand. No gravel. Heavily overgrown with tea-trees and a few eucalypts. Rise on far side of creek exhibits the only gullying (natural degradation of slope) seen at Lefroy. This is finegrained brown sand - perhaps dunal in origin.

APPENDIX II

ROCK EXPOSURES AND SITE INSPECTIONS

029

<u>Location</u> <u>Point</u>	<u>Grid</u> <u>Position</u>	<u>Remarks</u>
R 1	J 5	Traverses were made over the hills hosting the Londonderry/O'Farland group of mines shown on the map. The area comprises several steep hills giving rise to short steep gullies. Basement is close to surface and sometimes exposed, otherwise generally covered by a mantle of soil and in places a layer of white angular quartz fragments. Much of the cover is lbssc carrying varying percentages of angular quartz gravel. There are a number of trenches and shallow pits but none of the development would appear to have given rise to significant mining. Two trenches showed substantial reef quartz, mixed with basement, the quartz being iron-stained and containing a trace of pyrite.
R 2	H 3	A traverse was made along the ridgetop road. Basement appears to be close to surface, or exposed, cover being sand and sometimes thin angular quartz gravel with lbssc beneath. Only one shaft was traced, dimensions 3m x 1.3m and original depth unknown. Some logging had recently been completed and the land ripped, exhuming quantities of brown well-cleaved Mathinna basement.
R 3	G 1	Good exposures of Mathinna beds above the Curries River Dam.
R 4	G 1	Sand extracted over 0.5m depth exposes fine-grained sand heavily iron-infiltrated. Cause not clear.
R 5	G 1	Traverse to examine headwaters of Curries River and the extensive flats. Aborted due to very dense vegetation - prickly shrubs, spear-grass and fallen timber. Height 3m.
R 6	I 5	Examination of 200m of road cutting, height at centre 10m. Both sides of Bridport road. Adjacent to West Volunteer. Faulting with thin veins of quartz introduced and rhomboidal-pattern quartz veinlets in the less-disturbed Mathinna away from the faults. Two quartz samples and two photographs taken.
R 7	I 5	Cutting in north side shoulder of hill. Traces of quartz but Mathinna much less disturbed.
R 8	I 6	Cutting north side of road and some on south side. Occasional quartz stringer exposure but Mathinna not much disturbed.
R 9	I 6	Cutting south side of road over 150m. Very occasional small veinlets of quartz but Mathinna hardly disturbed. Basement rock strike 120° dip 50° - 60° SW. Shows slate and sandstone alternations without gradation. Photograph taken.
R10	I 6	Marked on map as 'gravel reserve'. Low knoll trending 320° which had been covered with white angular quartz gravel but now showing Mathinna with removal of road fill. On NW side are a number of lines of white quartz stringers, also trending 320°, suggesting the surface expressions of lodes. However, they are unlikely to be auriferous at that strike.
R11	H11	Marked on map as 'gravel reserve'. Close to the road are depressions and hummocks, with clay, gravel and basement intermixed much as the landscape after a gold-rush! Reason unknown. In a southerly direction there is a 180m face where shallow extraction of gravel has taken place. This somewhat worn gravel is layered with clay and would have required selective extraction if used as gravelling for roads. Bottom of extraction, ranging to say 1.5m, has been taken at a soft silty clay horizon. Left on this bottom are a number of large (1 x 0.5m) boulders of silicified conglomerate containing waterworn gravel and pebbles, and one large basalt boulder.
R12	F11	In an area cleared by logging is mixed sand and Mathinna rubble. Nearby is some 'sinter' material which appears to be a basaltic scoria which has picked up sand whilst still 'tacky' to give an odd composite, or perhaps gravelly basaltic scoria has become mixed with sand and then iron-cemented.
R 13	E11	Here an area of gravel has been cleared, presumably for road surfacing, leaving exposed lbssc and some basement.
R14	B3	This area is marked on the map as a gravel reserve. This is pasture land with some copses of thick bracken and eucalypts. Close to the main Beechford road there is a scattering of gravel on surface with large slabs of Mathinna and large pieces of cemented conglomerate. 500m from the road over an area of 150m x 100m is a surface scattering of cemented conglomerate - mainly angular to subrounded quartz gravel and pebbles in a siliceous matrix, attributed to the Tertiary and presumably a remnant underlying a small area. Soil over most of the paddocks is lbssc under the humic layer. A gully draining the area is about 1.5m wide incised to 0.5m; this shows lbssc with occasional gravel (angular) and sand within the incised section.
R15	I4	Crest of Big Hill Road. Faulted sheared slate bounded by sandstone, with quartz veins on walls and within the shear. This probably well-represents the descriptions of auriferous lode occurrences given by Montgomery (the 'formations') Two photographs, one sample.

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- R16 C11 Examination of lower section of White Lead SE of 23M/83. For a length of about 150m or so the lead has been worked by sluicing over widths ranging 15m-25m. Very little virgin wash material left. Residual quartz ranges up to 0.3m size. Most is angular but some is fully rounded. Large quartz cobbles and boulders present 80m-100m SE of start point on road, which includes silicified conglomerate. Bottom exposure is Mathinna beds. SE of sluiced ground are some old pits. Old pits are also present at either side off the lead. There are also several Epoch pits, eg. BE4A, BE3A, BE1, BE6A. This latter obtained wash material 4m NE of the wall of the sluiced lead, say 90m from the traverse origin point at the road. There are also 1.5m wide pits in the same vicinity, possibly dug by Crawford's Gradall excavator. Close to the road at the origin point is Epoch pit BD3. No evidence of basalt was detected at the SE end of the workings, which consist of pits which were inaccessible. Thick vegetation prevented detailed examination and visibility was very poor. Presumably the pits exploited wash above basalt at that location, i.e. at the boundary of the lease.
- It has to be concluded that this lower section of the White Lead has been worked out and no useful length of sub-basalt lead is present within the existing lease.
- R17 B11 Examination of upper section of White Lead NW of 23M/83 over a trend length of 350m. This ground appears to have been worked by pitting rather than sluicing, presumably because it could not be commanded by a race water supply from Bill Tom's Gully. Pits are of the order of 3m deep and most have not been belled out at the bottom to extract wash-dirt. (Grades too low?) In places the pits are close together, elsewhere quite sparse. Little remaining surface heaps of dirt but heavy vegetation obscures the overall picture. Width of lead appears to vary 10m - 25m. Corner-post with Allchin's lease stumbled upon at an estimated 350m from traverse start point.
- The reconnaissance suggests that the upper section of White lead has not been worked out, in the sense of total extraction of wash-dirt. Not much washdirt was evident in any of the pits, the exposure in which was mainly silty sandy and in parts, gravelly material normally associated with overlying waste. It may be that the wash was not payable in terms of gold price and working costs of the day.
- R18 C11 Examination of Red Lead south east of the road. This was traversed for about 300m, most of which is very heavily vegetated. Exploitation appears to have been mainly by pitting. Width of lead seems to be about 50m. Some parts are closely pitted and other parts have wide-spaced pits. Depths uncertain but probably 2.5-3m. Belling out of bottoms of pits is not common - ?low grade? At the end of the lead there is some old sluicing which terminates in Mathinna exposed basement level falling abruptly over a short distance, as mentioned in contemporary reports. No basalt in evidence, however.
- Several Epoch and other pits of recent times. The spoil from these shows brownish silty clay and quartz in the range 0.5-5.0 cm at pit bottom.
- A little E of the terminal workings is the Deep Lead Shaft 3.5m x 1.5m, water to top with pumprod still protruding. Rock waste dump adjacent 25m long, 4.5m high pyramid section, almost totally black slate - some coal-black. Very little quartz present - all angular buck quartz with no sulphide. No basalt on dump. Nearby is a depression from mining - race nearby would indicate sluicing. Exposed Mathinna - steep gradient of exposed basement.
- It seems that not all of the potential wash here was removed by the pitting - possibly too low a grade for the period mining was active in the district.
- R19 C10 Reconnaissance of a recent opencut working on a lead SW of the Cardigan Lead. May be on a mining claim held by V. Pearce. 30m length of face carrying wash exposed at base. Trend of face 140° mag. and trend of lead, if it is a lead, 45° mag. Basement not exposed due to dirt falls but approximate section exposed is, 0.9m of well-compacted sub-rounded quartz 3mm-75mm with very little clay or sand included, 0.15m of finer gravel (say, headings), 0.4m white clay horizontal layer, 2.4m of silty, grey/mottled red clay to surface, neglecting thin humic layer. One small pan washed yielded 5 very small colours (? 0.005gm).
- The area had been dug and back-cast by back-hoe, ie excavator over an area of up to 100m x 50m, but tailings from treatment indicates not much dirt was actually treated, or that gravel oversize from screening has been removed from site.
- R20 C10 This is the Blackman's lead, which is not within Tihele's zone of interest. About 650m was traversed up the lead to the point where a short easterly branch joins in with the Red Lead. Width ranges 15-40m wide and it has all been sluiced out and/or repeatedly worked. The overburden showing on the walls is mainly lbssc. At the top end some of the overburden is a brown silty sandy formation carrying some small gravel which is sub-angular. For a short distance beyond the end of the sluiced section of lead are some close-spaced old miners' pits.
- Lady Emily and Hidden Treasure shafts were picked up. Neither is impressive. Gray shale waste rock and a few pieces of dead white laminated quartz, with some vughs containing quartz crystals. No sulphides.
- R21 C11 Examination of section of Red Lead NNW of track. This is not within Tihele's zone of interest. This area has been worked by pitting and again it would appear that not much wash was extracted. Pitting density varies from intense to sparse, but very thick vegetation obscures the overall picture. Examination abandoned after traversing about 350-400m. Ground controlled by Crawford.

- R22 I 6 Examination of the Epoch trial alluvial mining area. Workings are in a shallow valley and consist of a number of small pits from which wash was extracted and the holes used for water reticulation. Now water-filled and thus no exposure. A stockpile of about 500 c.m. standing 4m high remains. Wash consists of silt and clay with some sand and gravel and cobbles. Probably 50% is under sand size. Gravels is white, slightly rounded at the corners and devoid of sulphides except for occasional iron-staining. Of four small pans cleaned up, one produced a single small colour, and another produced two very tiny colours. The clay content is such that puddling is difficult. Scrubber /trommel treatment would be required in testing and commercial exploitation of this type of washdirt. Site would form a suitable central test-treatment location on account of pondages available. Four panoramic photographs taken.
- R23 I 4 Exposure both sides of road over distance of 150m. South side gravelly material on surface, then lbssc to mathinna basement at total cover depth of 2.5m. North side similar except more gravel and depth to basement less i.e. basement horizon falls to the S.
- R24 I 4 Road exposure south side only. Length 100m. Cutting rises from 1m at end to 5m height at centre. At 30m from western end of section there is faulting/shearing. Weathered grey slate, chewed up and contorted carries quartz stringers to 3cm following foliations and major fracture planes. Photograph taken. (in road gutter some tramp pieces of silica-cemented conglomerate - the quartz pebbles being somewhat rounded.)
Other than the above-quoted faulting the rest of the section exhibited reasonably undisturbed basement rocks.
- R25 I 4 Exposure in road cutting over length of about 170m. Cutting height range mostly 3m -4m. Several exposures of shearing disturbance and veinlet infiltration parallel to fracture planes. Quartz stringers never more than 4cm wide - often only 3mm. Most of section is undisturbed.
- R26 I 5 Examination of the Volunteer line. Old winding engine foundations of the Volunteer still intact but shaft position lost under recent earthmoving/tree-felling activity. Examined battery sand and slimes adjacent, some of which is thought to have been taken to Cuprite plant for leaching. Several traverses made over the lower slopes of the hill on which the line of mines is situated. There are several old shafts, all of which appear to have been minor workings. Fair amount of trenching and pitting from the early days. The waste dumps from the Volunteer/West Volunteer carry grey slate and sandstone i.e. competent rock. No sulphides noted. That seen on surface was not derived from the oft-quoted 'formations' - i.e. the shear zones. There is very little quartz in the waste dumps and it has the appearance of being non-auriferous. Would have come from 380m depth in barren ground. There is battery sand tailings in a steep-sided creek of quite high gradient still surviving! A very small seepage from this presently dry creek is producing a stain of ferric hydroxide (orange) - presumably the sulphides leaching out.
- R27 G 4 Examination of the Native Youth mine area. Three principal waste dumps, each about 16m long, 12m at the base and 4m high. Most of the rock on the dumps is grey or brownish Mathinna but very little quartz. Some pyrite and stibnite? in the quartz but very sparse. A trace of pyrite in some of the waste. Where waste has been lying around in wet conditions there is brown staining, presumably ex sulphides but hardly consistent with fresh waste on the pile. The latter would of course be from deeper levels where sulphides, or at least gold mineralisation, was poor. Most of the waste rock examined was flat-bedded, i.e. bedding planes flat and slaty. However a few examples of acute crenulation as in shearing were observed. Near the edge of the dam was what appeared to be a small working of alluvials. Three samples taken.
- R28 G 4 Examination of Sludge Creek. A number of traverses were made over the area both in the creek and on the eastern side of the Clarence line, where the embayment of basalt was penetrated to wash in several of the mines. The creek generally has a width of 30m or so. Southern part of creek carries heavy vegetation. A number of the Epoch pits were picked up. In some basalt with light brown sandy wash material; others merely fine white quartz which is not waterworn. In the vicinity of the embayment there are signs of old alluvial working (not extensive) and mine dumps - also not large. In places there is grey sandy silty material at surface and underneath rotted brown crumbly material consistent with rotted basalt. In the adjacent creek are boulders of competent basalt - waterworn. The Epoch pits appear to have been sited off the centreline of the creek in most instances - presumably due to difficulty of access within the creek bed.
- R29 F 4 Examination of Chum Creek. This also is heavily vegetated. Inspected a number of Epoch pit sites - all much the same as on the Sludge Creek as far as material at grass is concerned. Traversed along the Chum line of reef. Waste rock seen appears not to have been greatly disturbed by 'formations' except that closest to the main Beechford road (?New Chum) where removal exposes a section showing 'runs' of rotted waste at the angle of repose which probably reflects dumping of sheared material and fault gouge. It was noted that this carried very fine white acicular crystals which has 'grown' in recent times - ?magnesium sulphate. Within the dumps quartz is spare and mainly white buck quartz but some is, in Thureau's terminology, "more kindly", carrying a little stibnite and pyrite - possibly also arsenopyrite.
- R30 F 4/5 Examination of northerly portion of Field, including tailings areas opened out by Cuprite and the Deep Lead Shaft. Deep lead shaft could not be located
E 5 but slate waste from sinking run out on a shallow dump was found. No basalt found at site. Very little quartz in evidence and none of it appears carry mineralisation of interest.

Cuprite have discovered and cleared of thick vegetation two extensive areas of battery sands not far from the confluence of Chum and Blanket Creeks, the second not very far from the Deep Lead Shaft. Was ore brought here for milling from mines to the south which lacked water. On the main access track 0.9km from the Beechford Road turnoff is an area of exposed rotted basalt.

A number of Epoch pit sites examined. These include pits in the low terrace easterly of the creek where there are also signs of alluvial working in the past. The gravel is angular and sometimes has the corners knocked off ; it is larger and forms more of the section than generally seen in the district. Sandy ?windblown sand, on surface skin. Basement material, where seen in pit spoil at grass, is generally Mathinna but in places rotted basalt has been recovered.

APPENDIX III

LIST OF SAMPLES TAKEN

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<u>Designation</u>	<u>Location</u>	<u>Grid</u>	<u>Description</u>
20/1/1/A	R29	F 4	Battery slimes from Chum line
20/1/1/B	R29	F 4	Battery sands from Chum line.
EP 4	R30	F 5	Battery sands vicinity of Deep Lead Shaft.
EP 5	R30	F 4	Battery sands from large dump south of confluence Chum and Blanket Creeks.
18/4/1/A	R26	I 5	Battery sands from the Volunteer line west of the entry track and dam.
18/4/1/B	R26	I 5	Battery slimes from the Volunteer line west of the entry track and dam.
18/4/1/C	R26	I 5	Samples of quartz from waste dumps on the Volunteer line.
18/4/1/D	R29	F 4	Samples of waste and quartz from East Chum.
18/4/1/E	R29	F 4	Samples of mineralised quartz from the Chum line dumps.
EP 1	R30	F 5	Cleaved slate Deep Lead Shaft.
EP 2	R30	F 5	Cleaved sandstone Deep Lead Shaft
EP 3	R30	F 5	Quartz on waste dump Deep Lead Shaft.
11/5/1/A	R 6	I 5	Quartz from thin discontinuous stringers associated with disturbed Mathinna slate bed.
11/5/1/B	R 6	I 5	Quartz from thin stringers associated with rhomboidal fracture pattern in Mathinna beds close to above disturbed Mathinna.
13/3/1	R14	B 3	Silica-cemented conglomerate attributed to Tertiary.
19/1/1/A		I 2	Sample of lbssc taken 1m below surface side of road junction of Bridport and Dalrymple roads as a reference background geochemical sample.
19/2/1/A		I 3	Sample of lbssc taken 1m below surface side of road junction of Bridport and Lefroy roads as a reference background geochemical sample.
19/3/1/A	R15	I 4	Reference geochemical sample take 0.3m east of shear zone with quartz stringer. Shear in slate, sample taken in sandstone alongside shear,
19/4/1/C	R27	G 4	Example of warped country rock from Native Youth Mine
17/2/1/A		B10	Quartz from waste dump at Lady Emily mine, Back Creek.
14/1/1/A	R15	I 4	Quartz from the shear at the crest of Big Hill Road, adjacent to 19/3/1/A.
19/5/1/A	R30	F 4	Basalt from Epoch pit H 68 - east of Chum Line
19/4/1/B	R27	G 4	Slate from Native Youth dump. Some pyrite sockets present on one face.
16/1/1/A	R18	C11	Quartz from dump of Deep Lead Shaft. Back Creek.
12/3/1/A	C14	D 6	Upper portion of Epoch pit A01 or A02.
12/3/1/B	C14	D 6	Lower portion of Epoch pit A01 or A02.
17/1/1/A	R19	C10	Concentrate from washing one pan (small) of wash at base of mined face. 5 very small colours present.
17/3/1/C	R22	I 7	One very small colour from cleanup of one pan of dirt from stockpile.

Several other samples were taken at site but discarded on account of weight and bulk of total samples.

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APPENDIX IV

APPENDIX IVParticulars of Photographs

<u>No</u>	<u>Location</u>	<u>Remarks</u>
1	R 6 I 5	In wall of road cutting in vicinity of Land o' Cakes and Volunteer mines. Contorted siltstone with introduced quartz veinlets, one veinlet on the undisturbed sandstone wall. Very similar to descriptions of 'formations' in the mines but this one is dipping west.
2	R 6 I 5	Taken 20 m from the above photograph. Undisturbed Mathinna beds with quartz filling induced fracture planes in a rhomboidal pattern.
3	R 6 I 5	Taken in the same road cutting vicinity. The hammer lies on a narrow fault plane containing sheared slate and quartz veinlets.
4	R 9 I 6	Road cutting showing undisturbed Mathinna. Alternating slates and fine sandstones without grading. Note distinct cutoff between beds.
5	C14 D 6	At Moonlight Flat. Epoch pit and debris pile. This pit produced a minor gold value - one of only two pits to do so in work conducted in the EL!
6	R15 I 4	Crest of Big Hill Road, road cutting facing east. Hammer lies on 1m wide fault shear. Note traced other side of road in cutting.
7	R15 I 4	Same location - other side of road. Mathinna reasonably undisturbed, with minor quartz veinlets filling random fracture planes.
8	R19 C10	At Back Creek just southwest of the Cardigan Lead. Recent working - gravel exposed in pit over 30m length. Obtained five very small colours from one small pan. Gravel is well-consolidated and carries little sand and clay.
9	R19 C10	As above.
10	R20 C10	Shot looking NW up worked-out section of Blackman's Lead about 300m from its SE end.
11	R21 C11	Somewhere on Red Lead about 50m north of the road! Heavily pitted underfoot but vegetation too thick to get a sight of them...
12 A,B, C,D.	R22 I 6	Epoch trial mining area. Facing roughly north. Panoramic view from west to east in four shots.
13	R24 I 4	Cutting on Bridport Road, south side only. Sheared slate with introduced quartz veinlets.
14	R29 F 4	Waste dump on Chum line adjacent to the main Beechford Road. Partial removal has exposed section. Brown 'runs' are not a reflection of iron leached from sulphides but soft rubbly country rock likely to have been mined from 'formations'.



PLATE 1

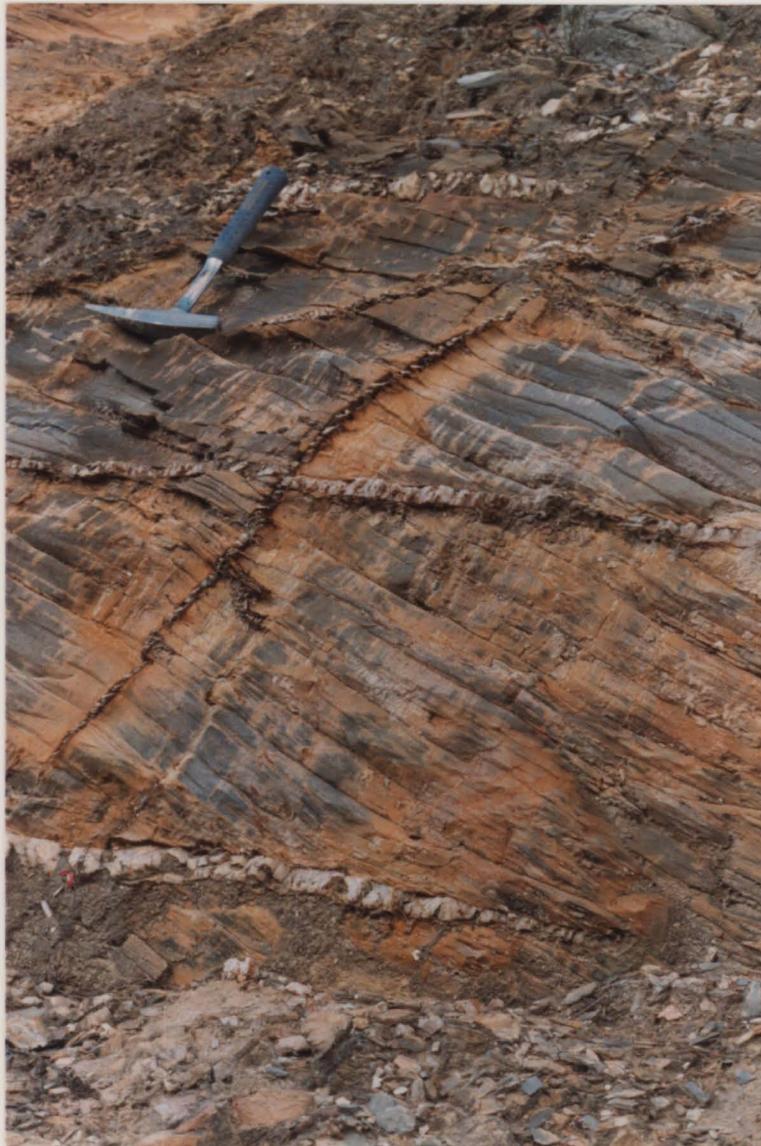


PLATE 2

PLATE 3



PLATE 4



PLATE 5



PLATE 6



PLATE 7



PLATE 8



PLATE 9



PLATE 10

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PLATE 11



PLATE 12A



PLATE 12B



PLATE 12C



PLATE 12D



PLATE 13



PLATE 14

map missing

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