DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 87/130

TARCOOLA GOLDFIELD

GEOLOGICAL SURVEY

by

S.J. DALY
REGIONAL GEOLOGY

C.M. HORN

W.P. FRADD
MINERAL RESOURCES

APRIL, 1988

DME.143/85

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REPT.BK.NO. 87/130
D.M.E. NO. 143/85
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ABSTRACT

Between 1901 and 1986 2.387 tonnes of gold was produced from the Tarcoola Goldfield. The bulk of production occurred prior to 1918 however potential for open cut mining of the Tarcoola Blocks Mine and nearby granite is currently being investigated.

Gold occurs in both subvertical quartz reefs which cross cut folded Mid Proterozoic Tarcoola Formation sediments and in altered younger granite.

INTRODUCTION

Tarcoola Goldfield is 600 km north-west of Adelaide and 2 km east of the intersection of the Transcontinental and Tarcoola-Alice Springs Railways. Total recorded gold production as at December 1986 is 2.387 tonnes from 63 703 tonnes of ore (37.47 g/t bullion). Potential for open cut mining is at present being investigated by Tarcoola Gold Ltd around the Blocks mine and by Afmeco-Aberfoyle-BHP Gold Ltd joint venture in the surrounding area.

HISTORY AND PREVIOUS INVESTIGATIONS

Alluvial gold was found at Brown's Hill and the east end of Tarcoola Hill in 1893 (Brown, 1908), and led to the discovery, in April 1900 by Ward and Fabian of rich gold-bearing vein quartz, later named Fabian's Reef. Ward and McKechnie Reefs were found soon afterwards, and the Tarcoola Blocks Company was

established. The company leased ten, 20 acre (8.09 ha) blocks which surrounded these reefs. Soon other companies were formed, reefs found and further leases taken up.

Gold production commenced in May 1901. In 1904 at the peak of the gold rush 170 men were employed at the Tarcoola Blocks Mine which by March 1912 had produced 1.39 tonnes of gold from 35 230 tonnes of ore (39.47 g/t bullion). The Tarcoola Blocks Mine, however, had ceased operations and surrendered all leases by June 1918.

Tarcoola Blocks mine workings, on closure, consisted of a 152.4m underlie shaft and a three compartment, 3.66 x 1.22 m vertical shaft timbered to 106.7m with a sump to 111.25m. Extensive work on three levels at 33 ~~32.92~~m, 76.2m and 91.44m and between these levels had been done. Three reefs, Fabian, McKechnie and Western Branch, had been worked to No 3 level, Ward's reef to No 2 level, Sullivan, Dedman and Imperial reefs to No 1 level. Elsewhere on the field, workings were developed between the surface and , about the static water level at approximately 30m depth.

Subsequent activity throughout the goldfield was limited and sporadic. H. Quick and J.L. Nielson leased the Tarcoola Blocks Mine in 1934 and produced gold from Fabians Reef between the 33 ~~32.92~~m level and surface. In November 1947 Standard Mining optioned the mine, dewatered it to No 2 level and retimbered the main shaft. Before ceasing operations in 1952, Standard Mining produced 227.4 kgs Au from 4 482 tonnes of ore, and an additional 12.44 kg of specimen gold sent direct to the Perth Mint. Underground mapping was carried out by the South Australian Department of Mines, (Ridgway and Johns, 1949; Ridgway, 1951).

In 1970 Inland Mining leased the Tarcoola Blocks Mine and the surrounding ground was acquired in 1972. An estimated 200 tonnes of ore was produced. Emperor Mines Ltd (Fiji) signed an option agreement with Inland Mining in September 1973. Workings were dewatered to No 3 level and the main shaft cleaned out,

repaired and a manway installed. Extensive sampling on all levels revealed significant gold values in old workings (Martins, 1974) and drilling was recommended. In 1974 Emperor terminated the option because of the unfavourable political situation and general economic conditions at the time.

Recently small scale mining from Imperial and Sullivan's reefs has produced 7.217 kg of gold from 341 tonnes of ore (21.29 g/t bullion). In April 1986, Insight Mining Ltd (now Tarcoola Gold Ltd) signed a three year option agreement with the current lessees P. and P.B. Philip-Harbutt. The first phase of exploration drilling began in March 1987.

GEOLOGY

Tarcoola Goldfield occurs in the central Gawler Craton (Parker, this volume) within a sequence of folded Middle Proterozoic sediments, c. 1600 Ma in age overlying Archaean basement. Tarcoola Formation (type section 1 km east of Tarcoola Blocks Mine) has been divided into three members. Basal Peela Conglomerate Member is a pink arkosic grit with locally abundant banded iron formation fragments. The likely fluvial grit contains copper carbonates possibly derived from distal volcanics. Fabian Quartzite Member contains thin, laminated carbonates overlain by thin-to very thick-bedded (<2m) well-sorted quartzite and carbonaceous pyritic micaceous quartzite and siltstone referred to historically as "slates". These sediments were probably deposited in a shallow-marine shelf environment. The overlying, likely marine, Sullivan Shale Member consists predominantly of thin-bedded, carbonaceous and pyritic quartzites, and carbonaceous siltstone. East of the mine interbedded altered thin dacitic and andesitic tuffs contain anomalous Cu (495 ppm), and Zn (240 ppm), and detectable Au (<0.1 - 0.05 ppm), (Daly, 1984).

Tarcoola Formation is folded along east-west trending axes reflecting movement along Archaean basement structures (Daly, 1985). The goldfield is situated on the moderately-dipping southern limb of an easterly trending anticline. Hiltaba Suite

granite c.1580 Ma has intruded the folded sediments along a strike length of 11 kms, with a contact which crudely parallels strike of the sediments (Fig. 1). Large subvertical to vertical gold-bearing quartz reefs cross cut the sediments and were emplaced following development of tension fractures, generally perpendicular to strike, by the upwardly stoping granite. The granite is locally very chloritic, may contain abundant sulphides and has been mined for gold.

Curdnatta Mine (Fig. 1) was the largest producer of gold from within the granite with recorded production of 1 807 tonnes for 53 394 gms (29.55 g/t Au). White Hope Mine, 700 m northwest of the Blocks mine, yielded 31 692 gms from 888.2 tonnes treated (35.69 g/t Au bullion). Government mine adjacent to Curdnatta produced 862 tonnes for 34 653.5 gms Au bullion (40.6 g/t). Channel sampling along costeans excavated by BHP Gold Ltd in weathered granite and along poorly exposed contacts between sediments and granite gave 7.0 m @ 4.2 g/t Au and 36 m @ 1.5 g/t Au. (BHP Gold Ltd., 1987). Approximately 7 km^2 of granite is exposed in the mine area.

Hiltaba Granite, Tarcoola Formation and quartz reefs are intruded by dacitic and andesitic dykes which contain detectable gold. Old stockpiles of dyke material suggest some gold was produced from these rocks.

TABLE 1

Analyses of andesite dykes collected from dump material mined from:

	Au	Cu	Pb	Zn	Ag	Sn	Cr	Ba
Fabian's Reef (RS612)	0.01	210	410	1740	1	<4	280	750
Fabian's Reef (RS613)	0.01	270	130	780	1	<4	230	760
Imperial Reef (RS614)	4.2	240	170	1880	4	6	270	870
Sullivans Reef (RS615)	0.08	200	150	460	<1	<4	230	1390
Sullivans Reef (RS616)	0.05	220	70	4090	1	6	210	790

Analyses in ppm

Gawler Range Volcanics, Hiltaba Suite and the late stage volcanic dykes are all considered comagmatic. Anomalous base metals occur within the Tarcoola Formation where it contains interbedded volcanics. No volcanics have been recognized in the mine sequence however they are known to occur elsehwere in the Tarcoola Formation.

MINERALIZATION

Gold bearing quartz reefs are up to 2 metres wide, 250-300 m long, with a vertical extent of at least 100m and contain abundant crushed xenoliths of quartzite and carbonaceous siltstone. Reefs have been described as narrower within thick-bedded quartzites and broader within thin-bedded carbonaceous siltstone and quartzites. A great deal of stoping has been done within the carbonaceous siltstones. Records suggest rich gold values have been obtained where quartz veins initially cross cut carbonaceous siltstones. Sampling by Emperor Mines (Martins, 1974) and recent drilling by Tarcoola Gold Ltd indicate gold haloes also occur around quartz veins cutting quartzite. Present-day workings indicate quartz veins of up to 20 cms commonly anastomose enclosing crushed material, suggestings reefs were probably quartz vein sets. Many small quartz veins which contain gold occur between the major reefs.

The ore contains not only gold but Ag, and locally abundant sulphides of Cu, Pb, Zn, and As. Reefs characteristically produce erratic gold values both laterally and vertically and contain both very fine grained and coarse gold.

TABLE 2
Analyses From Quartz Veins At Tarcoola

	Au	Cu	Pb	Zn	Ag	As	Co
A 1183/84	3.3	120	480	6 800	39	320	100
A 1184/84	6.8	1 600	9 700	3 700	16	80	10
A 1185/84	9 600	670	1.60%	720	6 500	180	6

	Ni	Cr	Cd	Mo	Mn	Fe	Bi
A 1183/84	200	10	3	4	510	26.9%	1
A 1184/84	56	60	48	2	370	2.2%	1
A 1185/84	10	10	4	4	46	2.2%	20

All values in ppm unless otherwise stated.

A 1183/84 Ferruginous quartz vein - Sullivans No. 2 lode
A 1184/84 Quartz vein - Wards reef
A 1185/84 Quartz vein - South end Sullivans No. 1 lode

STRUCTURE

The Tarcoola Formation in the goldfield area dips south at between 35 and 50 degrees and strikes aproximately east - west. Steeply-dipping gold-bearing reefs occupy fault fissures approximately normal to the bedding (Fig. 2).

Workings on the Fabian, Ward, Western Branch, McKechnie, Imperial and Sullivan's reefs from which the greater part of gold production has been won, are located between two strike faults, the "Main Slide" and the "Pug Seam Fault" (Fig. 2). The "Main Slide" fault is conformable with bedding with principal movement predominantly along strike but displacement of Fabian Reef indicates a reverse fault (Ridgway, 1951). Movement along the "Pug Seam Fault" however is uncertain. Gold-bearing quartz reefs are cut off by the "Pug Seam Fault" and their southern extensions cannot be accurately correlated. However, Lady Jane Reef is postulated by Ridgway and Johns (1949) as the possible extension of McKechnie Reef indicating a lateral movement of 21 metres, south side to the east.

Numerous smaller faults, parallel to the Main Slide Fault, are observed as breaks in Fabian Reef (Ridgway and Johns, 1949). Mafic dykes of the Gawler Range Volcanics have intruded the fault fissures which contain gold-bearing quartz veins and are also displaced by strike faulting.

PRODUCTION POTENTIAL

Although the greater part of gold production has come from the Tarcoola Blocks Mine (1.779 tonnes from 41 598 tonnes of ore -42.8 g/t) a further 610 kg has been produced from other mines on the field. Most reefs have only been worked to about the 30 m level. Gold-bearing quartz may extend to a depth of at least 150 m similar to the Tarcoola Blocks Mine.

Sampling by Emperor Mines Ltd in Tarcoola Blocks indicated considerable potential for high-grade ore between No 2 and No 3 levels. Significant ore tonnages also exist between No 1 & No 2 levels. Above No 1 level remnant ore and some undeveloped ore occurs. Low-grade gold values exist in wall rocks and in backfill in abandoned stopes. Some surface dump material contains gold values e.g. Parcel 1536 from Welcome Home treated at Peterborough State Battery in 1982 yielded 8.5 g/t from 18.3 tonnes. An additional extractable 29 000 g of gold exists in dumps at the Tarcoola Blocks Mine and 42 000 g of extractable gold is contained in dumps at the Tarcoola Government Battery (Fig. 1) (Horn and Fradd, 1985 a and b).

Currently exploratory drilling, nominally to 100m is testing gold mineralisation between reefs, the frequency of additional small reefs, the extent of gold haloes adjacent to reefs intersecting quartzite and gold values within unworked deeper parts of the Tarcoola Blocks Mine (ie below level 3). Potential exists for low-grade ore between the major reefs and the discovery of less continuous, narrow, but rich quartz veins. Further surface exploration will include reefs external to the Tarcoola Blocks Mine. Drilling and costeaning are also planned in the granite and along the granite contacts.

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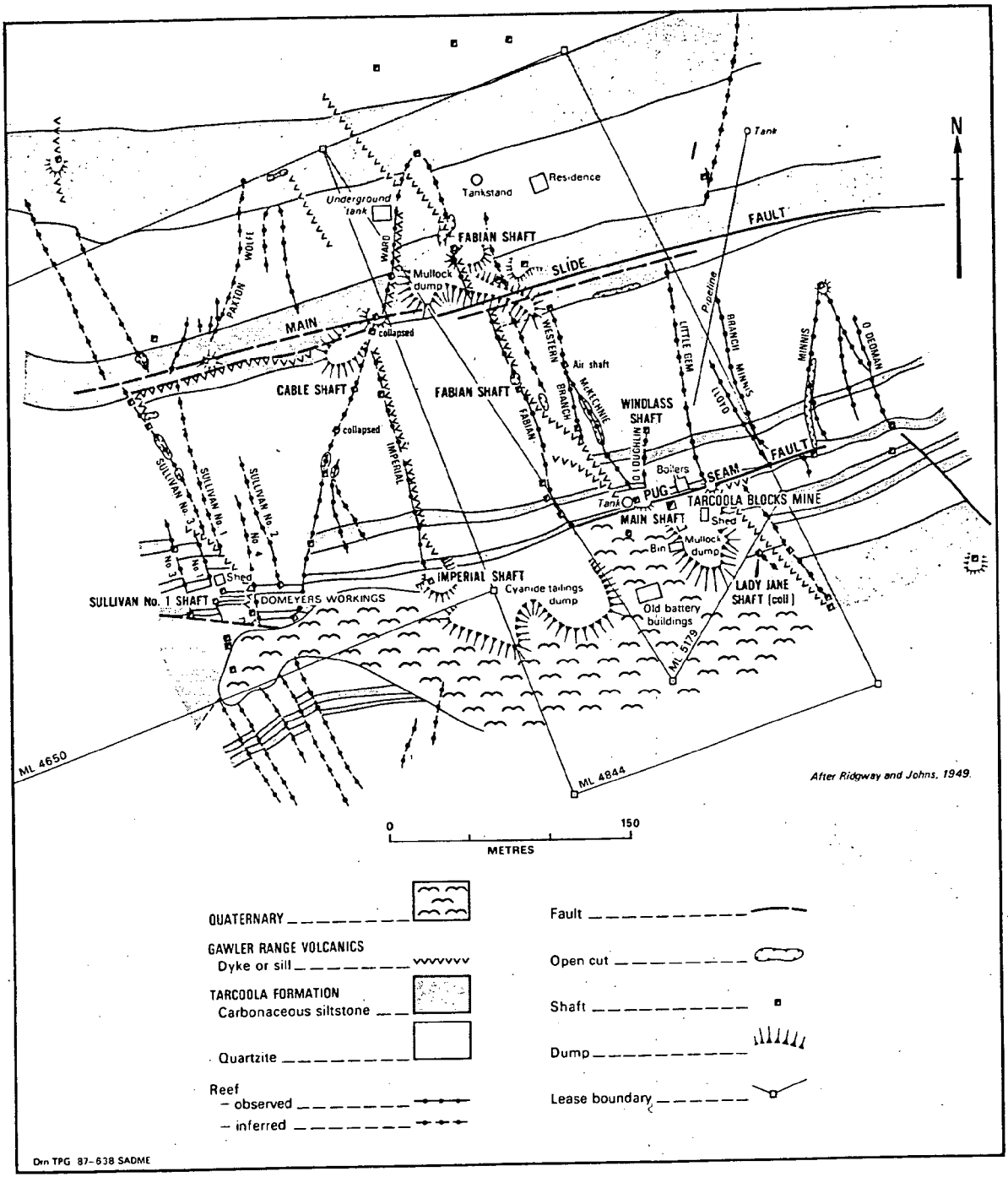
APPENDIX 1

Production figures for the Tarcoola Goldfield

MINE NAME	ORE (TONNES)	BULLION (GRAMS)	YIELD (G/T)
ALL NATIONS	4.06	28.71	7.07
ASSOCIATED	1 047.90	12 599.68	12.02
BLUE DUCK	106.68	3 369.02	31.58
BOHUN	95.25	866.30	9.10
CARTER, T.	7.11	250.62	35.25
COORABIN	6.76	194.10	28.71
CURDNATTA	1 807.12	53 393.58	29.55
DARK HILL	31.60	265.48	8.42
DAY DAWN (DAY DAWN UNITED)	1 042.67	48 877.77	46.88
ECLIPSE Tarcoola Enl.	84.68	1 632.86	19.28
ENTERPRISE (HISGROVES, LEASE 1021,781)	69.85	2 528.45	36.20
EVENING STAR	11.41	444.78	38.98
EXCELSIOR (1071, 1087)	10.16	23.72	2.33
FEDERAL (G.S. 808, G.L. 1126)	68.63	766.36	11.17
GARWOOD, F.	7.11	220.54	31.02
THE GEM	73.76	3 689.50	50.02
GOLD PURCHASES TARCOOLA BATTERY	-	2 340.64	-
GOLDEN HOPE	74.07	3 467.34	46.81
GOLDEN VICTORY	104.65	749.84	7.17
GOVERNMENT MINE	862.48	34 653.47	40.65
HARRY JOHN	104.65	1 086.39	10.38
HIDDEN TREASURE	89.15	1 826.25	20.49
KIRK, R.W.	14.66	458.85	31.30
LADY JANE	116.99	6 691.25	57.20
LAST RESOURCE	382.78	5 957.94	15.56
LEASE 1027	12.40	270.25	21.79
LONE HAND	858.32	21 945.95	25.57
MALCOM'S	9.40	312.90	33.29
MAY DAY	62.43	1 234.43	19.78
MISCELLANEOUS	4.67	83.47	17.87
MORNING STAR	816.91	26 038.37	31.87
NEW CHUM (GALLIPOLI)	468.07	9 190.15	19.63
NEAR ROYAL GEORGE	6.10	175.37	28.75
PROPRIETARY	6.10	106.29	17.42
PUTLAND, C.A.	6.10	48.61	7.97
ROBBINS, L.	9.14	101.17	11.07
ROYAL GEORGE	1 868.27	22 649.71	12.12
RUTLEDGE, DR. C.J.	7.11	116.01	16.32
SHAMROCK	145.08	3 959.56	27.29
SILVER LEAD MINE	5.33	29.62	5.56
SOUTHERN CROSS	45.72	428.78	9.38
TARCOOLA BLOCKS (G.L. 1655, G.L. 1872 G.L. 1961, G.S. 762, G.S. 727, G.S. 728, DEDMANS, NINNES, MINNIS, McKECHNIES, FABIANS, IMPERIAL, SULLIVANS, SULLIVANS NO. 2, WARDS REEF)	41 598.50	1 779 502.69	42.78
TARCOOLA ENTERPRISE	1 249.68	23 696.18	18.96
TARCOOLA GEM	20.02	1 731.95	86.51

TARCOOLA LUCKY HIT	6.60	71.03	10.76
TARCOOLA PERSEVERANCE	5 036.31	169 968.76	33.75
TARCOOLA PROPRIETARY	9.65	114.71	11.89
TARCOOLA SOUTH	5.08	56.12	11.05
TARCOOLA UNITED	98.70	4 548.61	46.09
TARCOOLA WEST	74.42	2 502.98	33.63
THISTLEDOME	25.40	80.88	3.18
WALSH, J.J.	15.24	1 982.24	130.07
WARRIGAL	90.27	1 280.69	14.19
WARRIGAL EAST	49.28	1 127.87	22.89
WARRIGAL NORTH	139.95	5 060.86	36.16
WARRIGAL SOUTH	519.46	11 611.28	22.35
WATKINS, R.	10.16	128.78	12.67
WELCOME HOME	2 950.21	64 810.63	21.97
WESTERN EXPLORATION SYNDICATE	11.18	644.72	57.67
WHITE HOPE	888.24	31 692.42	35.68
WILGENA ASSOCIATED	138.07	7 392.94	53.54
WILGENA ENTERPRISE	12.40	270.25	21.79
WILGENA SYNDICATE	30.23	739.60	24.42
WONDERGRAPH	169.01	5 727.67	33.89
TOTALS	63 703.39	2 387 084.14	37.47



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Tarcoola Mine Blocks plan
AIMM Publication Fig 2

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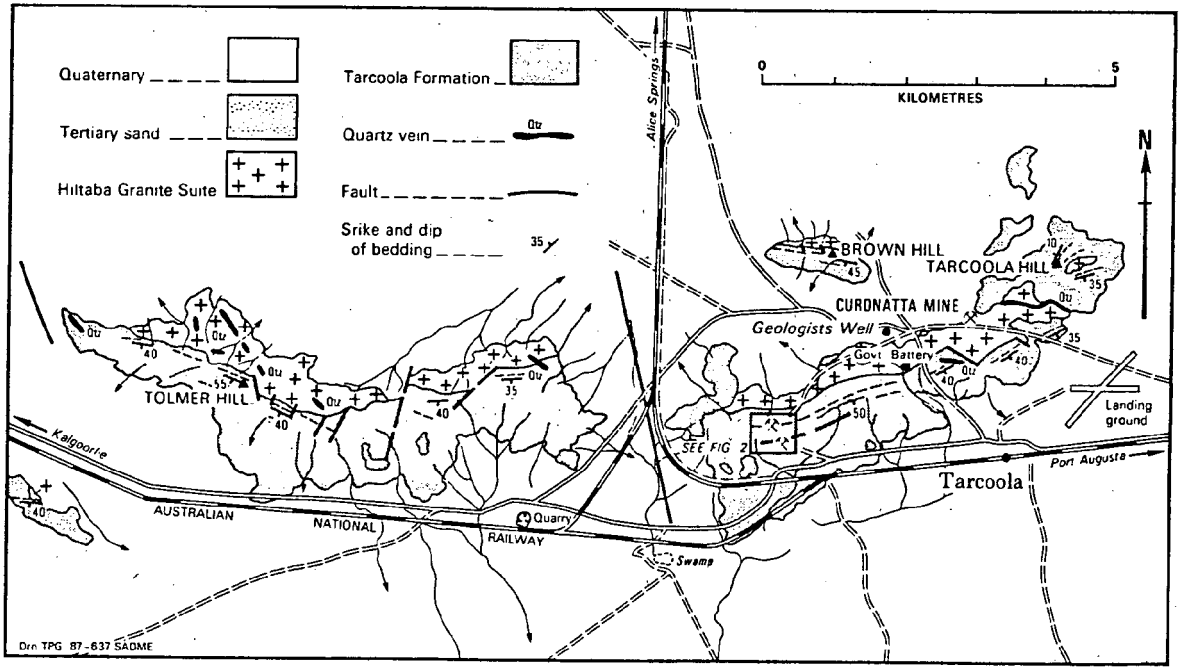

Tarcoola Goldfield regional geology plan
AMM Publication Fig 1

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