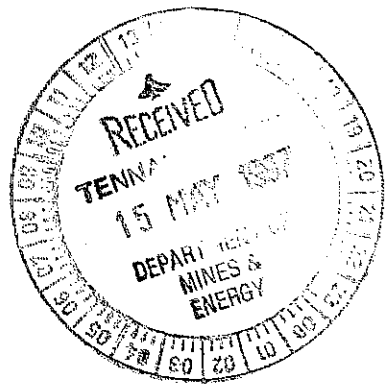


ENTERPRISE GOLD MINES N.L.

WHIPPET REPORT PROJECT 205

AUGUST, 1990

INTRODUCTION

A 12 month option was secured over 6 tenements (MCC945-949 inclusive and MCC917) from S. Titchener for [redacted] on 17 August 1989.

Enterprise Gold Mines may gain 100% of these tenements for a further [redacted] if the option to proceed beyond 12 months is exercised.

The properties are situated 42 kilometres from Tennant Creek on a magnetic bearing of 7° and completely surround the abandoned Whippet Mine site (MLC536). The mine operated between 1938 and 1951. Total production was 12 375 long tons. Average grade was 35 g/t from ore. A further 10.4 g/t were recovered from treatment of tailings.

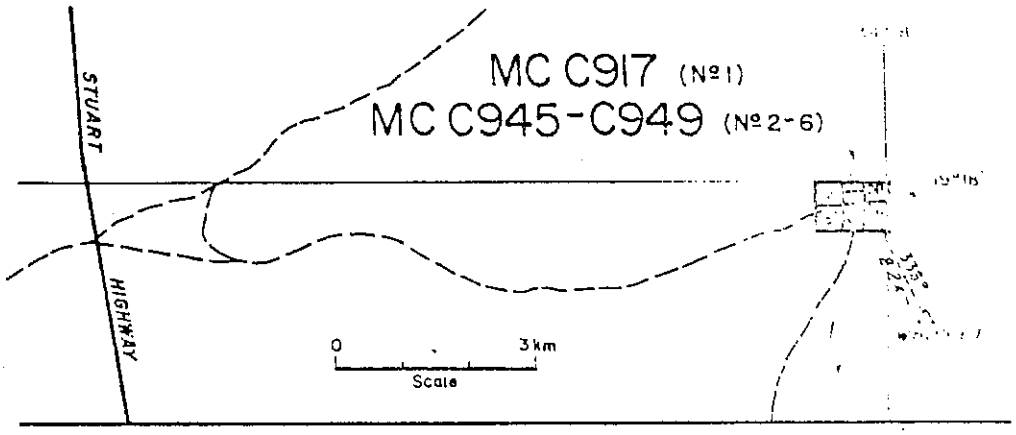
APPENDIX 1

Mining Act

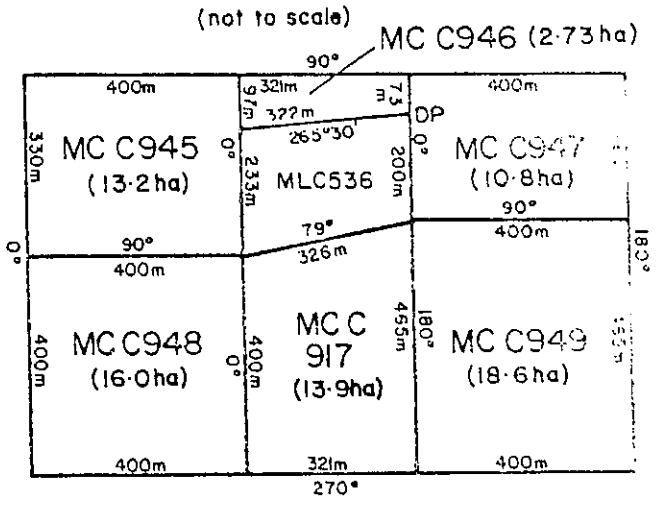
NOTIFICATION OF GRANT OF MINING TENEMENT/S

Registration Number/s:	C917, C945, C946, C947 C948 and C949	Date of Grant/s: Period for which	15 November 1988
Type of Tenement/s:	Mineral Claims	Title/s granted:	5 years
Name/s of Holder/s:	Simon Giles Titchener		

SKETCH MAP OF AREA GRANTED



ENLARGEMENT
(not to scale)



PREVIOUS WORK

Evidence exists that a 100 x 100m grid has been previously established over the tenements. What data were acquired is unknown since it is held in confidential and unpublished reports. Several shallow PVC cased RAB holes exist on the tenements. These were presumably drilled primarily on magnetic evidence since there is quite good correlation between field data collected by Enterprise Gold Mines and the location of these holes.

Evidence also exists that the tenements have been included in a regional grid established by the current exploration licence holder of the surrounding area (WMC).

GEOLOGY

Refer to Appendix 1.

ECONOMIC GEOLOGY

Refer to Appendix 1.

GEOCHEMISTRY

Surface soil geochemistry was deemed to be an unreliable exploration tool due to the transported nature of the cover. Shallow RAB drilling was therefore proposed.

RAB DRILLING RESULTS

A total of 150 metres of RAB drilling in 30 x 5 metre holes was carried out on 2 main zones of interest. Zone 1 is west of, and along strike from the abandoned Whippet workings. Zone 2 is south-east of the main workings. Both areas show quartz float with micaceous hematite. Zone 1 has an area of 10 000 m^2 and Zone 2, 25 600 m^2, i.e. 200 x 50 metres and 320 x 80 metres respectively. The area south of the mine site was not tested due to:-

(a) no favourable surface geological evidence

(b) no magnetic disturbance

(c) suspected down-slope contamination from the tailings treatment area.

GEOPHYSICS

Ground magnetics were run on a 100 x 10 metre grid over the tenements. Several areas were selected for infill ground magnetics at 50 x 10 metre grid spacing. A total of 19.19 line kilometres of data were collected.

A subsequently detected intermittent instrument fault makes this data set suspect. The RAB drilling program was therefore primarily designed on surface geological evidence (mineralised float).

The magnetic data are erratic and do not define any large features. The regional aeromagnetics do, however, show a regional magnetic high centred in the general area of the tenements.

CHIP SAMPLING RESULTS

A site inspection revealed that the Whippet mine site has been recently investigated by 8 reverse circulation drill holes. Composite samples were taken from the drill cuttings left on site. The results are presented in Appendix 2 as WH1 to WH8 inclusive. WH9 to WH13 inclusive represent chip samples from the surrounding tenements as do WH TAIL (tailings) and WH 00, WH 300E, WH 600E, WH 300W.

APPENDIX 3

ANALYSIS REPORT

Australian Assay Laboratories Group

PINE CREEK: Lot 174 Ward St,Pine Creek 0847
PO Box 41, Pine Creek 0847
Ph (089)761 262 Fax 761 310

ENTERPRISE GOLD MINES NL

REPORT : PC 018434 2 Page(s) Date : 14/07/89

Client reference :

Cost code :

Copies to : PETER MATVIEV

Samples Received : 27/06/89 | Type | Preparation code

Analysis	Code	Quality Parameter	Detection	Units
Au	FA50	Acc. ±15 %	0.01	ppm
Au(R)	FA50	Acc. ±15 %	0.01	ppm
Ni	D100	Prec.±10 %	5	ppm
Co	D100	Prec.±10 %	5	ppm
Cu	D100	Prec.±10 %	2	ppm
Pb	D100	Prec.±10 %	5	ppm
Zn	D100	Prec.±10 %	2	ppm

Laboratory Manager : Greg Walker

ANALYSIS REPORT

Australian Assay Laboratories Group

REPORT : PC 018434

Sample	Au	Au(R)	Ni	Co	Cu	Pb	Zn
WH 1	0.06		—	—	—	—	—
WH 2	0.10		—	—	—	—	—
WH 4	0.09		—	—	—	—	—
WH 5	0.10		—	—	—	—	—
WH 6	0.08		—	—	—	—	—
WH 7	3.26	3.82	—	—	—	—	—
WH 8	0.09		—	—	—	—	—
WH 9	0.29		—	—	—	—	—
WH 10	0.01		—	—	—	—	—
WH 11	0.02		—	—	—	—	—
WH 12	0.01	0.02	—	—	—	—	—
WH 13	<0.01		—	—	—	—	—
QB	0.01		—	—	—	—	—
HOL 1	<0.01		—	—	—	—	—
HOL 2	0.01		—	—	—	—	—
HOL 3	<0.01		—	—	—	—	—
HOL 4	0.01		—	—	—	—	—
HOL	0.02		—	—	—	—	—
GD 1	12.4	12.7	—	—	—	—	—
GD 2	0.06		—	—	—	—	—
WH TAIL	0.66	0.68	—	—	—	—	—
WH 00	2.50	2.87	—	—	—	—	—
WH 300E	0.06	0.06	—	—	—	—	—
WH 600E	0.03		—	—	—	—	—
WH 300W	0.02		—	—	—	—	—

Data in ppm unless otherwise stated.

Australian Assay Laboratories Group

ANALYSIS REPORT

REPORT : PC 018434

Sample	Au	Au(R)	Ni	Co	Cu	Pb	Zn
POW	0.02		14	<5	23	15	9

Data in ppm unless otherwise stated.

ANALABS DARWIN
Division of Inchcape Inspection and Testing Services Pty Ltd

(089) 47 2355 Cnr Coonawarra & Mataram Rds, Winnellie Fax: (089) 84 3984

PRELIMINARY ANALYTICAL REPORT No: 669.0.21.04427

INVOICE TO:

ENTERPRISE GOLD MINES NL
LEVEL 5
50 COLIN STREET
WEST PERTH WA 6005

ORDER No.: 00552

PROJECT:

DATE RECEIVED: 25/07/90

RESULTS REQUIRED: ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	10/08/90	1	30

SAMPLE NUMBERS	SAMPLE DESCRIPTION & PREPARATION	ELEMENT/METHOD
Various	So Prep: NONE	Au/351

RESULTS TO:

IAN TURNER
ENTERPRISE GOLD MINES NL
PO BOX 36969

WINNELLIE NT 0821

REMARKS:

AUTHORISED OFFICER

ANALABS DARWIN

PRELIMINARY ANALYTICAL DATA

SAMPLE	REPORT NUMBER 669.0.21.04427	REPORT DATE 10/08/90	CLIENT ORDER No. 0352	PAGE 1 OF 2
	Au			
1S	<0.5			
1M	0.6			
1N	1.5			
2S	2.5			
2M	<0.5			
2N	<0.5			
3S	<0.5			
3M	0.7			
3N	<0.5			
4S	<0.5			
4M	<0.5			
4N	<0.5			
5S	<0.5			
5M	0.5			
5N	<0.5			
[illegible]	0.5			
6M	<0.5			
6N	0.9			
7S	0.9			
7M	<0.5			
7N	<0.5			
8S	1.3			
8M	<0.5			
8N	<0.5			
9S	0.6			

AUTHORISED OFFICER

ANALABS DARWIN

PRELIMINARY ANALYTICAL DATA

	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
SAMPLE	669.0.21.04427	10/08/90	0332	2 OF 2

	Au
9M	0.8
9N	<0.5
10S	<0.5
10M	<0.5
10N	1.2

DETECTION	0.5
UNITS	PPB
METHOD	351

AUTHORISED OFFICER

Edna Beryl Mine.

The Edna Beryl gold mine is situated 25 miles north of the township, and 1 mile south of Kerramun Lagoon. The mine was discovered in 1935 and is owned by A. McDonald. In 1945-46, Murina-Malay Tin Company took over the option of the lease, but later relinquished it to the owner. The workings lie on the south-western edge of a low rounded hill, and are not extensive. 2,644.9 tons of ore, which assayed 32.06 dwt. per ton by amalgamation, and 4.6 dwt. per ton in the tailings, were produced; 12.07 oz. of gold were dollied.

Surface observations show that the lode lies in a shear zone at the contact of coarse to medium-grained sandstone with red slate, which dip vertically or steeply north. The lode is a brecciated slate injected with quartz veins and partly replaced by small quartz-hematite lenses and stringers. The gold has either a fine grain-size, or occurs as slugs, with a gold fineness of 950.

Klondyke Mine.

The Klondyke gold mine is situated 25 miles north of the Tennant Creek township, and 300 yards east of the Carraman mine. There has been no production. Surface workings include irregular costeans and shallow open cuts.

Sedimentary rocks in the immediate vicinity of the mine consist of red banded shales which have been lightly folded, and sheared in a direction parallel to their east-west strike. Two parallel shears have formed in these sediments and have been replaced by quartz-hematite bodies 4 feet and 12 feet wide. Dense specular hematite, quartz, jasper and veinose micaceous hematite make up the lode.

Carraman.

The Carraman gold mine is situated about 1 mile east of Karramun Lagoon on a flat alluviated stretch of country. The lease was worked for a time in 1947, but little or no work has been done since that date; 15.15 tons of ore, assaying 117.6 dwt. per ton, were produced. The mine has been worked by three shafts, the deepest being 70 feet, and underground drives and cross cuts. Sedimentary rocks associated with the lode consist of ribbon shales, and fine-grained to medium-grained ripple-marked sandstone.

A quartz-hematite lode crops out on the surface, and consists of 80 per cent. massive and micaceous hematite and 20 per cent. quartz.

WHIPPET AREA.

Whippet Mine (Plates 42 and 43).

Introduction.

The Whippet gold mine lies in the northernmost belt of the gold mines on the Tennant Creek Gold-field, and is the easternmost mine on this line. Other mines in this belt are the Edna Beryl, 7 miles to the west, and the Northern Star, 10 miles west.

The mine was geologically surveyed in 1948 by J. F. Ivanac and N. H. Krasenstein; mapping of new development was carried out in 1949 and 1950.

The Whippet gold mine is situated 26 miles from Tennant Creek on a magnetic bearing of 7°. Access to the mine may be had either by following the Stuart Highway north from the township for 23 miles and thence east along a poorly formed gravel road for 7 miles, or by travelling north along the Stuart Highway for 16 miles, thence east along the Barkly Highway for 1½ miles, and then generally north and east along a graded road for about 10 miles. Both gravel tracks are inaccessible for short periods during the annual wet season (From December to March).

History and Production.

The orebody was discovered in 1938 by J. English and partners, who loamed around the small hematite outcrops shown on Plate 42. Traces of gold were originally discovered in the vicinity of the present No. 3 shaft. No. 3 shaft was sunk, but the owners did not consider the results of this work very encouraging, even though ore averaging 12 dwt. of gold per ton was discovered at 20 feet below the surface. Operations were then moved to the present site of No. 2 shaft and gold ore yielding 1–2 oz. per ton was intersected at 35 feet below the surface. One thousand four hundred and twenty-six tons of ore with an average grade of 14.7 dwt. per ton were produced before production was halted for three years by World War II., when all mines on the field except Eldorado Pty. Ltd. closed down under National Security Regulations.

In 1948 the property was purchased by a Melbourne company, Gold Boring and Prospecting No Liability, who have operated the mine since that date. The high purchase price of the mine and the initial heavy capital expenditure on new equipment have seriously hampered exploration development. Development, to 1949, has merely attempted to delineate the boundaries of the ore-shoots.

In 1950, some diamond drilling for possible new ore-shoots was carried out, but no ore was located. Coupled with exploration by drilling, some driving and cross cutting within the limits of the present lode were carried out.

The total production figures of the mine are contained in the following table:—

Date.	Ore.	Recovery by Amalgamation.	Tailings.
	Long tons.	Dwt. per ton.	Dwt. per ton.
July, 1938, to June, 1939	40.42	13.3	11.0
July, 1939, to June, 1940	30.53	2.3	2.0
July, 1940, to June, 1941	50.08	3.0	2.1
July, 1941, to June, 1942	208.38	14.7	7.6
July, 1942, to June, 1943	153.79	31.7	18.4
July, 1943, to June, 1946	No production—World War II.		
July, 1946, to June, 1947	938.80	58.7	19.4
July, 1947, to June, 1948	1,320.89	49.97	27.4
July, 1948, to June, 1949	3,116.0	20.4	7.5
July, 1949, to June, 1950	5,581.0	13.1	..
July, 1950, to June, 1951	930.0	14.1	..
Total	12,374.89	22.6	6.7

Ore was originally treated at No. 1 Government Battery, 20 miles west of the Whippet mine. Later, when Gold Boring and Prospecting No Liability acquired the lease, this battery was hired to them by the Mines Branch of the Northern Territory Administration. In 1949 the company erected its own ten-head stamp battery and gold was extracted by amalgamation with mercury on copper plates.

Adequate water for treatment and underground purposes was obtained from a bore 1 mile east of the mine, and also from the 250-ft. level, which lies in the present water-table zone. The water from the latter soure is collected in a sump on the 250-ft. level, is pumped to the surface, and is almost sufficient to supply the needs of the mine. Unfortunately, this water is saline. Potable water has to be carried 23 miles from the Government fresh water bores, 7 miles north of the township.

C. J. Sullivan* investigated the bismuth reserves of the mine in 1942. Some of his results are recorded below:—

No. 3 Shaft (30 feet deep).—Three samples were taken and the highest assay was 0.29 per cent. bismuth.

48 feet Level No. 2 Shaft.—Four samples cut from the north and south, cross-cut returned nil, nil, trace, and 0.34 per cent., over a width of 8 feet. At the bottom of this shaft in an east drive an assay returned 1 per cent. bismuth. In other places 1.15 per cent. and 1.35 per cent. bismuth were obtained. The mineral occurs mostly as the carbonate and oxide.

A magnetometer survey of the leases was carried out in September, 1950, by M. Allen and J. Quilty, of the Geophysical Section of the Bureau of Mineral Resources. The large amount of magnetic interference caused by mine buildings and steel structures prevented the establishment of any recognizable magnetic contours from which conclusions could be drawn.

General Geology.

The Whippet gold mine is situated in a very flat-lying area bounded on the east, west and south by low rounded hills. To the immediate north the topography is very flat with no well-defined creeks.

Rock exposures near the mine are poor, and very little information could be obtained from these outcrops. Regional mapping has shown that the sediments are interbedded ripple-marked medium-grained sandstone, sandy slate, fine-grained and medium-grained tuffaceous sandstone, shale, and some mudstone. The predominant colours are purple, grey, and white. South of the mine these rocks have been altered by a quartz-felspar porphyry, solutions from which have permeated the sediments, without completely replacing them.

Underground, ripple-marked sandstone and shale have been exposed on the 90-ft. level. Shale and cherty slate were mapped on the 144, 200, and 250-ft. levels. The mapping shows that the rocks may be divided into two types—competent sandstone and cherty slate and incompetent shale.

* Unpublished report 1942.

Economic Geology.

Lodes.—Two lenticular quartz-hematite bodies of the type generally associated with the gold deposits of the Tennant Creek area crop out on the lease. The easterly body is 40 feet in length and averages some 12 feet in width at the surface. Underground, the maximum development of the lode is on the 144-ft. level where it has been exposed over a length of 230 feet and a width of 36 feet.

The western lode is 300 feet west of the eastern lode. It is 140 feet in length and averages 10 feet in width. It has been developed on the 90-ft. level where it has been exposed over a length of 80 feet and an average width of 30 feet.

These bodies consist of quartz, hematite, and jasper, and carry very little gold. The eastern outcrop is composed predominantly of massive hematite, whereas the western lode is a mixture of red jasper, quartz, and finely divided specular hematite. The western tip of the western lens contains approximately 10 per cent. hematite and 90 per cent. jasper.

The underground workings show that the gold-bearing lode consists of crushed shale impregnated by quartz and quartz-hematite stringers and contains massive quartz-hematite segregations. A distinct banding of the lode is in evidence on the 144-ft. level. The banding consists of (from south to north)—

Soft micaceous hematite;

Crushed shale, cavernous in part, impregnated with iron and quartz: kaolin and manganese oxide are common with a little micaceous hematite;

Hard blue-black massive quartz-hematite.

The micaceous hematite is easily powdered and has a brilliant lustre. Manganese dioxide and limonite are scattered throughout the lode.

The ore is mostly confined to the middle band. The longitudinal limits are generally determined by assay, but there is some suggestion of a lithological sedimentary change from shale to sandstone.

Other minerals in the ore and lode include bismuth carbonate and malachite. Sullivan (1942) concluded that the ore may contain up to 1 per cent. Bi_2O_3, in the form of oxide and carbonate minerals. Gold is very closely associated, and is in places coated, with bismuth minerals. Bismuth-rich pockets in the ore assay up to 140 oz. per ton with the Bi content as high as 30 per cent. The mineral is a carbonate and is glistening white in colour. Some very fine talc particles (less than one-fiftieth of an inch diameter) and sericite are associated with the ore. Malachite was observed only in one place, in the water-table zone.

Later quartz veins occupy an irregular east-trending zone on the surface (Plate 42). The quartz is barren of gold and contains a few flakes of micaceous hematite.

The longitudinal projection (Plate 43) shows that the crush zone has been worked in two places, namely the eastern and western ore-shoots. The eastern ore-shoot has been exposed over a length of 70 feet and width of 30 feet on the

90-ft. level and a length of 80 feet and width of 25 feet on the 144-ft level. Only two narrow legs of ore reach the 200-ft. level. The top of the ore-shoot is 40 feet below the surface (as shown by cross-section AA, Plate 43).

The western ore-shoot is approximately circular in plan and pipe-like in section. It has a maximum length of 20 feet and a width of 10 feet. The ore-shoot forms about 8 per cent. by volume of the exposed western lode.

Structural Control.

Because of the limited number of observations possible, the geological structure is not yet fully understood. However, a number of important localizing factors have emerged from the study undertaken. These are as follows:—

(*a*) The lodes lie in the fractured north limb of a west-plunging anticline. The ore is localized where a shale horizon intersects this crush zone.

(*b*) The main rock types involved in the fracture can be divided into competent sandstone and cherty slate and incompetent shale. The former tend to buckle and fracture slightly, the latter to crumple, brecciate, and flow, during folding. The axial trend of the folding strikes approximately east-west and dips at 85° to the north. This is an important direction as the main ore "make" is parallel to it (*see* plan, 144-ft. level, and cross section AA, Plate 43). Further, the ore markedly decreases in grade and finally cuts out where the strike changes to the north-east. This change in strike is a reflection of the fact that the ore-shear in the incompetent rocks is parallel to the cleavage direction and in the competent rocks to the bedding direction.

(*c*) Another very important structural feature is that the ore-shoot and lode are "sandwiched" between two massive sandstone horizons and the position of the ore-shoot is clearly controlled by the structure and not related to secondary enrichment.

(*d*) Several important minor structures have been mapped, and these have given valuable clues towards the understanding of structure control. Grain elongation of pyrite crystals on the 215-ft. sub-level was 70° east, parallel to the pitch of the ore-shoot. Many minor buckles of variable pitch indicate that the area is one of considerable pitch change. Plate 43 shows that the pitch given by bedding on cleavage across the plane of the lode indicates that the major ore-shoot "makes" in the zone of flat pitch.

These features together with the important structural controls previously specified point to the conclusion that on the Whippet gold mine there are east pitching ore-shoots in west pitching lode.

The western ore-shoot has been localized by bedding-plane shearing at the contact of sandstone with purple shale.

Secondary Enrichment.

The very high gold content of the lode is considered to have been due partly to secondary enrichment, and partly to structural sedimentary controls. The evidence suggestive of secondary enrichment is based on the rich nature of the ore above the 200-ft. level, whereas at this level, although the rock types are lithologically similar, the grade of ore is decidedly low.

In the country rock surrounding the lodes several of the zones commonly associated with the ideal lateritic profile are present. A zone of surface silicification is present and is underlain by the mottled and kaolinized zones. These may be associated partly with the lateritization in Tertiary times and partly with the long period of oxidation and erosion which affected the Tennant Creek Gold-field from the Upper Proterozoic to the present day. The gold enrichment zone can be related to the kaolinized and mottled zones: the base of the kaolinized zone is above the 200-ft. level. Also, there is the zone of surface impoverishment from the surface to approximately the 50-ft. level.

On the other hand, near the base and possibly near the top of the ore-shoot, the lode is cut by unfavorable sandstone. This indicates that the ore-shoot may be limited by lithological changes in the sediments in which the ore has been emplaced.

Some malachite was reported from the water-table zone. In similar rocks on the Peko gold mine the ore changes from a gold lode above water table to a gold-copper lode below the water-table level. This may be the case on the Whippet, and, if so, any other bodies of lode material which may be found and which contain payable gold above the water table may continue as workable gold-copper bodies below the water table.

Prospect of Further Discovery.

The future life of the mine lies entirely in the discovery of new ore-shoots as the present "shoots" have been completely worked out.

ALLUVIALS.

Last Hope Mine (Plate 44).

Introduction.

A geological survey of the Last Hope gold mine was carried out by J. F. Ivanac and B. P. Walpole in 1950.

The Last Hope gold mine is situated 40 miles north-west of Tennant Creek township in an area known as the Alluvials. It is reached by travelling north along the Stuart Highway to the Old Telegraph Station, whence a formed all-weather gravel road leads west to No. 1 Government Battery; 3 miles west of No. 1 Battery a track turns off to the north-west and leads direct to the Last Hope mine, a distance of approximately 26 miles from the turnoff. This track is generally in poor condition and is not always useable after rain.

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

BULLETIN No. 22.

THE GEOLOGY AND MINERAL DEPOSITS OF THE TENNANT CREEK GOLD-FIELD, NORTHERN TERRITORY

BY

J. F. IVANAC.

VOLUME I.—DESCRIPTION.

VOLUME II.—MAPS.

Issued under the Authority of Senator the Honourable W. H. Spooner, Minister for National Development.

1954.

By Authority:

L. F. JOHNSTON, Commonwealth Government Printer, Canberra.

(Printed in Australia.)

3721.

CONCLUSIONS AND RECOMMENDATIONS

The results of geochemical RAB sampling (Appendix 3) and ground magnetics have failed to disclose any indications of economic concentrations of gold in the tenement areas which surround the abandoned Whippet mine. Sampling from past RC drilling at the mine site seems to indicate that the possible ore shoot proposed by Ivanac (1954) was not confirmed by that program. The tenement areas would therefore appear to have little strategic value in terms of any possible future re-development of the old workings.

Based on available evidence further exploration is not warranted. It is recommended that the tenements be returned to the holder and the option to proceed be not exercised.