

63/3
c.3

Calumet

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.
BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

1963/3

015635 *



MINOR METALLIFEROUS INVESTIGATIONS
NORTHERN TERRITORY RESIDENT GEOLOGICAL SECTION
OCTOBER - DECEMBER, 1962

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

MINOR METALLIFEROUS INVESTIGATIONS
NORTHERN TERRITORY RESIDENT GEOLOGICAL SECTION
OCTOBER DECEMBER, 1962.

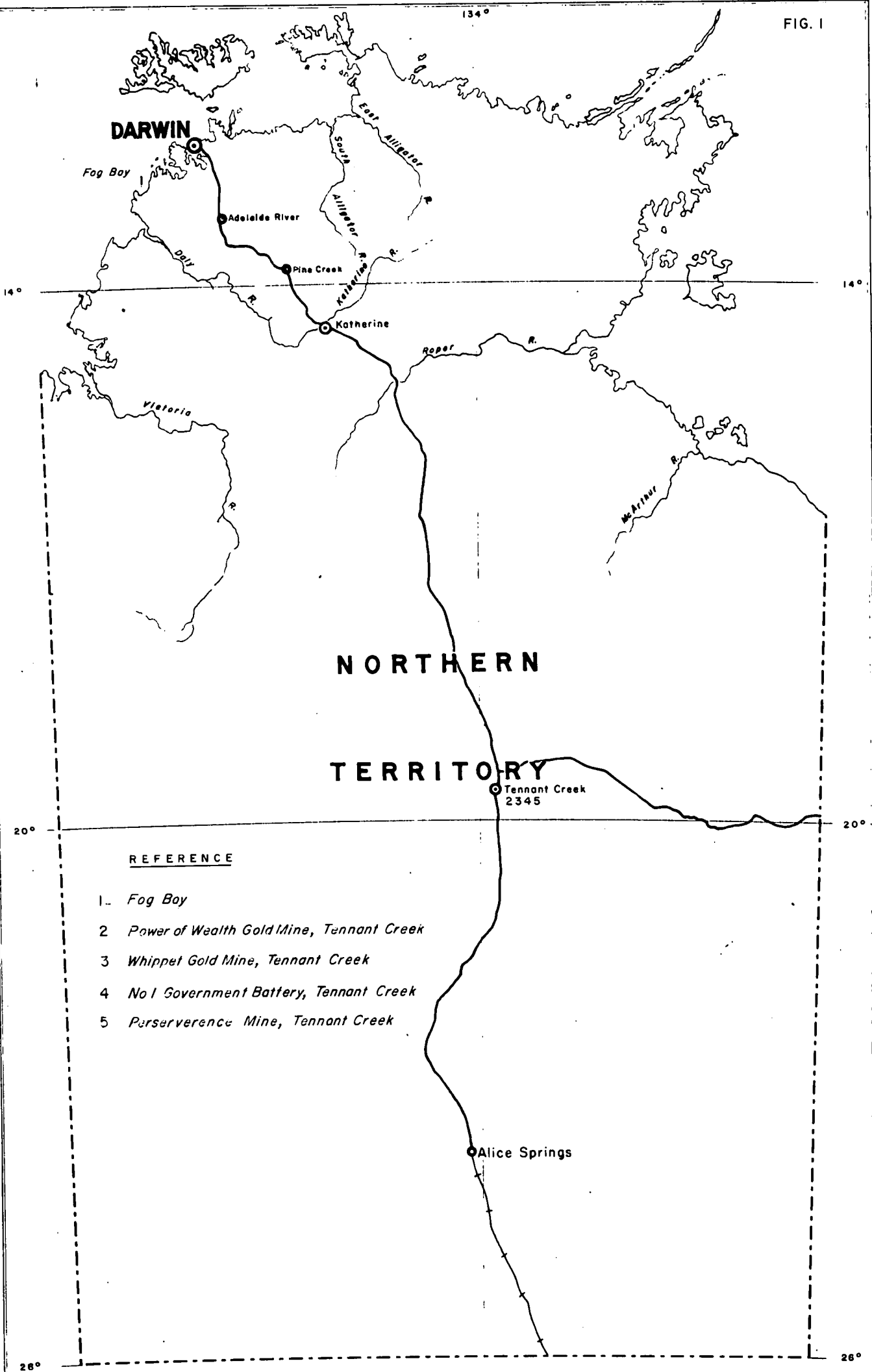
RECORD 1963/3

CONTENTS

	<u>Page</u>
FIGURE 1. Locality Map. Scale 1 inch to 95 miles.	
SUMMARY	1
LATERITES OF THE FOG BAY AREA: by J. Hays.	2
Summary	2
Introduction	2
Geology	2
Geomorphology	3
Superficial Deposits	3
Deposits of Economic Interest	4
References	4
Appendix I - Analyses of Ferricrete from Cliff in Fog Bay Area.	
Plate 1 - Geological Sketch Map, Fog Bay Area, Northern Territory. Scale 1 inch to 1 mile.	
GEOLOGICAL EXAMINATION OF THE POWER OF WEALTH GOLD MINE, KURUNDI AREA, NORTHERN TERRITORY: by J. Barclay.	5
Summary	5
Introduction	5
General Geology	6
Mining and Economic Geology	6
Samples and Assay Results	7
Conclusions and Recommendations	8
Acknowledgements	8
Appendix II - Assay Results, The Power of Wealth Gold Mine, Northern Territory.	
Plate 2 - Geological Sketch Map of the Power of Wealth Gold Mine. Scale 1 inch to 100 feet.	
Plate 3 - Section and plans of the 40-foot and 95-foot levels of the Power of Wealth Gold Mine. Scale 1 inch to 20 feet.	

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

<u>CONTENTS (CONTD.)</u>	<u>Page</u>
EVALUATION OF RESERVES OF BISMUTH BEARING SANDS IN THE TAILINGS DUMP AT WHIPPET GOLD MINE, TENNANT CREEK. by J. Barclay	10
Summary	10
Introduction	10
Sampling	11
Tonnage Evaluation	11
Conclusions	11
Appendix III - Assay results; density tests; and tonnage figures	12
Plate 4 - Sketch of tailings dump, Whippet Mine, Tennant Creek. Scale 1 inch to 20 feet.	
EVALUATION OF RESERVES OF BISMUTH BEARING SANDS AT THE NO. 1 GOVERNMENT BATTERY, TENNANT CREEK by J. Barclay	13
Summary	13
Introduction	13
Sampling and Evaluation of Reserves	13
Conclusions	14
Appendix IV - Report of Analysis by the Australian Mineral Development Laboratories	15
Plate 5 - Plan and cross sections of the Bismuth bearing sands at No. 1 Government Battery, Tennant Creek. Scale 1 inch to 20 feet.	
GEOLOGICAL SURVEY AND SAMPLING FOR BISMUTH AT THE PERSEVERENCE MINE, TENNANT CREEK by J. Barclay	16
Summary	16
Introduction	16
General Geology	16
Economic Geology	17
Conclusions and Recommendations	17
Reference	17
Plate 6 - Plan and section of Perserverence Mine. Plan - 1 inch to 40 ft: Section 1 inch to 20 feet.	



REFERENCE

1. Fog Bay
2. Power of Wealth Gold Mine, Tennant Creek
3. Whippet Gold Mine, Tennant Creek
4. No 1 Government Battery, Tennant Creek
5. Perseverance Mine, Tennant Creek

LOCALITY MAP

MINOR METALLIFEROUS INVESTIGATIONS

N.T. RESIDENT GEOLOGICAL SECTION

OCTOBER - DECEMBER, 1962

SUMMARY

This report consists of five minor reports on metalliferous investigations carried out from October to December by the N.T. Resident Geological Section; one in the Katherine-Darwin area and four in the Tennant Creek area.

Laterites in the Fog Bay area some 50 miles south-west of Darwin were examined for a possible source of aluminium or iron. The laterites were classified as ferricrete and two main types, an older and a younger ferricrete, were recognised. The ferricrete is unlikely to yield any large amounts of iron or aluminium.

The Power of Wealth Gold Mine was mapped and sampled after a request from the lessee. The mine is located in several lenticular quartz reefs from 3 to 7 feet wide over a length of about 1000 feet. The reefs dip at 30 to 40 degrees in Precambrian quartzite, sandstone, and quartz schist, which dip at 25 to 35 degrees. The 99-foot Main Shaft intersected a 9-foot thick quartz reef at the 40-foot level, but it is not exposed on the 95-foot level. On this level gold mineralization is patchy and occurs over a length of 70 feet and an average width of 4 feet; the highest assay obtained was 8.6 dwts/ton. The reef is estimated to contain about 20 tons of auriferous quartz per foot down the dip.

The last three reports deals with the estimation of reserves and grade of bismuth, two in bismuth - bearing sands in the tailings dumps of the Whippet Gold Mine and the No. 1 Government Battery, and the other in the Perserverence Mine, Tennant Creek. 2,840 tons of sand were estimated in the tailings dumps at the Whippet Mine and 1600 tons at the No. 1 Government Battery, both sands average about 0.9 per cent bismuth. At the Perserverence Mine bismuth ore occurs in patches in brecciated massive siliceous hematite. Development work is not sufficiently advanced to estimate the ore reserves, but assays from four samples of bismuth-bearing ironstone ranged from 0.62 to 5.45 per cent bismuth.

LATERITES OF THE FOG BAY AREA

by

J. Hays

SUMMARY

A reported occurrence of laterite was examined in the Fog Bay area some 50 miles south-west of Darwin. Two types of ferricrete were recognised: an older one consisting of ferruginous consolidated gravel, which caps the cliffs and occurs at heights between 80 feet and 100 feet above sea level; a younger one, which is similar to the first type, but contains more maghemite and quartz, and some pebbles of the older ferricrete, and which occurs at about 40 feet above sea level.

The ferricrete is unlikely to yield any large amounts of iron or aluminium, so that no further work is recommended in the area.

INTRODUCTION

The Fog Bay area and part of the Tumbling Waters area were visited on the 20th, 21st, and 22nd of August, 1962, to examine laterite deposits reported by E.J. Malone in September, 1961. The area is inaccessible to motor traffic for most of the year and no roads exist. Access was by means of a bush track westerly from the Darwin River Quarry through Breakneck Pass to a stockyard on the Finniss River at Roslyn Plains and thence through the bush to the mouth of the Finniss River. The low ground is covered by Paper Bark swamps and mud flats, and most of it is impassable. The higher ground is covered by Pandanus scrub and can be traversed in a landrover.

Access by sea is possible for small craft, but after landing it involves several miles of traversing alluvial mud flats, mangrove swamps and paper bark swamps.

GEOLOGY

Geological maps and air photos of the Fog Bay area were not available at the time of the investigation. The adjoining Tumbling Waters 1 mile sheet (printed edition) shows the area to be almost completely covered by undifferentiated Cainozoic deposits, but three small outcrop areas of the Litchfield Complex are indicated. The outcrop areas are much more extensive than indicated on the map, but individual outcrops are small and widely spaced, and few of them exceed five square yards in area.

The outcrops consist of a leucocratic medium-grained biotite granite showing faint foliation in some exposures. Rosiwal analyses in the field indicate less than 10 percent ferromagnesian minerals (mostly biotite), about 35 percent to 40 percent quartz, and more than 50 percent grey white cloudy feldspar, probably microcline. The diameter of the biotite crystals are mostly less than 1 m.m. and the distribution is patchy. The diameter of the quartz and feldspar crystals are generally less than 3 m.m., but some of the granite is porphyritic with the diameter of the microcline (?) phenocrysts up to 10 m.m.

Granite sand and gravel are abundant in the north-west portion of the Tumbling Waters area and in a one mile-wide strip on the east of the Fog Bay area. The western limit of the sand is a north-north-east line of quartz-fault rock that crops out for at least five miles as low ridges and concentrations of quartz gravel. West of this supposed fault line no granite sand or gravel was seen. The only outcrops noted were ferricrete (resting upon what appeared to be the pallid zone of a lateritic profile developed on argillaceous rocks), quartz fault rock, and, in the extreme west, a ridge of quartzite and sheared conglomerate striking at 340° magnetic and dipping steeply west, and perhaps bounded on the west and east by faults. The sedimentary rocks are tentatively considered to belong to the Noltenius Formation. The main structural features are the faults mentioned above.

GEOMORPHOLOGY

The major geomorphological feature of the area is the complex sub-coastal plain surface ('C' surface of Hays (1962) above which project extensive residuals of the post laterite 'B' surface. Very low ridges of quartz-fault rock stand above the 'B' surface and are thought to be partly reduced remnants of the 'A' surface. The identification of the surfaces is confirmed by the complete absence of laterite in the area and by the presence of pallid zone material beneath some of the 'B' level ferricrete.

The Finniss River flows through a drowned, alluviated, and rejuvenated valley. Black alluvial mud extends up all tributaries, and chains of billabongs indicate old stream channels formed before rejuvenation.

SUPERFICIAL DEPOSITS

The superficial deposits consist of alluvium, ferricrete, and loose gravel.

The ferricrete is the only deposit of potential economic interest. Two generations of this type of deposit were noted.

The older generation consists of ferruginous consolidated gravel. The pebbles consist of fragments of ferruginous laterite, quartz pebbles, a small quantity of buckshot gravel, and fragments of pallid zone and mottled zone material. The cement consists entirely of iron oxides including maghemite.

In some places the quartz pebbles amount to about 30 percent of the total volume, but very few were noted at the cliffs mentioned by Malone. The thickness of the deposit ranges from a few inches to about 10 feet. It is restricted to some of the 'B' surface residuals and caps the cliffs mentioned by Malone, occurring at heights of between 80 feet and 100 feet above sea level.

The younger generation of ferricrete is similar to the first, but contains much more maghemite and quartz, and some pebbles of the older generation ferricrete. It occurs at a general level of about 40 feet above sea level and its mean thickness could not be estimated. Some cliffs about 6 feet high, consisting entirely of ferricrete, were observed.

DEPOSITS OF ECONOMIC INTEREST

Three samples of the older generation of ferricrete were collected, but two of them contain too much detrital quartz to warrant assay and only the cliff sample was forwarded to Australian Mineral Development Laboratories for iron and aluminium determination.

Even if the assay results are favourable, the total reserves of iron and aluminium are unlikely to be large enough for any further work to be carried out. Access by sea is impossible for large freighters, and access by land involves the construction of permanent roads in areas impassable during the wet season under present conditions.

REFERENCES

HAYS, J., 1962 - Land surfaces in the Northern Territory.
Bur. Min. Resour. Aust. Rec. (in prep.)

APPENDIX 1

Analysis of Ferricrete from Cliff in Fog Bay Area.

Ferric Oxide	30.1%
Aluminium Oxide	21.8%

Analysis by Australian Mineral Development Laboratories, October 1962 of sample 199706 submitted by J. Hays.

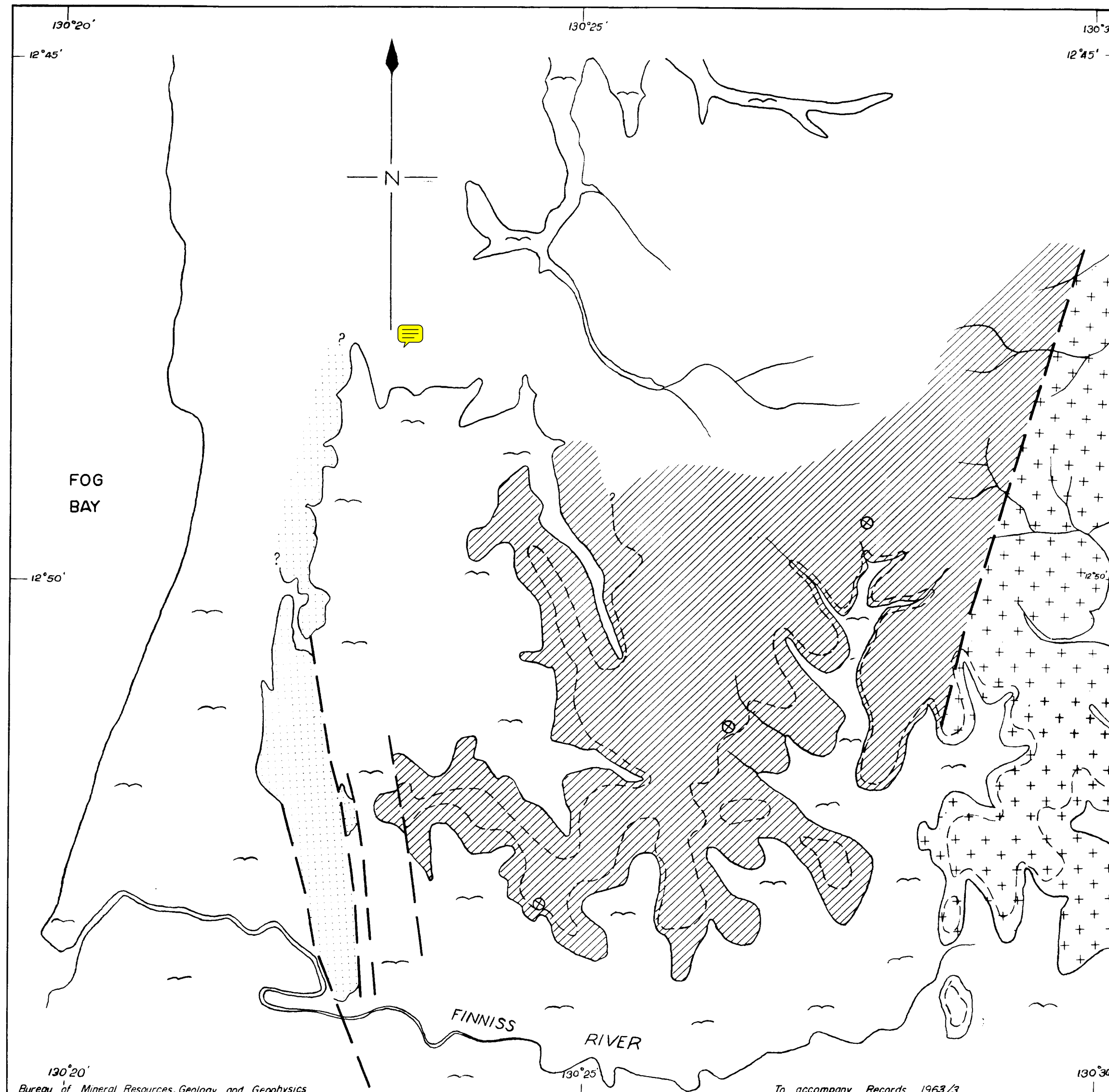
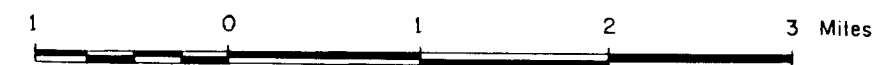


PLATE 1

GEOLOGICAL SKETCH MAP FOG BAY AREA NORTHERN TERRITORY

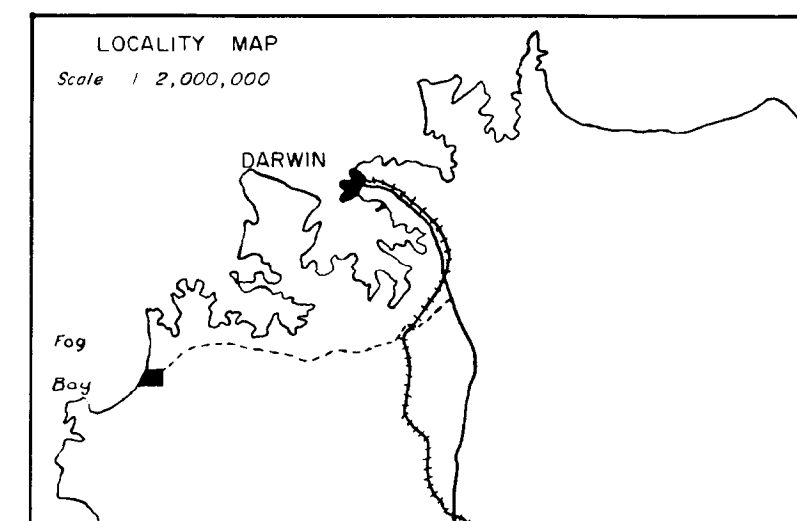
SCALE



REFERENCE

- Alluvium and beach deposits
- Areas of Ferricrete probably underlain by argillaceous beds
- Noltenius Formation - Quartzite
- Litchfield Complex { Areas probably underlain by biotite granite - slightly foliated
- Dip and strike - measured
- Fault
- Limited mud flats and paperbark swamps
- Approximate limit of "B" surface ferricrete
- Sample locality

Based on Fog Bay 1 mile photo-mosaic



GEOLOGICAL EXAMINATION OF THE POWER OF WEALTH GOLD MINE,
KURUNDI AREA, NORTHERN TERRITORY

by

J. Barclay

SUMMARY

The Power of Wealth Gold Mine was mapped and sampled after a request from the lessee.

The geology of the mine consists of several lenticular quartz reefs from 3 to 7 feet wide over a length of about 1,000 feet in moderately dipping Precambrian quartzite, sandstone, and quartz schist. The main quartz reefs strike north or north-west and dip east or north-east at 30 to 40 degrees.

The main part of the workings consist of a 99-foot deep Main Shaft and two levels, one at 40 feet and the other at 95 feet. There are two crosscuts at the bottom of the shaft. On the 40-foot level the Main Shaft intersected a 9-foot thick quartz reef which was developed by two drives, one 45 feet long to the north-west and the other 25 feet long to the south-east, and a 25-foot long winze. On the 95-foot level the reef is apparently not exposed except for some irregular quartz stringers.

Assay results during the mapping indicate that the gold mineralization on the 40-foot level is patchy, low grade (highest assay was 8.6 dwts/ton) and exposed over a length of 70 feet and an average width of 4 feet. About 20 tons of auriferous quartz per foot down the dip is estimated in the main quartz reef.

INTRODUCTION

The Power of Wealth gold mine is situated about 55 miles south of Tennant Creek on a true bearing of 155°. It is reached by travelling 60 miles south of Tennant Creek along the Stuart Highway to Bonney Creek, 17 miles eastwards on the Kurundi track, and 6 miles north-east to the mine camp.

The lessee, Mr. H. Hachmann, intend to offer the property for sale; he requested the mine to be examined, and a report made available to him for perusal by any prospective buyer.

The surface geology and underground workings were briefly examined and eleven samples of auriferous quartz reef and quartz stringers were taken in the workings from the Main Shaft. Gold assays on these samples indicate patchy values with the highest of 8.6 dwts/ton.

GENERAL GEOLOGY

The country rock consists of Precambrian (?Hatches Creek Group) interbedded quartzite and sandstone, with individual beds ranging up to 2' thick, which strike north-west and dip to the north-east at angles between 25° and 30° . Rare pebble-beds occur interbedded with the quartzite and sandstone.

Highly contorted quartz schists crop out in the valley halfway between the mine camp and Main Shaft, and on the hillside 150 ft. south of the Main Shaft. They are also exposed in the east drive at the 95 ft. level of the Main Shaft.

An igneous rock, probably a quartz-feldspar porphyry, is exposed near the track 3 miles south-west of the mine camp. The shape of the outcrop is elliptical, about 250 feet long by 150 feet wide with the longer axis striking west-southwest.

Several quartz reefs outcrop on the hill to the south of the Main Shaft. The main ones strike north or north-west and dip to the east or north-east at angles of from 30° to 40° ; their true thickness is about 3 ft. to 7 ft. However, the shallow dip and its relationship to the slope of the hill give outcrop widths of up to 15 feet. One of these reefs was traced for 1,000 feet to the south-east and, it is known to occur for a farther two miles in the same direction. Most of the other reefs appear to be lenses. There are also some subsidiary reefs striking north-east. The quartz reefs are mainly white, but a few of them show a transition to pink quartz.

MINING AND ECONOMIC GEOLOGY

Of the 5 shafts on the lease, only the Main Shaft and the Water Shaft (10' deep) are accessible, and it is from the development work of the Main Shaft that all production to date has been obtained.

Official records show that in 1950 two parcels of ore were treated with returns as shown below:-

18 tons ore	5 ozs. gold	6.5 dwts/ton in tailings
21 " "	6 " "	1.7 " " "

The Main Shaft is 99 feet deep, with east and west crosscuts driven from the bottom of the shaft for 80 feet and 20 feet respectively.

At the 40 ft. level the shaft penetrated a 9 ft. thick quartz reef, which strikes north-west and dips at 40° to the north-east. This reef has been driven on for 45 ft. to the north-west and 25 ft. to the south-east. An inclined winze has been sunk down the dip of the reef for 25 ft. from the Main Shaft.

The northern and southern limits of the reef were not exposed in the drives, nor was the lower limit reached by the winze. An exposure of massive quartz, opened by a costean at 35 ft. to the west of the Main Shaft, is the surface position of the reef.

At the 40 ft. level the reef consists of 2 ft. of massive quartz, underlain by 2 ft. of shattered quartz and then by another 3 ft. of massive quartz, and the bottom 2 ft. section is again of shattered quartz. The reef is usually white except in the vicinity of sample sites 8 and 9, where it has a strong pink tinge.

The 80 ft. east cross-cut, at the foot of the shaft, was apparently intended to intersect the quartz reef at depth. However, as can be seen from the section (Plate 3), only irregular quartz stringers were encountered at the end of the cross-cut. It is possible, therefore, either that the reef is displaced by faulting perhaps by the steep fault seen in the east cross-cut on the 95 ft. level at 7 ft. from the Main Shaft, or that the shape of the reef is a lens, as suggested by some of the reefs exposed on the hill to the south of the Main Shaft.

SAMPLES AND ASSAY RESULTS.

Eleven samples were obtained from the workings of the Main Shaft (Plate). Two samples were taken from the irregular quartz stringers at the end of the east cross-cut on the 95 ft. level, one from the quartz reef at the foot of the inclined winze, and eight from the quartz reef exposed in the drives at the 40 ft. level.

All the samples were chip samples taken over the exposed width of reef or stringers, and those on the 40 ft. level were taken at 10 ft. intervals along the drives.

The best assay results were obtained from the 40 ft. level samples and these indicate that the gold mineralization is of a patchy nature with the highest assay result of 8.6 dwts/ton.

According to a report by geologists of Australian Development N.L., Nobles Nob Mine, Tennant Creek, samples taken by company representatives on the 40 ft. level ranged in value from 1 dwt/ton to 34.4 dwts/ton, but most of the samples were selected and not representative (personal communication from Mr. H.E. Edwards, Mine Manager, Nobles Nob). The samples and assay results obtained by Australian Development N.L. are shown in Appendix II.

A report in 1949 by Mr. A. McDonald, former Mines Inspector, N.T. Administration, stated that there are 400 tons of ore in sight and 200 tons on the dump each averaging 10 dwts/ton.

CONCLUSIONS AND RECOMMENDATIONS

A small, patchy gold shoot, has been exposed by existing workings. The gold mineralization occurs at least over a length of 70 ft. and average width of about 4 ft. at the 40 ft level. The extent of mineralization down the dip of the reef is not known, and, apart from making an estimate of about 20 tons of auriferous quartz per foot down the dip, it is not possible to give an estimate of reserves at this stage.

If further development work is carried out, the ore produced could be treated locally by the three head stamp battery, provided a nearby supply of water is established. The Main Shaft would be the most convenient point from which a water supply could be obtained. The presence of water at the bottom of the shaft is due either to the position of the water table, or to an inflow of surface water during rainy periods. The Mine is equipped to test the quantity of water at the bottom of the shaft and testing should be carried out before any other major investigations are undertaken.

It is understood, from official records, that 500 samples were taken from outcropping quartz reef in this area by the E. & R. Syndicate, but only eleven of these contained any gold. However, further surface sampling of all outcrops of pink quartz should be carried out, since gold mineralization may be related to the occurrence of zones of pink quartz.

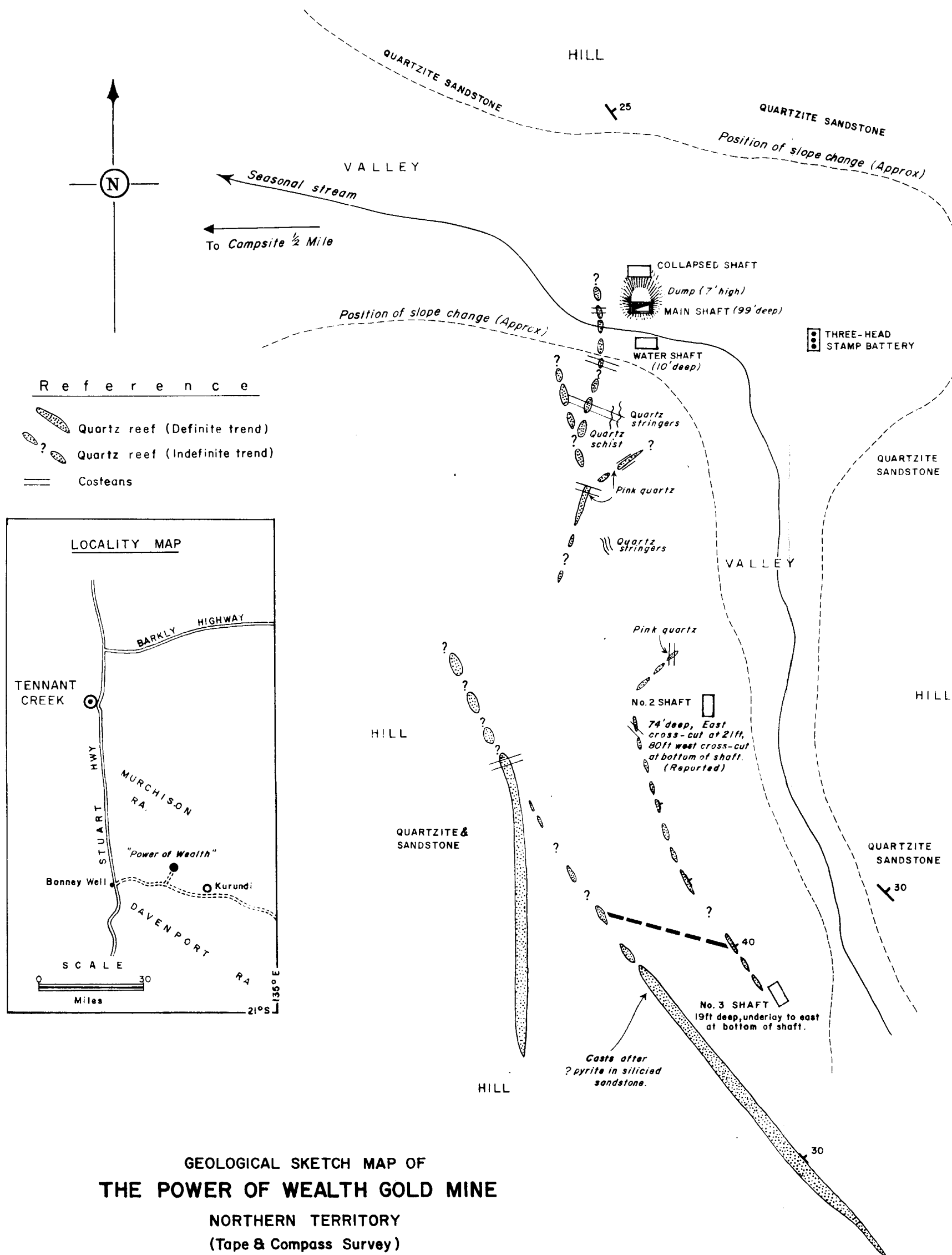
ACKNOWLEDGEMENTS

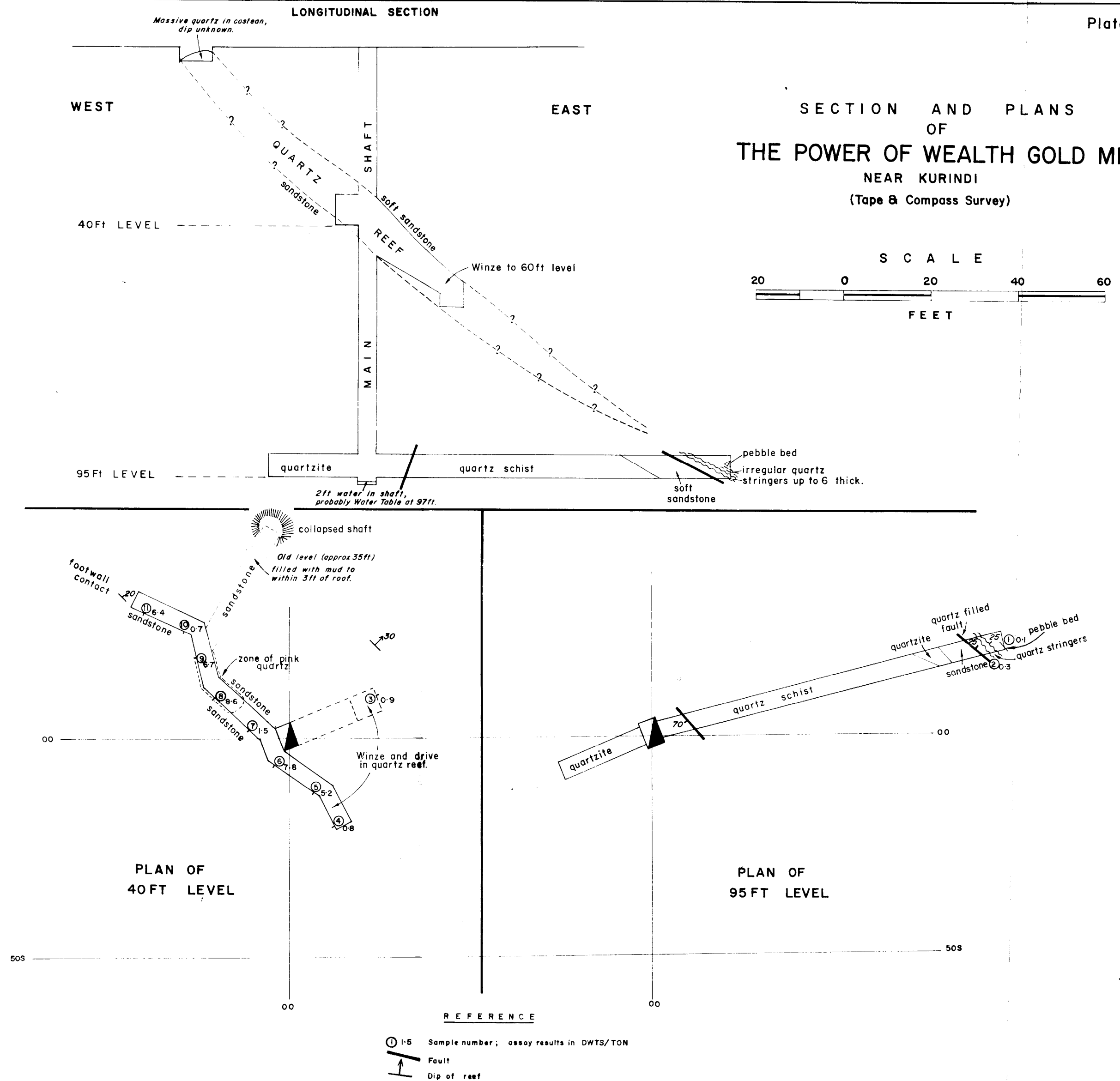
The co-operation of Mr. H.E. Edwards, Mine Manager of Nobles Nob Mine, Tennant Creek, in permitting publication of assay results obtained by the Company pertaining to the Power of Wealth Mine, is greatly appreciated.

APPENDIX IITHE POWER OF WEALTH GOLD MINE, N.T.ASSAY RESULTS

<u>Samples taken by Resident Geologist</u>				<u>Samples taken by</u>
<u>Sample No.</u>	<u>Locality</u>	<u>Au.dwts/ton</u>	<u>Width of</u> <u>reef</u> <u>sampled</u>	<u>Australian</u> <u>Development N.L.</u>
				Sample sites near positions of samples taken by Resident Geologist. Au.dwts/ton
1	East end of E. Cross-cut 95 ft level	0.1	6"	
2	" "	0.3	3"	
3	Bottom of inclined winze from 40 ft level	0.9	4'	
4	40 ft level South drive, west wall.	0.8	4'	3.2, west wall
5	" "	5.2	4'	1.0, east wall
6	" "	7.8	5'6"	1.0, east wall
7	40 ft level North drive, west wall.	1.5	3'	1.6, hanging wall 0.8, foot wall.
8	" "	8.6	3'	21.6, west wall 14.0, east wall
9	" "	6.7	3'3"	34.4, west wall
10	" "	0.7	5'	9.0, east wall
11	" "	6.4	5'6"	7.2, west wall

Samples numbered 1 - 11, taken by Resident Geologist
were assayed at the Central Government Battery,
Tennant Creek.





EVALUATION OF RESERVES OF BISMUTH-BEARING SANDS IN THE
TAILINGS DUMP AT THE WHIPPET GOLD MINE, TENNANT CREEK

by

J. Barclay

SUMMARY

The tailings dump at the Whippet Gold Mine, Tennant Creek was estimated to contain about 2,850 tons of sand averaging about 0.90 percent bismuth.

INTRODUCTION

The lessees of the tailings dump at the Whippet Mine recently requested that investigations be carried out to obtain estimates of bismuth content and tonnage of sand available in this dump.

For some time the lessees, Messrs. C. Strong and K. Shirley, have been mining and treating bismuth ore on a small scale at the Jubilee Mine, Tennant Creek. In order to increase their ore reserves, they have also leased the Perserverence Mine and the tailings dump at the Whippet Mine, and they have applied for the right to treat bismuth bearing sands at the No. 1 Government Battery on completion of present work there by Mines Branch.

Investigations were carried out on 13.7.62 on the sands dump at the Whippet Mine. Dimensions of the dump were obtained by tape measurements and six representative samples were taken by augering and channel sampling.

The sands dump, already treated by cyanidation for gold, was expected to reveal an even bismuth grade due to thorough mixing of the sands during the cyanidation process, and this is shown by the assay results which range from 0.88% to 0.94% Bi.

The Whippet Mine is reached by travelling northwards along the Stuart Highway for twenty-four miles from Tennant Creek and thence eastwards by bush track for a farther seven miles.

The tailings dump, situated about 200 yards south of the Main Shaft, consists of a central low-lying pile of iron-rich sand surrounded by eight separate piles of similar iron-rich material.

SAMPLING

Plate 4 shows the positions and other details concerning the several piles of sand. One auger sample was taken from each of No. 1, 2, and 4 piles. Pile No. 3 was augered in three places and a composite sample taken. Piles Nos. 5 and 6 were channel-sampled and a composite sample made, and Pile No. 7 was channel-sampled separately since it contained material of a slightly different appearance from the rest of the dump.

Each sample was coned and quartered, and finally divided into four equal representatives parts. One part was forwarded for bismuth assay to Australian Mineral Development Laboratories. A second part was forwarded to the Kalgoorlie School of Mines by Mr. Strong for check assaying, and the remainder of the sand from each sample was retained for possible future use.

Reference to the list of assay results, shows that the six assay results obtained from Australian Mineral Development Laboratories were of slightly lower value than those from the Kalgoorlie School of Mines. The A.M.D.L. results range in value from 0.88 percent to 0.94 percent Bi with an average of 0.93 percent Bi.

Tonnage Evaluation

The volume of each pile of sand was roughly estimated from tape measurements and the calculations expressed in cubic feet.

To convert volume to weight a conversion factor was found by using a length of piping, 9 $\frac{1}{2}$ " long by 4" internal diameter, which was gently driven into the side of one of the piles of sand so as to obtain a relatively undisturbed sample. The sand within the pipe was then removed and weighed. This operation was repeated on two other piles of sand and an average weight of sand obtained. This indicated that one ton of sand would occupy approximately 17 cubic feet.

By applying this conversion factor of 17 cubic feet/ton, it was estimated that the several piles contained a total of 2,840 tons of sand (Appendix III).

CONCLUSIONS

The size of the dump could be more accurately calculated from a plane table survey, but a reasonable estimate has been made by the method used. Similarly, additional density tests could be made to substantiate the conversion factor obtained.

The even grade shown by the assay results is believed to reflect the thorough mixing of sands achieved during the previous cyanidation treatment for gold and further sampling would not be necessary.

APPENDIX IIIASSAY RESULTS

<u>SAMPLE NO.</u>	<u>ASSAYED BY</u> <u>AUSTRALIAN MINERAL</u> <u>DEVELOPMENT LABORATORIES</u>	<u>ASSAYED BY</u> <u>SCHOOL OF MINES</u> <u>KALGOORLIE</u>
1	0.94% Bi	1.05
2	0.935 "	1.03
3	0.91 "	1.02
4	0.915 "	Not determined
5	0.935 "	" "
6	0.875 "	" "

DENSITY TESTS

Dimensions of Pipe used = 4.0625" internal diameter x 9.5" long.

Volume " " " = $11 \times (2.03125)^2 \times 9.5$ cu. ins.

The pipe was driven gently into three separate piles of sand and the weights of sand recovered were 9 lbs 9 ozs, 9 lbs 1 oz, 9 lbs 8 oz. respectively, the average being 9 lbs 6 ozs (= 9.375 lbs).

$$\begin{aligned}
 &\text{The density (or conversion factor) of the sand} \\
 &= \frac{11 \times (2.03125)^2 \times 9.5}{(12)^3} \times \frac{2240}{9.375} \text{ cu.ft/ton} \\
 &= \underline{17 \text{ cu.ft/ton}}
 \end{aligned}$$

TONNAGE

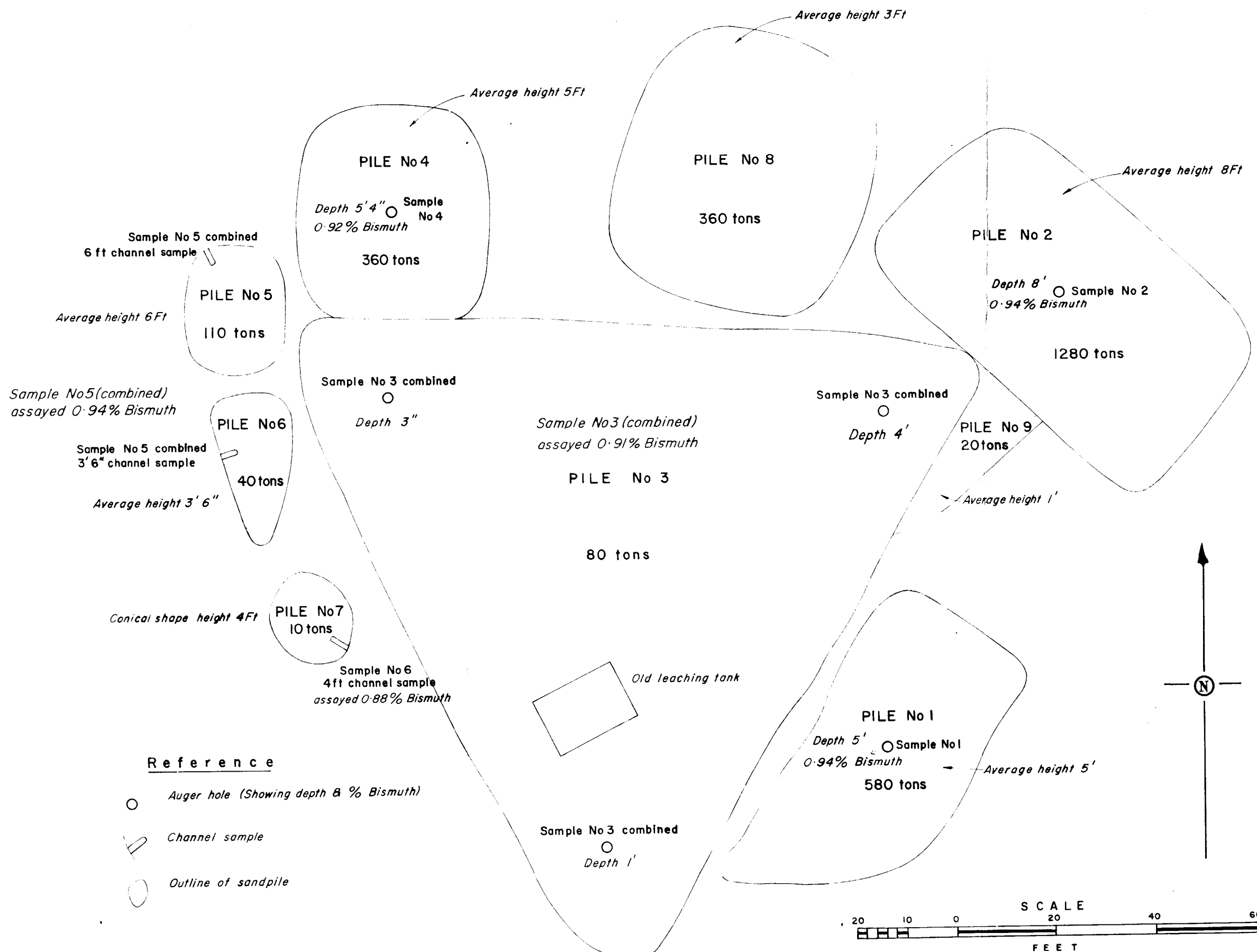
The following tonnage estimates are obtained by use of the above conversion factor of 17 cu. ft/ton

<u>PILE NO.</u>	<u>VOLUME IN CUBIC FEET</u>	<u>TONNAGE</u>
1	9,860	580
2	21,760	1,280
3	1,360	80
4	6,120	360
5	1,870	110
6	680	40
7	170	10
8	6,120	360
9	340	20
Total	<u>48,280</u>	<u>2,840</u>

SKETCH OF TAILINGS DUMP

WHIPPET GOLD MINE

TENNANT CREEK



EVALUATION OF RESERVES OF BISMUTH BEARING SANDS
AT THE NO. 1 GOVERNMENT BATTERY, TENNANT CREEK

by

J. Barclay

SUMMARY

The investigations of the bismuth bearing sands at the No. 1 Government Battery, Tennant Creek, show that about 1600 tons of bismuth sands are present; and assay results of unscreened four samples, Nos. 1, 3, 4, and 5, range in value from 0.69 percent Bi to 1.05 percent Bi. A fifth sample, No. 2, was largely of contaminated material and assayed 0.125 percent Bi.

INTRODUCTION

A survey and sampling of the bismuth bearing sands at No. 1 Government Battery were carried out at the request of Messrs. C. Strong and K. Shirley, who have applied for the right to treat the sands.

No. 1 Battery is best reached by travelling on the new bitumen road to Orlando Mine for 17 miles north-west from Tennant Creek and thence by bush road for a farther 2 miles to the north-east. The Battery has been in existence since the early days of mining at Tennant Creek.

The sands with which this report is concerned are reported to be tailings from some of the ore of the Whippet Mine. They were treated by cyanidation for gold several years ago and the remainder of the tailings dump is presently being treated by cyanidation in a project under the direction of Mines Branch.

SAMPLING AND EVALUATION OF RESERVES

The bismuth bearing sands are contained in one main pile (No. 1) which is flanked by two very small piles (Plate 5). Five representative samples were taken from these dumps during the investigations.

Samples Nos. 1 and 3 were auger samples obtained by drilling from the top to the base of the main pile. Samples Nos. 2 and 4 were channel samples from the sides of the main pile, and No. 5 sample was taken by collecting numerous small grab samples from piles Nos. 2 and 3.

The main dump contained not only fine-grained sand, but also many pebbles of quartz, sandstone, and mudstone. These pebbles were usually larger than $\frac{1}{4}$ " and ranged up to 1" in size. They were probably mixed with the sand to allow faster leaching in the cyanidation process to which the sands were previously subjected.

After coning and quartering, each sample was screened through a $\frac{1}{4}$ " mesh and assays were made on both screened and unscreened fractions to estimate the amount of dilution caused by the pebbles.

No. 2 sample was very contaminated with admixed material, apparently caused during building of the pile by bulldozer. However, this contaminated part may represent a negligible fraction of the whole of the dump.

After sampling a tape and compass survey was made from which the sketch map of Plate 5 was compiled. Due to the irregular shape of the dump, the volume was calculated by cross-sectional method.

Density determinations were not undertaken, but a conversion factor of 17 cu. ft/ton used by Mines Branch officials for the rest of the dump, has been applied to the calculations. A more accurate estimate of tonnage could be made by surveying the dump by plane-table survey and carrying out density experiments to verify the conversion factor used.

CONCLUSIONS

The results of the investigations show that about 1600 tons of sand are available with a bismuth content ranging from 0.69 percent Bi to 0.75 percent Bi (unscreened) on the main pile (No. 1) of 1500 tons, to 1.05 percent Bi on the small piles (Nos. 2 and 3) which amount to 100 tons.

The procedure of screening the sands for assay did not affect the results appreciably as can be seen the two sets of results are compared:-

<u>Sample No.</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Unscreened % Bi	0.69	0.13	0.75	0.73	1.05
Screened % Bi	0.78	0.16	0.72	0.83	1.07

If Messrs Strong and Shirley eventually treat the dump, by leaching for bismuth content, it will not be necessary to pre-screen the sands.

APPENDIX IVREPORT OF ANALYSIS BY THE AUSTRALIAN MINERAL
DEVELOPMENT LABORATORIES

LOCALITY: Tailings dump at No. 1 Government
Battery near Tennant Creek.

<u>Mark</u>	<u>Weight of sample</u> gm	<u>+ $\frac{1}{4}$"</u> g	<u>Bismuth (Bi)</u> %
1			0.69
2			0.125
3			0.75
4			0.73
5			1.05
1A	648	1.2	0.775
2A	345	115	0.155
3A	1199	49	0.715
4A	779	59	0.825
5A	889	49	1.07
4B			0.81

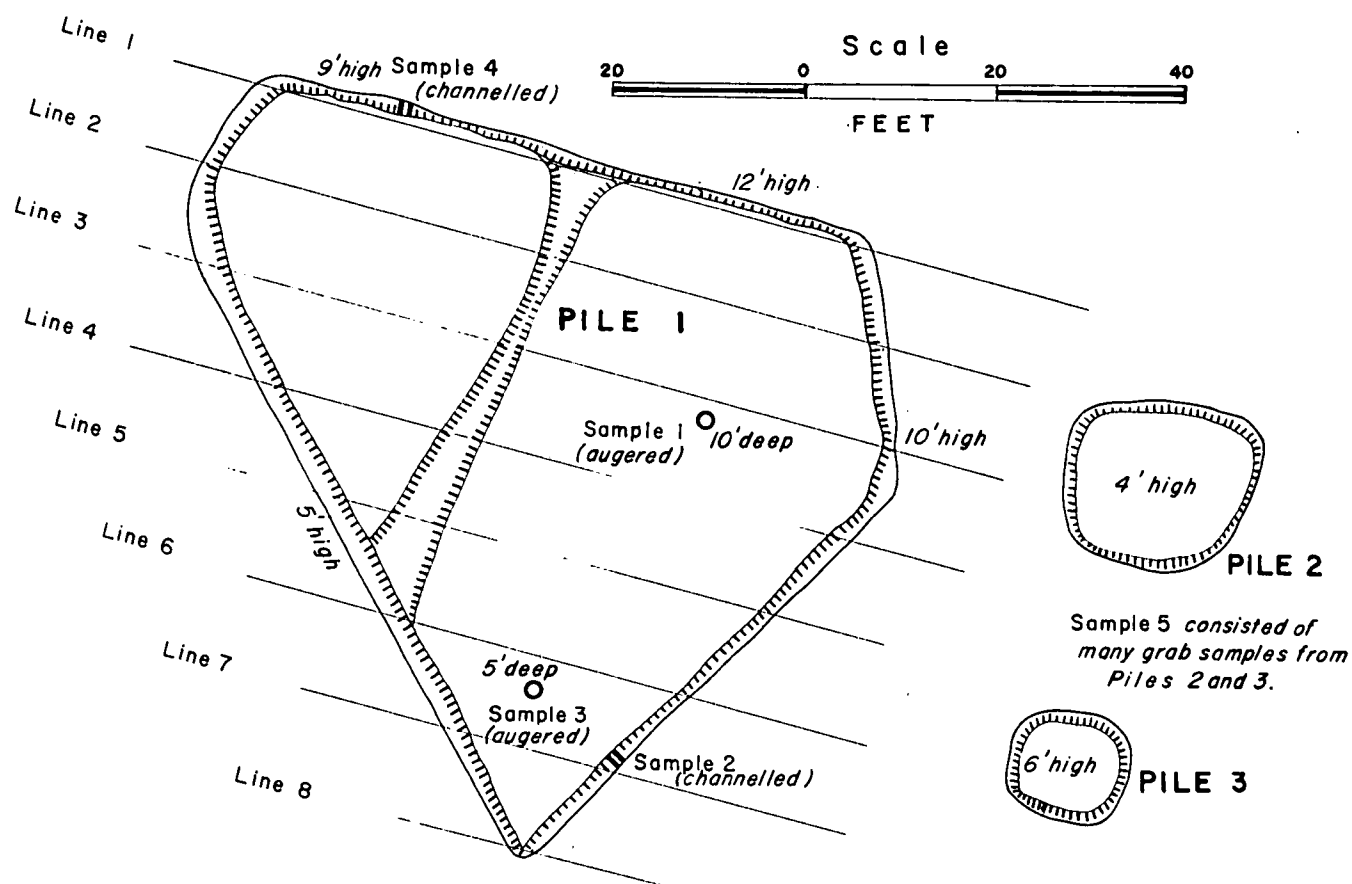
Samples 1 - 5 were unscreened
 " 1A - 5A were screened
 " 4B was the lower part (from 8' - 9') of
 channel sample No. 4 which was taken
 from the top of the dump at 0' to a
 depth of 8' down the side.

PLAN AND CROSS SECTIONS

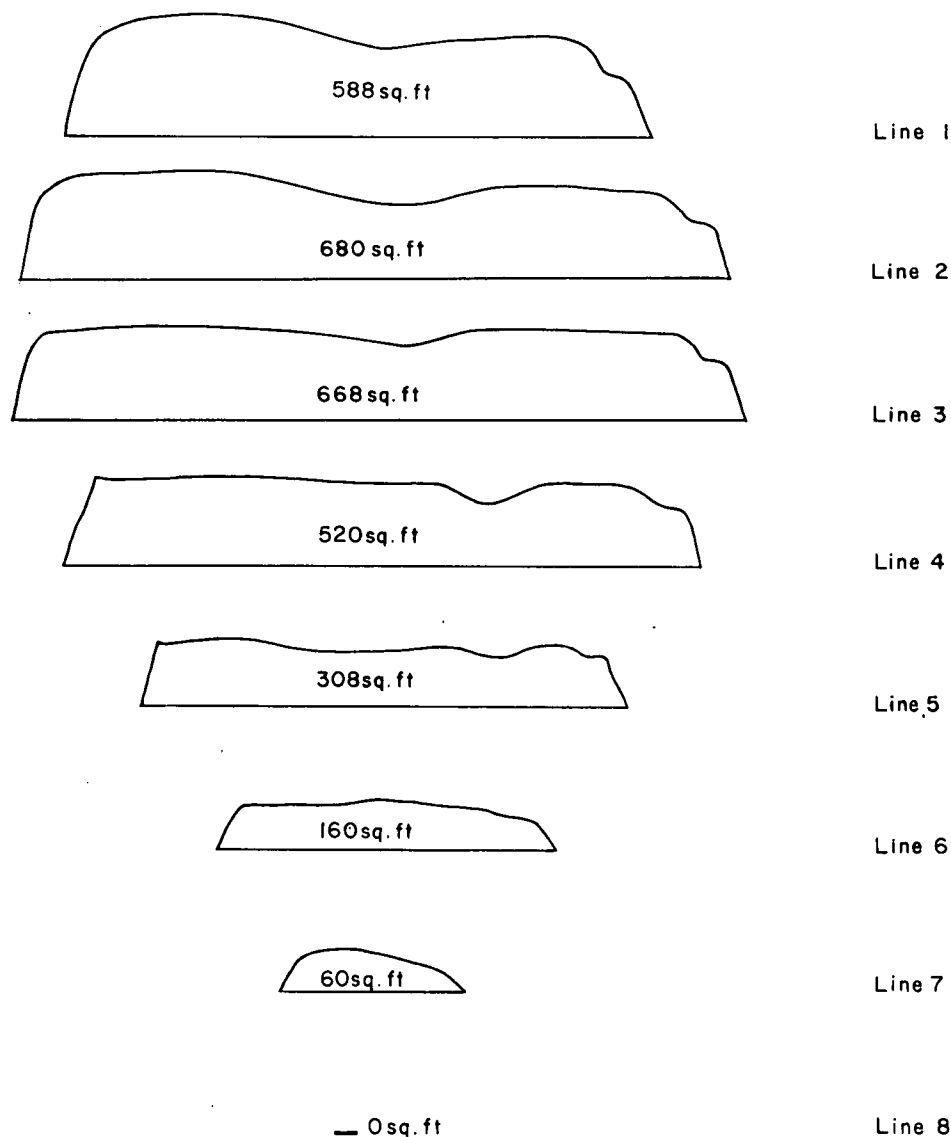
BISMUTH BEARING SANDS AT THE No1 GOVERNMENT BATTERY

Plate 5

(Tape & Compass Survey)



Approximate Cross-Sections of Lines 1 to 8



PILE 1: Total volume is 26,900 cu. ft.:- Tonnage @ 17 cu. ft/ton \approx 1500 tons

PILES 2 & 3 Volume is (15' x 20' x 4') + (10' x 10' x 6') cu. ft @ 17 cu. ft/ton \approx 100 tons

Total Tonnage \approx 1600 tons

GEOLOGICAL SURVEY AND SAMPLING FOR BISMUTH AT
THE PERSERVERENCE MINE, TENNANT CREEK

by

J. Barclay

SUMMARY

The survey at the Perserverence Mine was made to establish further reserves of bismuth ore in addition to the ore at the Jubilee Mine.

The investigations, carried out on 26.10.62 revealed that the bismuth ore occurs in patches in brecciated zones within massive siliceous hematite and development work is not yet sufficient for an estimate of ore reserves to be made. However, four samples of bismuth bearing ironstone were taken and assay results range from 0.62 percent to 5.45 percent Bi. The samples were also assayed for gold, but the highest value was only 0.5 dwt/ton.

INTRODUCTION

A geological survey and sampling at the Perseverence Mine was undertaken at the request of the lessees, Messrs K. Shirley and C. Strong of Tennant Creek. They have been mining and treating bismuth ore at the Jubilee Mine and wished to establish further reserves of bismuth ore.

The Perseverence Mine lies at a distance of 20 miles to the east of Tennant Creek and is best reached by way of the Peko, Kia-Ora, Renate, and Gold Mile Mines. It is situated on a low, broad hill about one mile east of the ridge containing the quartz-hematite lodes of the Golden Mile area.

GENERAL GEOLOGY

Near the mine, the only outcrops consist of quartz-hematite bodies, containing kaolin and, rarely, bismuth, and the rest of the area is soil covered. At 100 yards to the north, and on the northern edge of the hill there are outcrops of sediments of the Warramunga Group. These rocks, consisting here of sandstone, mudstone and hematite shale, have been folded and available evidence indicates that the folding pitches to the east-north-east at an angle of 25°. The sketch map (Plate 6) shows that the strike of the ironstone bodies is also to the east-north-east. In the shaft, at a depth of 25 ft. from the surface, a contact between iron impregnated, brecciated mudstone and massive quartz-hematite pitches to the west. Relic bedding at the top and bottom of the shaft, strikes approximately north-south and dips to the west at 25°. Although complete evidence is lacking, the ironstone bodies may have been emplaced in the crestral region of a west pitching fold. Reversal of pitch is also present in the area.

ECONOMIC GEOLOGY

Reference to the official records listed by Ivanac (1954) shows that 192.34 oss of dollied gold were won from the Mine up to June 1952. There has been no further work at the mine in recent years.

In the present investigations, the workings were mapped and Plate 6 shows that these are of very limited extent.

The walls of the shaft are timbered to a depth of 14 ft. below which are exposures of iron impregnated, brecciated mudstone. At a depth of 25 ft. from the surface and underlying the brecciated mudstone is a body of massive quartz hematite. The sharply defined contact strikes at 330° , dipping 25° to the west. The workings at the 25 ft. level apparently were made to test the hangingwall contact zone.

Bismuth ? carbonate in the ironstone is exposed near the bottom of the shaft, and near the small chamber at the 48 ft. level. The bismuth ore has a white spotted appearance in irregular brecciated zones within the well-jointed, massive quartz-hematite. The largest of the zones measured 6 ft. by 4 ft. in the eastern wall of the shaft.

Four samples of the ore were taken and assay results showed a range in values from 0.62% to 5.45% Bi, and from Nil to 0.5 dwts of gold/ton. In addition a grab sample taken from the dump by the lessees was assayed and found to contain 4.43% Bi.

CONCLUSIONS AND RECOMMENDATIONS

The assay results show that fairly rich bismuth ore is present.

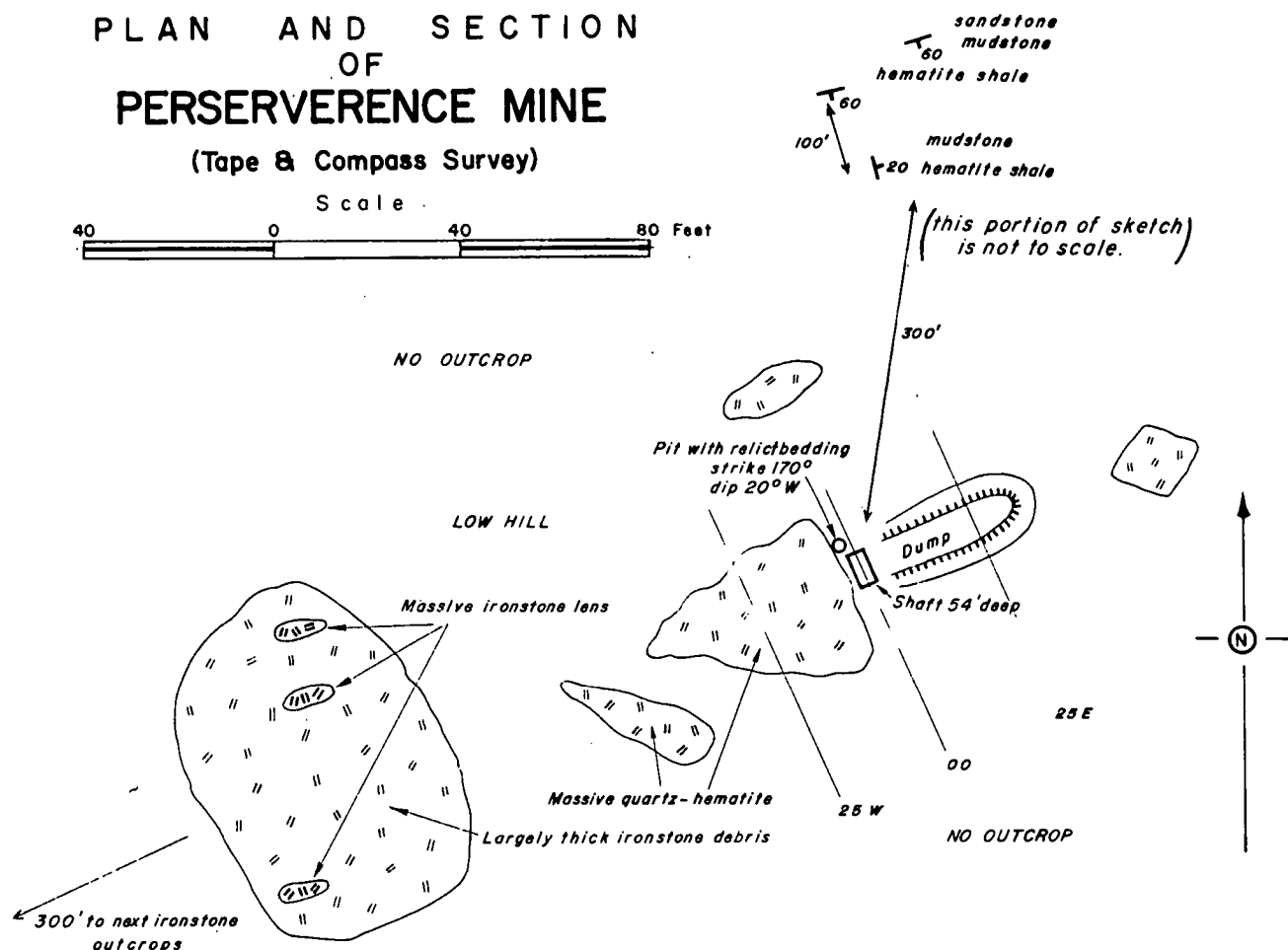
However, further development work is necessary before any estimate of ore reserves can be attempted and, since the bismuth occurrences are apparently small and patchy, development should be controlled with test holes by long-hole drilling in advance of driving or cross-cutting.

REFERENCE

- IVANAC, J., 1954 - The geology and mineral deposits of the Tennant Creek Goldfield, Northern Territory. Bur. Min. Resour. Aust. Bull. 22.

PLAN AND SECTION OF PERSERVERENCE MINE

(Tape & Compass Survey)



SECTION

Scale

20 0 20 40 Feet

