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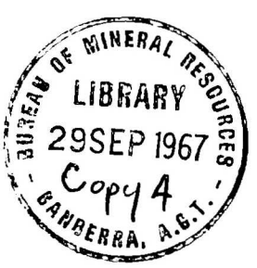

THE MINERAL DEPOSITS OF WEST ARM, BYNOE HARBOUR AND BAMBOO CREEK FIELD, NORTHERN TERRITORY.

by

K. W. A. SUMMERS

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SUMMARY

This report is the result of a survey of the resources of niobium, tantalum and tin in the West Arm, Bynoe Harbour and Bamboo Creek area of the Northern Territory. The survey was made as part of the investigation for uranium and related minerals in the Darwin-Katherine area.

An examination of the recordsfor production and history of the field showed that mining commenced on the field in 1886 and the total production to 1956 was 585.398 tons of tin concentrate and 14.927 tons of tantalum concentrate.

Niobium, tantalum and tin occur in small pegmatite veins which intrude the folded lower Proterozoic metamorphics of the region and in the eluvium derived from the weathering of pegmatites. Mineralization within the pegmatites is sporadic and irregular.

A regional geological map (1 inch = 1 mile) showing the location of known prospects is appended. Individual prospects and mines were mapped on a scale of either 1 inch = 40 feet or 1 inch = 20 feet, depending on the size of the prospect. Thirty-four mines were mapped and forty-six prospects inspected.

The majority of the pegmatites are zoned. All are quartz, muscovite, feldspar rocks, the feldspar being invariably completely kaolinised. Most of the veins are intruded parallel to the strike of the country rock.

It is not possible to assess the ore reserves of the pegmatite lodes owing to the sporadic distribution of mineralisation. The exploitation of the pegmatites themselves has had only limited success in the past. The eluvial gravels may be worth consideration by a large organization prepared to do the extensive prospecting and sampling involved.

INTRODUCTION

Tin, tantalum and niobium minerals occur in small pegmatite veins and eluvial gravels which are found in a belt of country about 6 miles in width, extending south from Kings Table (8 miles south-south-west of Darwin) for 34 miles to

the Bamboo Creek area. (Plate 1).

Access from Darwin is by the Stuart Highway to the 35 mile peg, then by the all-weather Dolissaville road leading west, crossing the Darwin-Birdum railway 9 miles from the highway, to Observation Hill, a further 35 miles west. From Observation Hill dry-weather tracks radiate within the field (Plate 2).

The pegmatite survey was undertaken as part of an investigation of Australian resources of niobium, and was carried out during the 1955 and 1956 field seasons. All known and reported occurrences of tin, tantalum and niobium mineralisation in the district were located and investigated. (Plate 2). The largest of these were mapped on a scale of 1 inch = 20 feet, and some others at 1 inch = 40 feet. The smaller mines and prospects were inspected but not mapped.

The deposits studied were of two types:

(i) Pegmatite veins with accessory minerals containing tin, tantalum and columbium;

(ii) gravels, both alluvial and eluvial, which have been derived from the weathering of pegmatites.

As far as could be ascertained all pegmatites occur within the Lower Proterozoic Koltendus Formation. Mineralisation is associated with pegmatites of irregular size and shape, and the study of the mines and prospects revealed that it follows no regular pattern of distribution within the pegmatites. The Mt. Finniss mine is the only area where systematic sampling of the eluvial gravels has been carried out.

Field work on this investigation was commenced during the 1955 field season, by Mr. D. Dow and Dr. H.P.T. Hyde. The writer continued the work and completed the survey during the 1956 field season.

Acknowledgements. The writer wishes to thank the prospectors, Messrs. Paddy Doran and George Parkinson, for their co-operation and hospitality during the 1956 field season.

PHYSIOGRAPHY

In the northern part of the area a series of meridionally trending hills rise about 200 to 250 feet above sea level. To the south and the west they merge into featureless undulating country. Numerous creeks rise in the ridges to the east of the mineralized belt, drain into low swampy country with numerous billabongs and then flow into Bynoe Harbour or the West Arm. In the dry season the creeks are a series of billabongs.

The country south of the Finniss River (Plate 2) is more rugged than the northern part of the mineral belt, but the relief is not great.

To the north of Observation Hill the drainage is into West Arm; to the south as far as the Lucy Mine it is predominantly into Bynoe Harbour by the Charlotte and Annie Rivers and their numerous tributaries. As a result of this pattern of drainage, alluvial tin is first distributed into the higher swamps and then into Bynoe Harbour and West Arm.

Rainfall is limited almost entirely to the period between October and March and is usually about 60 inches per annum. The intervening six months are dry except for occasional localised thunderstorms. During the wet season there is extensive and rapid growth of natural grasses and general vegetation, choking the smaller streams and swamps and retaining a large quantity of water which does not dry out until late in the dry season. As a result the area is often not wholly accessible until June. Water is plentiful in billabongs throughout the entire dry season.

Apart from the annual grasses the main vegetation consists of stunted eucalypts, pandanus, and fan palms (Livistonia). Perennial grasses are found in the swamps.

HISTORY

The history of mining in the Bynoe Harbour-Southport area dates back to 1886 when tin was discovered by C. Clarke. By 1890 the leviathan mine in Bynoe Harbour and the Annie mine were discovered, but activity was small until 1902.

In 1903 the Hang Gongs Wheal of found and 109.1 tons of tin concentrates were produced in 1905. In 1906, the mine produced 79.95 tons of tin concentrates, but it was worked out and closed down the following year after a total of 189.45 tons of tin concentrates had been won.

In 1903 a lubra discovered Bell's Mona mine but this did not come into production until four years later.

In 1909 activity was virtually limited to Leviathan, Bamboo Creek and Bell's Mona. In this year seven diamond drill holes were bored on the Good Hope and Loyal British mines. Results were "unsatisfactory". Little production came from the field between 1907 and 1909.

In 1914 extensive dredging licences were granted to a New Zealand applicant, but no efforts were made to test the prospects until 1918 when drilling carried out in West Arm gave satisfactory results. No other activity was report from the field, until 1924 when small parcels were produced. Renewed activities in 1925 coincided with the granting of exclusive prospecting licences over an area of 26.75 square miles in the Bynoe-Harbour-West Arm section but once again nothing eventuated.

From 1925 to the present day the main producers have been Mt. Finniss, Bamboo Creek, and the Walkers Creek group of mines. A small number of other mines have produced some tin, but total production from the field has not been high.

Testing of the eluvial ground at Mt. Finniss mine in 1944 indicated 50,000 cubic yards of material with an average depth of 2 ft. and an average grade of 0.84 lb. tantalum per cubic yard (a total of 18.3 tons tantalum).

The records of production for most mines are not complete, and in numerous cases changes have been made in the the names of claims which tend to confuse the records still further. In many cases the published names of mines cannot be linked with the field occurrences.

PRODUCTION

On Table I the available records of production from the field are set out.

REGIONAL GEOLOGY

The geology of the Bynoe Harbour-Southport area was mapped by regional parties from the Bureau of Mineral Resources during the 1956 field season. Plate 2 is based on the results of this mapping, and covers portion of the Southport, Tumbling Waters and Mt. Tolmer 1 mile areas of the Darwin Sheet of the Australian 4-mile map series.

The stratigraphy of the area is as follows:

Quaternary: Soil, alluvium and ferruginous deposits

Mesozoic: Cretaceous

Mullaman Group

Porcellanite and Grit

Precambrian: Upper Proterozoic

Tolmer Group

Buldiva Sandstone

Depot Sandstone Member

Pink ripple-marked friable quartz-sandstone with conglomerate near base.

Lower Proterozoic

Finniss River Group

Noltenius Formation.

Quartz pebble conglomerate, quartz greywacke, siltstone, phyllite, mica-schist, andalusite-mica schist.

Brocks Creek Group

Burrell Creek Formation

Siltstone, greywacke siltstone.

Archaean: Hermit Hill Complex.

Garnetiferous granite, granodiorite, diorite, dolerite.

The tin, tantalum and niobium bearing pegmatite veins are intruded into the Noltenius Formation.

STRUCTURE

The general structure of the lower Proterozoic is shown by Plate 2. The regional structure and lithology are reflected in the topography by the parallel ridges in the north-eastern section occupied by the Burrells Creek Formation

and by the flatter country occupied by the Moltenius Formation. In the area under consideration, there is evidence that the rocks are on the western limb of an extensively puckered syncline pitching steeply to the north. Sharp reversals of pitch occur in isolated areas. One major reversal is a dome five miles due west of the Lucy Mine. The domal structure is elongate meridionally and does not extend more than five miles. Other reversals of pitch appear to be purely local and confined to very small flexures.

Axes of folding trend from due north to north-north-east. The limbs of the folds are steeply dipping, ranging from 65° to vertical, but the general dip is in the vicinity of 80°.

The pitch is steep, commonly about 60-70° to the north.

The shearing is parallel to the axis of the folds and varies between north to north-north-east. The intensity of shearing changes rapidly over short distances. The north-north-east direction of fold axes and shearing is the main direction of structural weakness, and is reflected in the schistosity and the plane of elongation of the pegmatites. It is the major structural feature of the whole area. Strong groups of faults trending north-north-east/north-east are found throughout the area.

Minor jointing has been developed only in the clastic sediments of the Moltenius Formation. Bedding planes are commonly well defined.

GEOLOGY OF THE PEGMATITES

In the area investigated the mineralized pegmatite veins occur in a long narrow belt extending from West Arm south at least to Bamboo Creek, a distance of 34 miles. The belt has a maximum width of six miles. The deposits are all similar in lithology and structural control. In general the pegmatites are concordant with the schistosity and interfinger along the bedding planes, but small discordant bodies are also

found. Most of the pegmatites show pronounced zoning, although it is not always possible to delineate exact boundaries owing to poor outcrop and to the fact that most of the shafts and costeans which would indicate the underlying structure are filled with water and detritus.

The pegmatites are irregular in distribution and lie in four major zones within the belt. The most northerly zone comprises a small group at Kings Table and Black Jade mines. The major group of mines and prospects is centred around Observation Hill about 10 miles south of Kings Table. The third zone contains the Lucy group south of Charlotte River; the fourth is the southern group which includes the Mt. Finniss, Bamboo Creek and Walkers Creek mines.

No direct evidence was recognised as to the reason for these divisions in the distribution of the pegmatites. Within the belt no granite crops out but it is to be inferred that the pegmatites have been derived from granite cupolas at shallow depth.

ALLUVIAL DEPOSITS

The present gently undulating topography of the area does not lend itself to the formation of thick alluvial deposits. Erosion takes place mainly in sheet floods in the early parts of the wet season but owing to the luxuriant growth of annual grasses in the latter part of the season, movement of detritus is retarded and deposition takes place mainly in the many swamps.

The drainage pattern of the alluvial areas is in two main sections:

1. North of Observation Hill two main drainage channels flow northward parallel to each other into West Arm. These two unnamed creeks drain an area covering the main line of pegmatites.

2. South of Observation Hill. From the Lucy Mine in the south to Observation Hill the area is drained westward to Bynoe Harbour by a number of rivers including the Annie, Charlotte and East Charlotte.

The heavy ore minerals derived from the erosion of the pegmatites have been concentrated in the drainage channels. The initial concentration was in the "higher level" swamps, which were later incised by streams flowing into the sea. The second concentration in the shallow sea along the coast was re-distributed by the range of tidal variation. It would require extensive sampling to determine the tonnage and grade of all alluvial material.

A further possible source of ore minerals is the eluvial material on the slopes of the hills forming the pegmatite lodes; for example at Mt. Finnics, where 50,000 cubic yards containing 0.84 pounds tantalum per yard has been established.

ECONOMIC POSSIBILITIES OF THE FIELD

The deposits worked so far are a large number of small disconnected pegmatites scattered over a wide area. The field has been well prospected but very little work appears to have been done below the water table. Most of the pegmatites are small and would only be suitable for working by one or two men.

Tin, tantalum and niobium minerals have been determined by spectrographic analysis in the majority of the pegmatite lodes but insufficient evidence is available to establish a ratio between these minerals. Assay data are not sufficient to formulate a figure for the average grade of the deposits.

Diamond drilling carried out during 1956, and earlier in the century gave negative results as far as the pegmatites are concerned.

The best possibilities for future development lie in the eluvial material in the immediate vicinity of the lodes and the alluvial deposits in the swamps, watercourses and tidal areas of West Arm and Bynoe Harbour.

No attempt other than at Mt. Finnics has been made to evaluate the superficial deposits. Before any estimate can

be made it will be necessary systematically to test other eluvial material.

The alluvial deposits require systematic sampling, and any extensive exploration should be directed at the assessment of the mineral reserves in these swamps, water-course and tidal deposits.

The major factor determining the future development of the known resources of the area is the isolation during the wet season. No vehicular passage is possible during the rainy season and for some weeks afterwards until the low-lying country has dried out.

A gravel road was constructed from Darwin River siding to Delissaville via Observation Hill during World War II. This road has deteriorated and all bridges have been burnt down.

INDIVIDUAL MINES (MAPPED)

All mine co-ordinates are taken from the 1-mile military sheets named.

MT. FINNISS MINE (Plates 3 and 4).

The Mt. Finniss Mine is situated about 17 miles by dry weather track south-west of Darwin River Railway Siding and 18 miles due west of the Rum Jungle mine at coordinates 758490: Tumbling Waters 1-mile sheet.

Topography: The Mt. Finniss pegmatite occupies a long narrow ridge approximately 100 feet above the surrounding country and is situated 1½ miles from the Finniss River. The area is covered with Woolybutt (Eucalyptus miniata) and grasses flanking all slopes.

History and Production: The presence of tin and tantalum minerals was reported in 1886 but little work was done until 1906 when 1.5 tons of tantalite concentrates were exported. In 1925 production was resumed and 5 cwt. of unspecified concentrates exported. Mining continued sporadically until 1951.

Production figures for the period are given below:

Year	Tin - tons in concentrates	Tantalite - tons of concentrate
1924-25	0.5	
1926-27	0.35	0.075
1927-28	0.613	0.475
1928-29	0.463	1.375
1929-30	0.038	4.338
1930-31	0.200	2.051
1931-32	Nil	1.1
1932-33	Nil	0.375 (raised, not sold)
1933-34	Nil	0.175
1934-35	Nil	1.069
1935-36	1.73	Nil
1936-37	0.85	0.463
1937-38	Nil	0.375
1938-39	?	Nil
1939-40	4.66	Nil
1940-41	2.054	0.029
1941-42	0.37	-
1942-43	0.46	0.36
1943-44	-	-
1948-49	1.0	
1949-50	4.5	
1950-51	1.19	

Total production 18.968 tons tin concentrates, 12.26 tons tantalum concentrates.

During the early life of the mine the main production was obtained from surface workings in eluvium and decomposed pegmatite. The major portion of the surface material of the pegmatite has been removed.

The workings in the mine consist of two vertical shafts, at present 40 feet deep, which were inaccessible when the inspection was made. There are five small open cuts with a maximum depth of 15 feet. The No. 1 open cut has 3 small cross cuts east, south and west averaging five feet in length. Numerous pits, costeans and shallow workings are found on the property.

Four large dumps of eluvial material are situated on the eastern and western slopes of the hill. The mine is in quartz greywacke and schistose of the Lower Proterozoic

Noltenius Formation which locally trends N.N.E. and dips 75 degrees east.

The orebody occurs in a discontinuous pegmatite vein which is intruded concordantly into fine-grained quartz-greywacke and siltstone. The exposed portion of the pegmatite is lenticular, with the extremities interfingering irregularly into the sediments, but the outcrops are insufficient to show completely the true form and attitude of the body. It has an overall outcrop length of 600 feet. The maximum width is 250 feet.

From the contact inwards the pegmatite may be divided into five zones:

(1) A narrow border zone of fine granitic-textured quartz mica pegmatite - in sharp contact with country rock;

(2) a wall zone, up to 12 inches thick, predominantly of quartz and mica laths, crystallized perpendicular to the wall zone; this zone appears to be continuous around the pegmatite;

(3) an outer intermediate zone of fine-grained quartz, mica and feldspar (almost completely kaolinised) with a typically granitic texture;

(4) an inner intermediate zone predominantly of feldspar (almost completely kaolinised) with small quantities of quartz scattered irregularly throughout; and

(5) a core zone of massive milky quartz.

As well as these subdivisions there are remnant xenoliths of country rock which, during the process of assimilation, have been converted into as massive fine-grained green mica.

Mineralisation: Minerals present consist of tin, tantalum and niobium in the form of cassiterite and manganotantalo-columbate. An assay received by the Mines Branch, from Benedict, Kitto & Sons (London) of a concentrate of nett weight 1352 lb. showed:

SnO_2	68.67 per cent.
Ta_2O_5	11.12 "
Cb_2O_5	8.93 "
TiO_2	0.20 "
WO_2	0.025 "

FeO	2.61 per cent.
MnO	2.53 "
SiO_2	3.30 "
CaO	Trace "
Undetermined (by difference)	2.39 "

The mineralisation is in sporadic and irregular shoots throughout all zones of the pegmatite and in the xenoliths. The ore minerals occur as crystals up to 1 inch in diameter. From the position of the old workings the economic concentrations appear to have been mainly confined to the inner intermediate zone. The assumption that the inner intermediate zone was richest may be false, because this zone, being softer than the others due to kaolinisation of the feldspars, would lend itself most easily to the methods of mining employed by the early prospectors.

Sampling has been carried out on various exposed faces, but, owing to the nature and distribution of the minerals, is not expected to be definite. Assay results from these samples are given in Appendix I.

Prospect Drilling: Diamond drilling was carried out during this survey to study the behaviour of the pegmatites at depth.

Diamond Drill hole No. 1 from a position on the east side of the outcrop opposite the northern group of workings was bored at a direction of 300° with an inclination of 45°. Pegmatite showing traces of mineralization was intersected from 6 feet to 30 feet. From 30 feet to 280 feet the hole intersected quartz, mica-andaulusite schist and interbedded quartz greywacke.

As a result of the failure to intersect the main body of the pegmatite in the first hole a second hole (D.D.H. No. 2) was bored at an angle of 25° in the same direction as the first from a position on the east side near the southern end of the outcrop. The hole failed to intersect any pegmatite even at this shallow depth and the hole was abandoned at 193 feet.

Alluvial Mining: A considerable body of eluvial material occurs on the slopes of the rise occupied by the pegmatite, and the investigation carried out in 1944 showed 51,000 cubic yards containing 0.84 lb. tantalum per yard. These figures were obtained from a series of samples taken over an area of 800 feet by 1600 feet (approx. 29 acres) on a grid interval intersection of 200 feet. Assays for tin and columbium were not carried out on samples, but spectrographic analysis of grab samples taken during the present survey revealed 20 per cent cassiterite, 80 per cent columbite (carrying 5 per cent Ta_2O_5) from a 100 per cent concentrate of alluvium on the eastern slope. A similar sample from the west slope gave 40 per cent cassiterite, 60 per cent columbite.

Geological: In the mine there is a large pegmatite body with low-grade disseminated mineralization. The workings on the lode have been mainly confined to the strongly kaolinized material which could be easily removed and sluiced in the adjacent Finniss River. The main open cuts suggest that this material was entirely removed. The remaining lode consists of low-grade material of which the exact amount present cannot be determined from the available data; but diamond drilling has shown the pegmatite to be shallow-bottomed. The lode could be removed by open cut mining. Treatment would involve crushing and sluicing to concentrate the ore. Investigation of the alluvial deposits carried out in 1944 revealed 50,000 tons of ore of an average grade of 0.84 lb.per yard of tantalum, but did not provide complete assays for tin and niobium present. Further checking of the eluvial material to determine the tin and niobium to supplement the tantalum survey of Kaylon would be advisable before any large scale sluicing operations were carried out.

This mine might still prove payable for a small syndicate prepared to do the work involved.

BATTERY CREEK (Plate 5)

Location: The Battery Creek tin mine is situated

1½ miles south from the junction of Bamboo and Walkers Creek, approximately 19 miles due west of Rum Jungle Siding on the North Australian railway line, at co-ordinates 639352 Mt. Tolmer 1-mile sheet.

The mine is accessible only in the dry season by a single vehicle track from the Rum Jungle siding. This track goes west for 15 miles to Mt. Finniss, turns south and crosses the Finniss River further on, and continues for ten miles due south to Bamboo Creek.

The pegmatite in which the lode occurs crops out near the top of one of a series of ridges rising about 250 feet from a gently undulating and swampy plain.

History and Production: The mine was first reported in 1906 and was worked until 1909. Small parcels of ore were won. During 1909 the Government diamond drilled the lode but the results were "unsatisfactory".

From 1909 to 1926 the mine remained closed. In 1927 it was reopened and 0.81 tons of tin concentrates were produced. Further work was carried out in 1939 and continued until 1952 when the mine was abandoned. The following table gives the total production of the mine.

Year	Tin - tons concentrate
1906	1.0
1908	3.0
1927	0.81
1939-40	0.42
1940-41	0.456
1941-42	0.06
1942-43	-
1943-44	4.60
1944-45	10.80
1945-46	4.94
1946-47	8.86
1947-48	7.00
1948-49	3.60
1949-50	-
1950-51	0.71
1951-52	-
TOTAL	46.736

In addition 0.345 tons of tantalite concentrates

are reported to have come from the mine.

Workings: The lode was first opened up by 3 open cuts from the surface, but to facilitate mining an adit was driven 250 feet from a point 90 feet below the surface outcrop and stoping carried out until the shoots above were completely removed.

Underhand stoping was carried out on a downward extension of the No. 1 shoot (see Plate 5).

Sampling was carried out by Mr. D. Pitman for Utinium Syndicate of Brisbane in 1953 and in the same year the mine was reported on by J. N. Reid, Consulting Geologist, Brisbane.

Geology: The ore-bearing pegmatites occur in the Woltenius Formation which in this area consists of sandstone and phyllite with interbedded conglomerate, striking 350° and dipping steeply westward at angles between 60 and 70°.

The pegmatite is a lenticular discordant mass with a long axis trending about 45 degrees. It pitches steeply in a south-westerly direction, as shown in the three stopes on the accompanying map (Plate 5).

Tin, tantalum and niobium minerals occur on the footwall of the pegmatite in the vicinity of the wall and border zones where the country rock interfingers with the intrusive pegmatite. Only traces of mineralization are known in the other zones of the pegmatite.

Conclusions: From available records it appears that several tons of fairly rich ore have been removed from the mine. No. 1, 2, and 3 ore-shoots have been completely stoped out above the adit level, and a small amount of underhand stoping has been carried out in No. 1 shoot.

There are no indications of the depth to which values continue beneath the adit level, and underground explorations alone will add anything further to the picture.

Any further prospecting should be directed to establishing the behaviour of the known shoots below the adit level, and to the exploration of the contact zones

between country rock and pegmatite, particularly at the northern and southern extremities where the pegmatite interfingers with the country. It is unlikely that the main bulk of the pegmatite carries tin-tantalum-niobium minerals in any economic quantities.

GOODWILL EXTENDED TIN MINE (Plate 6)

Location, Access, etc: The Goodwill Extended mine is 15 miles due west of Rum Jungle Railway Siding and is reached by a dry weather road from the siding 15 miles westward to Mt. Finniss, then southward 8 miles, crossing the Finniss River 2 miles south of Mt. Finniss.

The mine is situated on the east bank of Walkers Creek on a series of low ridges rising to a maximum of 50 feet above the creek. Mt. Tolmer co-ordinate is 670422.

History and Production: No record exists of the original discovery of the mine, nor of any production up to the year 1954-1955 when 0.075 tons of concentrates were produced. The following year 0.25 tons of concentrates were recorded. The mine is still being worked by Mr. G. Parkinson.

Workings: Surface workings consist of a number of open cuts which have been formed by sluicing the pegmatites. Four shafts have been sunk in the northern section of the lode to a maximum depth of 40 feet, and cross-cuts have been driven from these shafts; but caving had made the workings inaccessible at the time of examination.

Geology: The pegmatities in which the ore occurs are in quartz-mica-andalusite schist of the Noltenius Formation. There are at least five small bodies of pegmatite which are elongate, sinuous and concordant with the sediments forming the country rock. The contacts between the pegmatite and country rock are clearly exposed and zoning is pronounced. The border zone is two inches thick and consists of fine-grained quartz-mica pegmatite with a saccharoidal texture. The wall zone which is twelve inches thick is composed of quartz and mica, the crystals of which are perpendicular to

The contact. The No. 1 Intermediate zone is a fine-grained quartz-mica-feldspar pegmatite and the No. 2 Intermediate zone a fine-grained feldspar-mica pegmatite in which complete kaolinisation of the feldspars have taken place. There is a core zone of milky quartz. Zoning is not continuous or concentric.

Traces of mineralization can be found scattered through all zones of the pegmatite, and in the northern section there is a strong and rich mineralization in the border and wall zones.

Conclusions: This mine is the only one which was being worked at the time of the investigation, and the pegmatite is virtually unexplored. The open cuts formed by sluicing have only removed the weathered surface material, and no stoping has been done from the crosscuts and shafts underground. In the vicinity of the shafts exposed surfaces show that rich shoots may exist in the orebody.

Further work by a small-scale operator is obviously practical on this mine.

LEVIATHAN MINE (Plate 7)

Location: The Leviathan mine is situated on the eastern banks of the Leviathan Creek at the head of Bynoe Harbour, nine miles south-south-west of Observation Hill from which it is reached by 15 miles of bush track. During the wet season the mine is subject to flooding. Tumbling Waters co-ordinate 661689.

History: The mine was discovered in 1886 by C. Clarke. By 1890 a total of 400 tons was raised for a return of two tons of tin oxide and a plant was being erected to treat the ore.

Work was then suspended until 1900 when a syndicate formed the "Bynoe Harbour Tin Mining Co." to work the Leviathan Mine. A treatment plant was purchased and erected. The records state that small amounts of tin concentrates were won between 1814 and 1904. It is recorded that at the surface the outcrop was 15 feet wide

but at a depth of 50 feet it had narrowed to 6 feet and the pegmatite was coarse with irregularly distributed patches of tin. The leases were abandoned in 1909.

Workings: Workings visible from the surface consists of two open cuts 600 feet apart. The southernmost strikes north-east and is 150 feet long, averages 20 feet wide and 20 feet deep. The northern open cut which strikes north is 120 feet in length, with a maximum width of 30 feet, and 10 feet deep. It is apparent that caving has occurred in both these open cuts; the depth prior to caving is not known.

In 1891 Parkes in his report mentions that three shafts were being worked but these could not be identified. It is assumed that they are represented by three depressions west of the southern open cut.

Numerous costeans and prospecting pits occur between the two main open cuts.

Geology: The pegmatites occur in quartz-mica schist of the Moltenius Formation. Outcrop is poor, as a capping of lateritic gravel is present. The outcrop indicates that the schist is strongly puckered and that the pegmatites, although sinuous in outline, are concordant with the sediments. Isolated small quartz flows in the area have no apparent relationship to the pegmatites.

The pegmatite is zoned. The border zone is composed of fine-grained quartz and mica and is 3 inches thick. The wall zone is 12 inches thick and is composed of mica and quartz - the mica in elongate lathes perpendicular to the contact; the first intermediate zone is fine-grained quartz-mica and feldspar, and the second intermediate zone fine-grained feldspar-mica. In both intermediate zones complete kaolinisation of the feldspar has taken place.

It is probable that the mineralization was mainly concentrated close to, or in, the border and wall zones, as these appear to have been selectively mined and have been almost entirely removed in the open cuts.

Conclusions: Records of production of this mine are sketchy, but those available suggest that the overall grade of ore was generally low and that the mine has been worked out.

HANG GONG WHEAL OF FORTUNE (Plate 8)

Location: The mine is on a small knoll rising to a height of 25 feet above the surrounding plain and is situated 3¼ miles south-south-east of West Arm landing. It is 71 miles by road from Darwin, 1 mile north of Observation Hill, on the western side of the road to Delissaville Native Settlement. Co-ordinate 752832; Southport 1-mile sheet.

History: The mine was first reported in the year 1903 when work commenced on the lodes. Production in 1904 was 109.7 tons of concentrates valued at £8,258. The following year the production was 79.15 tons. The mine then closed down as it was considered that the pegmatites had lensed out at depth. Renewed interest was taken in the area in 1956 when the leases were again pegged. The total production was 189.45 tons of tin concentrates.

Workings: The surface workings consist of a large open cut which trends north and is 100 feet long, with a maximum width of 20 feet. The present maximum depth is 8 feet but it is obvious that a considerable amount of rubble has fallen in and filled the hole. Two smaller adjacent open cuts run parallel with the main one. The first is 40 feet by 10 feet, the second 10 feet by 20 feet; the maximum depth in both is 8 feet, but they again are obviously caved in. Three small shafts, each about 15 feet deep have been sunk in the lode. They were inaccessible at the time of inspection.

Numerous costeans and prospecting pits are scattered over the lease.

Eluvial workings are found on the northern and north-eastern slopes of the hill on which the lode occurs.

Geology: The ore occurs in a strongly zoned pegmatite concordantly intruding quartz-mica schist country rock. The three major zones in the pegmatite are an outer fine-grained [illegible], an intermediate fine-grained strongly silicified quartz-mica, and a second intermediate zone of fine-grained

feldspar-mica. Massive white quartz veins are found throughout the pegmatite.

No trace of mineralization in situ could be found in the pegmatite, at the time of inspection.

From early reports it seems that the mineralized lens wedged out at 16 feet deep and no further lenses were located.

Conclusions: The lode appears to have been worked out and there are no indications of any further shoots.

LUCY MINE (Plate 9 - not published but available in records of the Bureau of Mineral Resources, Canberra)

Location and Access: The Lucy Mine is 10 miles due west of the Darwin River railway siding and is reached by dry weather road from the siding. The mine is located on the eastern bank of the Annie River. Co-ordinates 775629; Tumbling Waters 1-mile sheet.

History: Although this mine is apparently one of the oldest in the district, the first official report is for 1920 when 0.91 tons of concentrates were produced. In 1933-1934, 1.35 tons of concentrates were produced. The mine has remained idle since that time. Total recorded production is 2.26 tons of tin concentrates.

Workings: The workings are divided into two sections with 600 feet of barren ground between. The southern group runs north-east for a distance of 240 feet and comprises two main open cuts 70 feet and 40 feet in length with an average width of 15 feet and depth of 6 feet. Several caved shafts occur adjacent to the open cut.

In the northern group are three shallow open cuts also striking north-east. The largest and most southerly of the group is 140 feet long, 50 feet wide and averages 5 feet in depth. The centre cut is 50 feet long, 20 feet wide and 5 feet deep. The smallest and most northerly is 25 feet deep. One shaft, 20 feet deep, is inaccessible. Numerous dumps, costeans, eluvial workings, and prospecting pits are scattered throughout the area.

Geology: The surface geology is mainly obscured by lateritic gravel and eluvial tin workings.

The bottoms of the open-cuts are almost completely silted and few outcrops of pegmatite can be seen.

In the southern section the pegmatite is attenuated and concordant with the country rock which is a laminated siltstone striking north-east and dipping steeply west. The pegmatite is not zoned and is a fine-grained quartz-mica feldspar rock in which the feldspar is completely kaolinised. Its contact with the country rock is not sharply defined.

The boundaries of the pegmatite in the northern section are completely obscured by eluvium and detritus, but the shape of this open cut suggests it was lenticular and concordant with the country rock.

Minerals collected from the dumps were found to contain tin, tantalum and niobium.

Conclusions: The pegmatite crops out over a very limited area. Although many of the small workings were examined no evidence of further lenses of ore was seen.

LEES TIN MINE (Plate 10, not published)

Location and Access: The mine is ¾ mile due south of Observation Hill, on the east side of the main dry weather track leading to the Lucy Mine. Southport co-ordinate 761803.

History and Production: The Mines Branch has no records of the history or production in this mine.

Workings: The main surface work is an open cut 60 feet long, 30 feet wide and 10-12 feet deep, striking north-east.

There are two shafts at least 20 feet deep and numerous others at least 10 feet deep. Costeans and prospecting pits are scattered all over the area.

To the south-west of the mine are many dumps and eluvial workings.

Geology: Surface outcrop is poor, almost non-

existent, except in the workings. The area is scattered with numerous sheets of pegmatite; the strikes of their contact with the country rock range from north-west/north-east. The strike of the country rock, laminated siltstone, is equally variable, suggesting that folding is locally intense.

The pegmatite is a homogeneous quartz-mica-feldspar rock showing no signs of zoning. Kaolinisation of the feldspars is complete. The metallic minerals are exceedingly fine-grained and distributed sporadically through the pegmatite. This is well demonstrated in the western walls of the open cut.

Conclusions: The mine consists of a number of small pegmatites with no apparent orientation.

All underground workings are now inaccessible, and in the absence of production records it is now impossible to say what stage of development was reached in this mine.

From surface evidence it is not promising.

OLD BUCKS MINE (Plate 11 - not published).

Location and Access: Old Bucks Mine is 8 miles south-west of Observation Hill, midway between Leviathan and Annie Creeks, and one mile north-east of Leviathan mine at the south-eastern end of Bynoe Harbour. The site of the mine is in an extensive alluvial field which is flooded in the wet season.

The mine is reached by road from Observation Hill, seven miles south to the Charlotte River crossing at Rocky Bar, then five miles south-west along a gravel track.

Co-ordinates 678703; Tumbling Waters 1-mile sheet.

History: Originally this mine was called Fords Claim, and in 1905 was the main producer in the field. No further information is available until 1951 when an option was taken on the mine by Drilling and Development T.C. No Liability. It is reported that this company undertook a drilling and sampling programme, but no records are available of the results of the survey. No further work has been carried out on this mine, and no production of ore has been recorded.

Workings: The workings consist of one open cut striking north/south, 50 feet in length, 8 feet wide, and a maximum of 7 feet deep; one main shaft 15 feet deep but inaccessible at the time of the visit. Scattered throughout the area and along the length of the pegmatite are a series of prospecting pits and costeans.

Geology: The pegmatite containing the ore strikes north and is attenuated and sinuous. It is concordant with the country rock which is micaceous siltstone.

The pegmatite is approximately 250 feet long, but it is probably discontinuous. The maximum width seen from the poor surface exposure is about 10 feet. Strong evidence of zoning is shown in the pegmatite, with traces of mineralization found in the border and wall zones.

Small pegmatites which interfinger in the country rock, are scattered over a wide area 100 feet north of the main workings.

Conclusions: Outcrop is poor in the area, but from the exposures seen it seems unlikely that any great tonnage of ore has been, or could be removed from this pegmatite.

BELLS NONA TIN MINE (Plate 12 - not published)

Location: The mine is situated 3 miles south-west of Observation Hill. The surrounding country is gently undulating, and in parts swampy, low-lying laterite-covered plateau. Co-ordinate 719775; Southport.

History and Production: The mine was discovered by a lubra in 1903 but was not worked until four years later. In 1907 it was purchased by Bell to be worked as a low-grade open cut. During 1908 two shafts were sunk to depths of 62 feet and 42 feet, and 3,247 tons of ore were mined, of which 2,833 tons yielded 13.5 tons of concentrates.

In 1909 development was carried out on the 53 feet and 62 feet levels and stoping was carried out on the 62 feet level. During 1910 diamond drilling was carried out by Government agency. No detailed records exist of the

location or angles of these holes. The No.1 D.D. reached a depth of 405 feet and traces of tin were found between 363 feet and 366 feet. No. 2 D.D. reached 126 feet.

As a result of this drilling and its failure to find any extension of the pegmatite at depth the mine was let on tribute to Chinese to work any small pockets of tin remaining in the pegmatite. Total recorded production was 13.5 tons of tin concentrates.

Workings: Workings consist of two open cuts trending north-north-easterly. The southern open cut is 280 feet long with a maximum width of 70 feet and a depth of 10 feet.

The northern open cut is 90 feet long with a maximum width of 50 feet, and a depth of 8 feet. Both open cuts were full of water at the time of the inspection. Five shafts on the lease were also full of water. Numerous prospecting pits and costeans are scattered over the lodes.

Geology: The pegmatites crop out on a laterite covered plain. They trend north-north-east in a linear outcrop and are concordant with the country rock. The pegmatite is composed of fine-grained quartz and feldspar and is not zoned. Traces of mineralization are distributed sporadically in the north end of the southern open cut.

Conclusions: This mine has produced a large tonnage of fairly low-grade ore, but appears to be completely worked out. Diamond drilling results point to the pegmatite pinching out rapidly in depth.

GOODWILL MINE

Location and Access: The Goodwill Mine is situated on the south bank of Walker's Creek, 8 miles south-west of Mt. Finniss and fifteen miles due west of Rum Jungle railway siding.

Access is by dry weather road from Rum Jungle siding 15 miles west to Mt. Finniss, then 10 miles south, crossing the Finniss River 2 miles from Mt. Finniss, and crossing Walker's Creek ½ mile from the mine.

The mine is on a ridge about 100 feet above creek level.

History: The first reliable report on the mine states that 0.85 ton of concentrates was produced in 1936-1937. In 1941-42 a further 0.24 ton was recorded.

The Inspector of Mines visited the mine in 1948 and reported that Territory Tin and Tantalite Company had commenced operations. The treatment plant was installed and 0.88 tons of concentrates produced. In 1949-1950, 4.5 tons of concentrates were produced, and in 1950-51, 1.19 tons. Operations then ceased and the lease was abandoned. Total recorded production was 7.66 tons of tin concentrates.

Workings: The workings consist of one open cut striking 227°, 189 feet long, 50 feet wide and up to 35 feet deep.

Geology: The main portion of the pegmatite in which the ore presumably occurred has been removed by the open cut. The only pegmatite remaining is at the extreme ends of the open cut.

From the evidence available the pegmatite was discordant with the country rock which is a laminated quartz greywacke striking 195 degrees. Dips in the country rock are between 80° East and vertical along the length of the open cut. The open cut is lenticular in shape, suggesting a lenticular pegmatite body, which pinches out rapidly at depths of 35-40 feet. Unfortunately, the floor of the open cut is covered with thick silt and detritus so that no outcrop could be seen. At the extremities of the open cut the pegmatite narrows out and cuts across the sediments. Traces of mineralization are evident in the pegmatite, but are irregular and sporadically distributed.

There is no evidence of zoning in the remaining fragments of pegmatite, which is a fine-grained quartz-mica-feldspar rock and has been completely kaolinised. The attitude of the open cut suggests that the pegmatite was vertical.

Conclusions: It is highly improbable that this pegmatite is worthy of any further consideration. It appears to have been developed to the limit.

GRANTS MINE (Plate 13 - not published)

The Grants Mine is situated on a laterite ridge 1½ miles

from Observation Hill on a bearing of 310 degrees. Co-ordinates 733837; Southport 1-mile sheet.

The mine was opened in 1905 when 3.15 tons of tin assaying 72 per cent metallic tin were produced; this is the only recorded production. Since 1905 it has been worked intermittently.

The pegmatite has been opened up by a number of open cuts and shafts to a vertical depth of 35 feet. The direction of the open cuts, which run north-south, no doubt corresponds with the longitudinal axis of the pegmatite, which is obscured by the accumulation of debris at the present day. The underground workings were inaccessible at the time of the inspection.

The pegmatite is zoned, but because of the lack of exposure it is not possible to delineate the zones. It is tabular and concordant with the quartz-mica schist country rock. In the report of the Government Geologist, 1905, the pegmatite was stated to range from five feet to six feet in width and the feldspar in the orebody was completely kaolinised and contained only traces of tin ore.

No traces of minerals could be found in either the pegmatite or on the dumps.

Minor Prospects.

The numerous small mines and prospects listed below are all associated with pegmatites exhibiting similar characteristics in trend, size, shape and mineral relationships. The lengths range from very small, 3 feet or less, to large, up to 200 feet. Within the pegmatites no systematic pattern with respect to size or shape is apparent. The trends are generally constant in a northerly direction and lie within the regional axis of folding. The shape of the pegmatites in the main is obscure due to the surface eluvial cover and the lack of underground workings. Within some of the openings minor structures can be noted which suggest an irregular shape and interfingering into the country rock. The main workings are invariably at the widest point exposed. In all cases

the length of the pegmatites is greater than the thickness.

The internal structure, where visible, shows zonal aggregations of mineral. The relationships between pegmatite and wall rock are sharp and conformable with the country rock. The border zone is fine-grained quartz-mica rock. The wall zone shows crystals of quartz, mica and in some cases feldspar perpendicular to the border zone. The intermediate zones, one or more in number, are fine-grained quartz-mica feldspar and differ according to the predominant mineral present.

The relationship between economic mineral and the internal structure within the pegmatite is completely obscure. With minor exceptions the only mineral discovered during this survey was on the dumps. The minerals determined were cassiterite, tantalite and columbite.

Map co-ordinates for the prospects listed are taken from the 1-mile military sheets named.

JOHNSTONS MINE (Plate 14 - not published)

The Johnstons mine is situated 1¼ miles from Observation Hill on a bearing of 317 degrees. Co-ordinates 739835; Southport 1-mile sheet.

NEWSHAMS MINE (Plate 15 - not published)

The Newshams mine is situated 1 mile from Observation Hill on a bearing of 317 degrees. Co-ordinates 739831; Southport 1-mile sheet.

HORDENS MINE (Plate 16 - not published)

The Hordens mine is situated on an alluvial flat 1 mile from Observation Hill, on a bearing of 240 degrees. Co-ordinates 736808; Southport 1-mile sheet.

LITCHFIELD AND LUGGS MINE (Plate 17 - not published)

The Litchfield and Luggs mine is situated 2 miles from Observation Hill on a bearing of 250 degrees. Co-ordinates 722806; Southport 1-mile sheet.

JEFFERSONS MINE (Plate 18 - not published)

Location: ½ mile south-east of Observation Hill on the Bynoe Road. Co-ordinates 759814; Southport 1-mile sheet.

QUART POT MINE (Plate 19 - not published)

The Quart Pot mine is situated ⅝ mile north-east of Observation Hill. Co-ordinates 757829; Southport 1-mile sheet.

BELL MINE (Plate 20 - not published)

Location: 4 miles from Observation Hill on a bearing of 200 degrees. Co-ordinates 732753; Southport 1-mile sheet.

TWO SISTERS MINE. LEASE 4GB WAGGAMAN (Plate 21 - not published)

Location: The prospect is situated 2⅝ miles south-south-west of Observation Hill. Co-ordinates 731776; Southport 1-mile sheet.

WHITE ANGEL MINE (Plate 22 - not published)

Location: Situated 3½ miles south-south-west of Observation Hill. Co-ordinates 729761; Southport 1-mile sheet.

BRADYS MINE (Plate 23 - not published)

Location: 1¾ miles from Observation Hill on a bearing of 195°. Co-ordinates 748791; Southport 1-mile sheet.

OLSEN AND THOMAS MINE (Plate 24 - not published)

Location: 1½ miles south of Observation Hill. Co-ordinates 756798; Southport 1-mile sheet.

BOOTH AND LEES MINE (Plate 25 - not published)

Location: 1 mile from Observation Hill on a bearing of 170 degrees. Co-ordinates 758798; Southport 1-mile sheet.

UN-NAMED MINE (SP6) (Plate 26 - not published)

Locations: ⅝ mile south of Observation Hill on the east side of track opposite the Lees Extended mine. Co-ordinates 752809; Southport 1-mile sheet.

LEES EXTENDED MINE (Plate 27 - not published)

Location: ⅝ mile from Observation Hill on bearing of 200°. Co-ordinates 748802; Southport 1-mile sheet.

ROCKY BAR MINE (Plate 28 - not published)

Location: 4½ miles from Observation Hill bearing 188°. Co-ordinates 747738; Southport 1-mile sheet.

AH BUNG MINE (Plate 29 - not published)

The Ah Bung Mine is situated ½ mile west of Rocky Bar Crossing on the Charlotte River. Co-ordinates 739740; Southport 1-mile sheet.

AH HOY MINE (Plate 30 - not published)

Location: 1½ miles east from Rocky Bar Crossing on the Charlotte River. Co-ordinates 741755; Southport 1-mile sheet.

MT. ENEL MINE (Plate 31 - not published)

Location; 4½ miles south of Rocky Bar Crossing on the Charlotte River. Co-ordinates 746664; Tumbling Waters 1-mile sheet.

CHINESE MINE (Plate 32 - not published)

Location: 4½ miles south of Rocky Bar Crossing on the Charlotte River. Co-ordinates 744668; Tumbling Waters 1-mile sheet.

SMITHERDENS MINES (Plate 33 - not published)

Location: 7 miles from Rocky Bar Crossing on the Charlotte River on a bearing of 175 degrees. Co-ordinates 759682; Tumbling Waters 1-mile sheet.

PICKETTS MINE (Page 34 - not published)

Location: 7½ miles from Rock Bar Crossing on the Charlotte River on a bearing of 195 degrees. Co-ordinates 717628; Tumbling Waters 1-mile sheet.

GOODLUCK MINE (Plate 35 - not published)

Location: 7½ miles from Rocky Bar Crossing on the Charlotte River on a bearing of 176 degrees. Co-ordinates 754616; Tumbling Waters 1-mile sheet.

MARTINS MINE (Plate 36 - not published)

Location: 7½ miles from Rocky Bar Crossing on the Charlotte River on a bearing of 175 degrees. Co-ordinates 757614; Tumbling Waters 1-mile sheet.

TIN POT MINE (Plate 37 - not published)

Location: 4¼ miles on a bearing of 230 degrees from the crossing of the Finniss River, 2 miles south-west of Mt. Finniss. Co-ordinates 661411; Mt. Tolmer 1-mile sheet.

ANNIE MINE

4½ miles south of Rocky Bar Crossing on the Charlotte River on bearing of 190 degrees. Co-ordinates 734660; Tumbling Waters 1-mile sheet.

LEE AH CHANGS MINE

Location: 5 miles from Rocky Bar Crossing on the Charlotte River on a bearing of 170 degrees. Co-ordinates 767650; Tumbling Waters 1-mile sheet.

SABINES MINE

Location: 6½ miles from Rocky Bar Crossing on the Charlotte River on a bearing of 185 degrees. Co-ordinates 743632; Tumbling Waters 1-mile sheet.

ROSES MINE

Location: On a low-lying laterite capped flat 2 miles on a bearing of 348 degrees from Observation Hill. Co-ordinates 748853; Southport 1-mile sheet.

BLACK JADE MINE

Location: On a laterite capped flat 5 miles north of Observation Hill and ½ mile north of Star-fish landing. Co-ordinates 761922; Southport 1-mile sheet.

MUGS FIRD MINE

Location: 5¾ miles north of Observation Hill on an alluvial flat. Co-ordinates 761922; Southport 1-mile sheet.

KINGS TABLE MINE

The Kings Table Mine, latterly known as West's Mine, is situated seven miles north of Observation Hill and on the edge of the mangrove swamps. Co-ordinate 762952.

JEWELLERS MINE

Location: On a low-lying laterite outcrop 4 miles north of Observation Hill. Co-ordinates 757891, Southport 1-mile sheet.

HILLS MINE

Location: 1 mile from Observation Hill on bearing of 340 degrees. Co-ordinate 745838, Southport 1-mile sheet.

BEAR AND WOLF MINE

Location: 1¼ miles south of Observation Hill. Co-ordinates 758794; Southport 1-mile sheet.

JONES MINE

Location: 1½ miles from Observation Hill on bearing of 195°. Co-ordinates 747791; Southport 1-mile sheet.

SHIRLEY MINE

Location: 2¾ miles from Observation Hill on a bearing of 190°. Co-ordinate 748778; Southport 1-mile sheet.

VICKMAN MINE

Location: 2¾ miles from Observation Hill on a bearing of 200°. Co-ordinates 737770; Southport 1-mile sheet.

KELLY MINE

Location: 3¾ miles from Observation Hill on a bearing of 192°. Co-ordinate 741755; Southport 1-mile sheet.

YAM YANG MINE

Location: ½ mile due south of Observation Hill. Co-ordinates 753806; Southport 1-mile sheet.

UN-NAMED (T.W.1)

Location: 5½ miles from Rocky Bar Crossing on the Charlotte River on a bearing of 237 degrees. Co-ordinates 667687; Tumbling Waters 1-mile sheet.

UN-NAMED (T.W.2)

Location: 5 miles from Rocky Bar Crossing on the Charlotte River on a bearing of 239 degrees. Co-ordinates 671689; Tumbling Waters 1-mile sheet.

UN-NAMED (T.W.3)

Location: ½ mile from Rocky Bar Crossing on the Charlotte River on a bearing of 240 degrees. Co-ordinates 742733; Tumbling Waters 1-mile sheet.

UN-NAMED (T.W.4)

Location: 2½ miles south of Rocky Bar Crossing on the Charlotte River. Co-ordinates 746698; Tumbling Waters 1-mile sheet.

UN-NAMED (T.W.5)

Location: 7 miles from Rocky Bar Crossing on the Charlotte River on a bearing of 178 degrees. Co-ordinates 752622; Tumbling Water 1-mile sheet.

UN-NAMED (T.W.6)

Location: 4¼ miles from Rocky Bar Crossing on the Charlotte River on a bearing of 205 degrees. Co-ordinates 716672; Tumbling Water 1-mile sheet.

UN-NAMED (T.W.7)

Location: 6¾ miles from Rocky Bar Crossing on the Charlotte River on a bearing of 194 degrees. Co-ordinates 722635; Tumbling Waters 1-mile sheet.

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APPENDIX I.

Samples from Mt. Finnigs Mine

Chemical Analysis for Niobium, Tantalum

Sixteen samples were submitted for analysis. Eleven of these were chip samples of lode material, two were diamond drill core and three were drill sludges.

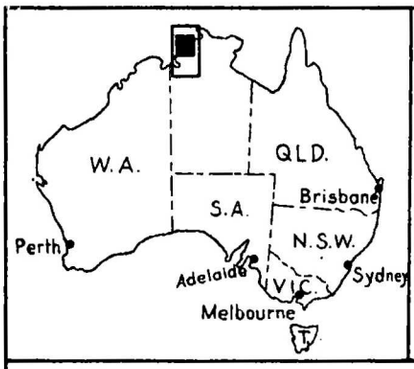
It was obvious from the preliminary examination of the samples that the niobium-tantalum content would be very small. In view of the extreme difficulty of carrying out satisfactory analyses for niobium and tantalum, heavy mineral separations were made to determine the practibility of an analysis on the assumption that the magnetite free heavy minerals could be entirely columbite-tantalite. A cut-off level of approximately 0.1% heavy minerals was adopted. Where the heavy mineral content was greater than this, concentrates were prepared by careful panning of the original sample and analysed for niobium-tantalum. The results are set out in the table below.

Microscopic examination of the heavy mineral concentrate from B6520 shows this to be composed almost entirely of cassiterite. This is confirmed by the high proportion of tin shown by spectrographic analysis. Spectrographic analysis of the heavy mineral concentrates in general shows that the concentration of tantalum is subordinate to the niobium concentrations and does not exceed 10% of the combined niobium-tantalum oxides.

Sample No.	Location and Description	[illegible] heavy miner[illegible]	[illegible]	[illegible] original sample
	Chip Samples			
B6520	No. 1 Open Cut N-W wall. From surface. Vertical 0-5'	4.65 %		0.056 %
B6521	" " " " " " " " 5'-10'	0.05		-
B6522	" " " West X cut N wall vertical 0-4'	0.04		-
B6523	" " " " S wall " 0-4'	0.12		-
B6524	" " " South Driver W wall " 0-3'6"	0.01	-	-
B6525	" " " " " " " " 3'6"-7'	0.01	-	-
B6526	" " " East X cut E face " 0-3'	0.58	13.1	0.076
B6527	No. 2 Open Cut W face N-end vertical 0-7'	0.13	-	-
B6528	" " " " " (5' S of 6527) vertical 0-5'	0.09	-	-
B6529	" " " W face N to S horizontal 0-6'	0.10	-	-
B6530	" " " " " " " 6'-12'	2.32	73.7	1.71
	Drill Core Samples			
B6544	Diamond drill hole No. 1 0-8'	0.38	22.0	0.084
B6545	" " " " 8-16'	0.04	-	-
	Drill Sludge Samples			
B7201	Diamond Drill hole No. 1 5'-10'	0.043	-	-
B7202	" " " " 10'-15'	0.10	-	-
B7203	" " " " 15'-20'	0.10	-	-
		? magnetite Fe[illegible] heavy mineral	Nb_2O_5 heavy mineral	Ta_2O_5 heavy mineral

PLATE I

MAP SHOWING AREA DEALT WITH IN REPORT AND REFERENCE TO AUSTRALIAN FOUR MILE MAP SERIES



MELVILLE ISLAND

BATHURST ISLAND

COBOURG PENINSULA

Van Diemen Gulf

130°

132°

12°

Darwin 4 mile to 1 inch Military Sheet

Darwin

Port Darwin

Byrne Hill

Finniss River

Rum Jungle

Mary River

South Alligator River

13°

Pine Creek 4 mile to 1 inch Military Sheet

Adelaide River

Stuart Highway

Brocks Creek

Burrundi

Daly River

N O R T H E R N

Pine Creek

14°

Katherine River

Katherine

T E R R I T O R Y

Fitzmaurice River

Victoria River

SCALE

Miles 10 0 10 20 30 40 50

NT IIA-1

PLATE 2

GEOLOGICAL MAP
BYNOE HARBOUR – BAMBOO CREEK TIN FIELD
NORTHERN TERRITORY

Base Map uncontrolled Photo Mosaic
Geology by B.M.R. field parties 1956

Scale 1 Inch to 1 Mile

LEGEND

QUATERNARY

- Soil & alluvium
- Ferruginous deposits
- Ferruginous sand & gravel with occasional ferruginous outcrops

MESOZOIC, Cretaceous

Mullaman Group — Klm — Porcellanite

PRE-CAMBRIAN, Upper Proterozoic

Tolmer Group — Pud — Buldiva Sandstone, Depot Sandstone Member — Pink, ripple-marked friable quartz sandstone with conglomerate beds near base

Lower Proterozoic

Finniss River Group — Pln — Noltenius formation — Qtz pebble conglomerate, quartz-greywacke, siltstone, phyllite, mica schist, andalusite mica schist; Qtz pebble conglomerate

Brocks Creek Group — Plb — Burrell Creek formation — Siltstone, siltstone greywacke, greywacke

IGNEOUS ROCKS

- Granite rocks
- Quartz vein
- Pegmatite vein

REFERENCE

Geological Symbols

- Geological boundary, position accurate
- Geological boundary position approximate
- Alluvium boundary
- Strike with direction & angle of dip
- Vertical dip
- Folds showing direction & angle of plunge
- Established fault, position accurate
- Established fault, approximate
- Probable fault
- Schist

Other Symbols

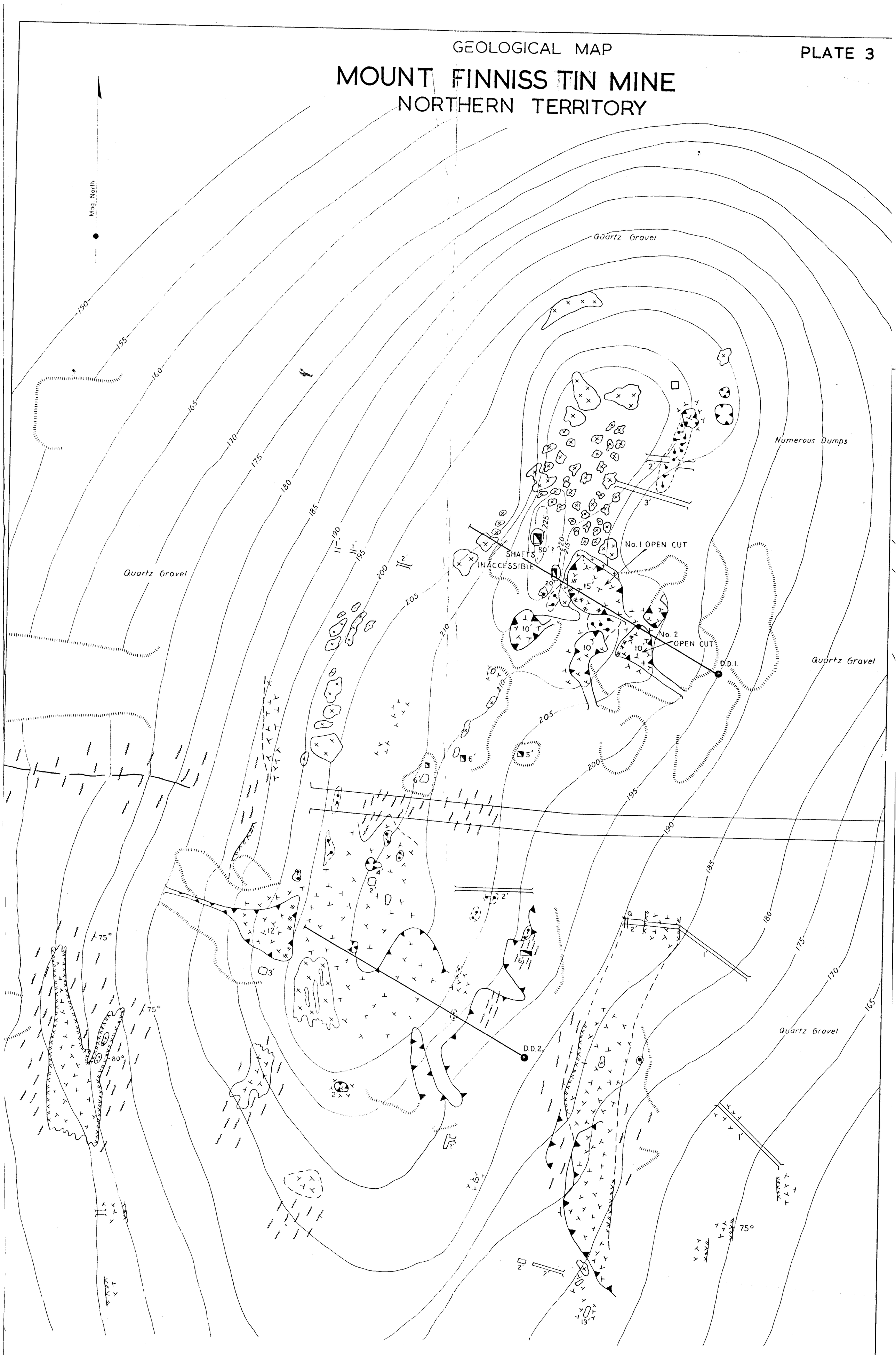
- x Sn LUCY MINE — Mine with name & type of ore produced (Sn • Tin, Au • Gold)
- Vehicle track
- Mangroves

PLATE 3

GEOLOGICAL MAP

MOUNT FINNISS TIN MINE

NORTHERN TERRITORY



REFERENCE

- Quartz Felspar Muscovite Pegmatite
- Felspar Quartz Pegmatite
- Quartz Pegmatite Core Zone
- Massive Green Muscovite
- Quartz Muscovite Pegmatite Border Zone
- Quartz Mica Andalusite Schist
- Detritus
- 200 Topographic Contour
- 12' Shaft
- Prospecting Pit
- 2' Costean
- 7' Rim of Excavation
- Foot of Dump
- 75° Strike & Dip of Strata
- Inferred Contact
- D.D.1. Diamond Drill Hole

Scale

40 20 0 40 80 FEET

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GEOLOGY & GEOPHYSICS
DARWIN 1956

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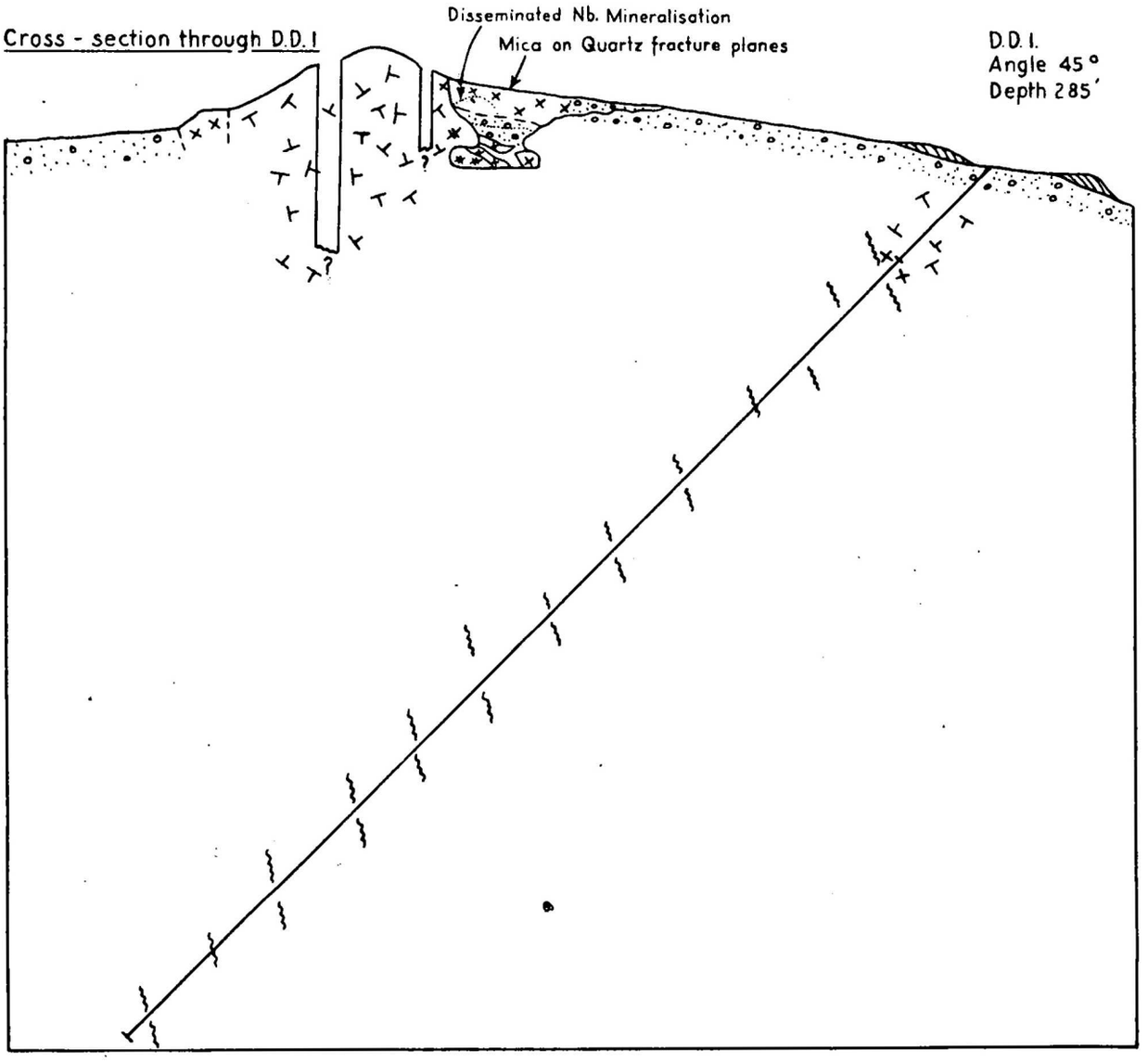
PLATE 4

CROSS-SECTIONS THROUGH DIAMOND DRILL HOLES

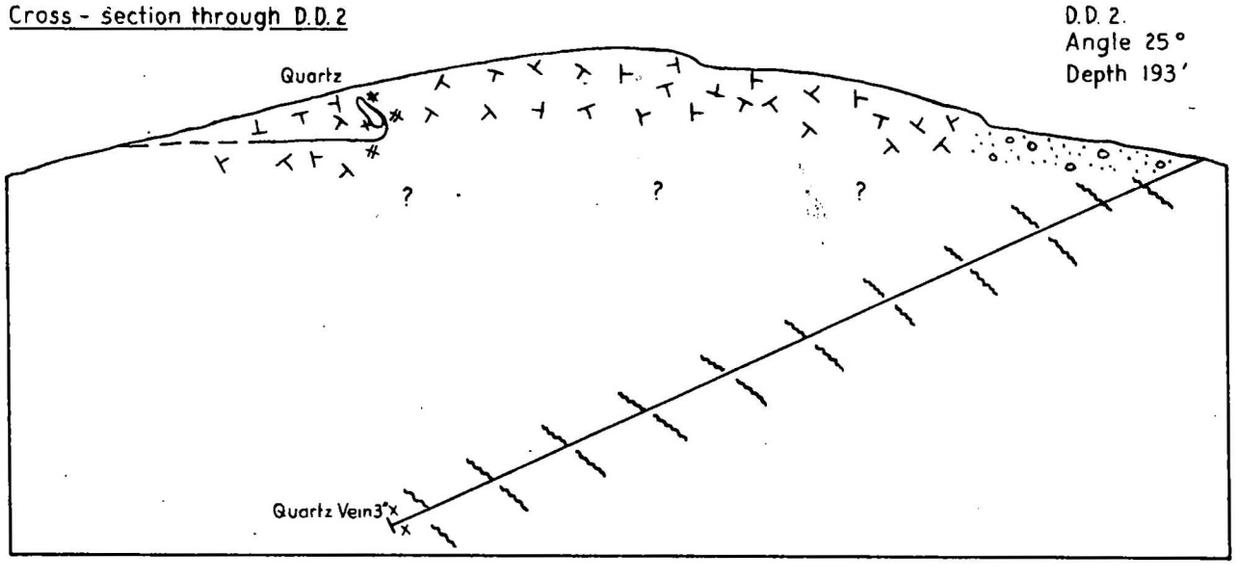
MT. FINNISS TIN MINE

Reference see Plate

Cross - section through D.D.1



Cross - section through D.D.2



SCALE 1" = 40 FEET

40 20 0 40 80 FT.

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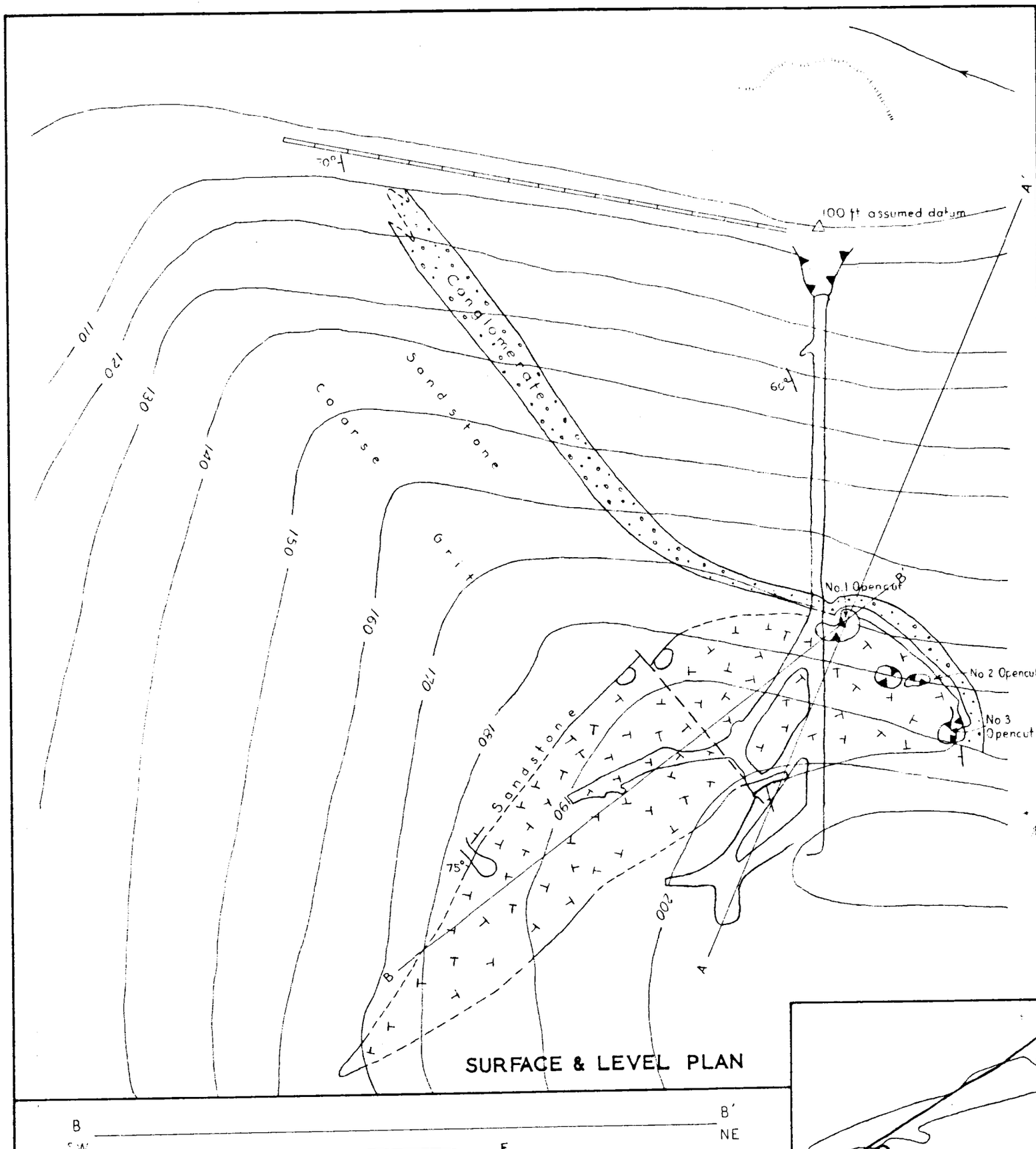
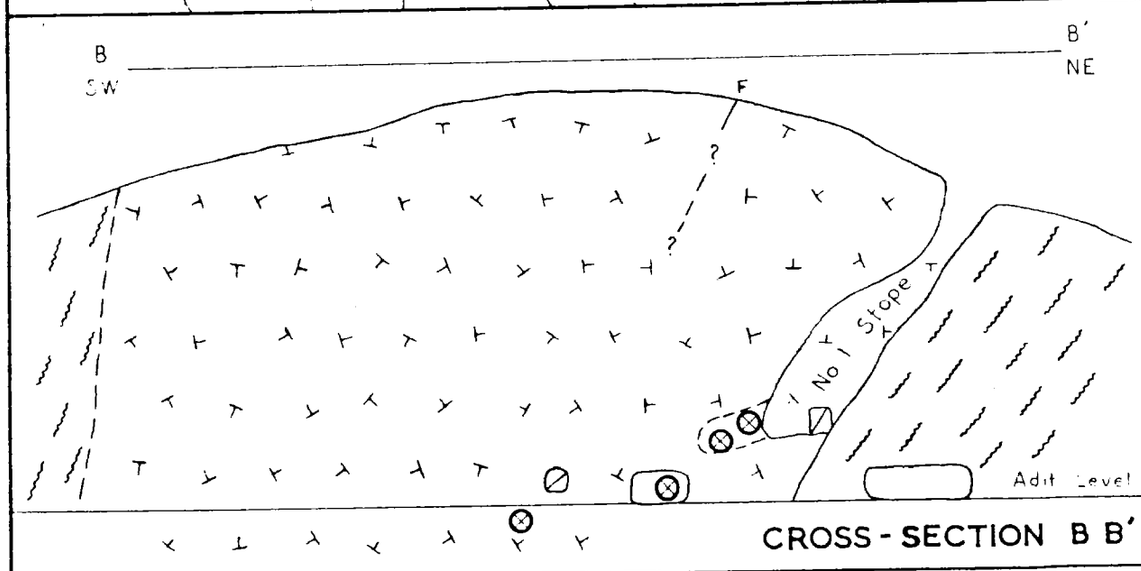
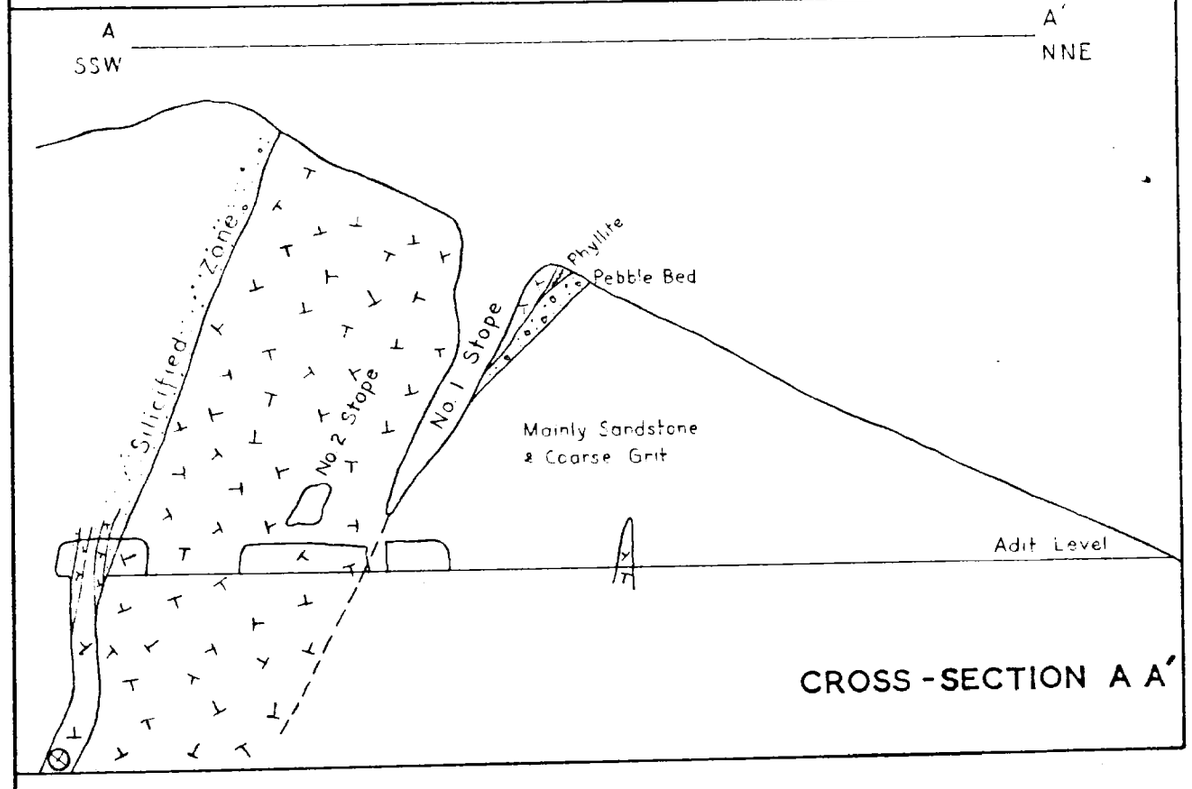
PLATE 5



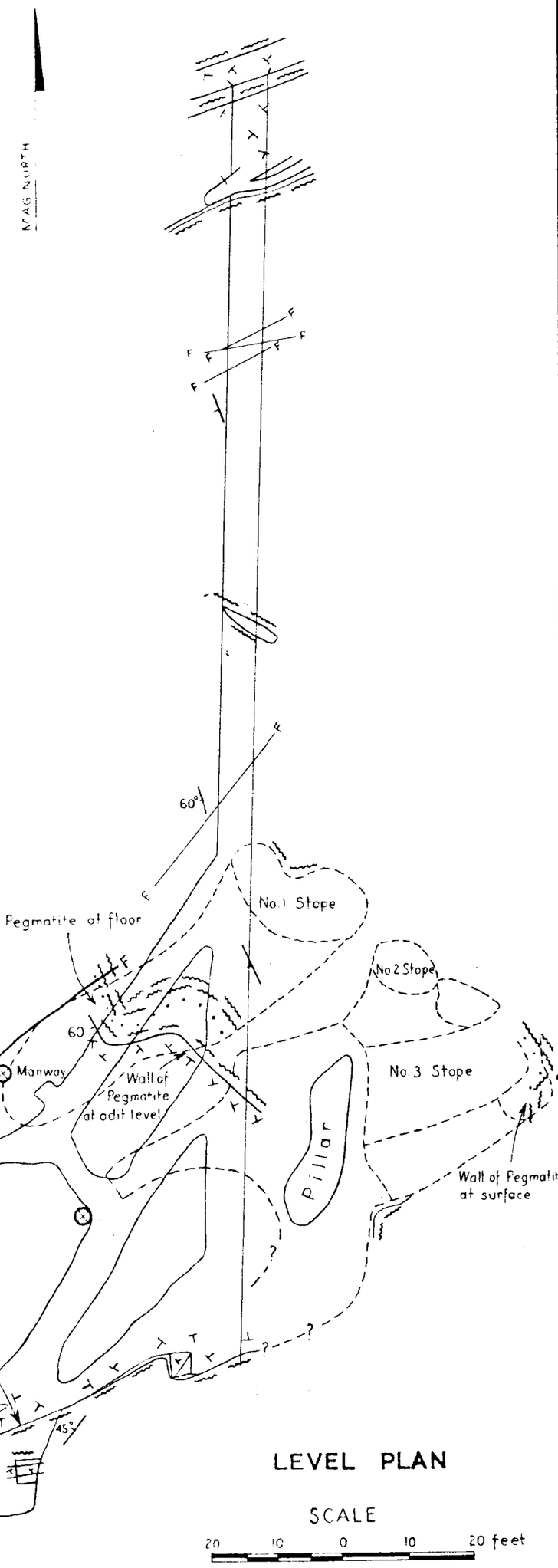
SURFACE & LEVEL PLAN



CROSS - SECTION B B'



CROSS - SECTION A A'



LEVEL PLAN

SCALE

20 10 0 10 20 feet

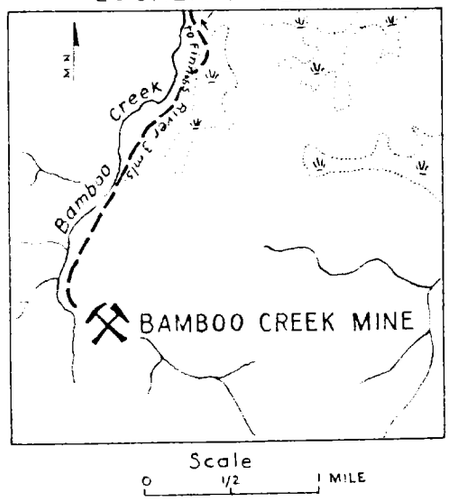
REFERENCE

SCALE

20 0 20 40 60 80 feet

- Undifferentiated Pegmatite
- Phyllite
- Conglomerate
- Shaft
- Drive
- Inferred Boundary
- Strike & Dip of Strata
- Foot of Dump
- 160 Topographic Contour
- F F Fault
- Tin Values

LOCALITY PLAN



Copied from plan by H. B. Owen, 1954

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GEOLOGICAL MAP
LEVEL PLAN & CROSS SECTIONS
OF
BAMBOO CREEK
TIN MINE

NT 11 A — 5

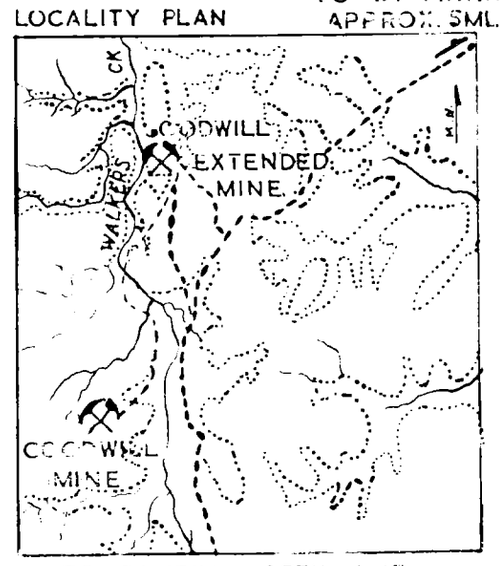
PLATE 6

GOODWILL EXTENDED TIN MINE.

MAG. NORTH

LOCALITY PLAN

TO MT FINNIS APPROX. 5MLS



TO BAMBOO CREEK MINE APPROX 3 MLS

0 ½ 1 ML.

REFERENCE

UNDIFFERENTIATED PEGMATITE

FELSPAR MICA PEGMATITE

QUARTZ MICA PEGMATITE BORDER ZONE

QUARTZ PEGMATITE

QUARTZ MICA ANDALUSITE SCHIST

RIM OF EXCAVATION

FOOT OF DUMP

6' DEPTH IN FEET

SHAFT

20' PIT

STRIKE & DIP OF STRATA

100 TOPOGRAPHIC CONTOURS

SCALE

20 0 20 40 60 80 FEET

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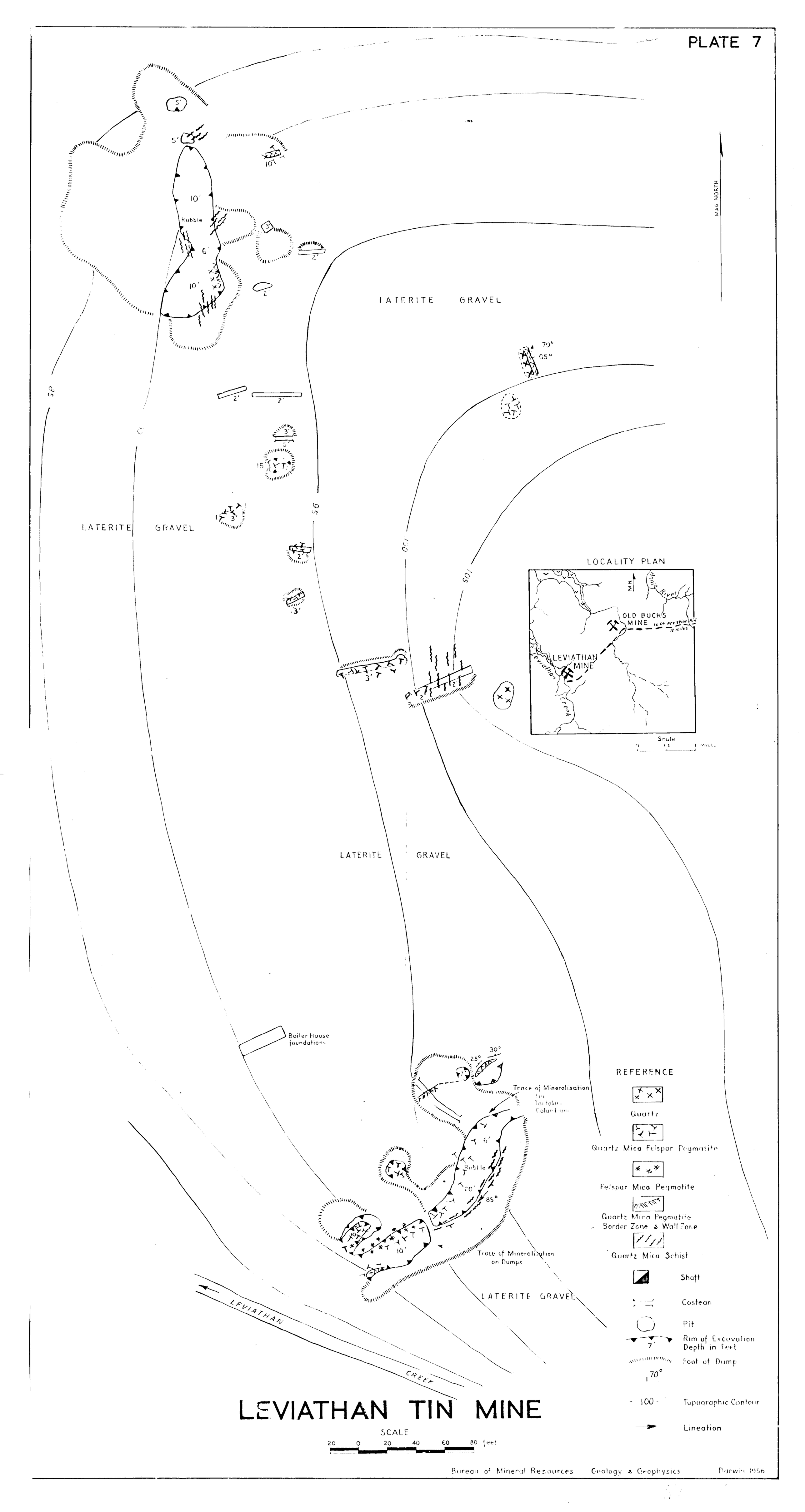
PLATE 7



LEVIATHAN TIN MINE

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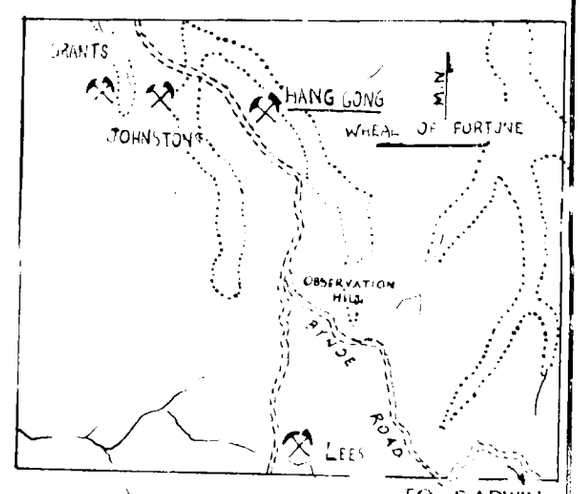
PLATE 8

HANG GONG WHEAL OF FORTUNE

MAG. NORTH

LOCALITY PLAN



0 ½ 1ML

ALLUVIAL WORKINGS

FERRUGINOUS GRAVEL

STRONGLY SILICIFIED ZONE

CRUSHED ZONE

ALLUVIAL WORKINGS

FERRUGINOUS GRAVEL

REFERENCE

- QUARTZ MICA FELSPAR PEGMATITE
- FELSPAR MICA PEGMATITE
- QUARTZ MICA PEGMATITE
- QUARTZ MICA SCHIST
- QUARTZ
- RIM OF EXCAVATION
- PROSPECTING PIT
- COSTEAN
- SHAFT
- SWAMP
- STRIKE & DIP OF STRATA

SCALE
20 0 20 40 FEET

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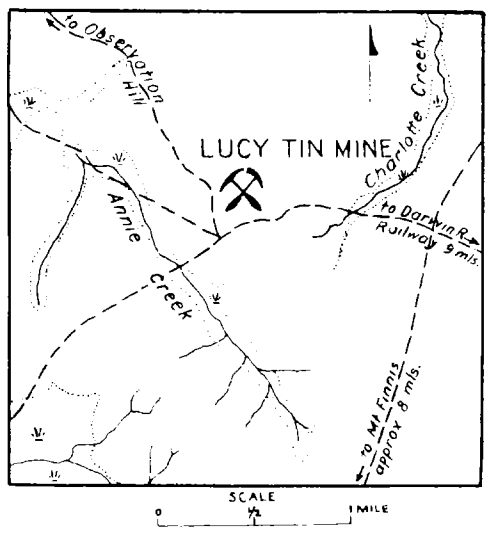
PLATE 9

LOCALITY MAP



MAG NORTH

Laterite

Open Cuts filled with Rubble

Laterite

Open Cut filled with Rubble

Laterite

Water level 20' below Collar

Traces of Tin Tantalum Columbium on Dumps

Laterite Gravel

Barren Zone of 600 feet between Northern & Southern Workings

Traces of Minerals on Dumps

Full Water

Pegmatite
Fine Grained Quartz Mica Felspar

Open Cuts full of Water, Shafts inaccessable.

Laterite Gravel

Shaft full of Water

LUCY TIN MINE

REFERENCE

- Undifferentiated Pegmatite
- Siltstone
- 7' Shaft
- 4' Prospecting Pit
- 7' Costean Depth in feet
- Rim of Excavation
- Foot of Dump

SCALE
20 0 20 40 60 feet

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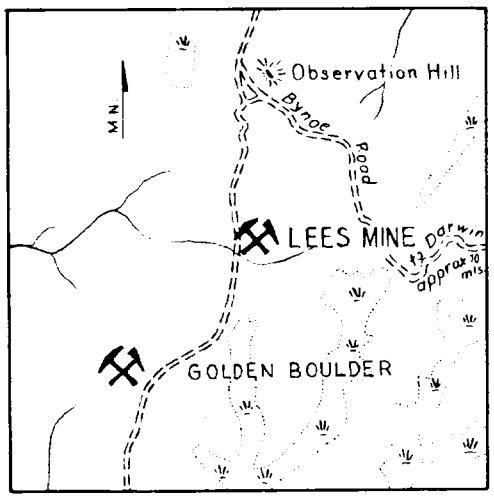
NT11A-9

PLATE 10

LOCALITY PLAN



SCALE

0 1/2 1 mile

LEES TIN MINE

MAG NORTH

Laterite Gravel

Laterite Gravel

10' to Water level

Contact Dip 60°

Siltstone

Shafts full of Water

Sporadic Mineralisation Along Walls of Opencut Tin, Tantalum, Columbium.

Numerous Dumps

Vehicle

filled with rubble

Full of Water

Alluvial Workings & Numerous Dumps

Laminated Siltstone

Siltstone Gravel

Siltstone Gravel

Track

Shaft full of Water

REFERENCE

- Undifferentiated Pegmatite Quartz Mica Felspar
- Laminated Siltstone
- Shaft
- Costean
- Rim of Excavation Depth in feet
- Foot of Dump
- Strike & Dip of Strata
- Prospecting Pit

SCALE

20 0 20 40 60 feet

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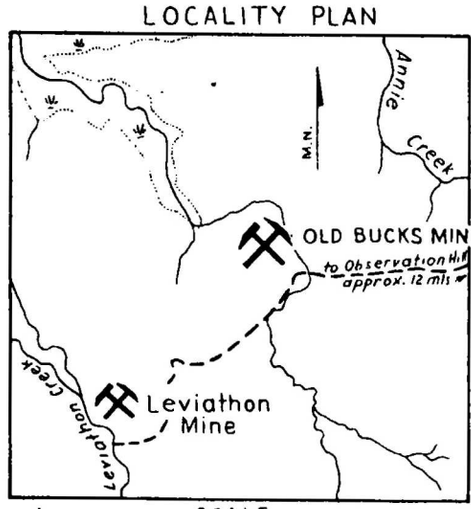
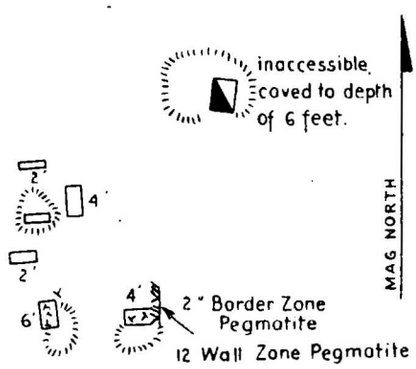
PLATE II

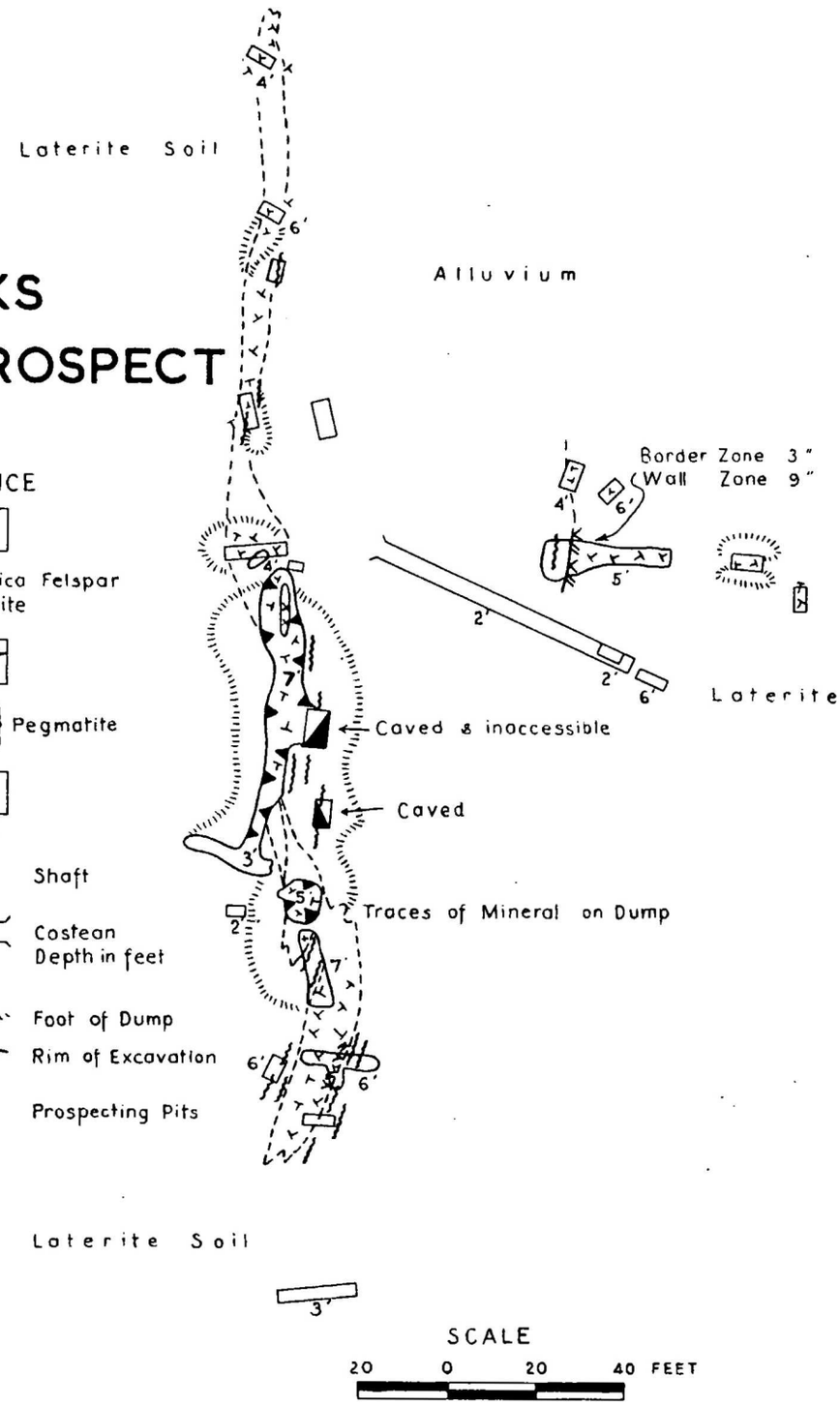
LOCALITY PLAN



SCALE
0 1/2 1 MILE



OLD BUCKS PROSPECT



REFERENCE

Fine grained Quartz Mica Felspar Pegmatite

Border Zone / Wall Zone } Pegmatite

Siltstone

Shaft

Costean, Depth in feet

Foot of Dump

Rim of Excavation

Prospecting Pits

SCALE
20 0 20 40 FEET

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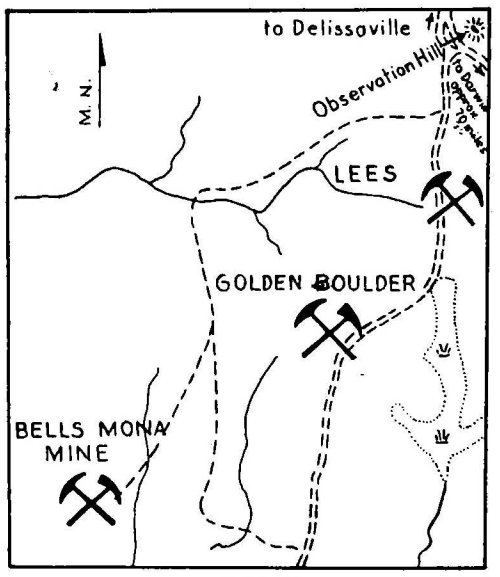
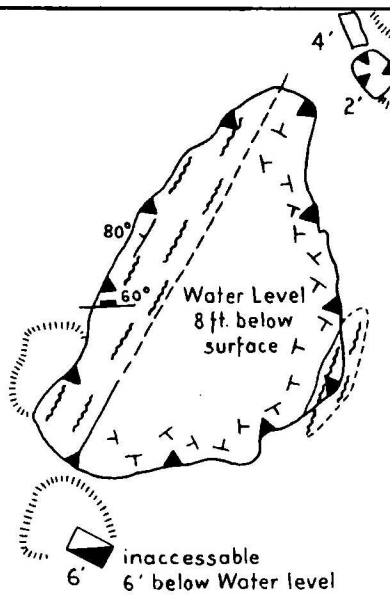
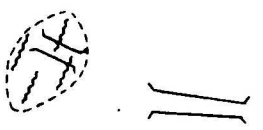
NT/11 H - 11

PLATE 12

LOCALITY PLAN



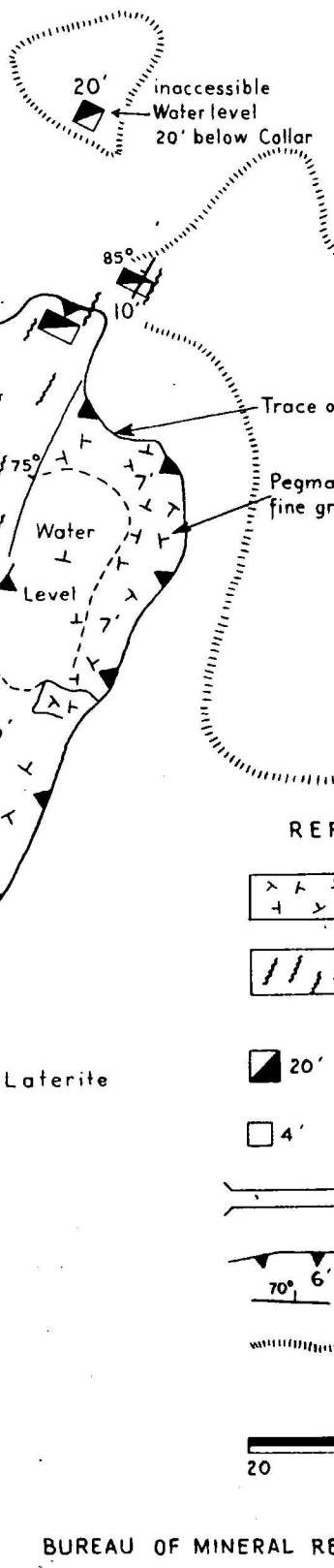




Laterite

Laterite

BELLS MONA TIN MINE



REFERENCE

- Undifferentiated Pegmatite
- Mica Schist
- 20' Shaft
- 4' Prospecting Pit
- Costean
- Rim of Excavation
- 70° 6' Depth in feet
- Strike & Dip of Strata
- Foot of Dump

SCALE

20 0 20 40 60 feet.

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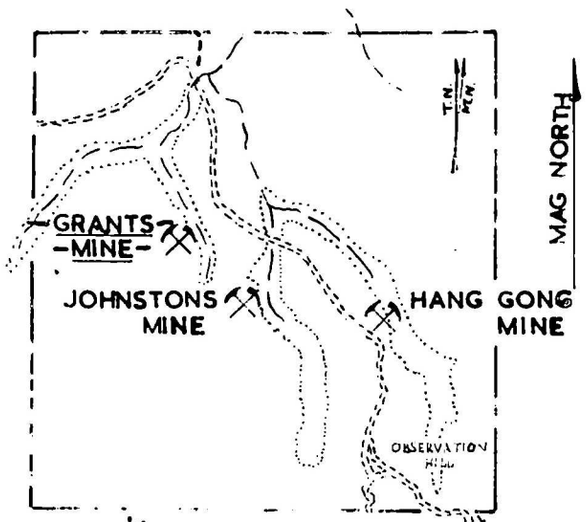
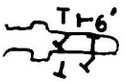
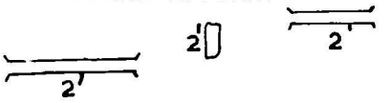
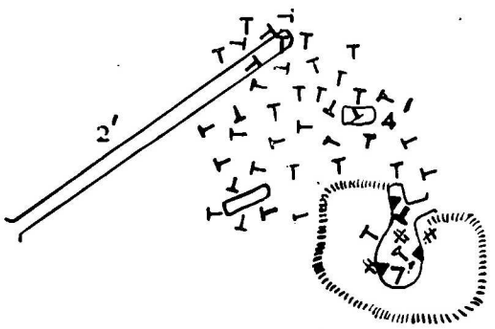
PLATE 13

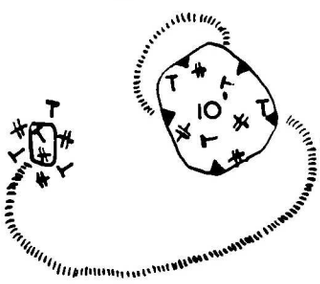








QUARTZ GRAVEL



REFERENCE

QUARTZ MICA FELSPAR PEGMATITE

QUARTZ FELSPAR PEGMATITE

MICA SCHIST

LATERITE

4' SHAFT.

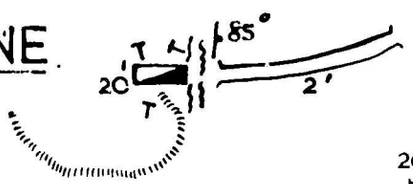
PIT.

COSTEAN

RIM OF EXCAVATION

FOOT OF DUMP

GRANTS TIN MINE



20 0 20 40 FEET

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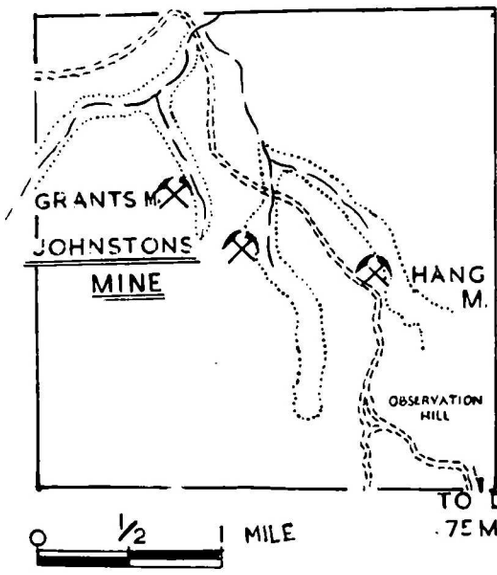
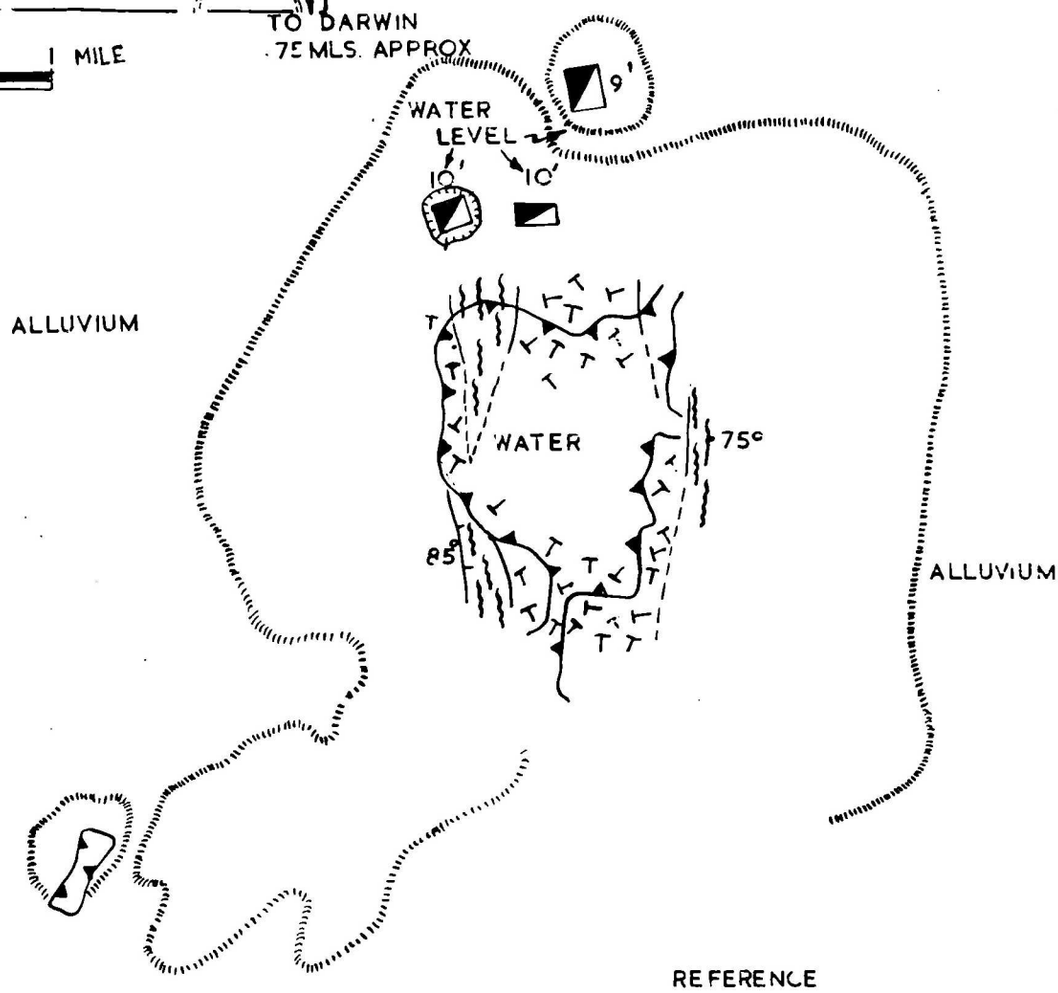
PLATE 14



MAG NORTH

TO DARWIN 75 MLS. APPROX

0 1/2 1 MILE



REFERENCE

UNDIFFERENTIATED PEGMATITE

MICA SCHIST

SHAFT

RIM OF EXCAVATION

FOOT OF DUMP

75° STRIKE & DIP OF STRATA

-----INFERRED BOUNDARY

JOHNSTONS TIN MINE

SCALE

20 0 20 40 FEET

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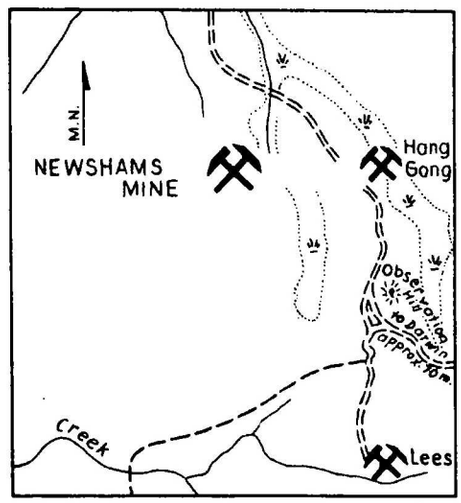
NT/11 A 14

PLATE 15

LOCALITY PLAN



SCALE
0 1/2 1 MILE

MAG NORTH

3'

2'

Laterite

Trace of Mineralisation on Dump

85°

3'

5'

Disseminated Mineralisation in bottom of Open cut

85°

4'

Laterite

Laterite

Undifferentiated Pegmatite

Quartz Mica Schist

Shaft

Costean

7' Rim of Excavation Depth in Feet

Foot of Dump

70° Strike & Dip of Strata

NEWSHAMS PROSPECT

SCALE
10 0 10 20 FEET

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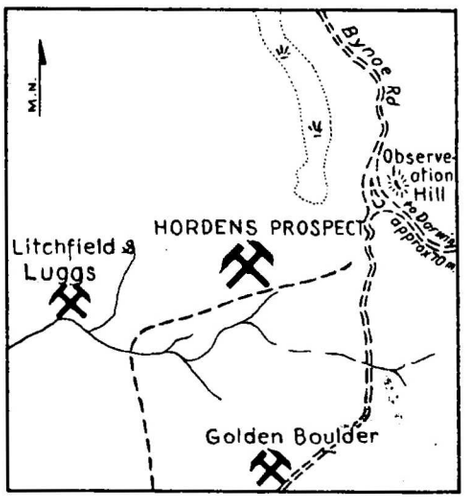
PLATE 16

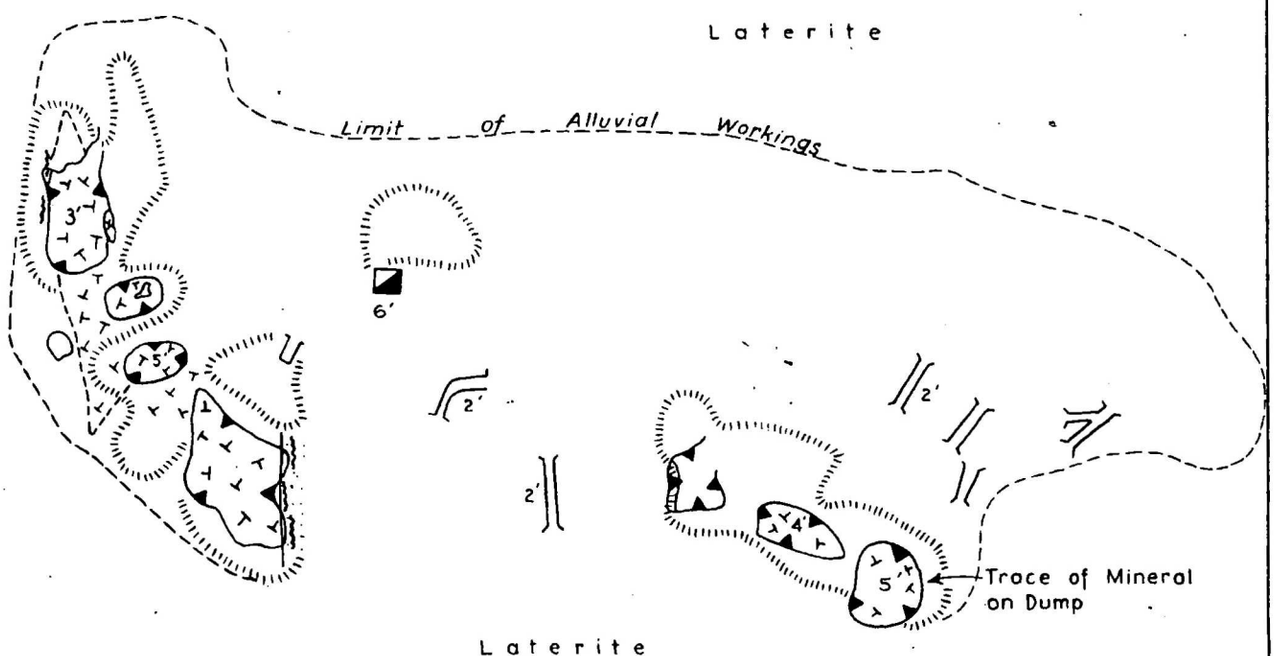
LOCALITY PLAN



SCALE

0 1/2 1 MILE

MAG. NORTH



REFERENCE

Undifferentiated Pegmatite

Quartz Greywacke

Shaft

Costean

6' Rim of Excavation Depth in Feet

Foot of Dump

HORDENS PROSPECT

SCALE

20 0 20 40 FEET

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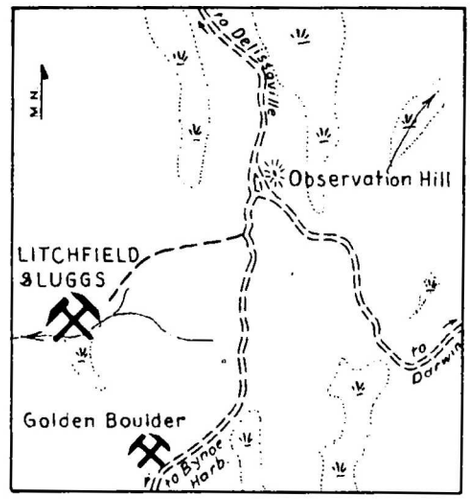
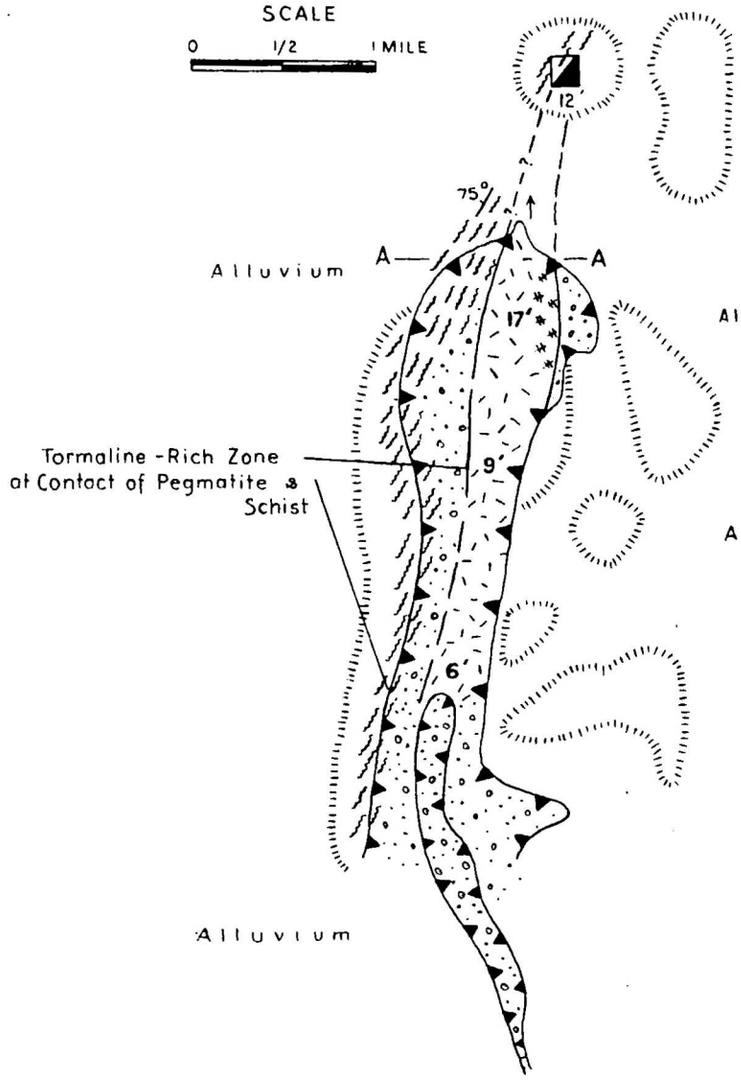
PLATE 17

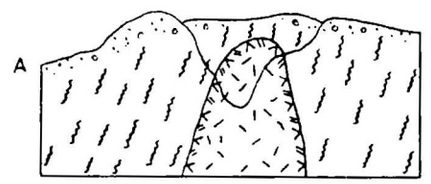
LOCALITY PLAN



MAG NORTH

SCALE
0 1/2 1 MILE





Overburden & Dump

Quartz Mica Felspar Pegmatite

Quartz Felspar Pegmatite

Quartz Mica Pegmatite (Border Zone)

Quartz Mica Schist

Rim of Excavation

6' Depth in Feet

Shaft

Foot of Dump

SCALE
20 0 20 40 FEET

LITCHFIELD & LUGGS TIN MINE

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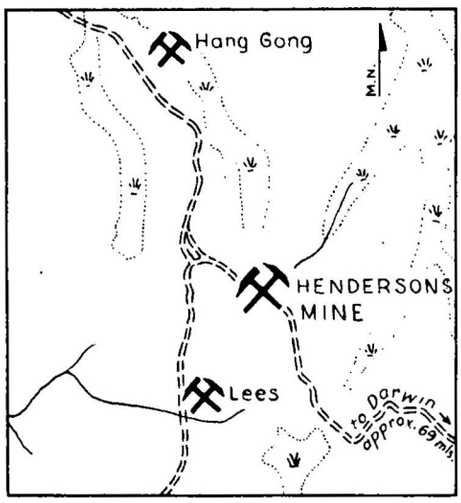
PLATE 18

LOCALITY PLAN



SCALE
0 1/2 1 MILE

HENDERSONS PROSPECT

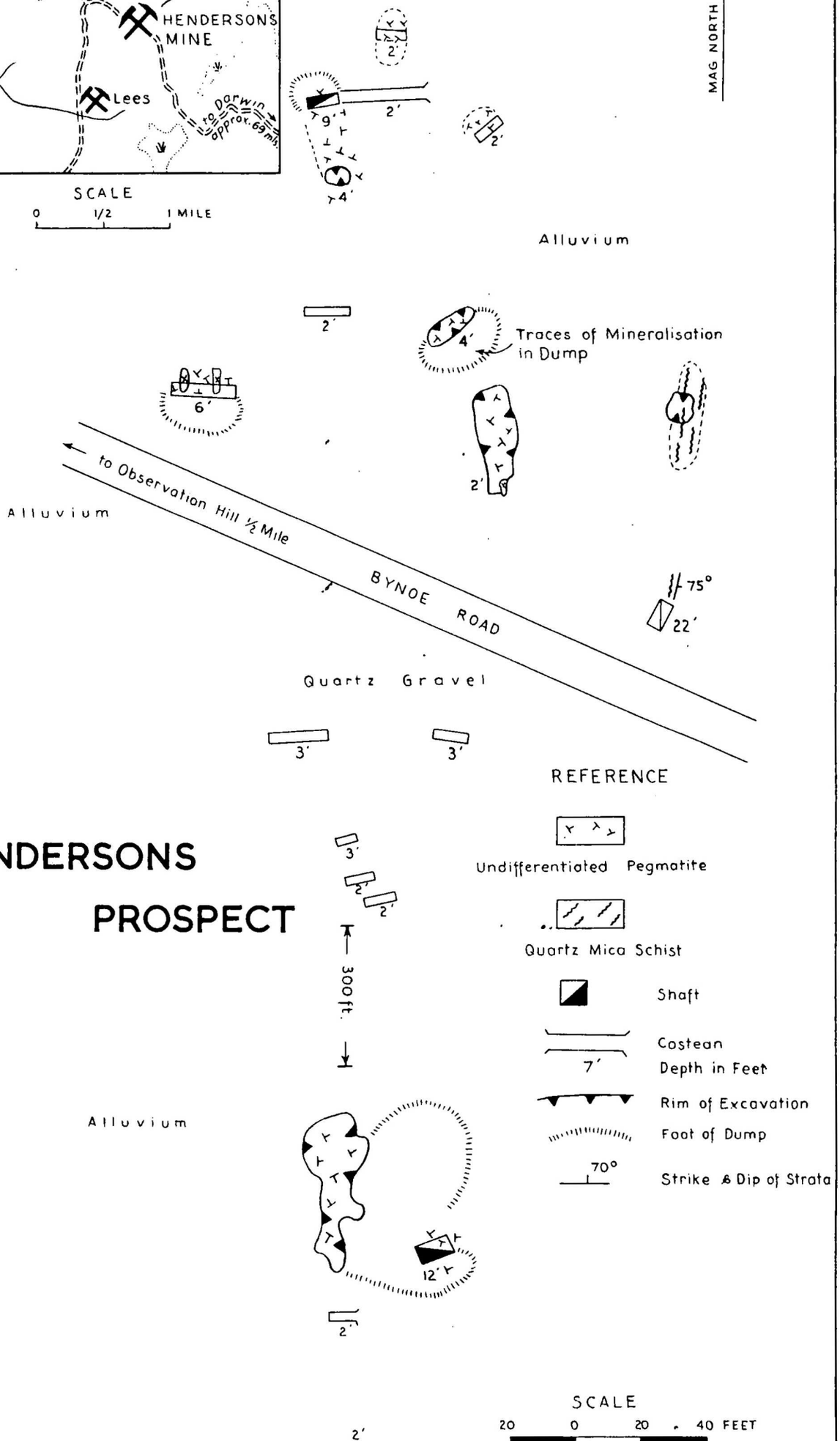


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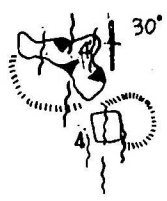
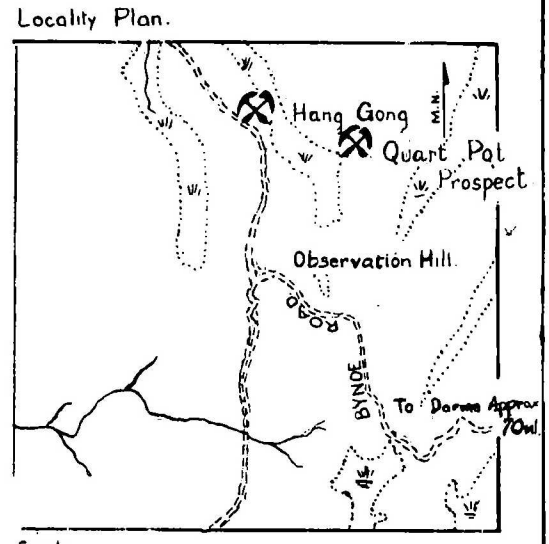
PLATE 19

Numerous Pits Scattered over large area.

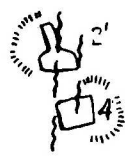


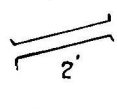
Alluvium.

Locality Plan.



Mag. North.





Alluvium.

QUART POT PROSPECT

REFERENCE

Undiffererentiated Pegmatite

Quartz Mica Schist

Shaft

Pit

Rim of Excavation

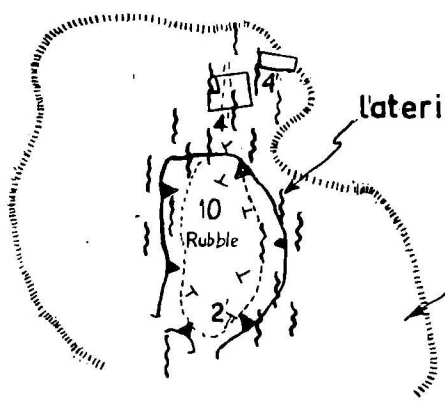
3' Depth in feet

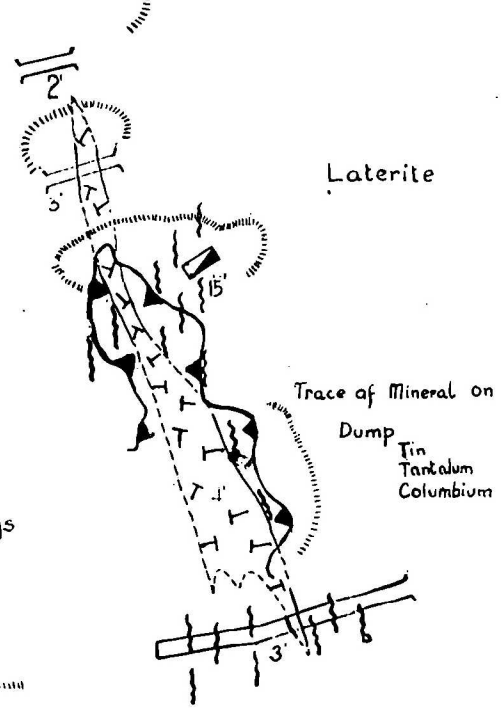
Foot of Dump.

3 Costean.

80° Strike & Dip of Strata

Inferred Boundary.





Alluvial Workings

Alluvial Workings.

Scale

20 0 20 40

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NT/A·19

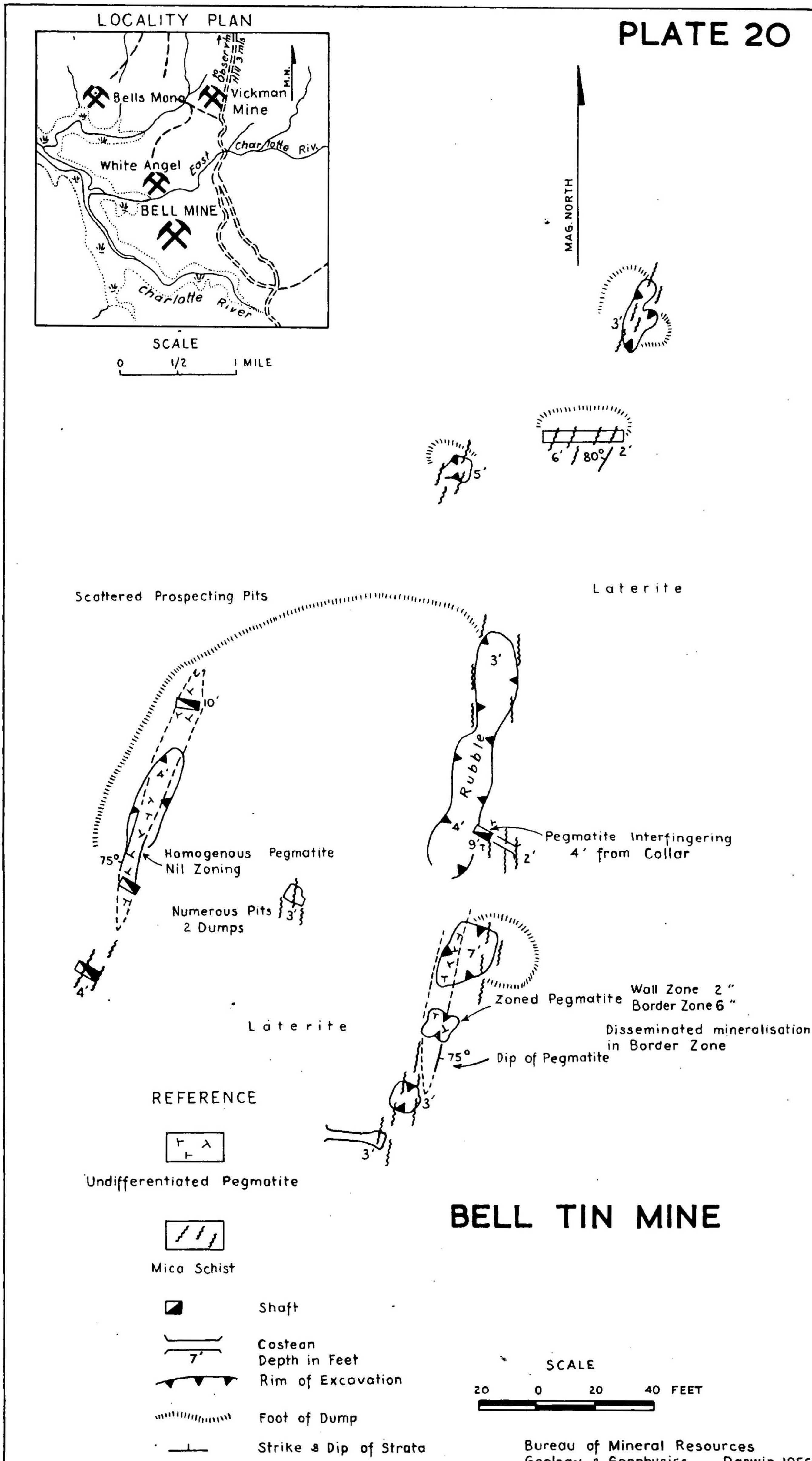


PLATE 20
LOCALITY PLAN
Bells Mona
Vickman Mine
To Observ'n Hill 3 mls
M.N.
Charlotte Riv.
East
White Angel
BELL MINE
Charlotte River
SCALE
0 1/2 1 MILE
MAG. NORTH
Scattered Prospecting Pits
Laterite
Rubble
Pegmatite Interfingering 4' from Collar
Homogenous Pegmatite Nil Zoning
Numerous Pits 2 Dumps
Zoned Pegmatite
Wall Zone 2"
Border Zone 6"
Disseminated mineralisation in Border Zone
Dip of Pegmatite
Laterite
REFERENCE
Undifferentiated Pegmatite
Mica Schist
Shaft
Costean Depth in Feet
Rim of Excavation
Foot of Dump
Strike & Dip of Strata
BELL TIN MINE
SCALE
20 0 20 40 FEET
Bureau of Mineral Resources Geology & Geophysics Darwin 1956

Locality Plan.

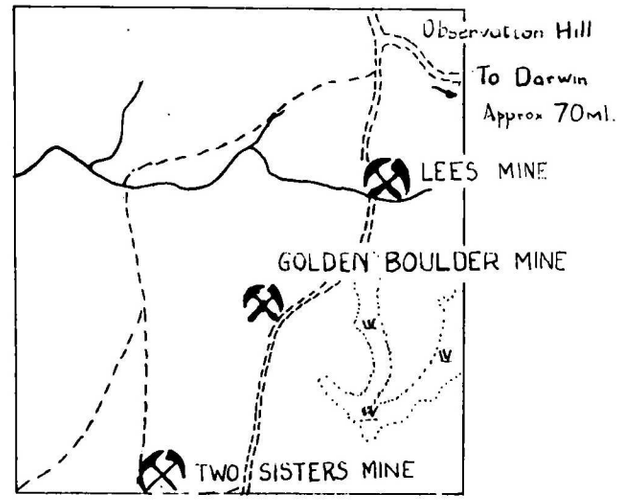


PLATE 21

Mag North

LATERITE

Caved inaccesible

LATERITE

Drive filled with Water
Trace of Mineralisation in Drive

LATERITE

LATERITE

REFERENCE

Undifferentiated Pegmatite

Quartz Mica Schist

Shaft

Rim of Excavation
Depth in Feet

Foot of Dump

Quartz Vein

Inferred Boundary

TWO SISTERS

PROSPECT

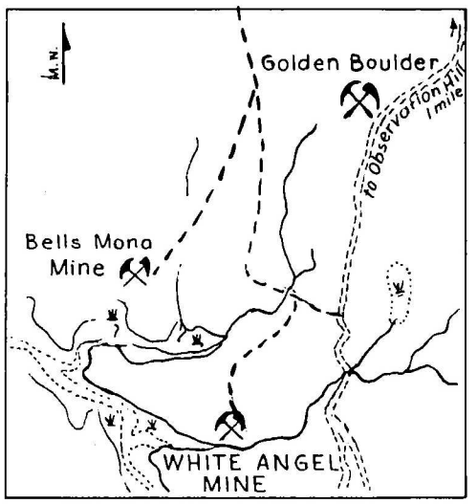
Scale
10 0 10 20 feet

Bureau of Mineral Resources Geology & Geophysics Darwin. 1956

NTTA-21

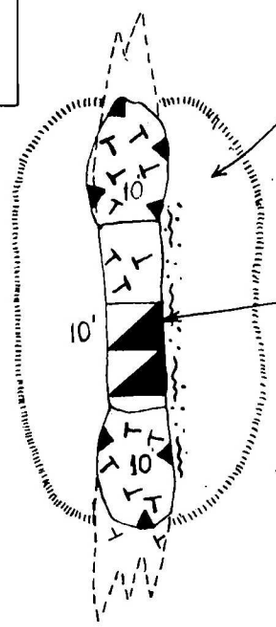
PLATE 22

LOCALITY PLAN



0 1/2 1 MILE
SCALE

Mag North



Fine Grained Pegmatite on Dumps

Evidence of Zoning

Shaft filled With water

Laterite

Laterite

Ore Paddock Minerals Identified

Tin
Tantalum
Columbium

WHITE ANGEL PROSPECT

REFERENCE

Undifferentiated Pegmatite

Quartz Greywacke

Shaft

Rim of Excavation.

7' Depth in feet

Foot of Dump

Inferred Boundary

Laterite

Scale.

10 0 10 20 feet

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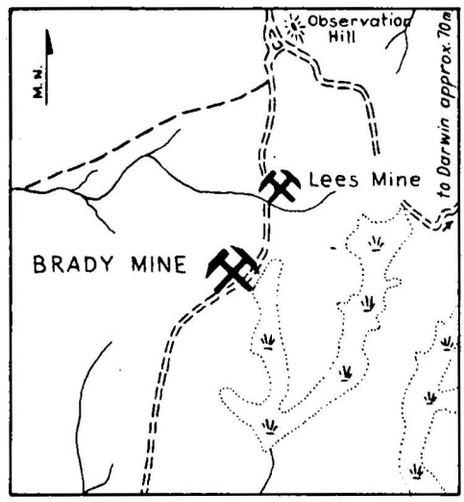
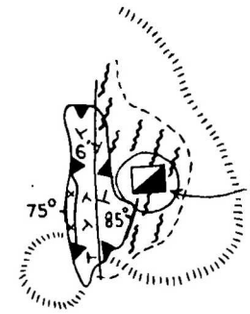
PLATE 23

LOCALITY PLAN



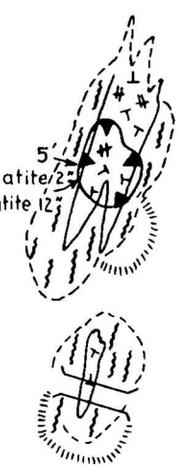
SCALE
0 1/2 1 MILE



Alluvium

Alluvium

Alluvium



Undifferentiated Pegmatite

Quartz Mica Schist

Shaft

6' Costean Depth in Feet

Rim of Excavation

Foot of Dump

Limit of Exposure

70° Strike & Dip of Strata

BRADY PROSPECT

SCALE
20 0 20 40 FEET

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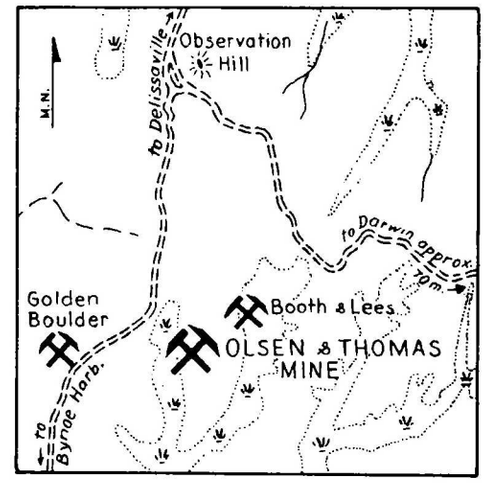
PLATE 24

LOCALITY PLAN



SCALE

0 1/2 1 MILE

MAG. NORTH

Alluvium

Alluvium

Alluvium

Alluvium

Alluvium

OLSEN & THOMAS PROSPECT

REFERENCE

Undifferentioted Pegmatite

Quartz Mica Schist

20' Shaft

2' Costean

10' Pit

Rim of Excavation

Foot of Dump

SCALE

20 0 20 40 FEET

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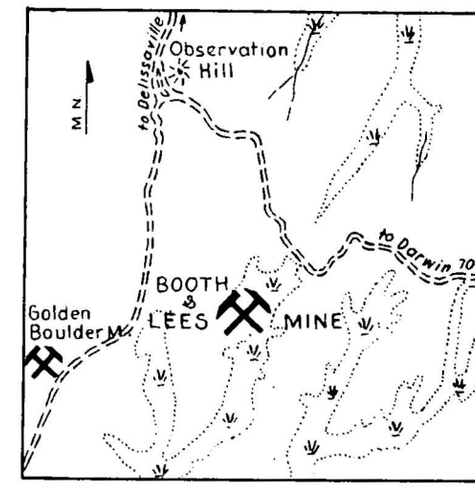
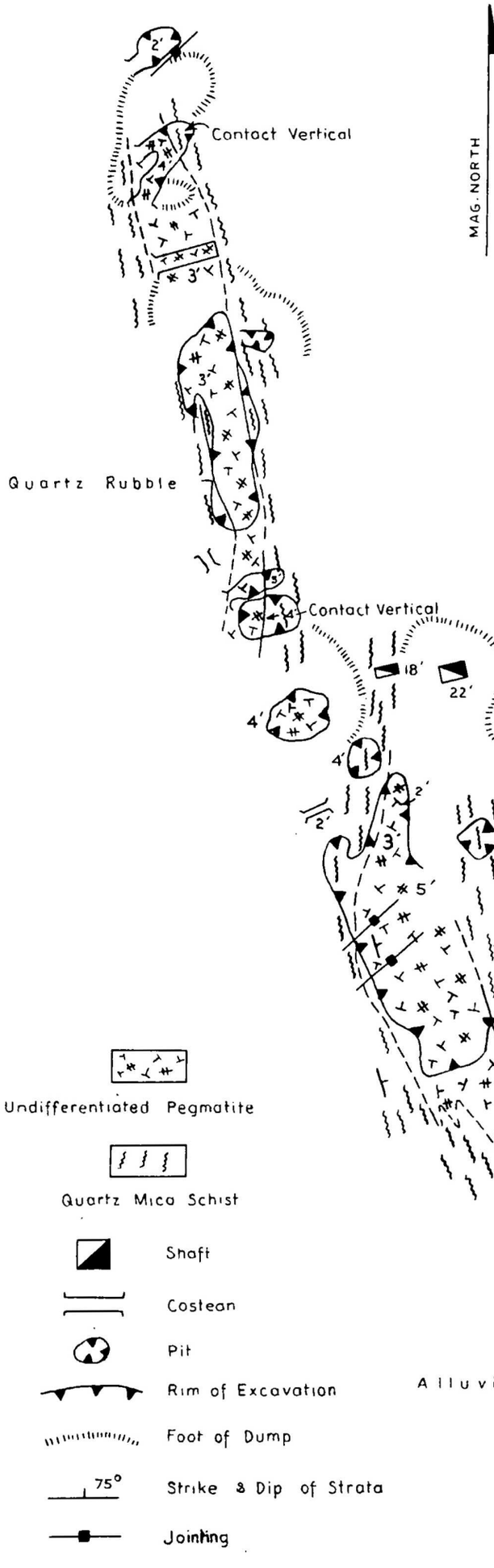
PLATE 25





BOOTH & LEES PROSPECT

Undifferentiated Pegmatite

Quartz Mica Schist

Shaft

Costean

Pit

Rim of Excavation

Foot of Dump

75° Strike & Dip of Strata

Jointing

SCALE
20 0 20 40 FEET

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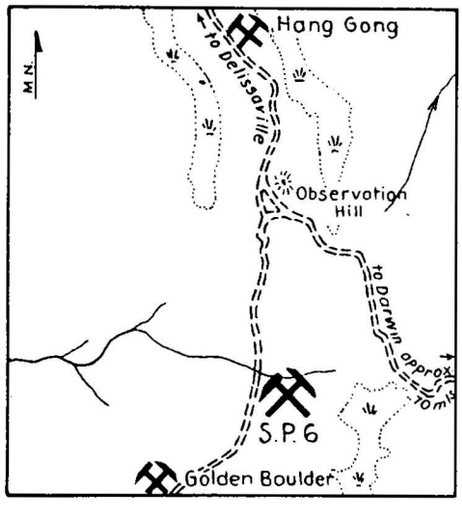
PLATE 26

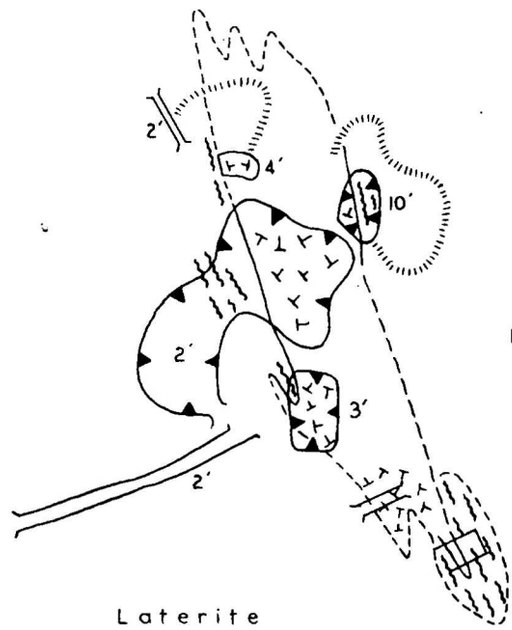
LOCALITY PLAN



SCALE
0 1/2 1 MILE

MAG. NORTH

UN-NAMED PROSPECT
S.P 6



REFERENCE

Undifferentiated Pegmatite

Mica Schist

Costean

6' Rim of Excavation Depth in Feet

Foot of Dump

Interpolated Boundary of Pegmatite

2'

SCALE
20 0 20 40 FEET

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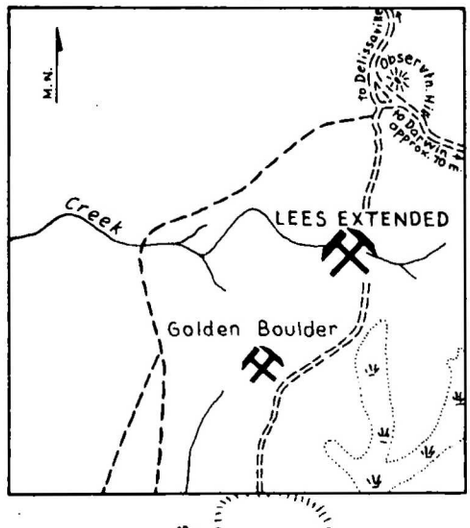
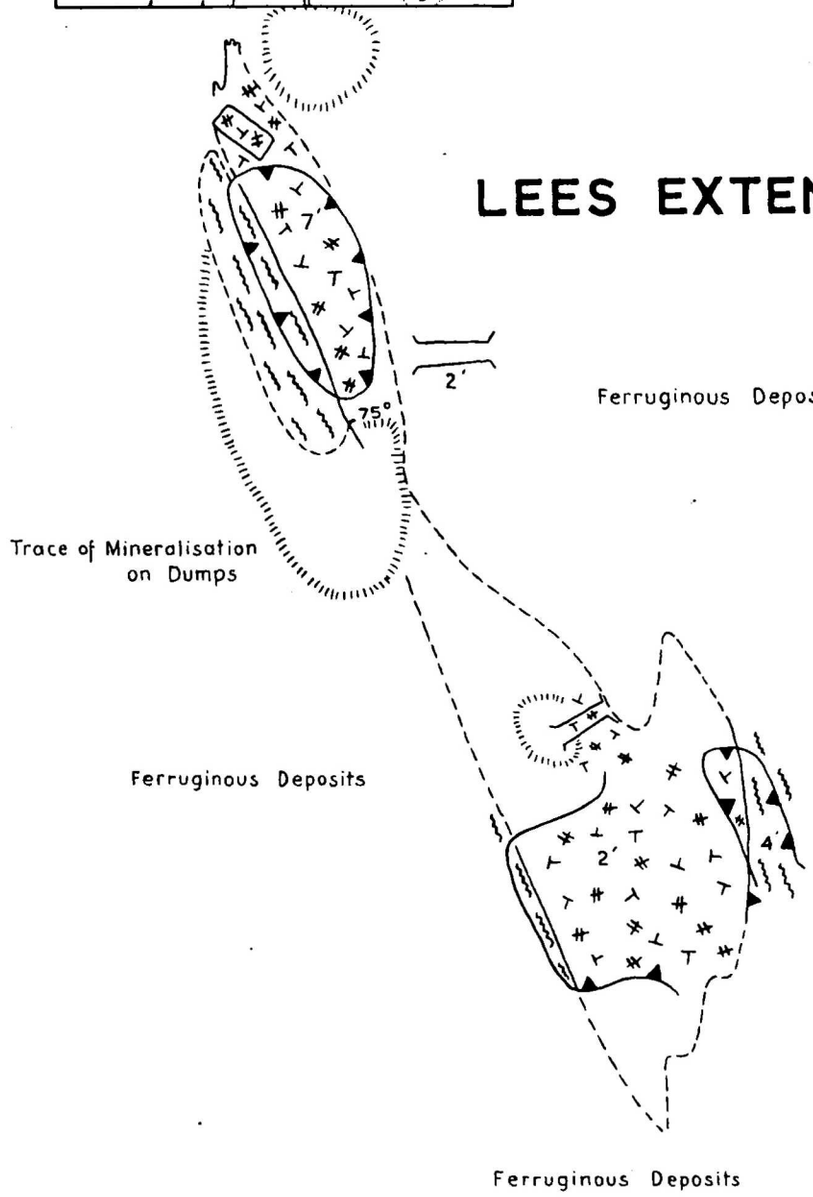
PLATE 27

LOCALITY PLAN SCALE 0 1/2 1 MILE



MAG. NORTH

LEES EXTENDED PROSPECT



REFERENCE

Undifferentiated Pegmatite

Mica Schist

7' Rim of Excavation Depth in Feet

Foot of Dump

2' Costean

70° Strike & Dip of Strata

SCALE

5 0 5 10 FEET

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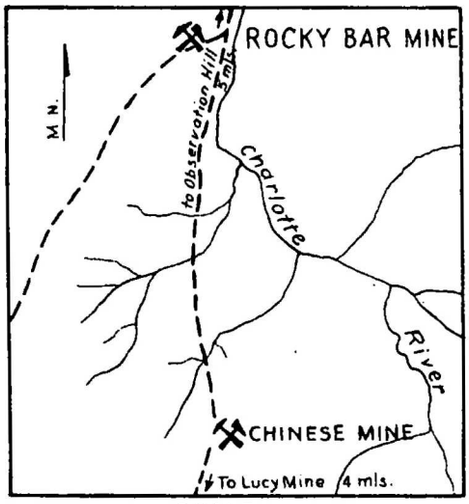
PLATE 28

LOCALITY PLAN



SCALE

0 1/2 1 MILE

MAG. NORTH

Laterite

Pegmatite
Homogenous
Nil Zoning

Water Level
10' below Collar

Laterite

Pegmatite Contact
Vertical

Laterite

Numerous Dumps

REFERENCE

Fine Grained Quartz Mica Felspar Pegmatite

Quartz Greywacke

6' Rim of Excavation
Depth in feet

Foot of Dump

75° Strike & Dip of Strata

ROCKY BAR PROSPECT

SCALE

20 0 20 40 feet.

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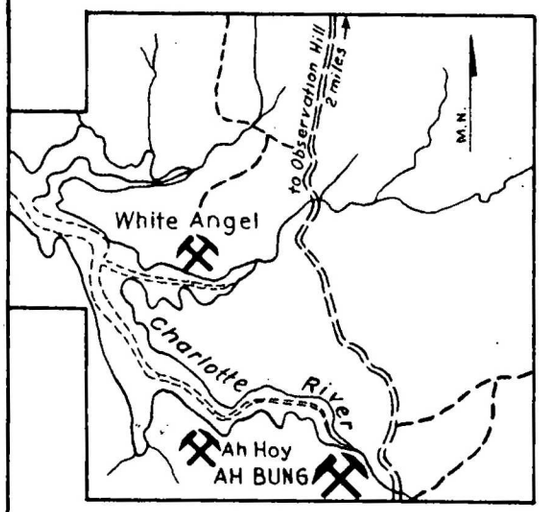
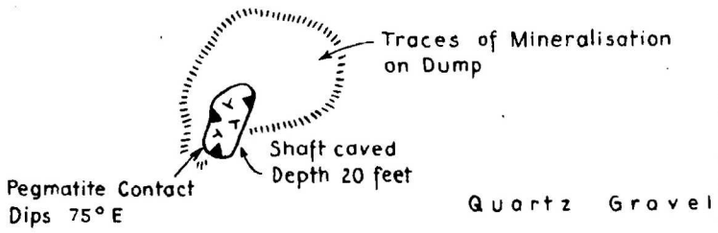
PLATE 29

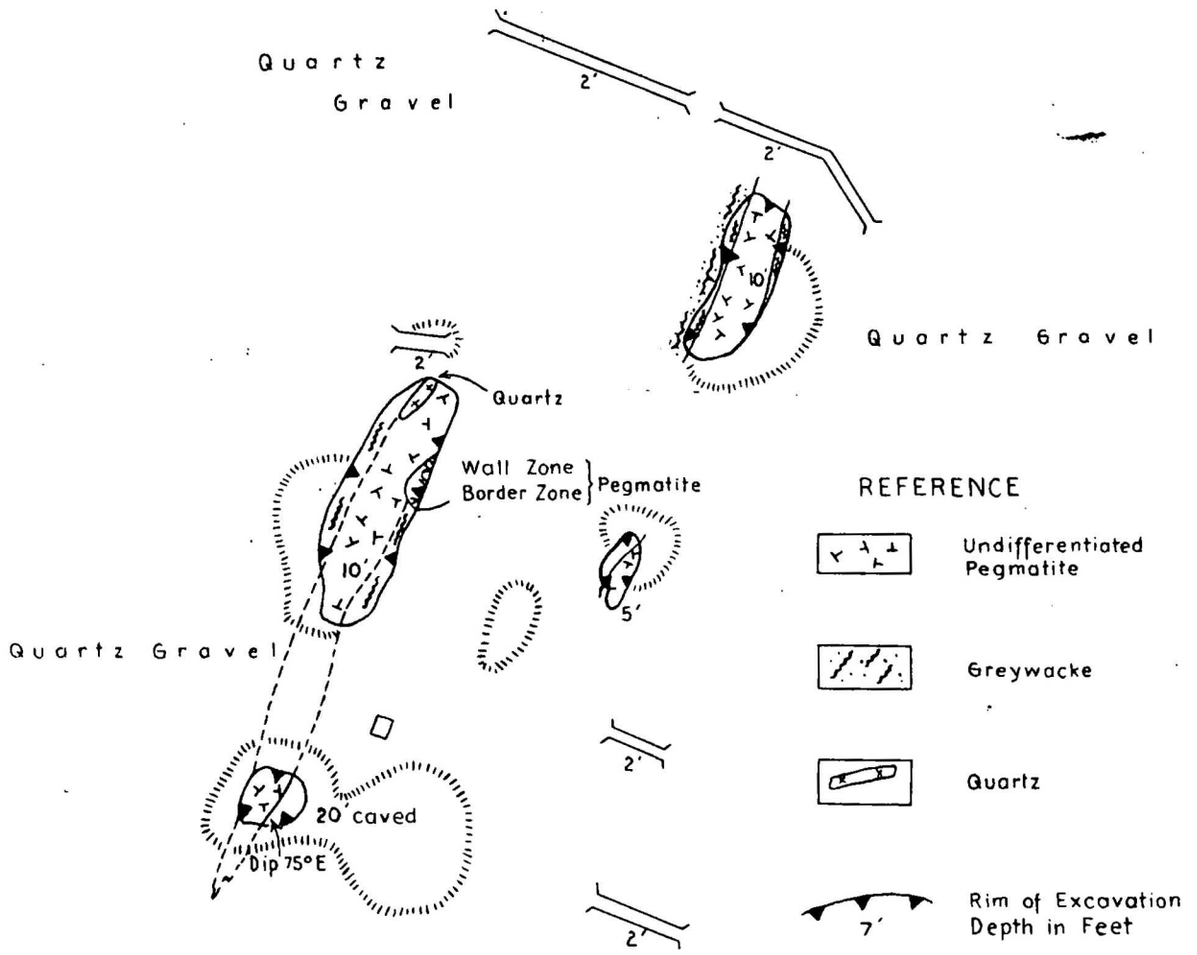
LOCALITY PLAN



SCALE
0 1/2 1 MILE

MAG. NORTH





REFERENCE

- Undifferentiated Pegmatite
- Greywacke
- Quartz
- 7' Rim of Excavation Depth in Feet
- Foot of Dump
- Costean

AH BUNG PROSPECT

SCALE
20 0 20 40 FEET

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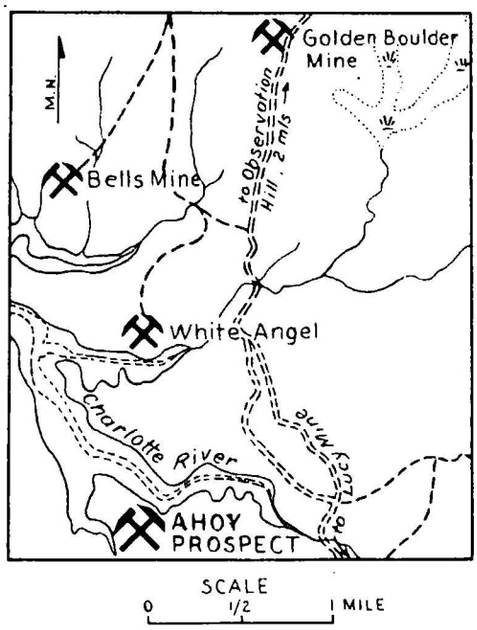
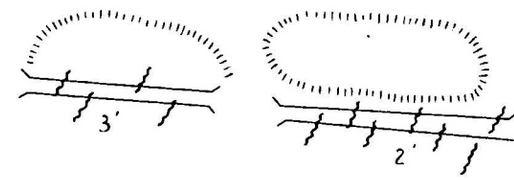
PLATE 30

LOCALITY PLAN



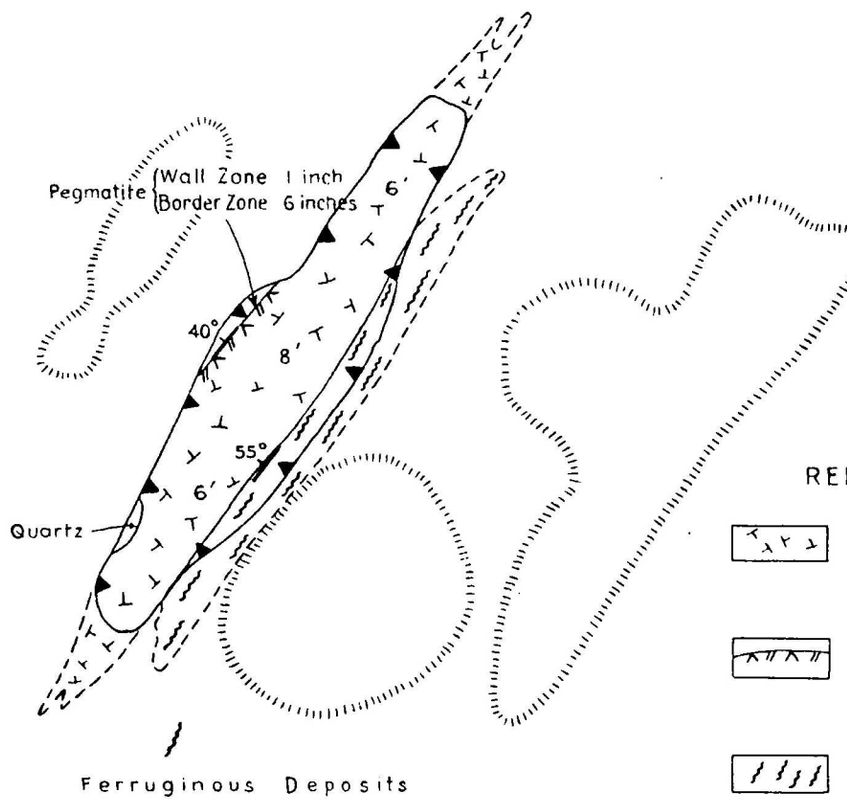
SCALE
0 1/2 1 MILE



MAG NORTH

Alluvium

Ferruginous Deposits



Ferruginous Deposits

REFERENCE

- Undifferentiated Pegmatite
- Border Zone Pegmatite
- Mica Schist
- 6' Costean
- 8' Rim of Excavation Depth in Feet
- Foot of Dump
- Strike & Dip of Strata

AH HOY PROSPECT

SCALE
5 0 5 10 FEET

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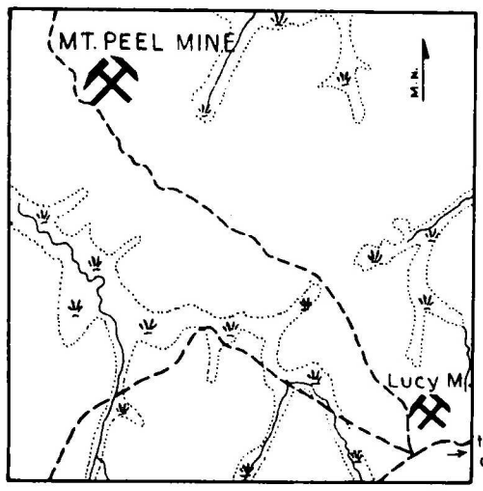
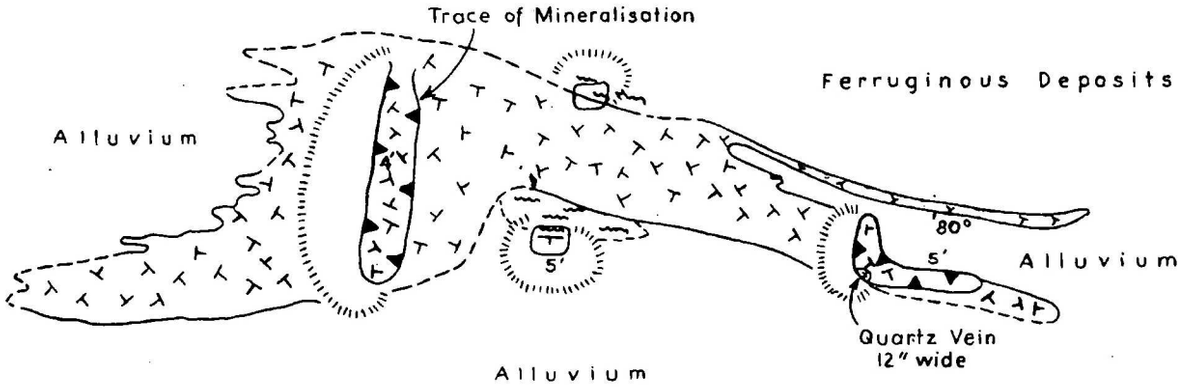
PLATE 31

LOCALITY PLAN



SCALE
0 1/2 1 MILE

MAG. NORTH



MT. PEEL PROSPECT

REFERENCE

Undifferentiated Pegmatite

Quartz

Quartz Mica Schist

Rim of Excavation
Foot of Dump

Prospecting Pit

70° Strike & Dip of Strata

Foot of Dump

SCALE
20 0 20 40 FEET

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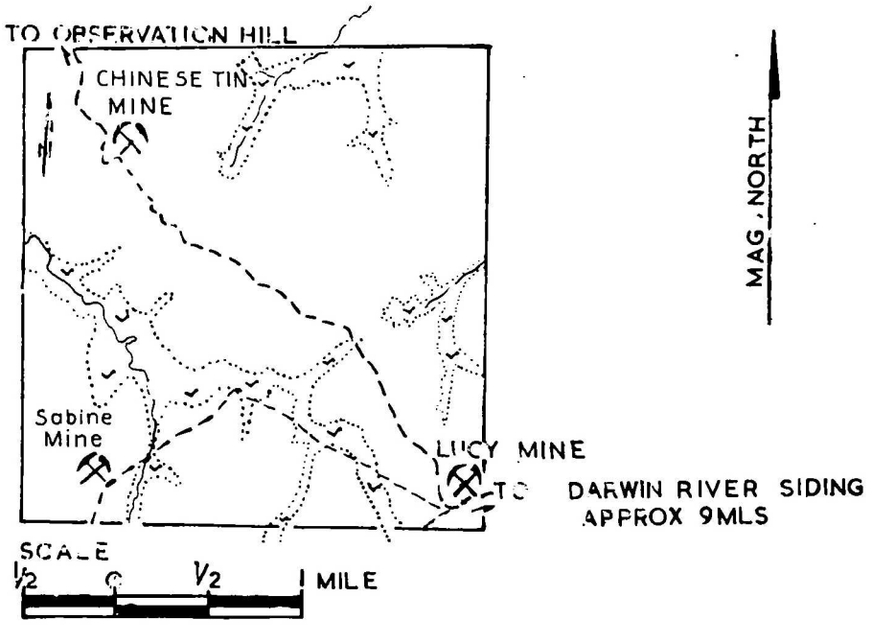
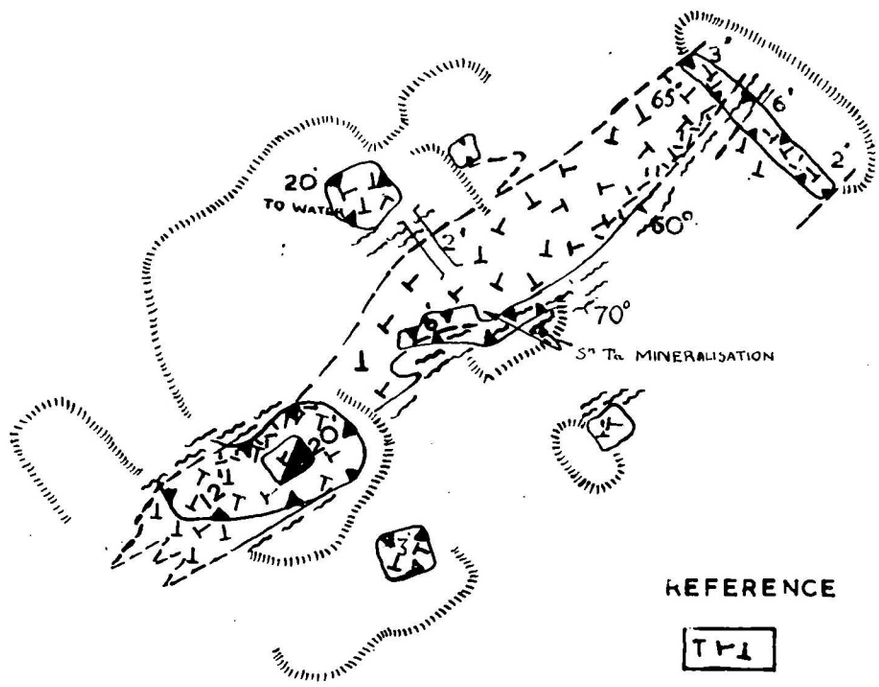
PLATE 32



CHINESE TIN PROSPECT



REFERENCE

T-1

QUARTZ MICA FELSPAR PEGMATITE

QUARTZ MICA PEGMATITE

MICA SCHIST

20 SHAFT

5' PIT

RIM OF EXCAVATION

FOOT OF DUMP

INFERRED BOUNDARY

70° STRIKE & DIP OF STRATA

SCALE

20 0 20 40 60 FEET

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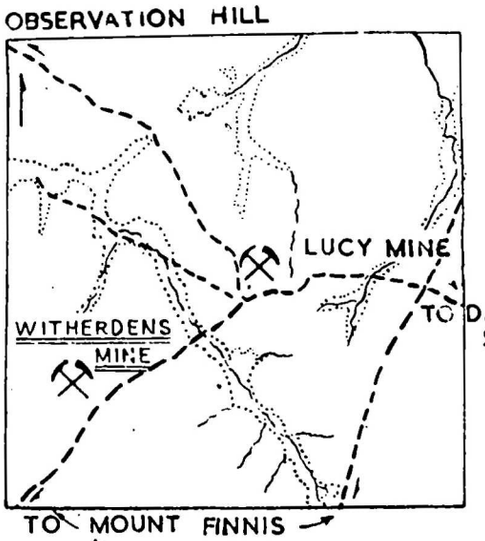
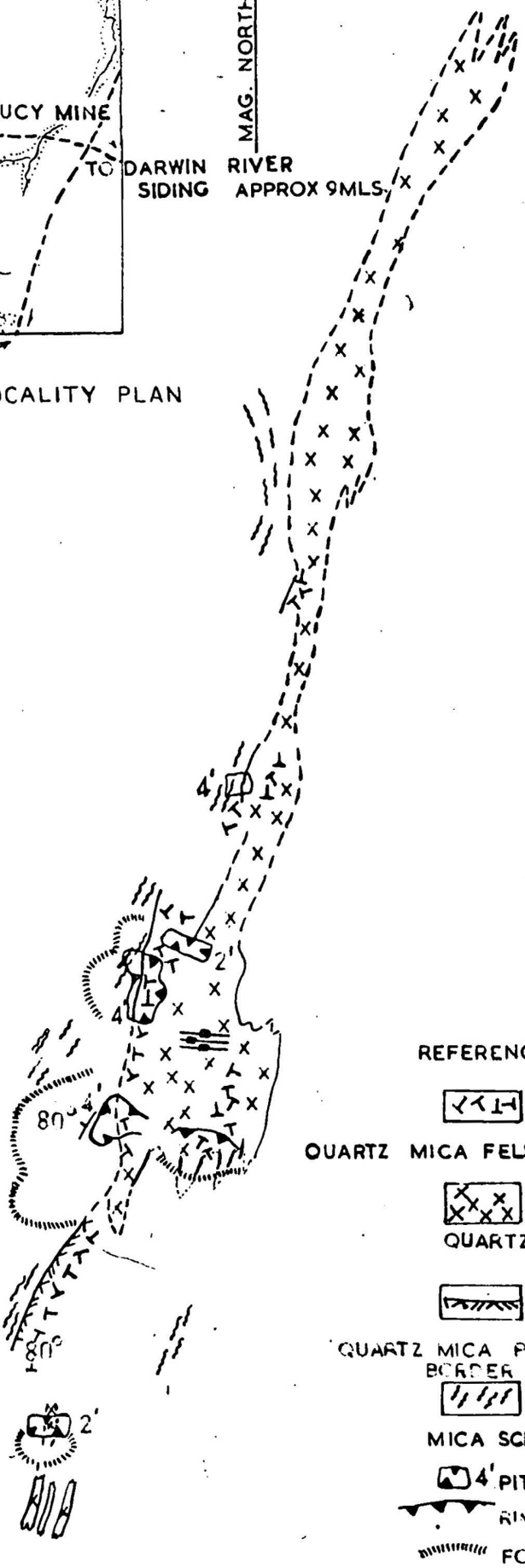
PLATE 33



LOCALITY PLAN



REFERENCE

QUARTZ MICA FELSPAR PEGMATITE

QUARTZ

QUARTZ MICA PEGMATITE BORDER ZONE

MICA SCHIST

4' PIT

RIM OF EXCAVATION

FOOT OF DUMP

STRIKE & DIP OF STRATA

INFERRED BOUNDARY

WITHERDENS PROSPECT

SCALE.
20 0 20 40 FEET

BUREAU OF MINERAL RESOURCES DARWIN 1956

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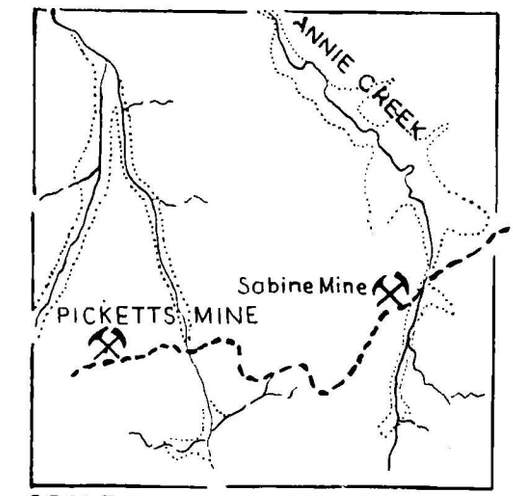
PLATE 34



SCALE
0 ½ 1 MILE

MAG. NORTH

QUARTZ GRAVEL

AMBLYGONITE

ALLUVIAL WORKINGS

TRACE OF MINERAL IN GRAVEL

NUMEROUS SMALL PEGMATITES

SLUICE RACE

AMBLYGONITE

QUARTZ GRAVEL

QUARTZ GRAVEL

REFERENCE

QUARTZ MICA SCHIST

QUARTZ MICA FELDSPAR PEGMATITE

FELDSPAR QUARTZ PEGMATITE & AMBLYGONITE

QUARTZ PEGMATITE

COSTEAN

RIM OF EXCAVATION

TOE OF DUMP.

PICKETTS PROSPECT

SCALE
20 0 20 40 FEET

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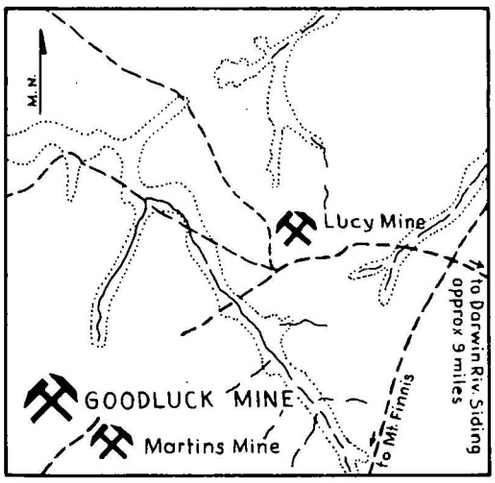
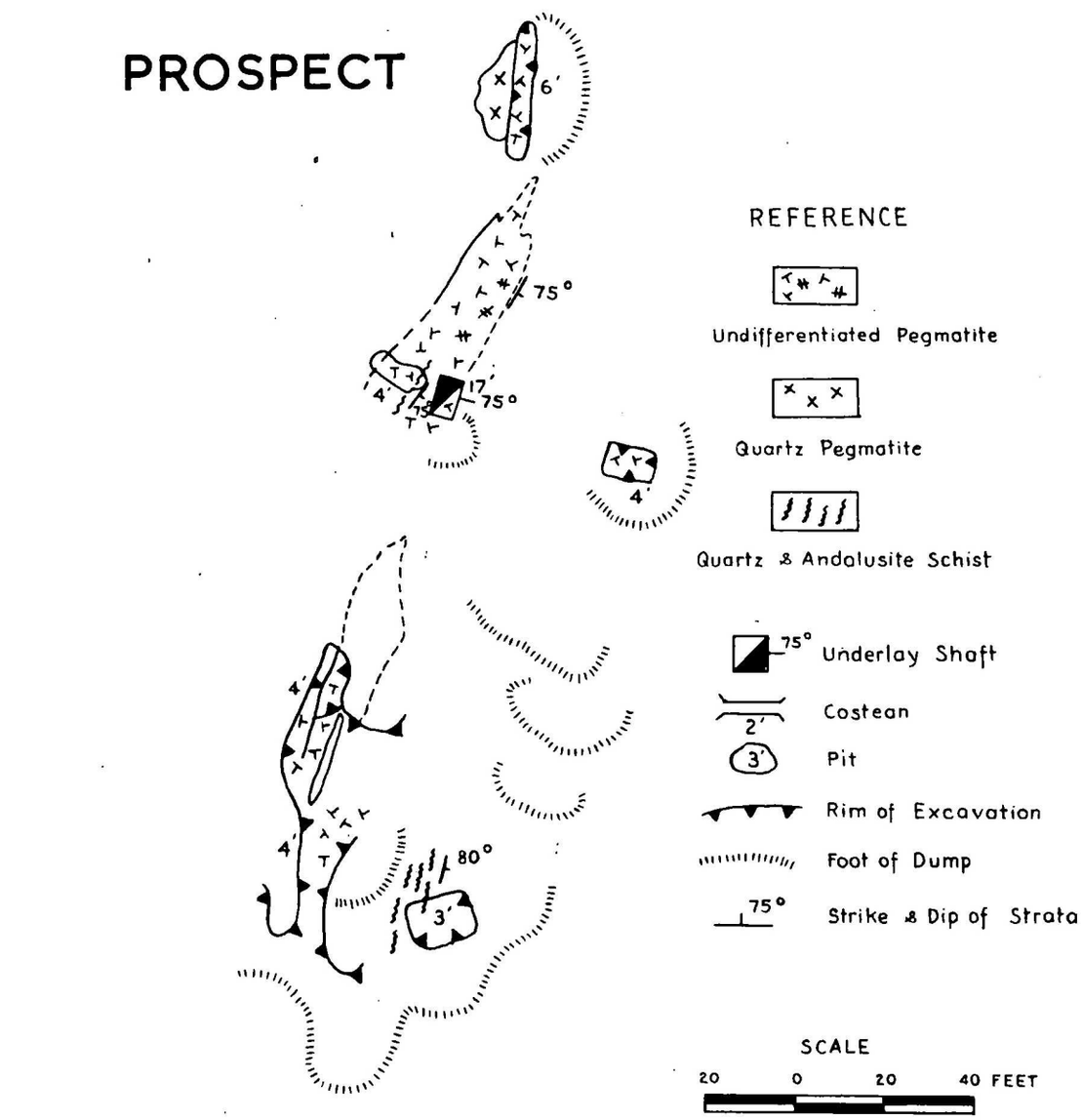
PLATE 35

LOCALITY PLAN



SCALE
0 1/2 1 MILE

GOODLUCK PROSPECT



REFERENCE

- Undifferentiated Pegmatite
- Quartz Pegmatite
- Quartz & Andalusite Schist
- 75° Underlay Shaft
- 2' Costean
- 3' Pit
- Rim of Excavation
- Foot of Dump
- 75° Strike & Dip of Strata

SCALE
20 0 20 40 FEET

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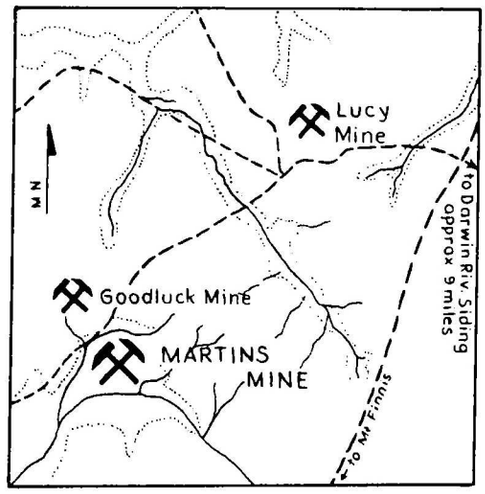
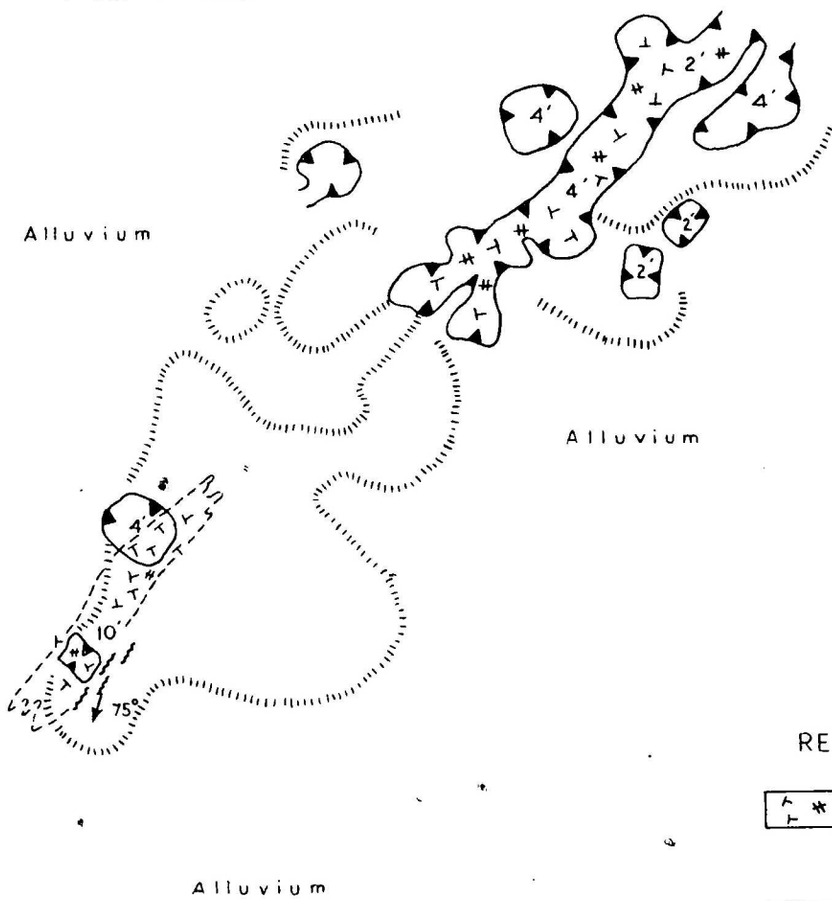
PLATE 36

LOCALITY PLAN



SCALE
0 1/2 1 MILE

MAG. NORTH



REFERENCE

- Undifferentiated Peg.
- Quartz Mica Schist
- 2' Prospecting Pit
- 7' Rim of Excavation, Depth in Feet
- Foot of Dump
- Pitch of Foliation

MARTINS PROSPECT

SCALE
20 0 20 40 FEET

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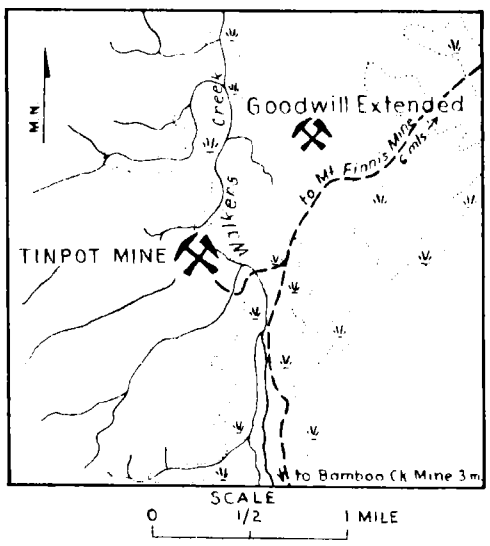
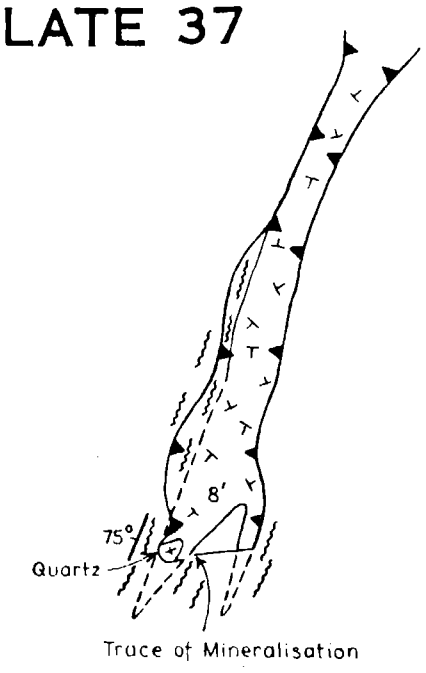
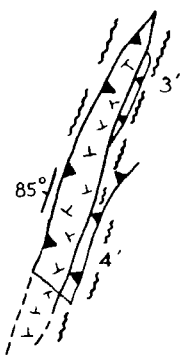
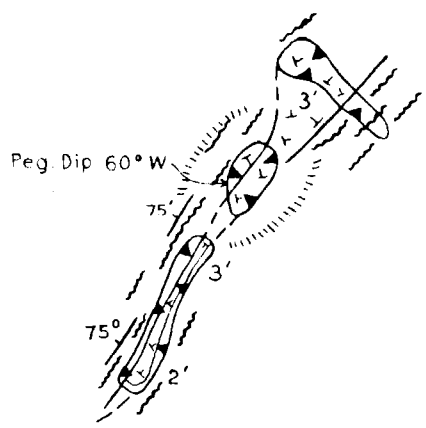
PLATE 37

LOCALITY PLAN

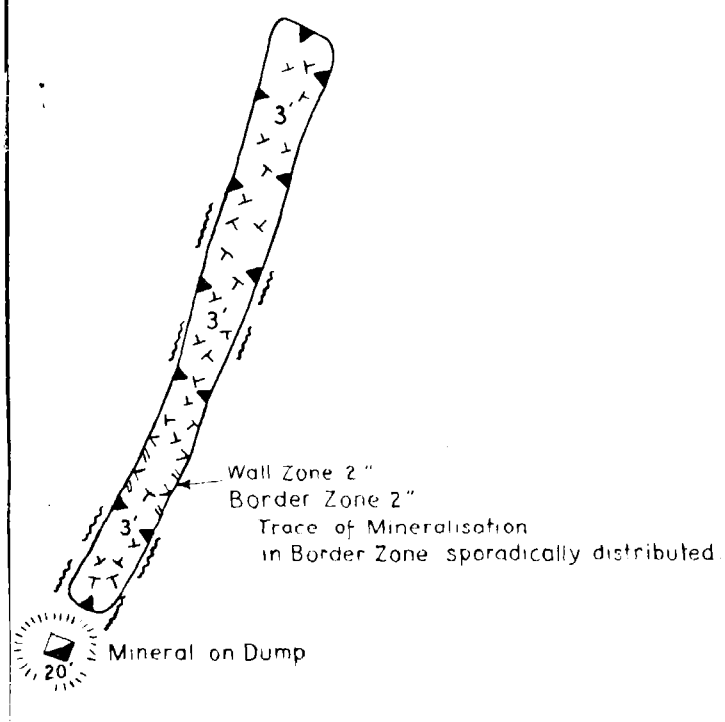








TINPOT PROSPECT



REFERENCE

- Undifferentiated Pegmatite (fine grained)
- Border Zone / Wall Zone } Pegmatite
- Quartz Mica Schist
- Shaft
- 6' Rim of Excavation, Depth in Feet
- Foot of Dump
- 70 Strike & Dip of Strata

SCALE

20 0 20 40 60 80 FEET

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