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PRELIMINARY GEOLOGICAL AND GEOPHYSICAL REPORT ON THE BURRUNDIE PROSPECT, NORTHERN TERRITORY.

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CONTENTS.

SUMMARY.

This report is an account of geological and geophysical investigations of the Burrundie Radioactive Prospect, which is located three and a half miles west-south-west of Burrundie Siding on the North Australian Railway.

Metamorphosed sedimentary rocks, which are thought to be of Lower Proterozoic Age (Noakes, 1949), crop out in the area. The sedimentary rocks are part of a conformable sequence of siltstones, slates and shales which form the west limb of a large south plunging anticline. The siltstones in the prospect area have been subjected to dynamothermal metamorphism (followed by injection of diorite sills) and later fracturing and shearing followed by metasomatism.

Extensive outcrops of granite occur one and a half miles north and 6 miles south of the prospect. The granites are thought to be connected at depth so that the overlying sediments form a roof pendant.

Radioactivity is restricted to a few places in a zone about 10 feet wide and 450 feet long, which occurs within a bed of dark grey silicified siltstone. The radioactive host rock is a ferruginous light brown rock which is gossanous in places. The best sample taken for radiometric assay contained 0.009 per cent eU_3O_8. Radiometric traverses indicate that the surface radioactivity is extremely localised and of low intensity.

No minerals of economic importance were discovered and self-potential traverses indicate that no strong sulphide mineralisation is present at depth.

The radioactive deposit at Burrundie is of a type not previously investigated in the Northern Territory. For this reason two exploratory drill sites have been chosen to provide information about mineralisation and radioactivity at depth.

INTRODUCTION.

Location and Access.

The Burrundie Prospect is situated three and a half miles on a true bearing of 242 degrees from Burrundie Siding which is on the North Australian Railway. The prospect is about 95 miles south-east of Darwin.

Access to the prospect is by a rough track which runs in a southerly direction from Grove Hill along Saunders Creek.

Previous Investigations.

Significant radioactivity was discovered on 20th May, 1954, by members of a Bureau of Mineral Resources Party led by B.P. Walpole.

A reserve of one square mile was applied for on 16th June, 1954, and detailed mapping began on 25th June, 1954.

Acknowledgements:

The writers were assisted in the field by G. Clarke (Geophysicist) and P. Mayman (Geophysical Assistant.)

REGIONAL GEOLOGY.

Igneous and sedimentary rocks crop out in the area. The sedimentary rocks, which are thought to be of Lower Proterozoic Age (Noakes, 1949), have been subjected to regional metamorphism. The regional geology has been described by Stewart (1954) who refers to "....carbonaceous rocks, - shales, greywackes and slates which in some places have been altered to graphitic schists. Limestone, greywacke, siltstone, shale and sandstone and the metamorphic derivatives of these rocks."

The sedimentary rocks of the region have been intruded by sills of diorite "....which have metamorphosed the adjacent beds to hornfels." (Stewart, 1954.)

Two granite bodies occur in the area. The Prices Springs Granite crops out approximately one and a half miles north of the prospect and the Cullen Granite crops out approximately six miles south of the prospect. If these granitic masses are connected at depth, then the sedimentary rocks of the Burrundie area form a roof pendant. Shearing in the sedimentary rocks of the prospect area probably reflects fracturing of the granite basement.

Regional geological mapping shows that the prospect is situated on the west limb of a south plunging anticline. One of the writers (J.R.) believes that the shearing in the prospect area is prominent because the crests of the anticlines are structurally weak and are more strongly affected by movement of the granite basement.

GEOLOGY OF THE PROSPECT.

Metamorphosed Sedimentary Rocks.

The most common sedimentary rocks are siltstones which have been subjected to dynamothermal metamorphism and later alteration due to silicification and kaolinisation. The rocks strike north-west and dip 50 degrees to the south-west. They show lineation produced by shearing and have a slaty appearance in many places and a blocky appearance in others. Cubic casts found in the rocks and on the surfaces of weak fractures indicate pyrite mineralisation.

The youngest rocks crop out on the south-west slope of the razorback ridge. These rocks are light grey siltstones, which contain cubic casts after pyrite and thin ferruginous bands.

The light grey siltstones are underlain by dark grey silicified siltstones, which contain veinlets of quartz having a general trend parallel to the bedding planes. The silicification is irregular and decreases north-west of the mapped area. The rocks are ferruginous in some places and in other places have a spotted appearance. In some places the rocks are slightly hornfelsed. Tension fractures in the dark grey silicified siltstones contain hematite, quartz and cubic casts after pyrite. These rocks are resistant to weathering and form the crest of the razorback ridge.

Small outcrops of a light brown ferruginous rock, which are aligned parallel to the dip and strike of the beds, occur within the bed of dark grey silicified siltstone. The rock is light in weight and porous, which suggests that it has been highly leached. The fine grained texture of the rock suggests that it was originally a siltstone.

A bed of light grey ferruginous siltstone underlies the bed of dark grey silicified siltstone cropping out on the crest of the ridge.

The oldest rocks exposed in the mapped area are dark grey siltstones which contain casts filled with hematite (possibly after pyrite.) These rocks have been silicified in places and are comparable in texture and composition with the rocks which crop out on the crest of the ridge.

The rocks cropping out on the ridge show considerable variation along their strike due to irregular metasomatism (silicification, pyritisation etc.) and to the degree of weathering.

A large part of the sequence is obscured by rubble.

IGNEOUS ROCKS.

Diorite.

Diorite rubble is abundant at the base of the north-east slope of the ridge and large outcrops occur near the creek which flows parallel to the ridge and to the axis of the large south plunging anticline. See PLATE I.

Quartz.

Quartz intrusions trend parallel to the strike of the sediments. Small veinlets of quartz are common in two horizons. The upper horizon is a bed of dark grey silicified siltstone (shown near the baseline on PLATE 2.) The lower horizon is a bed of dark grey siltstone (shown one hundred feet north east of Station D on PLATE 2.)

Brecciated vein quartz set in a matrix of ferruginous siltstone (Ferruginous quartz siltstone breccia) crops out fifty feet south-west of Station C (PLATE 2.) A thin zone of kaolinised rock containing thin veinlets of hematite can be traced along the strike on either side of the quartz siltstone breccia. A similar breccia occurs twenty five feet north east of Station D. The siltstone underlying the breccia north-east of Station D has been altered, probably by hydrothermal solution following vein quartz injection.

STRUCTURES.

The sedimentary rocks in the mapped area form part of the west limb of a south plunging anticline. The sediments were folded and injected by diorite during regional metamorphism. Strong lineation in the sediments indicates shearing which may have occurred at this time. One of the writers (J.R.) believes that slickensides indicate a resultant stress direction diagonal to the trend of the sediments.

Quartz veins and veinlets intersecting the trend of the diorite and trending parallel to the strike of the beds indicate fracturing and shearing before quartz injection.

Later bedding plane movement is indicated by brecciation, of quartz veins and the occurrence of narrow kaolinised zones which trend parallel to the bedding planes of the sediments.

Cleavage and drag folds which have been developed in less competent rocks, and tension fractures which have been developed in the competent dark-grey silicified siltstones, indicate a late stage of shearing which moved the older rocks south-east and the younger rocks north-west.

Joints of an open joint system intersect pre-existing structures and thus indicate the latest adjustment to stress.

ECONOMIC GEOLOGY.

The radioactive areas are located in the light brown ferruginous rock, which occurs within the bed of dark grey silicified siltstones on the crest of the ridge.

Five small costeans were put down in the ferruginous rock, but no minerals of economic importance were seen. In general, the distribution of radioactivity appears to be irregular but a small fracture intersecting the south-west face of a costean at Station B is associated with radioactivity of three times background. One of the writers (J.R.) believes that the radioactivity may be related to fractures with a north-east trend.

Small outcrops of gossan are found over the outcrops of the light brown ferruginous rock. One small outcrop of ferruginous gossan gas a coarse cellular structure and other small outcrops have a fine cellular structure with quartz walls (Ribwork.) The small outcrops of gossan suggest restricted sulphide mineralisation. However, the absence of any oxides of economically important minerals suggests that the gossan may be derived from pyrite.

The porous ferruginous rock provides a suitable host rock for the concentration of secondary uranium minerals.

RADIOMETRIC INVESTIGATIONS.

These investigations were confined to gridding of the prospect and costeans. The instrument used for all the work was C.A.E. scintillometer No. 142, which has a background count of 35 per second.

Gridding.

A total of 9,200 feet of radiometric traversing was completed. The geological baseline H-T shown on PLATE 2 was laid out to serve as a geophysical baseline. Traverses were made at 25 feet intervals at right angles to the baseline for 1,100 feet. Each traverse was 200 feet long.

The following radioactivity was recorded:

1. Twice background over an interval of 7 to 10 feet north-east of Station A.

2. Twice background over an interval of 2 to 8 feet north-east of Station B. This is immediately adjacent to costean 3N.

Costeans.

Costean 1N gave a uniform reading of three times background with no local highs.

Costean 2N gave a similarly uniform reading of two and a half times background.

Costean 3N gave a uniform reading of two times background with two and a half times background at the south-west end.

Costean 4N is ten feet long. The centre three feet gave two to two and a half times background. The remainder gave one and a half times background.

Costean 1S gave background only.

Assaying.

One specimen from costean 1N (which gave the highest counts obtainable) assayed 0.009 percent eU_3O_8. An absorption test indicated that the uranium was in good equilibrium. However as a considerable proportion of the radiation at the prospect may be due to radon gas this assay and absorption test must be accepted with reserve. It is likely that the eU_3O_8 assay is approximately correct, but that there is considerable disequilibrium with depletion of uranium.

The radiometric investigations at Burrundie Prospect strongly indicate that surface radioactivity is extremely localized and of low intensity.

Readings of five times background (made with a P.R.M. 200 in costean 1N immediately after digging) decreased to three times background following several days' exposure. This suggests that much of the radioactivity at Burrundie is due to radioactive gas (radon ?) trapped in the highly porous ferruginous host rock.

SELF-POTENTIAL INVESTIGATIONS.

The very porous radioactive host rock, the sporadic occurrence of boxwork gossan, and the presence of large cubic casts suggested the use of the self-potential method to test for sulphide concentrations at depth. Three traverses were run. The ground surface was very dry and the water table was probably at a depth greater than 100 feet.

Traverse No. 1 (See PLATE 3) is parallel to and 20 feet south-west of the geological base line. It is parallel to the bedding and the elongation of the surface radioactivity. The traverse was made to investigate the potential characteristics of any sulphide body associated with surface radioactivity found in the leached host rock.

A broad 200 M.V. negative anomaly occurs between 210 feet N.W. and 240 S.E. (See PLATE 3). A minimum occurs near 00 opposite costean 1N. This shows excellent correlation with the surface geology. The most south-easterly occurrence of the leached ferruginous host rock is 20 feet south-east of Q (See PLATE 2.) This is also 240 feet from costean 1N. The most north-westerly occurrence of the host rock is at costean 4N, which is 210 feet north-west of 1N. The minimum, 00, occurs opposite costean 1N, where the host rock is at maximum width. It is here that the maximum radioactivity was recorded.

Traverse No. 2 was run perpendicular to the strike of the beds at 00, where the minimum readings occur on traverse No.1. Traverse No. 2 could be expected, therefore, to record the maximum anomaly.

The 75 M.V. negative anomaly beginning at 120 N.E. corresponds to the light grey ferruginous siltstone shown 120 feet north-east of the baseline on PLATE 2. The continuation of the anomaly beyond the south-west outcrop limits of the light grey ferruginous siltstone is to be expected from the south-west dip of the strata.

A much stronger negative anomaly begins at 10 N.E. corresponding to the north-east edge of the radioactive ferruginous host rock. This anomaly continues to the end of the traverse. Two reasons for the continuation of the anomaly are:

(1) Since the angle between the surface and the ferruginous host rock (assuming the latter to be conformable to the bedding) is of the order of 30 degrees, active oxidation of any sulphide present would occur over a distance far greater than the actual width of the outcrop.

(2) The siltstones crossed between 00 and 400 S.W. are characterized by large cubic casts after pyrite. The oxidation of pyrite beneath the surface could account for the self-potential anomaly in these rocks. The presence of pyrite could also account for the more jagged appearance of the curve south-west of 00, as compared with north-west of 00. The rapid variation results from alternation of horizons with different pyrite content. The low negative between 80 and 110 S.W. which corresponds with an outcrop of very pyritic siltstone, is an example.

The second explanation of the anomaly is favoured by the writers.

The small negative between 10 and 40 S.W. probably represents the "contribution" from the ferruginous host rock.

Traverse No. 3 is similar to traverse No. 2, except that the anomalies are less sharp. This is to be expected from traverse No. 1. The "low" between 30 and 100 S.W. is probably due to the radioactive host rocks.

CONCLUSIONS AND RECOMMENDATIONS.

The geological, radiometric and self-potential work does not indicate economic concentrations of uranium or sulphide minerals.

It is possible that the bulk of any near surface uranium which may have been present would have beenremoved in solution because the host rock is strongly leached. Even if a much higher U_3O_8 content does exist at depth the restricted surface extent of the host rock indicates a small volume of ore.

The self-potential work at Burrundie Prospect does not rule out the possiblity of sulphide mineralisation at depth, but it does indicate that strong sulphide mineralisation is not present at depth. The small but definite anomaly on traverse No. 1 points to a sulphide concentration in the leached host rock which is above normal. How much above normal cannot be stated.

The writers believe the Burrundie Prospect is a very poor prospect. However, useful geological information could be gained if one or two drill holes were put down to intersect the zone of highest radioactivity at depth. This information will prove useful because this type of deposit has not been investigated elsewhere in the Northern Territory.

Two drill sites are indicated on PLATE 2. Diamond drill hole B.1 should be drilled first. The drill data is as follows:

Diamond Drill Hole B.1

Direction	038½ degrees
Inclination	69 degrees
Drill depth to intersection	188 feet.
Vertical depth below surface	250 feet.

?

Diamond Drill Hole B.2

Direction	038½ degrees
Inclination	60 degrees
Drill depth to intersection	199 feet
Vertical depth below surface	250 feet

The following work is also recommended:

(1) Ascertain which mineral in the area is radioactive.

(2) Detailed investigation of fracture lines favourable for uranium mineralisation.

a) Radiometric reconnaissance should be extended along the continuation of the north-east trending fracture line which intersects carbonaceous (?) shale in the creek bed north-west of the mapped area. Scintillometer readings three times background were made in this area.

b) Radiometric reconnaissance traverses should be made on the continuation of the razorback ridge north-west of the creek mentioned in 'a' above. Scintillometer readings of three times background were made in this area and there is topographic evidence of cross faulting.

REFERENCES.

Noakes, L.C., 1949. A geological reconnaissance of the Katherine-Darwin Region, Northern Territory. Bureau of Mineral Resources, Australia. Bulletin 16.

Stewart, J.R. 1954. Reconnaissance geological report. Burrundie Radioactive Prospect Reservation. Bureau of Mineral Resources, Australia. Unpublished report.

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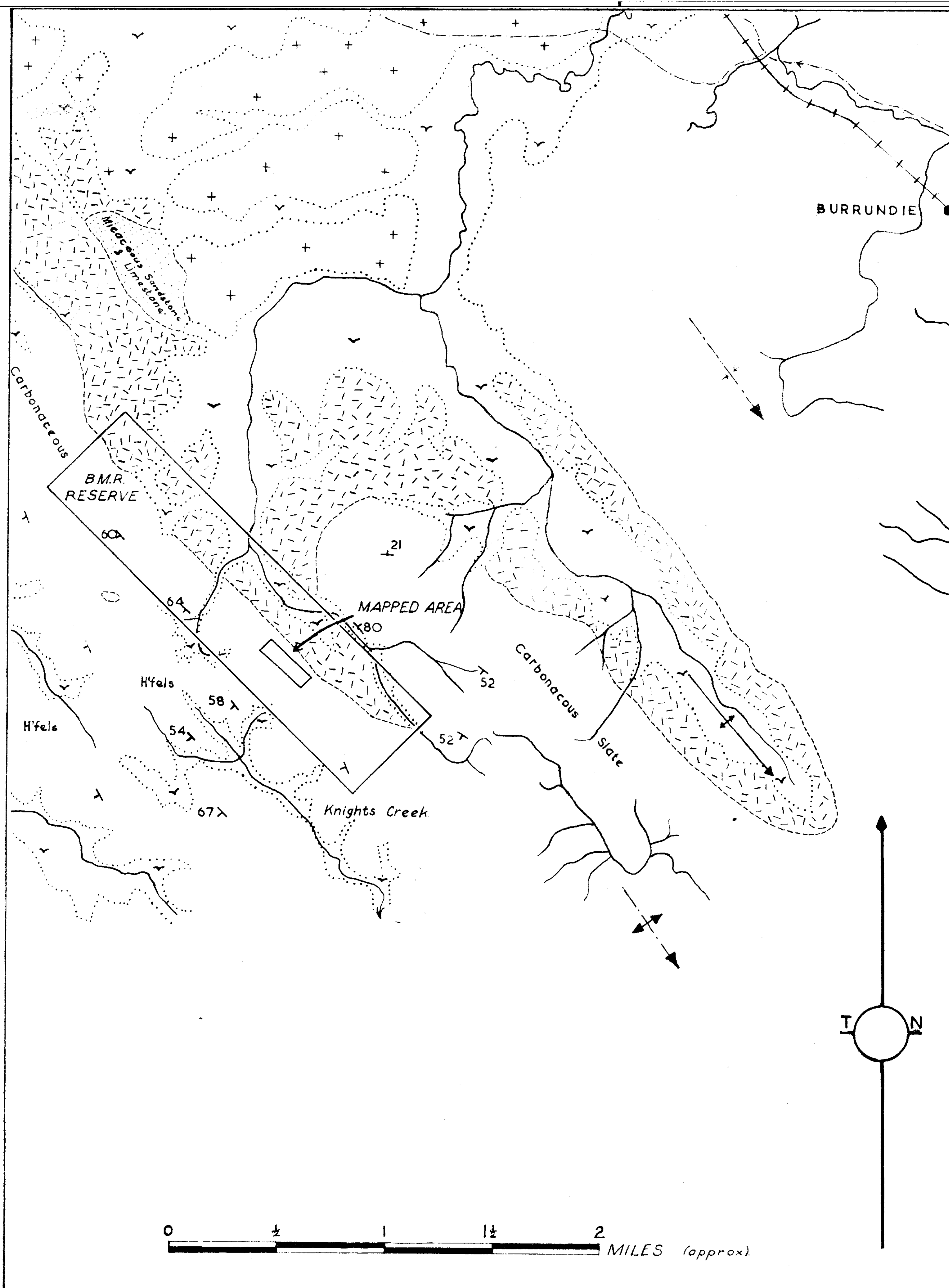
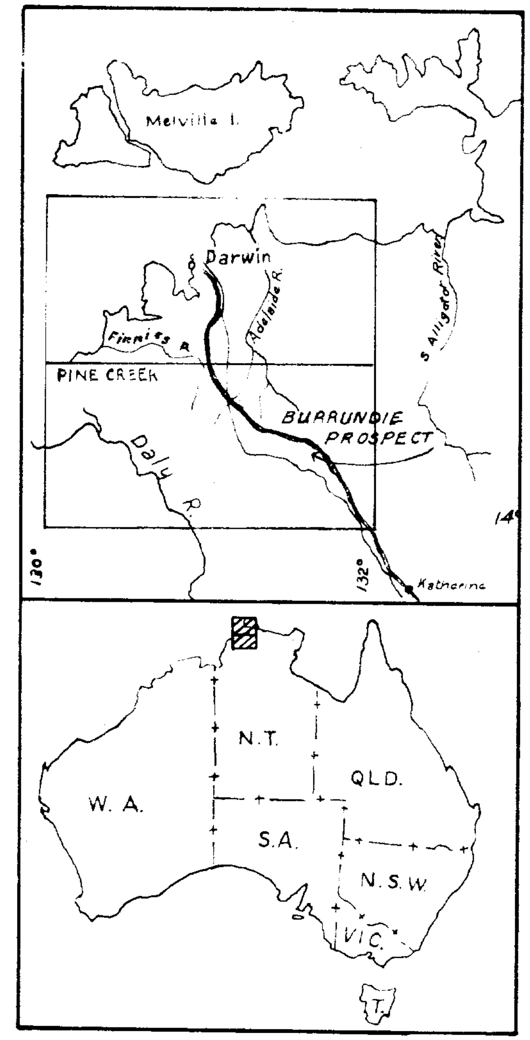
PLATE I.



Locality Diagram with reference to 4 mile map series.



LEGEND

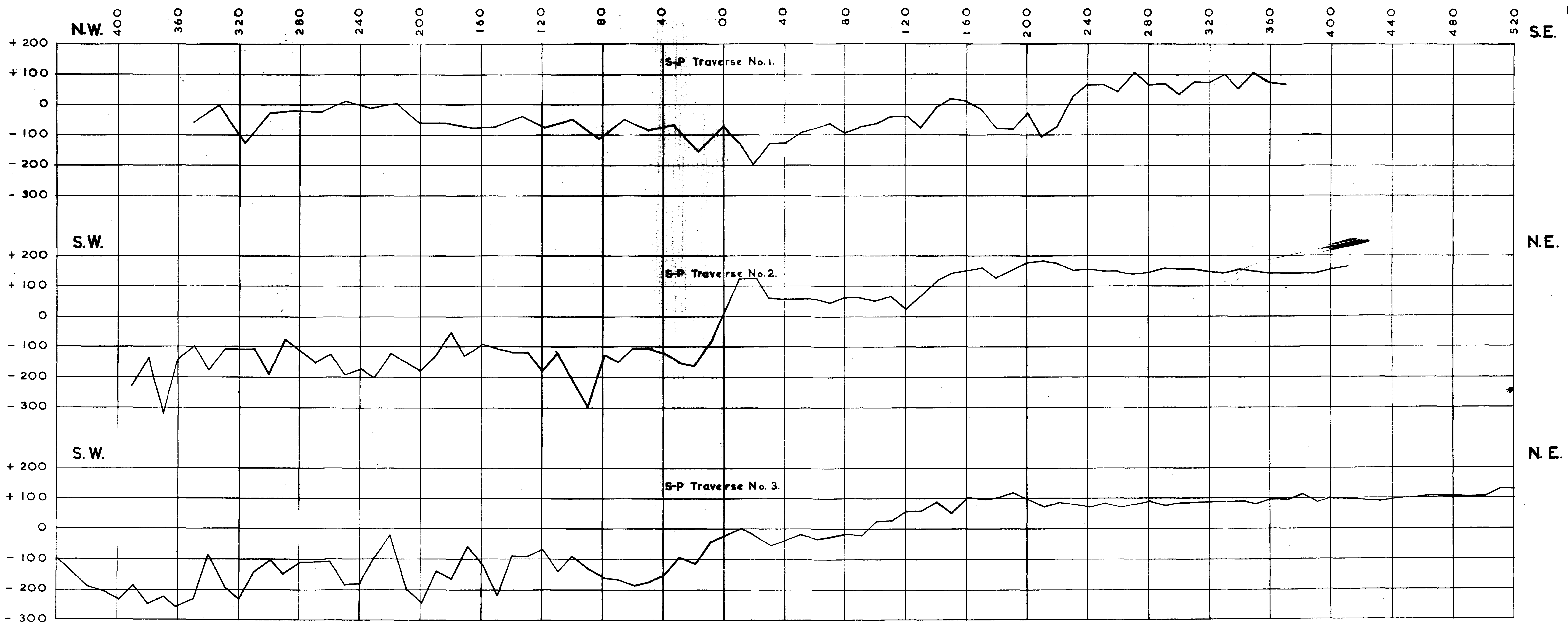
Lower Proterozoic

- Carbonaceous slates.
- Diorite.
- Granite.
- Alluvial boundary.
- Fault quartz filled.
- Geological boundary.

Location map of B.M.R. Reserve & Burrundie Prospect Geology after J. R. Stewart.


PLATE 2.
925'
950'
975'
975'
950'
925'
Kaolinized zone
A
E
F
G
H
Q
R
S
T
1N
2N
3N
4N
M
N.
REFERENCE
Light grey siltstone with pyritic (?) casts.
Dark grey silicified siltstones.
Light brown siltstone. Hydrothermally altered and strongly weathered
Light grey ferruginous siltstone.
Dark grey siltstone. Silicified in places
Ferruginous quartz-siltstone breccia.
Approximate geological boundary.
Inferred geological boundary.
Dip and strike of beds.
" " " cleavage.
Drag fold.
Cross fractures containing quartz and hematite.
Costeans and pits.
Plane table station.
Contours.
Geophysical base pegs.
SCALE.
40 0 40 80 FEET.
BUREAU OF MINERAL RESOURCES
RADIOACTIVE SECTION
Geological Plan
RADIOACTIVE PROSPECT
NEAR
BURRUNDIE N.T.
Geology & Plane-Table Survey by J. B. Firman and

PLATE 3.



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Compiled by J.B. Misz.

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