COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

RECORDS:

1963/156

GEOLOGICAL RECONNAISSANCE ON GREEN SWAMP WELL SHEET, N.T.

by

K.G. Smith

GEOLOGICAL RECONNAISSANCE ON GREEN SWAMP WELL SHEET, N.T.

by

K.G. Smith

RECORDS 1963/156

CONTENTS

GEOLOGICAL RECONNAISSANCE ON GREEN SWAMP WELL SHEET, N.T.

SUMMARY

In August, 1963, two flights were made in a chartered Bell Helicopter, Model 47 G2, from Tennant Creek westward to parts of the Green Swamp Well 1:250,000 Sheet area. En route, one landing was made on a fossiliferous Middle Cambrian outcrop near the western margin of the Tennant Creek Sheet. All outcrops examined on the Green Swamp Well Sheet consisted of apparently unfossiliferous sandstone and siltstone whose age is probably Cambrian. The thickness of the outcrops ranges from 5 to 30 feet, but the base is not exposed; bedding is either horizontal or dipping at less than 2 degrees. Rounded pebbles of quartz observed on the surface of some outcrops may represent remnants of either Permian or Mesozoic sediments.

Examination of air photographs, and the records of the explorer Davidson (1905), suggest that the sandstone-siltstone outcrops on Green Swamp Well area are part of a sequence, of probable Cambrian age, which crops out intermittently on the Wiso Tableland. This Tableland is an uninhabited and largely unmapped area named and defined by Hossfeld (1954) as bounded by Newcastle Waters, Wave Hill, The Granites and Barrow Creek. Preliminary results of an aeromagnetic traverse conducted by the Geophysical Branch of the Bureau in 1962 indicate that the depth to magnetic basement in the central northern part of the Green Swamp Well area is 6,000 feet; there is a gradual decrease in depth towards known Precambrian outcrops to the east and west.

To make a preliminary assessment of the Wiso Tableland area, it should be mapped geologically to establish the age and lithology of sedimentary outcrops and to delineate any occurrences of the Lower Cambrian Antrim Plateau Volcanics which may extend south and south-east from Hookers Creek settlement. Helicopter transport, with limited ground support, is recommended for this work, and the surface mapping should be supported by a programme of shallow coring in accessible areas.

INTRODUCTION

Two reconnaissance flights were made from a temporary base camp, situated two miles north of Tennant Creek aerodrome, to parts of the Green Swamp Well Sheet. The flights were made in a Bell Helicopter, Model 47, G2, chartered from Helicopter Utilities Ltd, Sydney. This machine had an operating range of about 170 miles under ideal weather conditions and when carrying only two persons. Each proposed flight was bout 200 miles long and therefore it was necessary to establish a fuel dump en route; 45 gallons of fuel were ferried by helicopter to a prominent claypan about 45 miles west of Tennant Creek and this supply was ample for both flights.

The objects of the reconnaissance were to examine outcrops which were suspected to be of Lower Palaeozoic age, to use the results of the examination in assessing the value of mapping the Wiso Tableland for petroleum search, and to assess the feasibility of using helicopter transport for mapping in that area.

The Green Swamp Well area is uninhabited desert but has one road. This road, which is visible on air photographs taken in 1950, has been constructed by grading. It leads from Tennant Creek township to the Orlando Mine and thence westwards across the Tennant Creek Sheet to the Green Swamp Well area. It was last observed at a point about 80 miles west of Tennant Creek township and on air photographs can be traced for an additional 20 miles to the west. On the Green Swamp Well area it was followed for several miles, and examined at three localities on the ground. The road was found to be in reasonable condition; in places, low scrub has grown to a height of about 30 inches in the centre of the road, but the wheeltracks are generally clear and there have been few washouts. The original purpose of this road, and its destination are unknown; two residents of Tennant Creek stated that it was a war-time road constructed between Tennant Creek and Halls Creek, W.A. Hooker Creek settlement is a likely intermediate destination.

Most of the country traversed on the Green Swamp Well Sheet consisted of sand plain, with a light spinifex and mallee vegetation, surrounding a few low, isolated, brown outcrops. Some rocks are exposed in low escarpments around the perimeters of several large claypans. Gum trees grow in most of these claypans, and debris around the bases of these trees indicates that the claypans have held about one foot of water. Green trees, probably gum, line the banks of a watercourse in the central northern part of the Green Swamp Well Sheet area. A few low sand dunes were traversed, but there are large areas of high dunes, trending west-north-west, just outside the areas examined and extending over much of the Sheet area. Davidson (1905) stated that many dunes were 40 feet high.

There was no surface water in the areas examined and probably none in the whole Sheet area, but the claypans may hold shallow water for a short period after heavy rainfall. Davidson (1905) obtained water from similar claypans to the south, in May, 1900, and estimated that the largest would hold for two months.

PREVIOUS INVESTIGATIONS

(i) Geological. A.A. Davidson (1905) noted 'red sandstone and ironstone conglomerate' when he crossed part of the Green Swamp Well Sheet area in 1900. P.B. Nye flew over the south-eastern part of the Sheet area in 1934, but his flight lines (in Hossfeld, 1940a) do not record outcrop there. J. Elliston of Peko Mines, Tennant Creek, (pers. comm) made a reconnaissance west from Tennant Creek in the late 1950s. C. Wegener of Australian Development, Tennant Creek, (pers. comm) followed the old road west from Tennant Creek almost to the border of the Tennant Creek Sheet and near the western extremity of the traverse found Cambrian trilobites in a chert section, 14 feet thick, overlying Precambrian rocks.

(ii) Geophysical. The Geophysical Branch of the Bureau conducted airborne radiometric and magnetometer surveys over approximately the eastern third of the Green Swamp Well Sheet in 1956. Maps showing the results of this survey are in press. In 1962 the Geophysical Branch conducted one airborne magnetometer traverse across the Green Swamp Well Sheet, in the course of a reconnaissance survey from Gordon Downs, W.A., to Tennant Creek. Preliminary results of this survey indicate a depth to

magnetic basement of 6000 feet on the Green Swamp Well Sheet, with a decrease in depth to both east and west.

GEOLOGY

(i) Tennant Creek Sheet

The only landing on this Sheet area was made near the western border, where 20 feet of rubbly, fossiliferous chert overlies gneiss of probable Archaean age. Hyloithids and trilobite fragments collected in the chert indicate a lower Middle Cambrian age (A.A.Opik, pers. comm).

(ii) Green Swamp Well Sheet

Numerous small, low weathered outcrops were examined on both flights; all were un-metamorphosed apparently unfossiliferous sedimentary rocks whose base was not exposed.

All outcrops visited on Flight No.1 (fig.1) consisted essentially of sandstone with interbedded siltstone but in the eastern part of the Sheet area the sequence also contains beds of chert up to 2 feet thick. The sandstone is red, orange and brown, medium-grained, thin-bedded, glauconitic in part; the siltstone is white, buff and purple. The outcropping thickness of the sequences ranges from 5 to 30 feet, and the beds were horizontal. Rounded pebbles of quartz were found on the surface of some outcrops, and these pebbles may be uncemented remnants of Mesozoic or Permian conglomerate. No fossils were found in any outcrop.

On Flight No.2, a large area of low outcrop was examined. The section described below is typical of all outcrops of this area, except for low mounds of white, sandy siltstone found only in the bottoms of several claypans. The sequence, in descending order, consists of:

3 feet of sandstone; red, weathered;

5 feet of sandstone; brown, medium-grained, medium-bedded, silty;

5 feet of siltstone; red;

7 feet of sandstone; medium-grained, thin-bedded, silty, ripple-marked;

10 feet of sandstone; medium-grained, brown, thin-bedded, porous.

Total 30 feet; base not exposed.

No fossils were found in the outcrops. Bedding is generally horizontal, but very low east dips were observed in outcrops near the south-eastern extremity of the survey area. The thickness of exposures ranged from 10 to 30 feet.

CONCLUSIONS AND RECOMMENDATIONS

1. The outcrops examined on the Green Swamp Well Sheet are probably Cambrian in age, but their lithologies are unlike those of fossiliferous lower Middle Cambrian sequences exposed on the Tennant Creek Sheet and in the Barkly Tableland area to the east.

2. Outcrops similar to those examined on the Green Swamp Well Sheet area are probably widespread on the Wiso Tableland. Davidson (1905) explored much of this area and reported small outcrops of horizontal or near-horizontal 'red sandstone and ironstone conglomerate' in numerous localities on the Green Swamp Well, Tanami East and Lander River Sheet areas. In the Buchanan Hills, on the Winnecke Creek Sheet area, Davidson reported 50 feet of conglomerate capping 200 feet of red sandstone which rested on crystalline limestone; he did not specify the thickness of this limestone but shows about 30 feet of it on a section accompanying his report. This limestone may be a continuation, or an equivalent, of the Middle Cambrian Montejinni Limestone which conformably overlies the Lower Cambrian Antrim Plateau Volcanics in the Wave Hill-Hooker Creek area. (Traves, 1955). A recent examination of air photographs and mosaics of Green Swamp Well, Tanami East, Lander River, Winnecke Creek and South Lake Woods Sheet shows numerous isolated, weathered outcrops similar in pattern to those examined on Green Swamp Well, some probable volcanic rocks in the north-central part of the Tanami East Sheet, and steeply-dipping Precambrian rocks in the south-west quadrant of the same Sheet.

3. The Wiso Tableland area should be mapped geologically as a preliminary step towards appraising its petroleum potential.

4. Experience of helicopter operations in the Green Swamp Well area, examination of distances to outcrops and the type of country between them, and consideration of lack of water supplies, show that the Wiso Tableland area could best be mapped by helicopter. There are sufficient relatively major topographic features (visible from an aircraft but not necessarily visible from the ground) to help with navigation and sufficient minor features to serve as check points on long flights.

REFERENCES

DAVIDSON, A.A. 1905 - Journal of explorations in Central Australia, 1898-1900. S.Aust.Parl. Pap. N.27.

HOSSFELD, P.S. 1940a - The Gold Deposits of the Granites-Tanami District, Central Australia. A.G.G.S.N.A. Rep. N.Terr. No.43.

HOSSFELD, P.S. 1954 - Stratigraphy and Structure of the Northern Territory of Australia. Trans.Roy.Soc.S.Aust., 77, 103-161.

TRAVES, D.M. 1955 - The Geology of the Ord-Victoria Region, Northern Australia. Bur.Min. Resour.Aust.Bull. 27.

GREEN SWAMP WELL

E53/13

TENNANT CREEK

E53/14

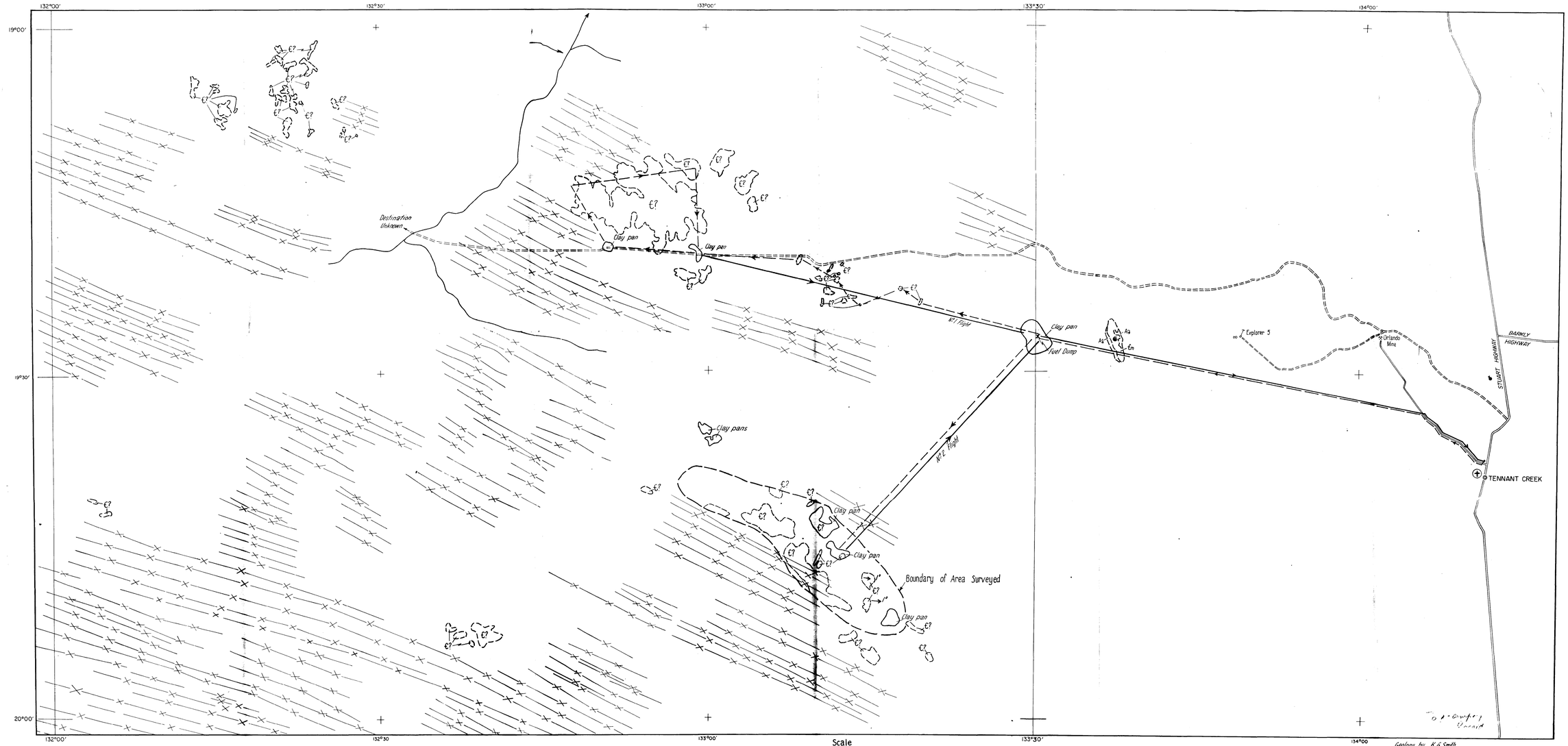


Fig. 1

Reference

UNDIFFERENTIATED CAMBRIAN ? — €? Sandstone, Siltstone, Some Chert

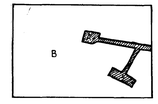
MIDDLE CAMBRIAN — €m Chert

Unconformity

ARCHEAN — Aa Arunta Complex

- Main road
- Track
- Mine
- Fossil
- Sand dune
- Airport
- Clay pan
- Flight lines
- Diamond drill hole

RELIABILITY DIAGRAM



A - Reconnaissance
B - Photo Interpretation

Bureau of Mineral Resources, Geology and Geophysics, October, 1963

To accompany Records 1963/42

Geology by K.G. Smith
Drawn by W.L. Kruger

Fig. 2

MAP OF WISO TABLELAND AND ENVIRONS

Modified from Tectonic Map of Australia

Scale

40 0 40 80 MILES

1:1,000,000

References

- Cz — Sand, soil
- TERTIARY — T — Undifferentiated
- MESOZOIC — M — Undifferentiated
- PALAEOZOIC — Pzl — Undifferentiated
- Antrim Plateau Volcanics
- Helen Springs Volcanics
- UPPER PROTEROZOIC — Pɯ
- Unconformity
- LOWER PROTEROZOIC — Pg — Granite
- P — Undifferentiated
- Plu — Davenportian Series
- Unconformity
- Pll — Agicondian Series
- Unconformity
- ARCHAEAN — A — Arunta complex

PRECAMBRIAN

- Highway
- Track
- Approximate boundary of area underlain by lower Palaeozoic sediments
- Airfield
- Grg18 — Drill hole
- VH-MIN 1962 — Airborne magnetometer traverse
- Magnetic profile along flight line

Bureau of Mineral Resources, Geology and Geophysics. October, 1963 To accompany Records 1963/166

LK