COMMONWEALTH OF AUSTRALIA.

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RECORDS.

Records 1957/78

GEOLOGICAL SURVEY OF THE STOKES HILL WHARF PARKING AREA

DARWIN, NORTHERN TERRITORY

by

W. F. McQueen

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CONTENTS

SUMMARY.

The new general parking area at Stokes Hill Wharf has been excavated from the base of Stokes Hill. The faces of the cut are unstable and there is danger of falls of rock.

The relationship of the joint and faulting planes of the Lower Proterozoic mudstone and siltstone to the direction and angle of the faces is responsible for this.

A reduction of the present batter on the excavated faces is necessary to avoid heavy falls of rock.

INTRODUCTION.

At the request of the Commonwealth Department of Works, the area for general parking at the Stokes Hill Wharf, Darwin, was examined geologically and a plane table survey was carried out on September 12th and 13th, 1957. The area is used as a car park by wharf labourers and visitors to the wharf.

The parking area was formed by excavating part of the base of Stokes Hill and is bounded on the north by a cut face about 55 feet high and on the west by a cut face 40 to 50 feet high. The remaining sides of the area are formed by roads at the level of the parking area.

LOCALITY AND ACCESS.

The parking area is in the town of Darwin. It is located near the wharf on the northern side of the new approach road to the Stokes Hill Wharf from Wood Street (see plate 1).

GENERAL GEOLOGY.

The stratigraphic sequence exposed at Stokes Hill from thetop downwards, is:-

Age	Thickness	Lithology
Recent	1 foot	Soil and gravel.
Lower Cretaceous (Darwin Formation)	(3 feet	Silicified Shale ("Porcellanite")
	(6 feet	Kaolinised Shale.
	Unconformity.	
Precambrian (Noltenius Formation)	53 feet vertical height exposed in face. Actual thickness very great.	Micaceous mudstone. Micaceous siltstone.

Plate 3 shows all units exposed.

LOWER CRETACEOUS

The Darwin Formation (Mullaman Group) of laterised shale is relatively thin and appears flat bedded.

The thickness of Lower Cretaceous ranges from two or three inches to nine feet. The Formation overlies the steeply dipping Precambrian with angular unconformity. The contact is relatively flat and is apparently the surface of an ancient peneplain. There is no sign here of the basal conglomerate found elsewhere in the Lower Cretaceous.

PRECAMBRIAN

The interbedded micaceous siltstone and mudstone of the Noltenius Formation strike approximately north and dip at angles ranging from vertical to 70 degrees east.

Intrusive quartz veins cut the rock near the area examined.

Three low angle faults showing movement of three or four inches strike east and dip at 15-20 degrees south. Two of these can be seen in Plate 4, the other in Plate 9. The rock is strongly jointed vertically and horizontally. A third set of joint planes dips about 60 degrees north.

The strike of the vertical and inclined joint planes is roughly east.

ENGINEERING GEOLOGY.

Only part of the hillside had been excavated before the making of the new road. The cliff surface was due to natural erosion. This face trended a little south of east and was more or less protected by surface silicification and induration. There was no record of landslides in the untouched areas until 1956 when heavy rain fell for six days. Slumping on a small scale took place. The cliff face followed the trend of the joint planes and was vertical in some places.

The construction of the wider approach road and rail tracks necessitated cutting into the base of the hill. A much higher cut was needed to form the parking area. This excavation removed the silicified and weathered shell and exposed high faces of strongly jointed interbedded micaceous siltstone and mudstone of the Noltenius Formation.

The parking area was finished in 1957 and the batter was constructed at a ratio of $1\frac{1}{2}$ to 1. The two faces so formed are the western and northern boundaries of the area.

The western face is almost parallel to the strike of the beds and shows details of the faults and joint planes (see Plate 4). As the beds dip very steeply (over 70°) the angle of batter on this face previously $1\frac{1}{2}$ to 1 has by fretting of the rocks now conformed to the angle of dip of the beds. Several bedding planes have opened up and slabs of rock are loose and unstable. This height of the face ranges from 25 feet at the southern end to 50 feet at its junction with the northern face.

The northern face rises to a height of 63 feet about the centre and then slopes down to the level of the parking area. The vertical and inclined joint planes strike almost parallel to the face. These factors together with the angle of dip of the fault planes have resulted in unstable areas on the face. Joint planes have opened up and several small falls have occurred. The face has changed from a $1\frac{1}{2}$ to 1 slope to vertical in some places. (See Plate 5). One crack has developed along an inclined joint plane and where rock has broken away overhangs are now evident. (See Plates 6 and 7).

Two drains flow out above the northern face and this concentration of water during the heavy rains of the "wet" will cause landslides. The face is unstable in its present state and the dangers to life and property will be increased by heavy rains.

CONCLUSIONS.

The coincidence between the strike of the joint planes and the direction and slope of the face caused the present instability. This is increased by the nature of the micaceous sediments. Some joint planes are open and others may open if rock below them falls. Heavy rains in the coming "wet" are very likely to cause further landslides.

Although the height of the face is lower, the same conditions apply along the northern edge of the railway line. This face is almost parallel to north face of the parking area and the remarks above about stability refer to it with due allowance for the lower height of face.

RECOMMENDATIONS.

It is recommended that the unstable rock be barred down (see Plate 8) and that the north face be reduced to a batter not exceeding 1 in 1. Even then further movement may be expected, but this is not likely to endanger life or parked vehicles. Regular cleaning up will be necessary until the slope is considerably reduced. The reduction of the present slope of the northern face of the parking area would require the removal of approximately 3,500 cubic yards of rock.

The shattering effect of any explosion would cause further opening of joint planes so it is recommended that no blasting be used to reduce the slopes.

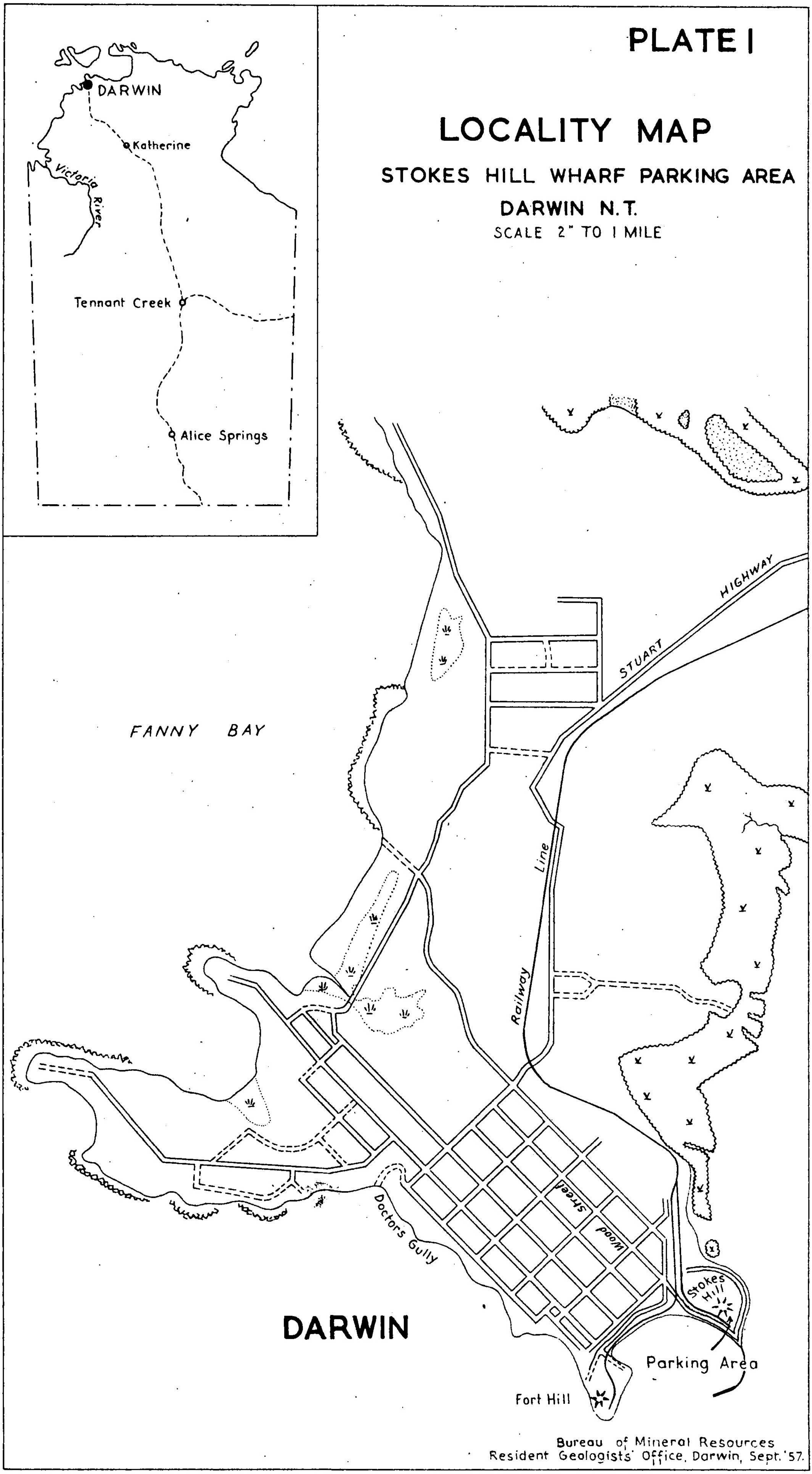
Darwin.
27/9/57.

PLATE I

LOCALITY MAP

STOKES HILL WHARF PARKING AREA
DARWIN N.T.

SCALE 2" TO 1 MILE



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Resident Geologists' Office, Darwin, Sept. '57.

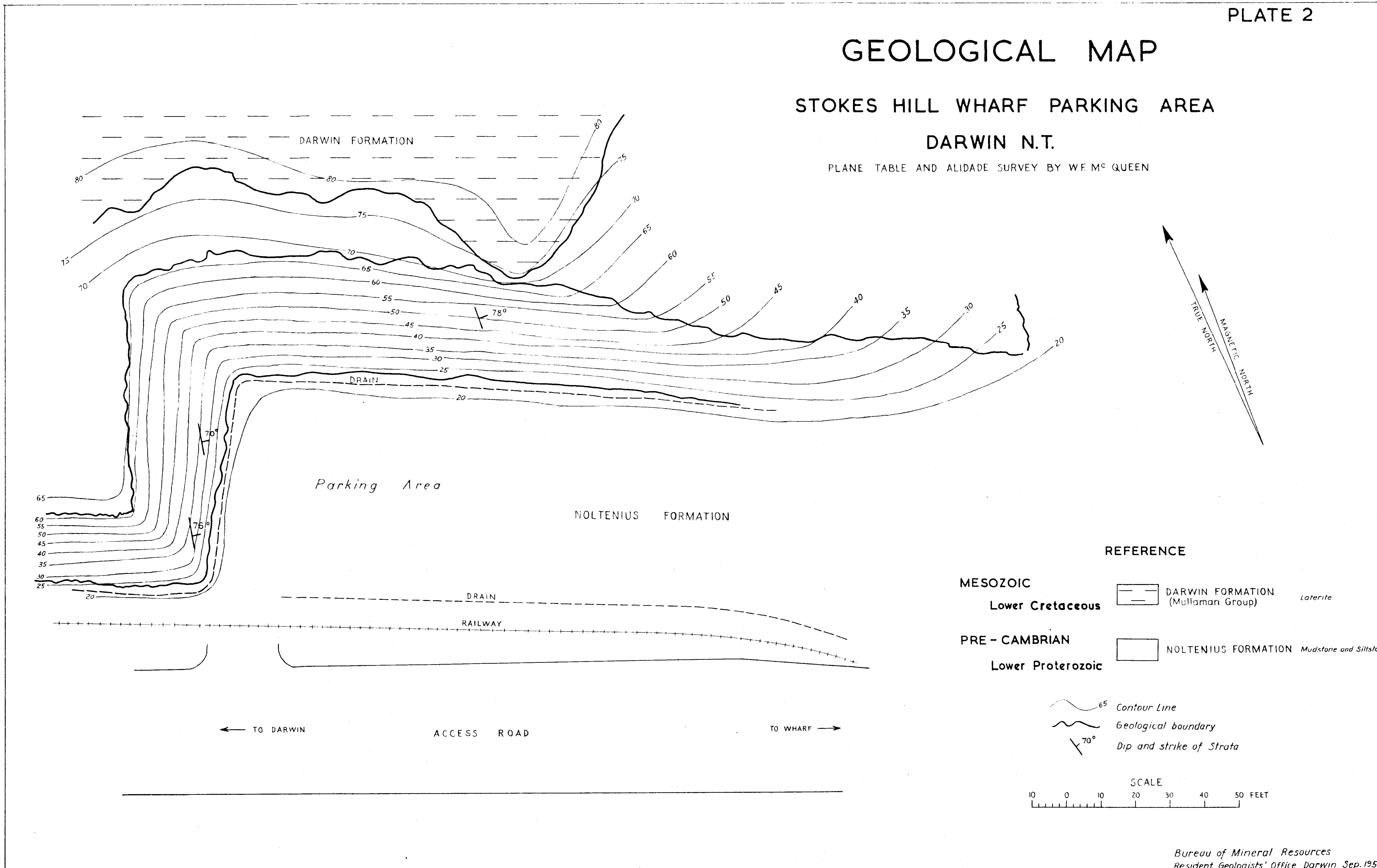
PLATE 2

GEOLOGICAL MAP

STOKES HILL WHARF PARKING AREA

DARWIN N.T.

PLANE TABLE AND ALIDADE SURVEY BY W.F. Mc QUEEN



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Resident Geologists' Office, Darwin, Sep. 1957

PLATE 3.

The contact between the steeply dipping Noltenius Formation and the flat lying Lower Cretaceous and recent deposits.

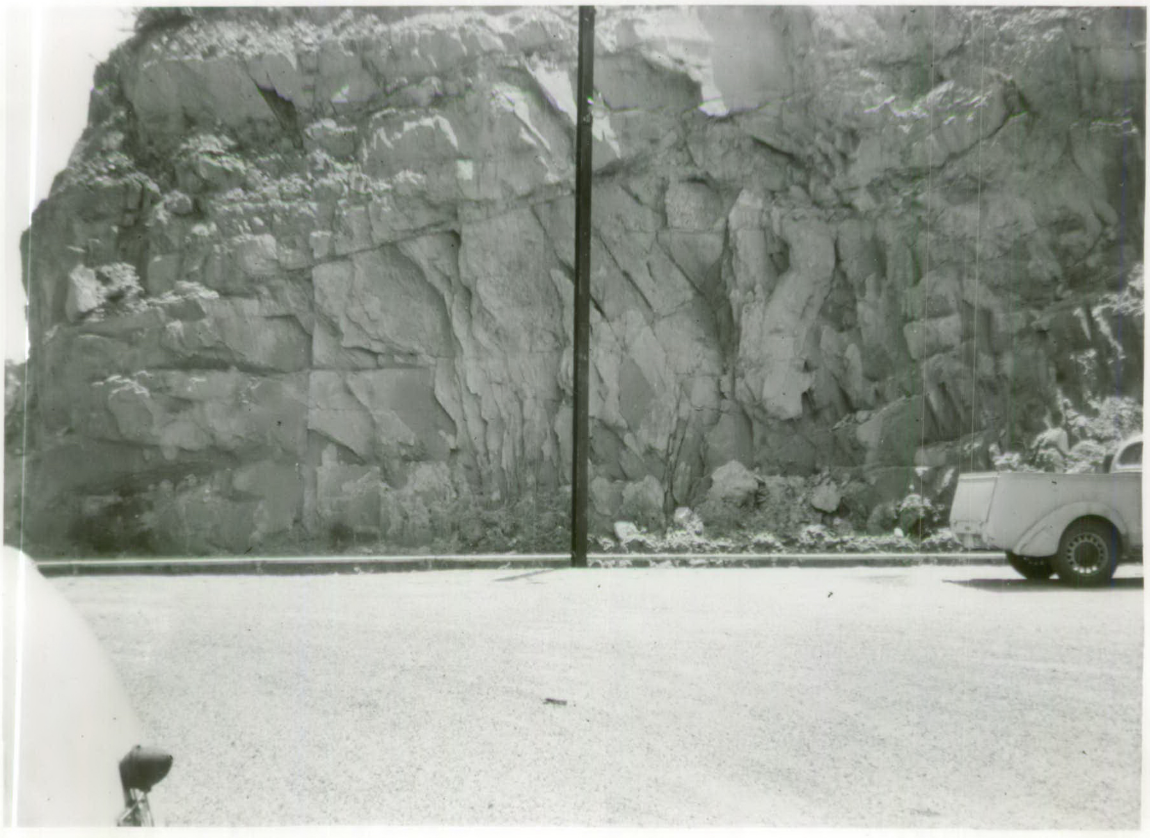

PLATE 4.

The western face showing fault planes, vertical and inclined joint planes and bedding planes.

PLATE 5.

General view of the northern face showing present angle of batter and vertical faces.

PLATE 6.

Section of northern face showing overhangs and unstable sections.

PLATE 7.

Showing relationship of parked vehicles to dangerous section. An open inclined joint plane is visible centre left.

PLATE 8.

General view of north face showing more detail of unstable areas.

PLATE 9.

North face showing clay breccia filled fault plane in centre of photograph.

PLATE 10.

Junction of northern and western faces showing dip of beds and open bedding planes.