Chief Geologist

COMMONWEALTH OF AUSTRALIA

MINISTRY OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Report No. 4

GEOLOGY OF THE NERRIMA DOME

KIMBERLEY DIVISION, WESTERN AUSTRALIA

By

D. J. GUPPY, J. O. CUTHBERT and A. W. LINDNER

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Issued Under The Authority Of The Right Hon. R. G. Casey,
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Ministry Of National Development

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C O N T E N T S.

		Page
1.	SUMMARY	1
2.	INTRODUCTION	1
	Purpose of Investigation	1
	Situation and Access	1
	Climate	2
	Mapping Methods	3
	Previous Work	4
3.	TOPOGRAPHY	4
	Nerrima Ridge	4
	Southern Ridges	4
	Crestal Flat	5
	Drainage	5
4.	STRATIGRAPHY	5
	General	5
	Nerrima Area	7
	Noonkanbah Shale	7
	Liveringa Sandstone	9
5.	STRUCTURAL GEOLOGY	10
	General	10
	Nerrima Dome	10
	Faulting	11
	Closure	11
6.	ACKNOWLEDGMENTS	12
7.	REFERENCES	13

PLATES.

			Page
1.	Locality Map	Facing	1
2.	Geological Map - Nerrima Dome	Behind	13
3.	Cross-sections - Nerrima Dome		
4.	Structure Contour Map - Nerrima Dome		

TEXT FIGURES.

1.	Columnar section showing marker beds used in mapping Nerrima Dome	Facing	6
2.	Nerrima Dome and surrounding structural features	Facing	10

TABLES.

1.	Mean monthly rainfall of southern part of West Kimberley Division, W.A.	2
2.	Mean monthly maximum and minimum temperatures of southern part of West Kimberley Division, W.A.	3
3.	Permian succession in West Kimberley Division.	5
4.	Fossil localities and assemblages from the Nerrima Dome.	8

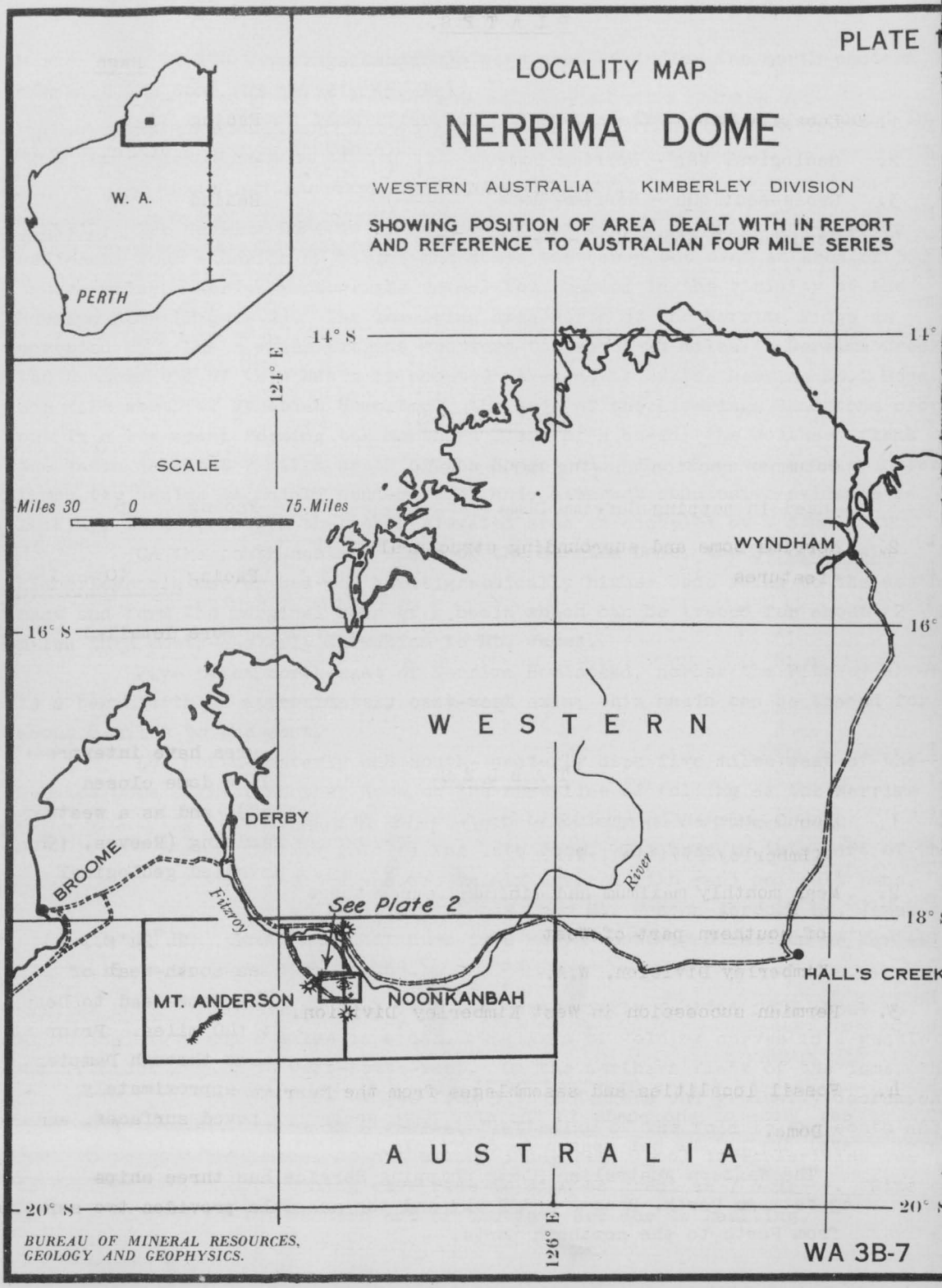
PLATE 1
LOCALITY MAP
NERRIMA DOME
WESTERN AUSTRALIA KIMBERLEY DIVISION
SHOWING POSITION OF AREA DEALT WITH IN REPORT AND REFERENCE TO AUSTRALIAN FOUR MILE SERIES
W. A.
PERTH
14° S
14°
124° E
SCALE
Miles 30 0 75. Miles
WYNDHAM
16° S
16°
W E S T E R N
DERBY
BROOME
Fitzroy
River
See Plate 2
18°
HALL'S CREEK
MT. ANDERSON
NOONKANBAH
A U S T R A L I A
20° S
20°
126° E
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.
WA 3B-7

1. SUMMARY.

The Nerrima Dome is 90 miles south-east of Derby in the Kimberley Division of Western Australia. Access is by road from Broome or Derby but is difficult or impossible during the monsoonal period between December and March.

The lower part of the Liveringa Sandstone and the upper part of the Nocnkanbah Shale - formations of Permian age - crop out in the area. The Liveringa Sandstone consists of fine- and medium-grained sandstone; it is exposed in the ridges on the northern and southern flanks of the dome. The Nocnkanbah Shale consists mainly of shale and claystone with some calcareous beds and is represented topographically by black soil plains.

The Nerrima Dome is one of a number of gentle folds which can be traced over an area of approximately 500 square miles. The angles of dip rarely exceed 5 degrees. Vertical closure of the dome is 250 feet over an area of 30 square miles.

The Freney Kimberley Oil Co. N.L. holds three leases in the area. In September 1939 the Company commenced drilling at Nerrima on a site selected by Dr. A. Wade. When drilling ceased in 1941 the bore had reached a depth of 4,271 feet. Examination of the bore cores, (Nerrima No.1 Bore), suggests that the drill had not penetrated below the Permian sediments. However, no reliable interpretation of the subsurface geology can be made until more detailed information of surrounding areas is available.

2. INTRODUCTION.

PURPOSE OF INVESTIGATION: Previous investigators in the area have interpreted the Nerrima Dome as a dome closed by folding (Wade, 1936), a dome closed against a transverse fault at the eastern end (Kraus, 1942), and as a westward plunging anticlinal fold probably closed by transverse faulting (Reeves, 1949). The purpose of the present survey was to determine, by detailed geological mapping, the structure of the Nerrima Dome.

SITUATION AND ACCESS: Nerrima No.1 Bore is situated at long. 124°24'E., lat. 18°27'S., (Mt. Anderson 4 Mile Military Sheet) 8 miles south-west of Nerrima Homestead (Plate 1). The distance by road from the Homestead to Derby, by way of Myroodah and Upper Liveringa Stations, is about 140 miles. Prior to 1941, the Freney Kimberley Oil Co. used a track which passes through Dampier Downs and Roebuck Plains Stations to Broome, a distance of approximately 200 miles. None of the roads in the area have sealed or paved surfaces, and road travel during the wet season is difficult.

The Western Australian State Shipping Service has three ships operating between Perth, Broome and Derby and the schedule provides two services a month from Perth to the northern ports.

The MacRobertson-Miller Aviation Co. Ltd. provides a weekly freight and passenger air service to stations between Derby and Wyndham. The aircraft land at Upper Liveringa and Myroodah Stations on alternate weeks.

CLIMATE: The climate of the Kimberley Division is one of extremes, due mainly to the influence of the north-west monsoon on an otherwise arid region. Two seasons are recognised, the "wet" and the "dry". During the monsoonal or "wet" season, from December until March, the weather is hot and humid. More than 80 per cent. of the annual rain falls during these months. The "dry" season lasts from April until November. During the first half of this period the weather is temperate but, after July, the temperature rises, humidity is very low, and increasingly hot and dry easterly winds blow almost continually.

The average monthly rainfalls and temperatures for the past 42-58 years have been tabulated to illustrate the climate of the region. (Tables 1 and 2).

TABLE 1.

Mean Monthly Rainfall of Southern Part of West Kimberley Division, W.A. (in points).

Station	Broome	Derby	Noonkanbah	Hall's Creek
Number of Years	52	58	42	52
January	648	746	566	554
February	568	562	385	433
March	393	443	290	292
April	115	140	87	69
May	61	75	41	37
June	96	53	32	26
July	20	23	20	25
August	11	9	7	9
September	5	1	2	16
October	3	6	17	52
November	56	83	95	137
December	325	404	274	316
T O T A L -	2301	2545	1816	1966

TABLE 2.

Mean Monthly Maximum and Minimum Temperatures of Southern Part Of West Kimberley Division, W.A. (in degrees Fahrenheit).

Station	Broome		Derby		Hall's Creek	
Number of Years	44		44		42	
	Max.	Min.	Max.	Min.	Max.	Min.
January	91.7	79.2	94.7	78.9	97.9	75.1
February	91.9	79.0	94.8	78.6	97.1	74.2
March	93.2	77.5	95.1	77.6	95.1	71.1
April	93.4	72.0	94.8	72.5	91.9	63.5
May	88.0	64.7	89.7	66.1	85.5	56.0
June	82.5	59.8	85.2	60.9	80.6	50.8
July	81.8	57.6	84.5	58.4	80.1	48.0
August	85.1	59.9	88.2	61.2	85.9	52.0
September	88.7	65.3	92.9	66.4	92.7	59.1
October	90.6	71.7	96.1	73.1	98.2	69.2
November	92.8	76.5	97.1	78.0	100.3	74.1
December	93.1	79.2	96.7	79.5	99.4	75.3

MAPPING METHODS: An area of 130 square miles was mapped by plane-table traverses on a scale of 1:60,000 approximately equal to that of the aerial photographs. A photogeological map was compiled using the plane-table base map as control. The geological map included in this report (Plate 2) is a composite map prepared from the plane-table traverse and the photogeological map.

Surface contours were drawn with an interval of 20 feet. The datum used was ground level at Nerrima No.1 Bore for which a height above sea-level of approximately 370 feet was determined from aneroid readings with Derby as a datum.

A structure contour map (Plate 4) was prepared, based on a polyzoal limestone bed 175 feet below the top of the Noonkanbah Shale. The contour interval is 100 feet and all contours are referred to sea-level.

Field work extended over a period of six weeks during September and October 1948. Mapping methods, the selection of marker beds and measurement of sections were the responsibility of J.O. Cuthbert and A.W. Lindner. D.J. Guppy supervised the work for the last ten days and examined the cores from Nerrima No.1 Bore.

PREVIOUS WORK: The structural basins surrounding the Nerrima Dome (Figure 2) were noticed by Woolnough (1933) during aerial reconnaissance. He suggested the presence of associated anticlinal folds, but no ground work was carried out to determine the possibility of closure.

Wade, assisted by Waterford, (Wade. 1936; Wade and Waterford. 1937) mapped the area and concluded that the dome was closed.

Kraus (1942) incorporated a plane-table survey of the Nerrima Dome in a general report on the Desert Basin. He doubted the existence of normal closure at the eastern end of the fold and stated that the fold might close in this direction against a transverse fault.

Reeves (1949) examined the area and described the Nerrima Dome as "a gentle fold plunging westward". He stated that any closure was due to transverse faulting.

Subsequent to Wade's report (1937), the Freney Kimberley Oil Co. N.L. began drilling in 1939, and in 1941 the bore had reached a depth of 4,271 feet. Operations ceased in 1941 and were not resumed until 1948. At the time of the survey (September-October, 1948) the Company was engaged in repairs to equipment and buildings prior to recovering tools which were obstructing the bore.

3. TOPOGRAPHY.

Three main topographic divisions can be recognised in the area occupied by the Nerrima Dome: the Nerrima Ridge, the Southern Ridges, and the Crestal Flat.

NERRIMA RIDGE: The lower beds of the Liveringa Sandstone are exposed in the Nerrima Ridge, which outlines the northern flank of the dome. The northern side of this ridge is a dip slope and is protected by a thick capping of laterite. A steep scarp forming the southern side of the ridge rises about 100 feet above the flat axial region of the dome. The relief of the Nerrima Ridge decreases towards the east and the ridge trends southwards around the eastern end of the dome where, as a result of the gradually diminishing dip of the beds, it merges into the flood plain of the Fitzroy River. The beds forming the Nerrima Ridge strike south-west near the western end of the dome. Owing to the advanced stage of erosion of the folds, these beds, which are high in the exposed stratigraphic section, do not effect a complete surface closure here but swing to the west-north-west along the southern rim of the basin to the north-west of the Nerrima Dome.

SOUTHERN RIDGES: The southern flank of the Nerrima Dome is exposed in a series of ridges gradually decreasing in relief from west to east. Owing to faulting on the western end of the dome, the ridges extend into the axial region of the fold in a discontinuous belt of high ground, which rises to 100 feet above the level of the plain.

The outcrops represent lateritised basal beds of the Liveringa Sandstone. Towards the eastern end of the dome, the southerly dip of the beds decreases and the resistant sandstone capping becomes progressively thinner and finally disappears. The ridges at the eastern end are lower and more rounded and result from local thickening of the polyzoal limestone near the top of the Noonkanbah Shale. They swing to the south-east along the northern flank of an adjacent basin and gradually merge into the sandy plain.

CRESTAL FLAT: The area between the Nerrima Ridge and the Southern Ridges - the Crestal Flat - is occupied by a clayey soil plain typical of areas underlain by Noonkanbah Shale. The claystone and shale beds weather to featureless plains on which the thin calcareous markers outcrop in lines of small slabs and boulders.

DRAINAGE: From a low divide at the western end of the dome the Crestal Flat is drained eastwards to the Fitzroy River and westwards to Nerrima Creek by a system of small channels. Gravitational seepage is also important particularly on the eastern part of the dome. Because the fall of the country both east and west of this divide is very slight, most of the Crestal Flat is water-logged for weeks after heavy rain. Drainage on the flanks is mainly directed away from the dome although some small gutters discharge into the Crestal Flat during the wet season.

4. STRATIGRAPHY.

GENERAL: The following table sets out, in normal stratigraphic sequence, the Permian succession as established by Wade (1936).

TABLE 3.

PERMIAN SUCCESSION IN WEST KIMBERLRY.

Name of Unit	Lithology	Fossils	Thickness
Erskine Series	Conglomerate grit, sandstone and shale.	Plant, and some marine, fossils. (estuarine).	-
Upper Ferruginous or Liveringa Series	Clay, sandstone and grit.	Marine, and some plant, fossils.	1,400 feet
Noonkanbah Series	Clay and shale with sandy beds, bedded and massive limestone and calcareous sandstone.	Marine fossils.	1,200 feet

TABLE 3. (Contd.).

Lower Ferruginous Series	Flaggy grit and sandy shale with some massive sandstone and grit. Beds are for the most part ferruginous.	Plant fossils,	1,200 feet
Nura Nura Limestone	Grey sandy limestone and shale with glacial erratics.	Marine fossils.	20 feet
Grant Range and Willanyie Beds	Boulder clay and tillite with massive lenticular sandstone, grit, arkose, conglomerate, clay beds, and clayey sandstone.	Fossil wood.	2,300 feet
Kungangie Beds	Conglomerate, boulder beds and boulder clay passing up into red to buff coloured massive sandstone with clayey or sandy shale and thick beds of chert.	Fossil wood.	2,000 feet

The sediments exposed on the Nerrima Dome are included by Wade in his "Noonkanbah Series" and "Upper Ferruginous or Liveringa Series". Kraus (1942) referred to these stratigraphic units as the "Noonkanbah shale formation", the "Liveringa iron sandstone formation", and the "Belina shale formation", the last two being subdivisions of Wade's "Upper Ferruginous or Liveringa Series". Reeves (1949) uses the terms "Noonkanbah shale", "Liveringa sandstone" and "Belina shale", and includes the last two in a general term, "Liveringa beds".

In accordance with the recently published Australian Code of Stratigraphic Nomenclature (Glaessner, Raggatt, Teichert and Thomas, 1948) it is proposed to name the formations examined during this investigation, Noonkanbah Shale, Liveringa Sandstone and Belina Shale. The Belina Shale is not exposed on the Nerrima Dome but appears in the troughs of the adjacent structural basins to the north and south.

As a result of measurement of sections throughout the area, Wade estimated that the thickness of the Noonkanbah Shale is 1,200 feet. The formation consists mainly of shale and claystone interbedded with thin beds of limestone, calcareous sandstone and sandstone. It occurs typically on plains on which only the calcareous and sandy beds crop out.

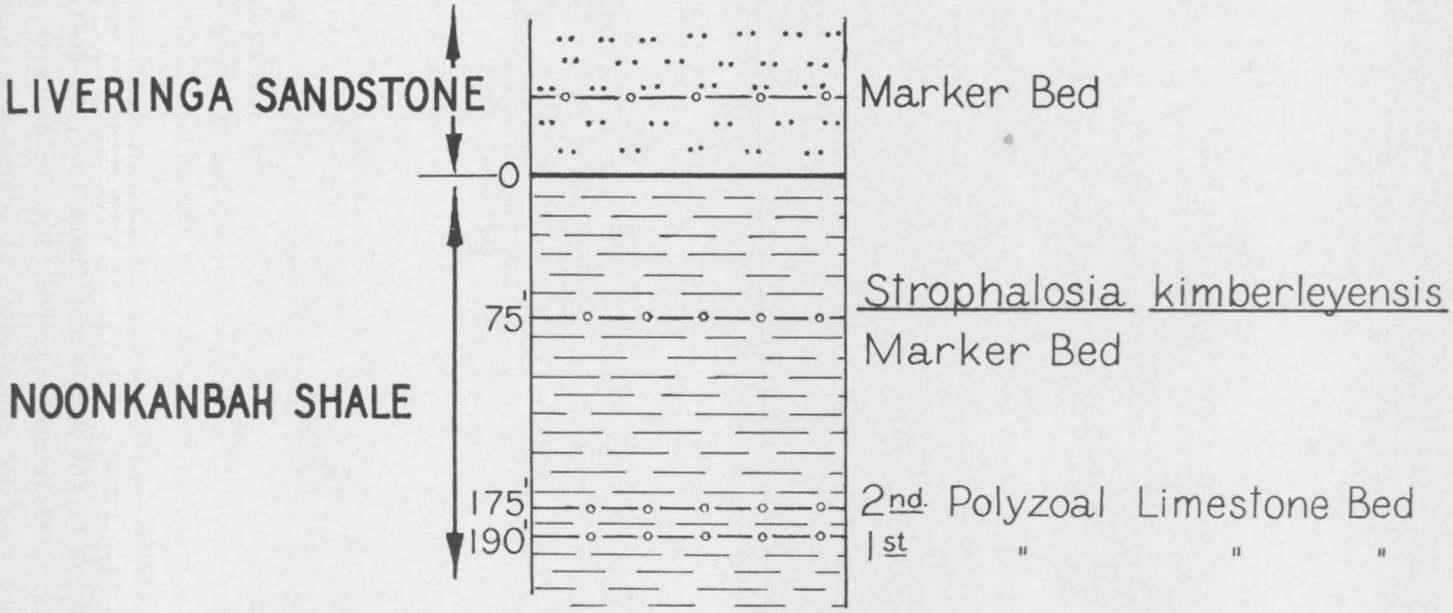

FIG 1. COLUMNAR SECTION SHOWING THE MARKER BEDS USED IN MAPPING NERRIMA DOME

The Liveringa Sandstone consists chiefly of coarse-, medium- and fined-grained sandstone with thin lenses of fine conglomerate throughout. Thin beds of shale and claystone occur at the base and at the top of the formation. Only the upper beds of the Noonkanbah Shale and the lower beds of the Liveringa Sandstone are exposed on the Nerrima Dome.

NERRIMA AREA.

Noonkanbah Shale: Approximately 400 feet of the Noonkanbah Shale is exposed on the Nerrima Dome. The shale and claystone beds, which comprise the greater part of the section, weather away completely on exposure and only the highly calcareous and sandy beds form recognisable outcrops. Mappable marker beds are confined to the upper 200 feet of the formation.

The lowest outcropping beds appear as discontinuous lines of small flags of polyzoal limestone between 200 and 250 feet stratigraphically below the top of the Noonkanbah Shale. Alternating thin limestone and calcareous sandstone beds intercalated with shale and claystone occur above these beds.

The lowest mappable units are the 1st and 2nd Polyzoal Limestone beds (Fig. 1) which are respectively 190 feet and 175 feet below the top of the Noonkanbah Shale. These beds crop out as discontinuous lines of small limestone flags containing polyzoa and brachiopods (e.g. N.S.23*). Both beds form continuous outcrops on the eastern part of the dome but elsewhere they are poorly represented.

At N.S.17, small limestone flags containing pelecypods, brachiopods and foraminifera occur in association with polyzoal limestone about 140 feet below the top of the Noonkanbah Shale. Similar assemblages have not been seen elsewhere on the dome and this outcrop is considered to represent a lenticular bed with a maximum thickness of 5 feet.

The marker bed most useful for mapping is the Strophalosia kimberleyensis marker bed, 75 feet below the top of the Noonkanbah Shale (Fig.1). This bed, which crops out as lines of slabs and boulders on the northern and southern flanks of the dome, contains two distinct fossil horizons separated by 10 feet of clayey and sandy limestone which weathers readily to clayey soil. The lower of these horizons (N.S.5 & 6) contains a number of fossils of which Spirifer nov. sp. is the most abundant (Table 4). The fauna of the upper horizon (N.S.7) consists almost exclusively of complete fossils of Strophalosia kimberleyensis Prendergast which form a solid mass up to 18 inches in thickness.

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* Refers to sample numbers, see Table 4 and Plate 2.

TABLE 4.

FOSSIL LOCALITIES AND ASSEMBLAGES FROM THE NERRIMA DOME IN DESCENDING STRATIGRAPHIC SEQUENCE.

FORMATION	PREDOMINANT FOSSIL CLASS	NUMBER OF SPECIMEN	FOSSIL DETERMINATIONS
Liveringa Sandstone.	Pelecypoda	NS 14	Ferruginous intraformational conglomerate with worm tubes.
		NS 9	Pleurophorus nov. sp.
		NS 10	Stutchburia nov. sp.
		NS 11	Pleurophorus nov. sp., Allorisma nov. sp., Stutchburia nov. sp., Oriocrassatella ? sp. Cardiomorpha sp., Atomodesma cf. exarata Wanner, Streblochondria nov. sp., Warthia cf. micromphala (Morris).
		NS 13	Aphanaia nov. sp.
	Gastropoda	NS 12	Cardiomorpha sp., Bellerophon sp., Euphemites cf. emerii (Eth.), Mourlonia nov. sp. Shansiella nov. sp.
		NS 19	Euphemites emerii (Eth.) Prodentalium nov. sp.
		NS 21	Nuculana cf. basedowi (Eth.), Euphemites sp. ind., Warthia sp., Prodentalium nov. sp.
		NS 15	Euphemites emerii (Eth.), Warthia cf. micromphala (Morris), Shansiella nov. sp., Prodentalium nov. sp.
Noonkanbah Shale.	Brachiopoda	NS 22	Small fragments of brachiopod and pelecypod shells.
		NS 8	Polyzoal and crinoidal limestone with Chonetes sp. ind., Streptorhynchus luluigui Hosking, Streptorhynchus sp., Spirifer sp. ind., Bellerophon sp. ind.
		NS 18	Chonetes sp., Streptorhynchus nov. sp., Spirifer sp. ind., Aviculopecten cf. sprenti Dana, Aviculopecten sp.
		NS 7	Strophalosia kimberleyensis Prendergast, Aviculopecten sp. ind.
		NS 6	Calceolispongia sp. ind., Spirifer nov. sp.
		NS 5	Strophalosia kimberleyensis Prendergast, Linoproductus cf. cancriniformis Tachern., Taeniothaerus subquadratus (Morris)
		NS 17	Calceolispongia sp. ind., Chonetes sp., Linoproductus, sp. ind. Spirifer sp. ind., Cleiothyridina cf. macleayana (Eth.), Posidonoyma ? nov. sp., Myalina ? sp. Hyperamminoides acicula Parr
		NS 23	Polysoal limestone with Chonetes sp.
		NS 16	Polyzoal limestone with Hexagonella sp., Stenopora sp.
		NS 1	Polyzoal limestone.

A limestone bed containing large brachiopods was noted in two localities (N.S.8 & 18), about 25 feet below the top of the Noonkanbah Shale. This limestone is overlain by micaceous calcareous sandstone which alternates with, and passes upwards into, ferruginous micaceous sediments of the Liveringa Sandstone. This gradational change, from a dominantly shaly and calcareous facies to a sandy facies, extends through a stratigraphic interval of about 20 feet.

The Noonkanbah Shale is found to a depth of 800 feet in the Nerrima No.1 Bore. Thin calcareous beds, common in the outcrop section and in the upper 500 feet of the core, are not represented between 500 and 800 feet. Below 500 feet, the shale and claystone are interbedded with thin sandstone beds which become progressively thicker and more common with increasing depth to 800 feet, where the bore passes into massive sandstone. The structure contour map indicates that the top of the section exposed in the bore is about 400 feet below the top of the Noonkanbah Shale. From these figures, an approximate thickness of 1,200 feet is obtained for the Noonkanbah Shale.

Liveringa Sandstone: The basal beds of this formation are siltstone, fine-grained ferruginous sandstone (which in some places is felspathic), and medium-grained ferruginous sandstone. Coarse sandstone appears in the upper beds, and thin lenses of fine conglomerate occur throughout the formation.

From examination of outcrops and bore logs, it was concluded that the ferruginous character of the Liveringa Sandstone is superficial and results from leaching which, in some places, may be related to lateritisation during the Miocene Epoch. Outcrops of the sandstone are more ferruginous than those of the finer sediments.

Some of the various concretionary patterns resulting from this leaching are restricted to particular beds and may be of use as local horizon markers.

Not more than 100 feet of the Liveringa Sandstone is exposed in the ridges flanking the Nerrima dome but, between the dome and the basins to the north, where the base of the Belina Shale is exposed, the Liveringa Sandstone has a thickness of 500-600 feet.

Both marine and plant fossils are found in beds of the Liveringa Sandstone. The flora is of the Glossopteris type (Wade, 1936) but, in the beds exposed on the Nerrima Dome, it is represented only by fragmentary pieces of fossil wood. The marine fauna, mainly pelecypods and gastropods, contrasts with the dominantly brachiopod fauna of the underlying Noonkanbah Shale.

Some of the more fossiliferous beds of the Liveringa Sandstone appear to be useful as horizon markers but, because of the lithological similarity of these beds, it was more convenient to base most of the structural mapping on the better defined limestone beds of the Noonkanbah Shale.

Marker beds in the Liveringa Sandstone were used to define the north-eastern flank of the dome (NS 19, 21, 15, 12).

All the fossil localities and the species from each are arranged in stratigraphic sequence in Table 4.

5. STRUCTURAL GEOLOGY.

GENERAL: The Nerrima Dome is in an area of low relief in which low-dipping sediments form a series of basins and domes that crop out over an area of 500 square miles. Aerial photographs reveal four basins in the vicinity of the Nerrima Dome (Figure 2). The low-lying area north of the Nerrima Ridge is occupied by a basin which extends westward for about 24 miles to Nerrima Creek the eastern end of this basin is about 9 miles north of the Nerrima No.1 Bore. One mile south of Myroodah Homestead, the beds of the Liveringa Sandstone crop out in a low scarp forming the northern flank of a basin· the southern flank o: the basin is about 7 miles south of the homestead. The elevated country betwe these two basins is mainly sand-covered and, although conclusive evidence is lacking, it is probable that this elevated area is occupied by a dome.

On the south-eastern flank of the Nerrima Dome, the Strophalosia kimberleyensis marker bed and stratigraphically higher beds swing to the south-east and form the marginal beds of a basin which can be traced for about 12 miles in a south-easterly direction to Mt. James.

Five miles north-east of Nerrima Homestead, across the Fitzroy River, is a basin with an approximately east-west axis; this basin can be traced for about 6 miles to the east.

Low north-westerly and south- westerly dips five miles west of the Nerrima Dome suggest another dome on the same line of folding as the Nerrima Dome, and lying between it and the western tributary of Nerrima Creek. Wade (1936) refers to this fold as the Tutu Dome. The beds in this part of th area are extensively faulted and are mainly covered with sand and salt pans.

A major zone of faulting extends from Mt. Fenton through Mt. James and Moulamen Hill South and continues in a north-westerly direction as far as Geegullie Creek (Wade 1936, p.44).

NERRIMA DOME: The Nerrima Dome is a low, extensively faulted fold about 16 miles in length and 8 miles in width. The axis of folding curves in a gentle arc from south-east to west-south-west. On the northern flank of the dome, th dip of the outcropping beds ranges from 3 to 5 degrees and gradually decreases from west to east. There is a general flattening of the fold to the south and east where dips in general do not exceed 3 degrees: local irregularities due to faulting and minor folding give rise to dips as great as 7 degrees. Dips o 10 - 12 degrees at the western end of the dome are due to faulting.

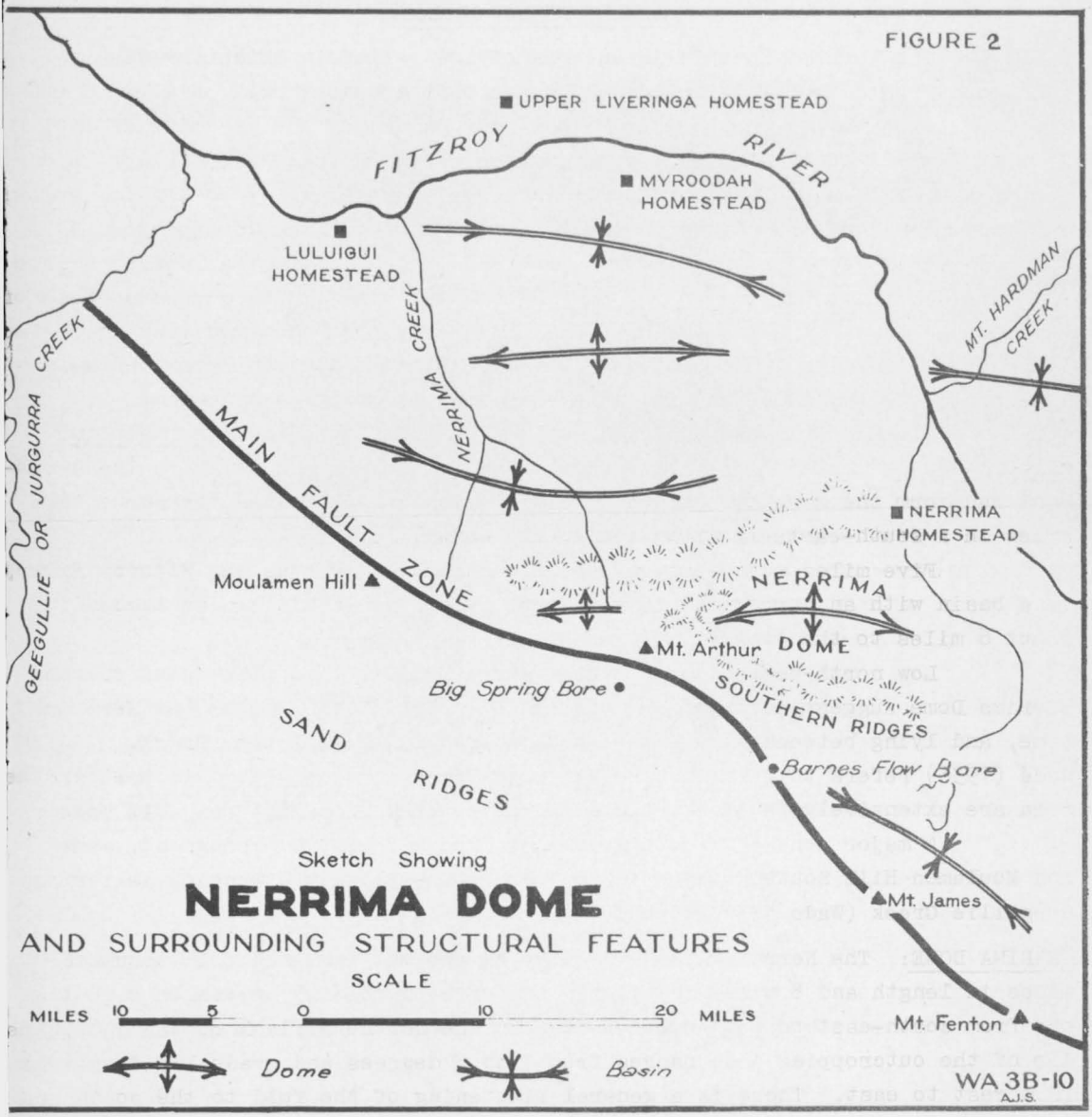
FIGURE 2
UPPER LIVERINGA HOMESTEAD
FITZROY
RIVER
MYROODAH HOMESTEAD
LULUIGUI HOMESTEAD
NERRIMA CREEK
MT. HARDMAN CREEK
GEEGULLIE OR JURGURRA CREEK
MAIN FAULT ZONE
NERRIMA HOMESTEAD
Moulamen Hill
NERRIMA DOME
Mt. Arthur
Big Spring Bore
SOUTHERN RIDGES
SAND RIDGES
Barnes Flow Bore
Mt. James
Mt. Fenton
Sketch Showing
NERRIMA DOME
AND SURROUNDING STRUCTURAL FEATURES
SCALE
MILES 10 5 0 10 20 MILES
Dome
Basin
WA 3B-10
A.J.S.

Faulting: The dome is extensively faulted on the northern flank and at the western end.

The beds on the eastern side of most of the faults on the northern flank have an apparent horizontal displacement to the south, the greatest displacement measured being 9.000 feet. These faults can be traced for 3 miles northwards in beds of the Liveringa Sandstone. They continue southward into the limestones at the top of the Noonkanbah Shale but in the incompetent claystones and shales, which occupy the crestal portion of the dome, there is little evidence of faulting.

The structure of the western end of the Nerrima Dome is not well defined. The outcropping beds on the northern flank are displaced by a strike fault and appear in the axial region in a low ridge consisting of beds of the Liveringa Sandstone, and in a small flat area in which the Strophalosia kimberleyensis marker bed crops out (NS 12, Plate 2). The vertical displacement is about 400 feet. Both the ridge and the limestone bed terminate in the east against a fault oblique to the trend of the bedding and striking in a south-westerly direction. This oblique fault is the eastern boundary of a down-faulted "hinge-block" and has a maximum vertical displacement of 300 feet at the northern end. To the west the Strophalosia kimberleyensis bed curves southwards, ends abruptly against an east-west fault, and does not appear elsewhere on the south-west portion of the dome. Lateritised beds of the Liveringa Sandstone crop out to the south of this east-west fault. The comparison of fossil assemblages of Liveringa Sandstone to the north and south of this fault suggests that the downward displacement to the south is small. As the dips are low, beds of the Noonkanbah Shale must be close to the surface south of this fault.

The eastern end of the dome is comparatively free from faulting and no evidence was found to substantiate a suggestion (Kraus, 1942, p.42) that the eastern end is closed by a fault striking south from Nerrima Homestead.

The depth to which the faulting on the Nerrima Dome persists is not known but, on surface evidence, most of the faulting dies out in the Noonkanbah Shale. That some of the larger faults may extend into the older sandstone formations is indicated by slickensiding and contortion in the core of Nerrima No.1 Bore below 1,800 feet.

Closure: The highest bed on which closure was established in the field is the polyzoal limestone bed 175 feet below the top of the Noonkanbah Shale. The structure contour map is based on the top of this limestone bed on which the highest projected point is 700 feet above sea-level.

The eastern end of the dome is closed to the 300 feet contour. At the western end, the closure extends only to the 450 feet contour resulting in a depth of closure of 250 feet over an area of approximately 30 square miles. The area of drainage from surrounding basins is about 300 square miles.

6. ACKNOWLEDGMENTS.

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Canberra 1st, June 1950.

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PLATE 2

NERRIMA DOME

WESTERN AUSTRALIA KIMBERLEY DIVISION

GEOLOGICAL MAP

BASED ON PLANE TABLE TRAVERSES AND AIR PHOTOGRAPHS.
GEOLOGISTS D. J. GUPPY, J. O. CUTHBERT, & A. W. LINDNER.

SCALE

MILES 0 1 2 3 MILES

Track to Aboriginal Homestead

Site of Freney's old quarters

Strophalosia Kimberleyensis Marker Bed

Polyzoal Limestone Marker Bed

Drainage

FRENEY'S NERRIMA NO.1 BORE

Freney Kimberley Quarters

Yard

Nerrima Homestead

RUN 6

RUN 7

Yard

Polyzoal Limestone Marker Bed

Strophalosia Kimberleyensis Marker Bed

N

M.N.

REFERENCE

- LIVERINGA SANDSTONE
- Sandstone Marker Bed (near Nerrima Homestead only)
- NOONKANBAH SHALE
- Strophalosia Kimberleyensis Marker Bed
- Polyzoal Limestone Marker Bed
- BEDDING TREND LINES FROM AIR PHOTOGRAPHS
- DIP AND STRIKE OF BEDDING
- FAULTS: Definite; Probable
- GEOLOGICAL BOUNDARIES: Definite; Approximate; Inferred
- CENTRE POINTS OF AIR PHOTOGRAPHS
- FOSSIL SPECIMEN LOCALITIES
- FENCES
- TOPOGRAPHIC CONTOURS

Datum Nerrima No.1 Bore 372' (above sea level) – elevation determined barometrically.

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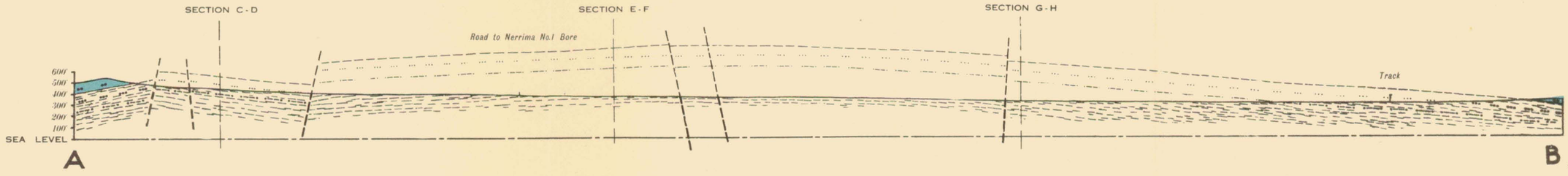
WA 3B-3

PLATE 3



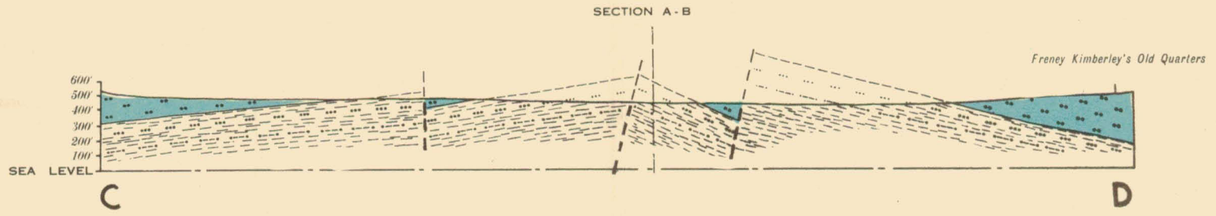
REFERENCE

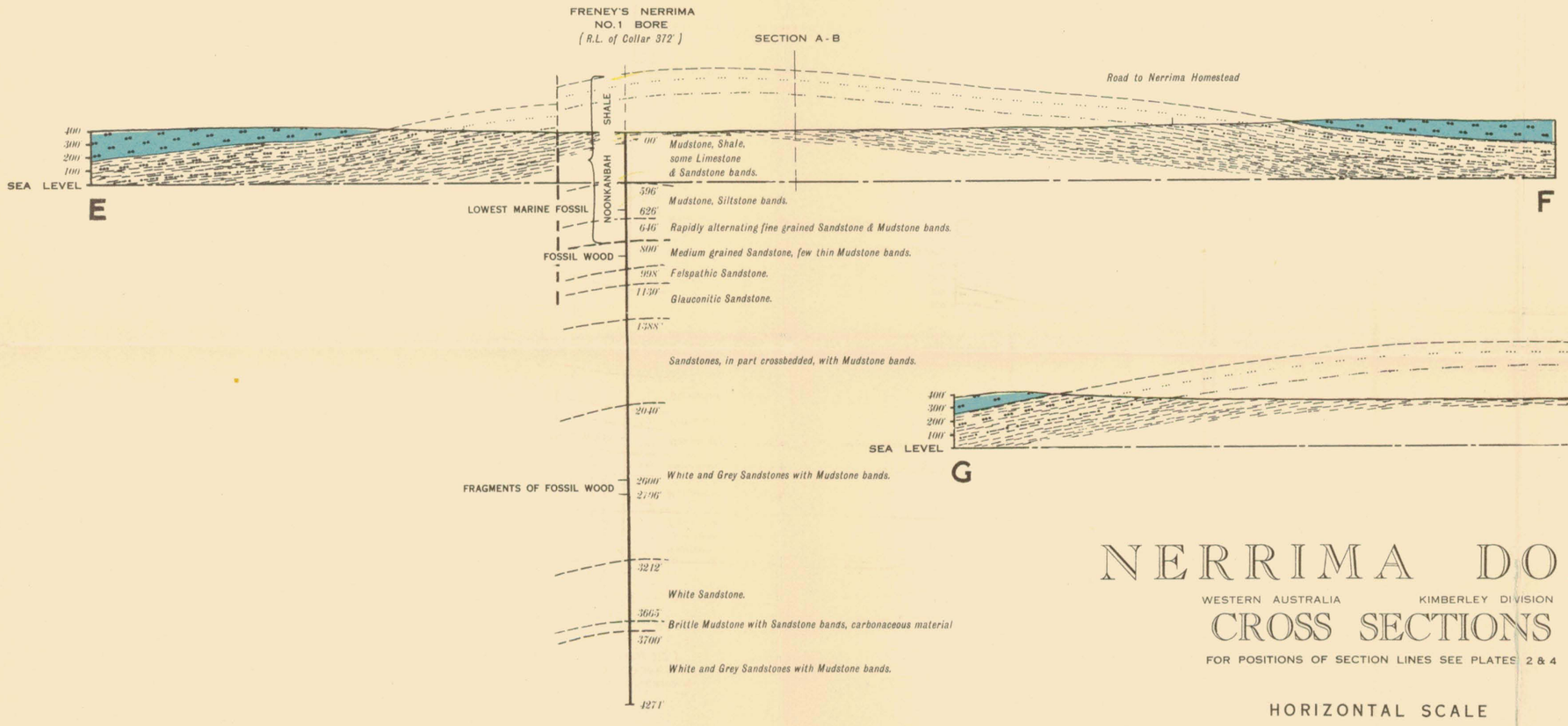
LIVERINGA SANDSTONE

Strophalosia Kimberleyensis Marker Bed

Polyzoal Limestone Marker Bed

NOONKANBAH SHALE





NERRIMA DOME

WESTERN AUSTRALIA KIMBERLEY DIVISION

CROSS SECTIONS

FOR POSITIONS OF SECTION LINES SEE PLATES 2 & 4

HORIZONTAL SCALE

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WA 3B-4

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PLATE 4

NERRIMA DOME

WESTERN AUSTRALIA KIMBERLEY DIVISION

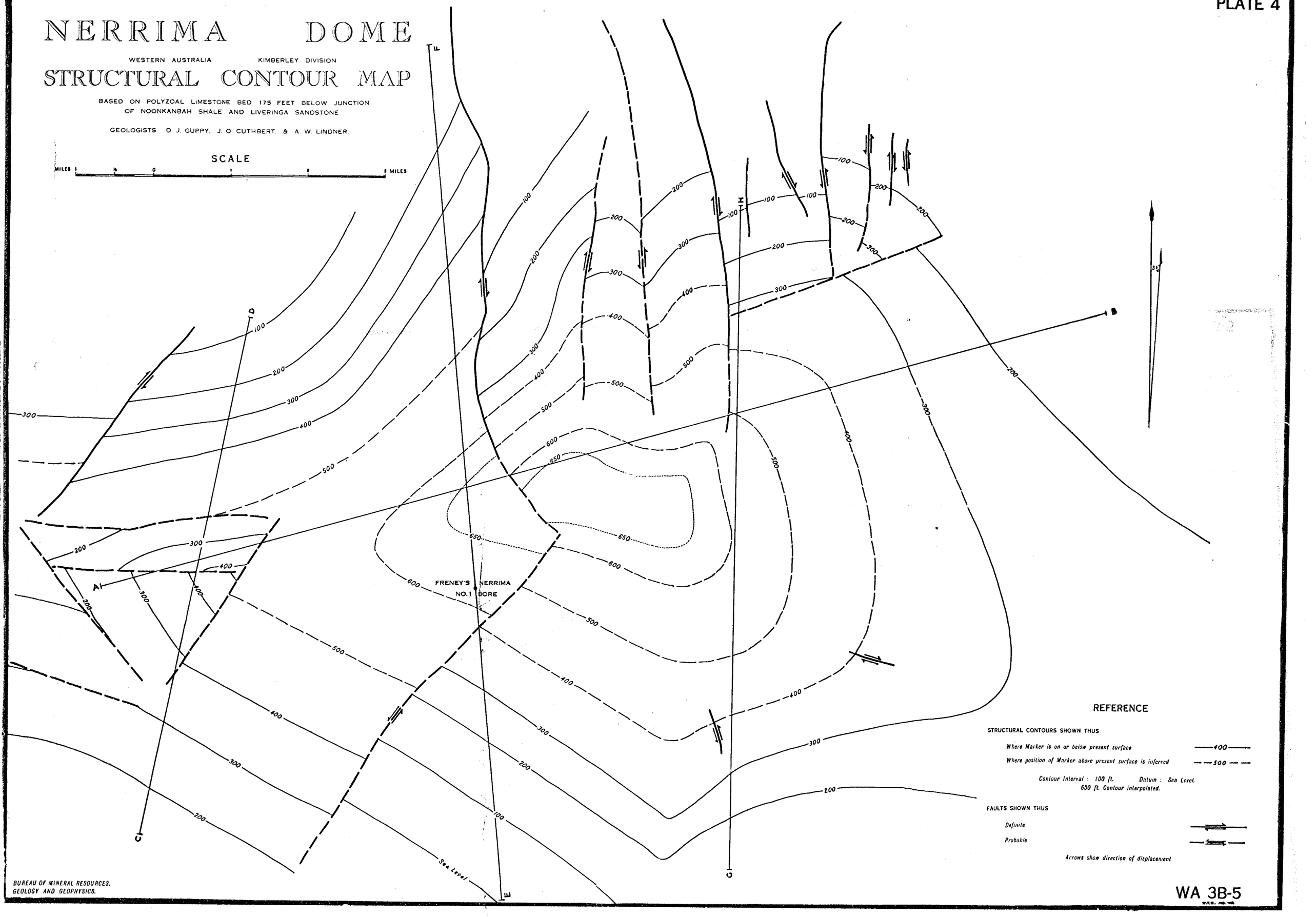
STRUCTURAL CONTOUR MAP

BASED ON POLYZOAL LIMESTONE BED 175 FEET BELOW JUNCTION OF NOONKANBAH SHALE AND LIVERINGA SANDSTONE

GEOLOGISTS D. J. GUPPY, J. O. CUTHBERT, & A. W. LINDNER.

SCALE

MILES 1 ½ 0 1 2 3 MILES



REFERENCE

STRUCTURAL CONTOURS SHOWN THUS

Where Marker is on or below present surface —400—

Where position of Marker above present surface is inferred – –500– –

Contour Interval : 100 ft. Datum : Sea Level.
650 ft. Contour interpolated.

FAULTS SHOWN THUS

Definite

Probable

Arrows show direction of displacement

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WA 3B-5