COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

PETROLEUM SEARCH SUBSIDY ACTS

Publication No. 23

CONORADA OOROONOO No. 1, QUEENSLAND

OF

CONORADA PETROLEUM CORPORATION

Issued under the Authority of Senator the Hon. Sir William Spooner,
Minister for National Development
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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

Minister: SENATOR THE HON. SIR WILLIAM SPOONER, K.C.M.G., M.M.

Secretary: H. G. RAGGATT, C.B.E.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Director: J. M. RAYNER.

This Report was prepared for publication in the Geological Branch

Chief Geologist: N. H. FISHER

FOREWORD

In 1959 the Commonwealth Government enacted the Petroleum Search Subsidy Act 1959. This Act enables companies that drill for new stratigraphic information, or carry out geophysical or bore-hole surveys in search of petroleum, to be subsidized for the cost of the operation, provided the operation is approved by the Minister for National Development.

The Bureau of Mineral Resources, Geology and Geophysics is required, on behalf of the Department of National Development, to examine the applications, maintain surveillance of the operations and in due course publish the results.

Conorada Ooroonoo No. 1 was drilled under the Petroleum Search Subsidy Act 1959, in the north-western part of Authority to Prospect 75P, Queensland, (Lat. 23°10'50" S. Long. 141°33'09" E.) by Conorada Petroleum Corporation. This Publication deals with the results of this drilling operation, and contains information furnished by Conorada Petroleum Corporation and edited in the Geological Branch of the Bureau of Mineral Resources. The final report was written by Ian McPhee, Chief Geologist of Conorada Petroleum Corporation. The methods employed in the drilling operation and the results obtained are presented in detail.

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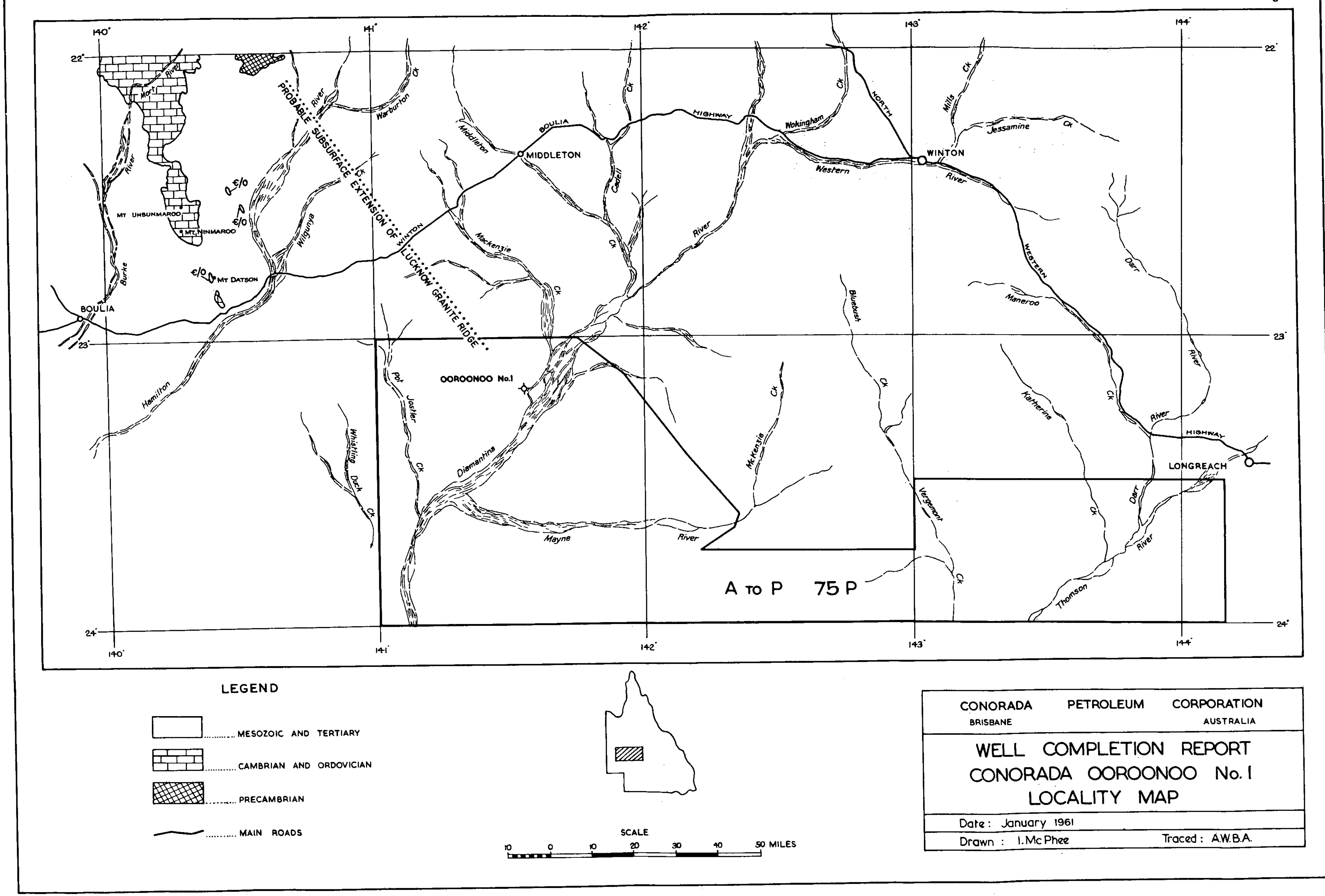
ILLUSTRATIONS

Fig. 1



140°
141°
142°
143°
144°
22°
23°
24°
PROBABLE SUBSURFACE EXTENSION OF LUCKNOW GRANITE RIDGE
BOULIA
MIDDLETON
WINTON
LONGREACH
MT UNBUNMAROO
MT NINMAROO
MT DATSON
€/0
BOULIA HIGHWAY
WINTON
NORTH
WESTERN
HIGHWAY
OOROONOO No.1
Burke River
Mort River
Hamilton
Wilgunya
Warburton Ck
Middleton
Mackenzie Ck
Cadell Ck
Wokingham Ck
Western River
Mills Ck
Jessamine Ck
Darr River
Maneroo
Bluebush Ck
McKenzie Ck
Katherine Ck
Vergemont Ck
Thomson River
Diamantina
Mayne River
Pot Jostler Ck
Whistling Duck Ck
A TO P 75 P
LEGEND
MESOZOIC AND TERTIARY
CAMBRIAN AND ORDOVICIAN
PRECAMBRIAN
MAIN ROADS
SCALE
10 0 10 20 30 40 50 MILES
CONORADA PETROLEUM CORPORATION
BRISBANE AUSTRALIA
WELL COMPLETION REPORT
CONORADA OOROONOO No. 1
LOCALITY MAP
Date: January 1961
Drawn: I. Mc Phee
Traced: A.W.B.A.

SUMMARY

Conorada Ooroonoo No. 1, located in the north-western part of Authority to Prospect 75P, Queensland, was drilled as an off-structure stratigraphic test by Conorada Petroleum Corporation. The contractor was Mines Administration Pty Ltd, and the rig used was a Sullivan 300A owned by the contractor. The well was spudded in on 20th July, 1960, and abandoned as a dry hole, at total depth of 3852 feet on 23rd August, 1960. A complete section of Great Artesian Basin sediments was drilled and granitic basement penetrated at 3840 feet. The coring and sampling programme carried out enabled as much information to be obtained about the section as was possible.

INTRODUCTION

The drilling of a well in the western part of Authority to Prospect 75P had as its objective the investigation of the nature and thickness of the Mesozoic section and determination of the nature of the underlying formations.

The presence of granitic basement (Lucknow granite ridge) was known in water bores 40 miles north-west of the proposed location and it was considered possible that this ridge extended south-eastward into Authority to Prospect 75P. If this were so it could limit the eastward extension of Cambrian and Ordovician sediments of the Georgina Basin.

WELL HISTORY

General Data

Well name and number:	Conorada Ooroonoo No. 1
Location:	Latitude 23°10'50"S., Longitude 141°33'09"E.
	The well is located near a waterhole in Ooroonoo Channel of the Diamantina River (see Fig. 1).
Tenement Holder:	Conorada Petroleum Corporation, Brisbane, Queensland.
Details of Petroleum Tenement:	Authority to Prospect No. 75P, Queensland.
District:	Footscray Parish, Binburie County, Queensland.
Total Depth:	3852 feet
Date drilling commenced:	20th July, 1960
Date drilling completed:	21st August, 1960
Date well abandoned:	23rd August, 1960
Date rig released:	26th August, 1960
Drilling time in days to total depth:	33
Elevation above mean sea level:	Ground 400 feet;
	Rotary table 405 feet
Status:	Abandoned as a dry hole
	Plugged with cement plugs at 3075 - 3025 feet

2350 - 2300 feet

230 - 180 feet

20 feet - surface

A steel plate showing the name and number of the well and the dates of commencement and abandonment was welded to the top of the surface casing.

Drilling Data

Drilling Contractor:	Mines Administration Pty Ltd, 31 Charlotte Street, Brisbane, Queensland.	
Drilling Plant:		
Make:	Sullivan	
Type:	300A	
Rated capacity with 2 7/8" drill pipe :	3500 feet	
Motors:	Make:	International
	Type:	UD 14
	BHP:	65
Mast:		
Make:	Sullivan	
Type:	Integral hydraulic	
Rated capacity:	60,000 lb.	
Pump:		
Make:	National Ideal	
Type:	C 150 B	
Size:	7 1/4" x 15"	
Motors:	Make:	GM
	Type:	Series 671
	BHP:	278
Blowout Preventer equipment:		
Make:	Regan	
Size:	8"	
Series:	A.P.I. 900	
Hole sizes and depths:	12 1/4" to 210 feet 5 5/8" to 3852 feet (total depth)	
Casing details:		
Size:	9 5/8"	
Weight:	40 lb/ft	

Grade:	J.55
Range:	1
Setting depth:	205 feet

Casing cementing details:

Size:	9 5/8"
Setting depth:	205 feet
Quantity cement used:	65 sacks
Cemented to :	surface
Method used:	Cemented with average slurry weight 1.85 S.G., and chased cement with 94 cu. ft following mud. Bumped plugs at 300 p.s.i.

Drilling fluid:* A conventional bentonite-water, low pH mud was used throughout. The initial slurry was mixed at 3 lb per cubic foot and treatments applied to control viscosity, gel strength, and water loss.

The standard A.P.I. tests were made each shift and specific gravity and Marsh viscosity recorded each hour. The mud had the following general characteristics:

Specific gravity	1.13
Viscosity (Marsh)	65 sec.
Filtrate	5.5 ml.
Cake	1.5 mm.
Sand content	2.0%
pH	7.0
Chloride - filtrate	1500 ppm. (1)

Drilling Conditions:

A high proportion of the formations penetrated were shales. Consequently a low water loss mud was desired to reduce the risk of the shale heaving or caving.

Mud Treatments:

The rate of water loss was limited by treatment with "Nymcel" (CMC) and viscosity and gel strength were limited by addition of myrtan and caustic soda.

Weight and viscosity build-up were persistent and, after myrtan and caustic treatments gave little effect, additions of new 2 lb per cubic foot-bentonite slurry were used, discarding an equal volume of old mud. As the mud weight approached a specific gravity of 1.2 a persistent loss of mud occurred which was not remedied by lost circulation material on hand, but was checked by controlling the mud weight as above.

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* By M.J. Mahoney, Mines Administration Pty Ltd.

(1) This figure differs from the salinity as measured electrically (2.1 ohm metres at 54° F - 3500 ppm). Apparently the silver nitrate solution was faulty, and an accurate end point could not be ascertained in a coloured solution, or else there was a considerable proportion of other anions.

Mud System:

The system was composed of a flow line from well head to a single shaker, fluming to 30-cubic foot settling tank, and a 200-cubic foot suction tank. Also on site were a 200-cubic foot reserve mud tank and 1000-cubic foot water storage tank.

Water Supply:

Water for the drilling operation was obtained from a water hole in the Ooroonoo Channel. The water was pumped about one-quarter of a mile to the drilling site.

Perforation and Shooting Record:

There were no perforating or shooting operations on the well.

Plugging back and squeeze cementation jobs:

There were no plugging back or squeeze cementation jobs. Abandonment plugs were run as described above.

Fishing Operations:

One fishing job was performed at a depth of 3839 feet when a bit cone was left on the bottom of the hole. One run with a magnet recovered the cone.

Side-tracked Hole: Nil

Logging and Testing

Ditch cuttings:

In general samples were caught at 10-foot intervals when drilling and at 5-foot intervals when coring. When zones of interest were encountered or anticipated, samples were taken at much closer intervals.

Coring:

The original programme called for cores to be taken as required by Queensland State Legislation, amplified if necessary to provide a core-

(i) at each change of formation indicated by a change in the penetration rate, or by cuttings;

(ii) when oil and/or gas was detected in the returns;

(iii) when an indication of porosity and/or permeability was noted; and

(iv) at depths selected by the company's well-site geologist, to provide that the interval between consecutive cores should not be more than 200 feet, except in thick uniform lithology when by agreement the maximum interval might be extended to 500 feet.

There was no deviation from this programme. Twenty-one cores were cut for a total footage of 220 feet of which 163'6" were recovered, giving a percentage recovery of 74% as shown in the following table.

Core No.	Interval (feet)	Recovery (feet)	Percentage
1	215-225	10	100
2	426-436	8.5	85
3	626-636	8	80
4	836-846	10	100
5	1038-1048	10	100
6	1252-1262	10	100
7	1462-1472	10	100
8	1676-1686	8	80
9	1882-1892	7	70
10	2086-2096	3.5	35
11	2288-2298	3.5	35
12	2298-2308	8.5	85
13	2376-2386	10	100
14	2576-2586	6.5	65
15	2796-2806	8.5	85
16	2976-2986	5	50
17	3186-3196	4	40
18	3379-3394	9	60
19	3545-3562	11.5	68
20	3649-3664	9	60
21	3849-3852	3	100
Cored	220 feet	163.5	74

The coring equipment used was:

Core barrel: Reed "Kor-King" conventional

Core heads: Reed hard and soft formation

Sidewall sampling: Nil

Electrical and other logging:

Electric and Gamma Ray Logs were run by Mines Administration Pty Ltd using a Failing Logmaster unit.

Electric logs: Spontaneous Potential

Resistivity 16" and 63" normals

Two runs - Run No. 1 200 - 1786 feet

Run No. 2 1650 - 3852 feet (T.D.)

The Gamma Ray Log was run to only 2110 feet as below this depth the logging tool ceased to function because of the high temperature.

Drilling time and gas log:

Drilling time was kept at two-foot intervals by the drillers and is plotted as part of the composite log (Plate 1).

No gas log was kept.

Formation testing: Nil

Deviation surveys:

Deviation surveys, using a "Totco" instrument, were conducted at the depths and with the results shown in the following table:

Depth (feet)	Deviation from Vertical (degrees)
426	0
836	0
1252	0
1676	1
1882	2
2086	1 3/4
2288	1 1/2
2570	1
2970	3/4
3379	3/4
3830	3/4

At no point was the deviation greater than 2^{o} from vertical.

Other well surveys:

No other well surveys were run.

GEOLOGY

Summary of Previous Work

Geological:

Reconnaissance surface geological surveys were carried out for previous permit holders by W.D. Mott (1958). The Queensland Geological Map (1953) gives a generalized picture of the regional geology. Cretaceous Winton Formation crops out near Ooroonoo.

Geophysical:

No previous geophysical work had been carried out by Conorada.

Available data from previous work in the area included:

BMR reconnaissance airborne magnetometer survey;

BMR preliminary results of reconnaissance gravity survey;

Hunting Geophysics airborne magnetometer survey conducted for Trans Pacific Ltd.

Drilling:

There had been no previous drilling for oil in the area. There are some old water bores close to Ooroonoo No. 1 but the lithologic descriptions by drillers are not very reliable.

Stratigraphy

Introduction:

Before Ooroonoo No. 1 was drilled the stratigraphy was known only from water bores drilled to the main artesian aquifer of the Great Artesian Basin. Some of these bores have lithologic logs but, apart from the top of the aquifer, these logs are generally unreliable for picking formation tops. Recent work by the Bureau of Mineral Resources in the Boulia area (Casey, 1959; Casey et al., 1960) has established the Mesozoic sequence there as, from top to bottom:

Winton Formation

Wilgunya Formation (equivalent to Roma-Tambo)

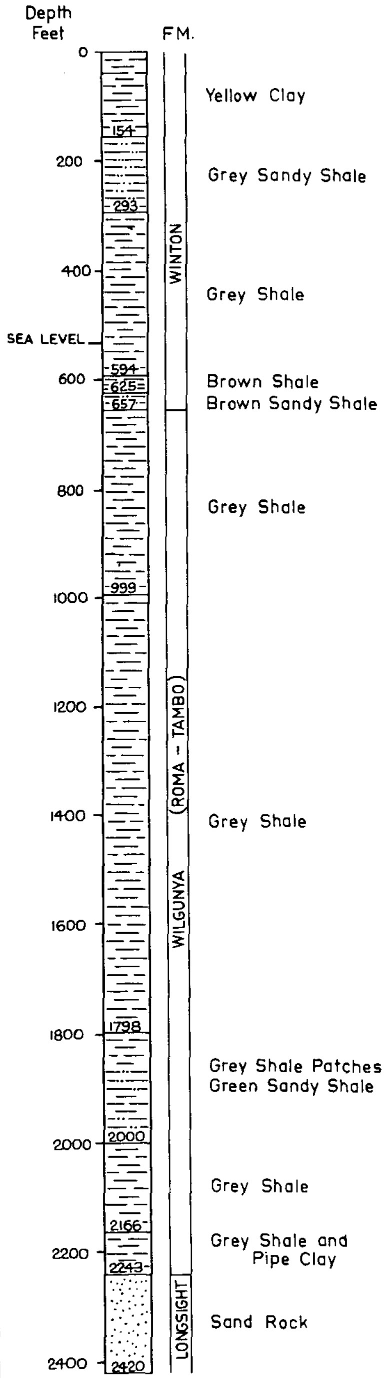
Longsight Sandstone (equivalent to part of Blythesdale Group)

Ooroonoo No. 1 was spudded in Winton Formation and drilled 1010 feet of Winton Formation, 1360 feet of Wilgunya Formatiion (Roma-Tambo) and 1470 feet of sands and shales of Cretaceous - Jurassic age, before encountering granitic basement.

For the Winton and Wilgunya Formations, correlations are possible with the Bureau's work to the west, and with Whitehouse's work in the east (Whitehouse, 1955). The name Wilgunya has been used here in preference to Roma and Tambo because of its prior use by the Bureau of Mineral Resources in the same general area, and because of the difficulty in picking a boundary between the Roma and Tambo Formations. The Wilgunya Formation is considered, however, to be the equivalent of these two formations. A distinctive slightly radioactive limestone from 1820 to 1840 feet is correlated with the Toolebuc Member of the Wilgunya Formation in the Boulia area (Casey et al., 1960). It is also correlated with a coquina bed in the Warbreccan wells (Whitehouse, 1955) and, if this correlation is correct, the member forms an excellent subsurface marker in the Eromanga Basin.

Fig. 2

BRIGHTON DOWNS No.5 WATER BORE



Location : 141°29′E 23°02′S

Elevation : 531 FT.

Total Depth : 2420 FT.

Details from Queensland Irrigation and Water Supply Dept. Strata Section No. 327 Drillers log only

NOTE :
This is the closest water bore to Ooroonoo

CONORADA PETROLEUM CORPORATION BRISBANE AUSTRALIA
FINAL REPORT ON CONORADA OOROONOO No.1 STRATIGRAPHIC COLUMN AS KNOWN BEFORE DRILLING
Date : January 1961
Drawn : I. McPhee Traced : A.W.B.A.

Below the Wilgunya Formation correlation with the formations of the eastern margin of the Great Artesian Basin is difficult. Whitehouse (1955) has traced members of the Blythesdale Group as far west as Warbreccan, where he was able to pick sand and shale members equivalent to those in the type section. The sand-shale section in Ooroonoo No. 1 lacks clear-cut division into these members and although it is here correlated with the Blythesdale, the name Longsight Sandstone as used by the Bureau in the Boulia area is retained. Discovery of Permian spores in the same core as Jurassic spores, and this, 200 feet above another core containing Jurassic spores, presents further problems of correlation, and indicates there has been reworking of Permian sediments (see page 11).

From 3740 feet traces of fresh granitic material were encountered in the sandstones and below 3800 feet granitic material was abundant. The top of the granite is placed at 3840 feet on samples and drilling time.

Details of Ooroonoo section

0-1010 feet. Winton Formation: Interbedded sands and shales.

Shales are grey, commonly silty, carbonaceous, and micaceous, pyritic in places; plant fragments are common. Sandstones are grey, fine to medium-grained, commonly shaly, micaceous, carbonaceous, calcareous, in places sideritic, often friable and porous.

Traces of gypsum and anhydrite were seen. Inoceramus fragments were found below 820 feet suggesting that the lower part of the Winton Formation here is marine and transitional into the Wilgunya Formation. All cores showed flat bedding.

1010-2370 feet. Wilgunya Formation (Roma-Tambo): The top of the Wilgunya Formation is picked on a lithologic change from interbedded sand and shale to dominantly shale with an occasional thin limestone. This is also a good E log pick, particularly on the S.P. curve. The shales in the upper part of the formation are grey, micaceous, carbonaceous in places, with traces of pyrite, and commonly fossiliferous. Thin beds of limestone are grey, hard, crystalline, and sandy. Some very minor sand beds are indicated by samples. From 1820 to 1840 feet a coquina of Inoceramus shells was drilled. This interval is correlated with the Toolebuc Member of the Boulia area and also with a similar coquina found in the Warbreccan wells. It is interesting to note that this bed caused the only appreciable increase in radioactivity on the Gamma Ray log.(2) Below the Toolebuc Member the shales have much the same character as above but are glauconitic in places. Thin glauconitic sands occur, and only one thin crystalline limestone occurs at 2010 feet. Cores 6 and 7 (Belford, Appendix 2) are regarded as Albian in age. The Aptian/Albian boundary cannot be picked. In general the beds are flat-lying but dips of up to 10^{o} were recorded in Core No. 8.

2370-2460 feet. Transition Zone: A change in formation was indicated by a pronounced drilling break at 2370 feet. Sand was recovered in circulated samples and a core cut from 2376 - 2386 feet was dominantly sandstone with interbedded sandy shale with a dip of 25^{o}. The contrast between this dip and the zero dip in the previous core (2298 - 2308 feet) suggests there may be an unconformity at the formation top. The 90 feet of this Transition Zone are composed of interbedded sands and shales showing little character on the Resistivity log. The age of the Transition Zone is established by Evans (Appendix 2) as transitional Upper Jurassic to Lower Cretaceous.

(2) Footnote by Bureau of Mineral Resources:
The Toolebuc Member in outcrop has a 3 - 4 times background count on the geiger counter, and yellow-green uranium minerals occur on fish scales.

2460-3840 feet. Longsight Sandstone: At 2460 feet both S.P. and Resistivity logs indicate a very definite formation change from the overlying Transition Zone to a predominantly sandstone section. It is interesting that the S.P. curve shows a positive rather than the usual negative increase indicating that the formation water is less saline than filtrate of the drilling mud. This sandstone is the upper artesian aquifer of the Great Artesian Basin. The top of the Longsight Sandstone is put at 2460 feet.

From 2460 to 2950 feet the formation is dominantly soft, friable to unconsolidated, coarse, well-sorted, micaceous sandstone, with some minor grey micaceous shales and traces of coal. All cores show flat bedding.

From 2950 to 3190 feet the formation contains more shale interbedded with the sandstone. Doubtful plant fragments are recorded at 3060 feet. Again the cores show flat bedding.

From 3190 to 3565 feet the electric logs indicate a predominantly sand section with less shale than is suggested by the sample descriptions; the cuttings probably include shale cavings. The sandstones vary from fine, white, and micaceous to coarse and unconsolidated. Dips in Cores 17 and 18, in this section, are 25^{o}.

From 3565 to 3840 feet the section is interbedded sandstone and shale.

At 3840 feet a red, brown, and varicoloured shale was encountered, a few inches of which were recovered in Core No. 20 at 3649 feet. The unusual character of this shale, particularly its colour, and the 13^{o} dip in the core could indicate an unconformity at this point. Below this the beds are mainly coarse, angular, unconsolidated sandstone and fine, white, friable sandstone. With depth the granitic component in the sand increases.

The Longsight Sandstone is regarded as mainly Jurassic, probably ranging to Lower Cretaceous near the top of the formation. (Evans, Appendix 2).

3840-3852 feet (T.D.) Gneissic Granite: (See Appendix 1). (3)

Problem of Permian Spores in Core No. 17:

Upper Permian spores have been found in coal in Core No. 17 at 3190 feet (N. de Jersey, and P.R. Evans, Appendix 2). Evans found Jurassic spores in the same core and also in Cores No. 16 (2976-2986 feet) and No. 18 (3379-3394 feet).

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(3) Footnote by Bureau of Mineral Resources:

An age determination by the potassium - argon method on a sample of granite from Core No. 21, Ooroonoo No. 1, was made by A. Webb and J. Cooper under the supervision of Dr. J. Richards of the Australian National University, Canberra. The age of the sample was determined as 860 million years.

The most plausible explanation for the presence of these Permian spores in the middle of a Jurassic section is that they represent reworked Permian sediments. Since spores are very durable and resistant, while coal is not, it is considered more likely that the spores are the reworked material rather than the coal itself.[(4)]

Structure

The well provides no information on local structure. It fits into the regional dip of the western side of the Eromanga Sub-basin and demonstrates thickening of the pre-Cretaceous sediments basinwards (see Fig. 3).

Cores in the Jurassic section show dips of 0^{o} and 25^{o} in alternation. This could indicate unstable conditions during the Jurassic and it is possible a number of minor unconformities exist.[(5)] These would not be widespread enough to be of a regional nature but could exist along the margins of the Lucknow ridge. Uplifts causing these unconformities could have exposed Permian strata to erosion and thus provided a source for the Permian spores in Core No. 17.

Relevance to the Occurrence of Petroleum

No shows of oil or gas were noted. The marine Cretaceous shales may be considered potential source rocks, and sandstone reservoirs exist in the Winton Formation and the Longsight Sandstone. The reservoirs in the Longsight Sandstone are probably fresh-water bearing. The discovery of granitic basement below the sandstones is discouraging and reduces the possibility of finding Cambrian and Ordovician source and reservoir rocks east of the Lucknow granite ridge.

Porosity and Permeability

No laboratory tests were run to determine porosity and permeability. Visual examination of the samples shows that porous sands are interbedded with impervious shales in the Winton Formation; the Wilgunya Formation is uniformly impervious; and the Longsight Sandstone has a high percentage of porous and permeable sands.

Contributions to Geological Concepts Resulting from Drilling

Ooroonoo No. 1 was the first properly sampled well drilled to basement in the north-western part of the Eromanga Sub-basin.

It established the presence of granitic basement and the possible extension of the Lucknow granite ridge at least this far south-east, and also is additional proof of the existence of the Boulia Shelf as outlined by reconnaissance aeromagnetic surveys.

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(4) Footnote by Bureau of Mineral Resources:

Evans (Appendix 2) suggests that the lack of mixing of Permian and Jurassic spores indicates reworking of coal fragments.

(5) Footnote by Bureau of Mineral Resources:

It is considered more likely that these dips represent foresets of current beds or slump folds.

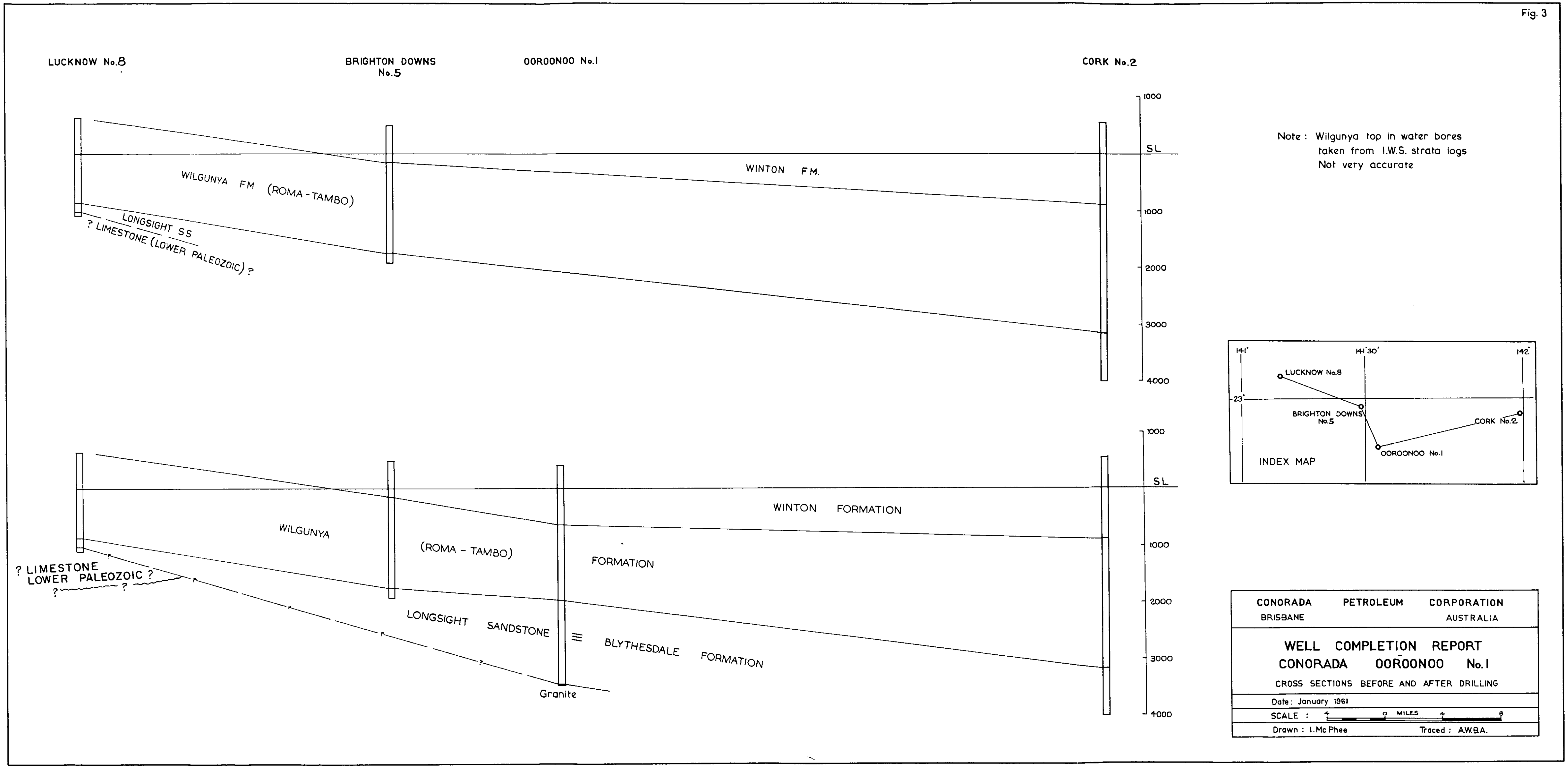
Fig. 3
LUCKNOW No.8
BRIGHTON DOWNS No.5
OOROONOO No.1
CORK No.2
1000
SL
1000
2000
3000
4000
WILGUNYA FM (ROMA - TAMBO)
WINTON FM.
LONGSIGHT SS
? LIMESTONE (LOWER PALEOZOIC) ?
Note : Wilgunya top in water bores taken from I.W.S. strata logs Not very accurate
141°
141°30'
142°
23°
LUCKNOW No.8
BRIGHTON DOWNS No.5
CORK No.2
OOROONOO No.1
INDEX MAP
WINTON FORMATION
WILGUNYA
(ROMA - TAMBO)
FORMATION
? LIMESTONE LOWER PALEOZOIC ?
LONGSIGHT SANDSTONE ≡ BLYTHESDALE FORMATION
Granite
CONORADA PETROLEUM CORPORATION
BRISBANE AUSTRALIA
WELL COMPLETION REPORT
CONORADA OOROONOO No.1
CROSS SECTIONS BEFORE AND AFTER DRILLING
Date: January 1961
SCALE : 4 0 MILES 4 8
Drawn : I. Mc Phee
Traced : A.W.B.A.

Thickening of pre-Cretaceous sediments basinwards is demonstrated, but insufficient information was obtained to carry a definite correlation of the Blythesdale Group this far west. The names introduced by the Bureau of Mineral Resources (Casey et al., 1960) for the Jurassic and Lower Cretaceous formations in the Boulia area are used, and correlation is made with these rather than the classic section of the eastern margin of the Great Artesian Basin.

The discovery of Upper Permian spores in coal fragments from the Cretaceous - Jurassic Longsight Sandstone is taken to indicate reworking of Permian sediments while this formation was being deposited.

Dips as great as 25^{o} in some Jurassic cores and possible unconformities are explained by postulated uplifts of the Lucknow granite ridge in Jurassic time. These uplifts also help to explain the reworked Permian spores.

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APPENDIX 1

PETROLOGICAL REPORT ON CORE No. 21, CONORADA OOROONOO No. 1*

by

B.R. Houston

Geological Survey of Queensland

Core No. 21, 3849 - 3852 feet:

Essentially, the core is of coarse uneven-grained (0.5 to 4 mm), grey rock with a granitic appearance. In detail, it is heterogeneous with an overall appearance of foliation. The bands are more or less parallel to the length of the core and are marked by concentrations of biotite between bands and a variation in grain size from one band to the next.

Augen of potash feldspar, up to 5 cm across are present though not abundant. Concentrations of biotite outline these "eyes" which lie with their long axes roughly parallel to the foliation.

Irregular veins (up to more than 6 cm across) of quartzo-feldspathic material are common; they are elongated roughly parallel to the foliation and outlined by concentrations of biotite.

Minerals which can be distinguished include -

Quartz - colourless, pink or green
Potash feldspar - pink or green, commonly not fresh
Biotite - black
The quartz and feldspar are, in general, anhedral and embayed.

Microslide GSQ 541, 3850'2": (coarse-grained rock).

Texture: Hypidiomorphic-granular; uneven-grained, dominantly 2 to 4 mm.

Constituents: Quartz: dominant constituent; anhedral, strained, fractured with decomposition products of the feldspar in the fractures. Rare anhedral inclusions of fresh albite (average 0.2 mm) are also present.

Feldspar: occurs as corroded lath-shaped crystals and as anhedral extremely decomposed - it is impossible to distinguish whether plagioclase is present - potash feldspar is dominant, if not exclusive; alteration products sericite and chlorite.

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* Publication authorized by the Chief Government Geologist, Geological Survey of Queensland, Brisbane.

Biotite: pleochroic from yellowish-brown to dark brown, almost opaque; some of the flakes are somewhat bleached; green chlorite is a rare alteration product; opaque dust is associated with most of crystals.

Muscovite: not common.

Estimated Composition:

Quartz	-	45-50%
Feldspar	-	30-35%
Biotite	-	10-15%
Muscovite	-	<5%

Name: GNEISSOSE GRANITE.

Microslide GSQ 542, 3851'4" (quartzo-feldspathic vein).

Texture: Allotriomorphic-granular to crudely micrographic; uneven-grained (0.1 to 5 mm)

Constituents:

Quartz:	predominant
Microcline:	fresher than in the host rock
Mica:	secondary

Decomposition:

The rock appears to have had a complex history. The crystal texture suggests an igneous origin; the foliation suggests movement after emplacement, probably as a "crystal mush". The corrosion of the feldspars, their extreme decomposition and the presence of albite suggest late-stage activity of solutions, either from the same source or from some distant source. There has been considerable movement of potash feldspar and quartz. Two features difficult to explain together are the presence of feldspar decomposition products in the quartz fractures (suggesting decomposition after crystallization) and the much greater decomposition of the feldspar in the host than in the veins. It is unlikely that the veins were injected in the solid state.

The decomposition appears to be an alteration rather than a weathering feature.

APPENDIX 2

PALAEONTOLOGICAL REPORTS

Preliminary Note on Foraminifera from Conorada Ooroonoo No. 1, Queensland

by

D.J. Belford

Bureau of Mineral Resources

This note gives only a brief outline of results obtained from examination of samples from this well. Some species, particularly among the calcareous forms, do not seem to have been previously found in the Lower Cretaceous rocks of Australia and require further study. As this is the only complete marine section available in this area it is felt that detailed examination and illustration of the fauna are desirable.

Foraminifera have been found in Ooroonoo No. 1 from Core No. 5 (1038-1048 feet) to Core No. 12 (2298-2308 feet) inclusive. The foraminifera in Core No. 5 are fragmentary and generally not specifically identifiable. Cores 6 and 7 contain abundant foraminifera, particularly of the genus Neobulimina, abundant prisms of the pelecypod genus Inoceramus and also ostracods and rare radiolaria. Calcareous foraminifera occur commonly in these cores; specimens of Globigerina are rare. Megaspores referred to the species Pyrobolospora reticulata Cookson and Dettmann also occur in Cores 5 to 7.

No foraminifera were found in Core No. 8. Inoceramus prisms occur abundantly and one fish tooth was found. Core No. 9 contained only arenaceous foraminifera (Ammobaculites, Verneuilina, Spiroplectammina) and very rare radiolaria. Few foraminifera were found in Core No. 10, and those found are rare arenaceous forms together with poorly preserved specimens of Lagenidae. Arenaceous forms are common in both Cores 11 and 12, with rare radiolaria and Inoceramus prisms.

Species identified from each core are:

Core No. 5 (1038 - 1048 feet)

Neobulimina minima Tappan.
Dentalina sp. and fragments of other Lagenidae.

Core No. 6 (1252 - 1262 feet)

Neobulimina minima Tappan
Anomalina mawsoni Crespin
Epistomina australiensis Crespin
Haplophragmoides chapmani Crespin
Trochammina sp.
Textularia sp. cf. T. washitensis Carsey
Trochamminoides coronus Loeblich and Tappan
Tristix excavata (Reuss)

Bifarina calcarata (Berthelin)
Lingulina sp. cf. L. furcillata Berthelin
Ammobaculites fisheri Crespin
Globigerina sp.
Lagenidae (Marginulina, Saracenaria, Vaginulina)

Core No. 7 (1462 - 1472 feet)

Neobulimina minima Tappan
Anomalina mawsoni Crespin
Textularia sp.cf. T. washitensis Carsey
Haplophragmoides sp.cf.H. dickinsoni Crespin
Trochammina sp.
Ammobaculites fisheri Crespin
Involutina sp.

Core No. 9 (1882 - 1892 feet)

Verneuilina howchini Crespin
Ammobaculites fisheri Crespin
Spiroplectammina edgelli Crespin
Haplophragmoides dickinsoni Crespin
Trochammina raggatti Crespin

Core No. 10 (2086 - 2096 feet)

Ammobaculites fisheri Crespin
Pelosina lagenoides Crespin
Trochammina sp.
Lagenidae (Robulus, Marginulina)

Core No. 11 (2288 - 2298 feet)

Textularia anacooraensis Crespin
Haplophragmoides chapmani Crespin
Pelosina lagenoides Crespin

Core No. 12 (2298 - 2308 feet)

Haplophragmoides chapmani Crespin
Ammobaculites australe (Howchin)
A. sp.
Textularia anacooraensis Crespin
Robulus warregoensis (Crespin)
Marginulina spp.

Zones 2 and 3 of Crespin (1956) may be recognized in this well. Cores 6 and 7 are regarded as Albian in age; deeper cores may be of Aptian age, but if so the position of the Aptian/Albian boundary is not known.

Reference

CRESPIN, Irene, 1956 - Distribution of Lower Cretaceous foraminifera in bores in the Great Artesian Basin, Northern New South Wales. Proc. Roy. Soc. N.S.W., 89, 78-84.

Palynology of Sample from Core No. 17,* Conorada Ooroonoo No. 1, Queensland

by

N.J. de Jersey

Geological Survey of Queensland

The sample examined from Core No. 17 (3186 - 3196 feet) comprised three inches of coal core taken at a depth of 3190 feet. On maceration it yielded abundant plant microfossils, including the following spore and pollen species:

Nuskoisporites gondwanensis
Nuskoisporites sp.
Lueckisporites limpidus
Lueckisporites amplus
Florinites eremus
Florinites ovatus
Vestigisporites sp.
Verrucosisporites hamatus
Leiotriletes spp.
Marsupipollenites triradiatus
Apiculatisporites filiformis
Apiculatisporites levis
Cirratriradites spp.
Granulatisporites trisinus
Granulatisporites micronodosus
?Pteruchipollenites sp.

This assemblage is similar to the microfloras of the Upper Bowen Coal Measures of Queensland and the Upper Coal Measures of New South Wales, and indicates an Upper Permian age for the sample. Of the species listed, Apiculatisporites filiformis is restricted to the Newcastle Stage of the Upper Coal Measures in New South Wales and its presence thus suggests that the horizon of the sample may be in the upper portion of the Upper Permian.

The writer was assisted by D.W. Dearne, Geological Survey of Queensland, in the maceration of the sample and examination of the microslides.

* Publication authorized by the Chief Government Geologist, Geological Survey of Queensland, Brisbane.

Palynological Report on Conorada Ooroonoo No. 1, Queensland

by

P.R. Evans

Bureau of Mineral Resources

Introduction

Conorada Ooroonoo No. 1 Well penetrated Cretaceous strata of the Great Artesian Basin to a depth of 2386 - 2576 feet and Jurassic to 3840 feet before entering granite.

The well is of palynological importance since it was the first in the west of the basin from which cores were taken every 200 feet throughout the Cretaceous and it has provided the best available reference section for that Period. Comparison of the distribution of spores and microplankton in Ooroonoo No. 1 with that in well sections known elsewhere in the Great Artesian Basin suggests that species characteristic of particular horizons are recognizable over a wide area.

This report is a revision of an unpublished report on Ooroonoo No. 1 (Evans, 1961a).

Samples from Conorada Ooroonoo No. 1 which have been examined palynologically in the Bureau of Mineral Resources came from the following depths. Each sample has been allocated a reference number under which permanent slides from the preparations are recorded in the Bureau's palaeontological collection.

Sample No.	Core No.	Depth			
MFP 917	1	221'10"	-	222'3"	
MFP 918	2	426'	-	436'	(2'6" - 2'10")
MFP 919	3	626'	-	636'	(6'0" - 6' 4")
MFP 920	4	836'	-	846'	(2'6" - 2'11")
MFP 921	5	1038'	-	1048'	(4'0" - 4' 5")
MFP 922	6	1252'	-	1262'	(4'0" - 4' 5")
MFP 923	7	1462'	-	1472'	(8'0" - 8' 5")
MFP 924	8	1676'	-	1686'	(2'5" - 2' 9")
MFP 925	9	1882'	-	1892'	(0'0" - 0' 4")
MFP 926	10	2086'	-	2096'	(2'0" - 2' 4")
MFP 927	11	2288'	-	2298'	(0'0" - 0' 4")
MFP 928	12	2298'	-	2308'	(8'0" - 8' 4")
MFP 942	13	2376'	-	2386'	(4'0" - 4' 5")
MFP 943	14	2576'	-	2586'	(2'0" - 2' 4")
MFP 944	15	2796'	-	2806'	(8'0" - 8' 4")
MFP 945	16	2976'	-	2986'	(2'0" - 2' 5")
MFP 1117	17	3186'	-	3196'	(8" - 12")
MFP 946	17	3186'	-	3196'	(2'0" - 2' 4")
MFP 1118	18	3379'	-	3394'	(6'0" - 6' 4")

Sample No.	Core No.		Depth
MFP 947	19	3545'	- 3562' (0'0" - 0' 4")
MFP 1119	19	3545'	- 3562' (10'0" - 10' 3")
MFP 1120	20	3649'	- 3664' (2'0" - 2' 4")
MFP 948	20	3649'	- 3664' (4'0" - 4' 4")
MFP 827	cuttings	3810'	
MFP 826	"	3812'	
MFP 825	"	3820'	
MFP 832	"	3824'	
MFP 831	"	3826'	
MFP 830	"	3830'	
MFP 829	"	3835'	
MFP 834	"	3840'	
MFP 833	"	3845'	
MFP 835	"	3849'	

Species Distribution and Stratigraphic Implications

The total ranges of microspores and microplankton which have been found in Ooroonoo No. 1 are displayed in the accompanying chart (Plate 2). Many new forms were observed in addition to published types but, at this stage, they are mentioned only where of apparent stratigraphic significance. Modification to ranges that might be falsely restricted by observation failure, particularly of species of low abundance, could result from further work. This applies particularly to results obtained from Cores 10, 14, 18, 19 and 20, in which the concentrations of micro-organisms were low. The lithological column in the chart was reduced from weekly drilling reports and is subdivided into the formations identified by the company geologist.

Stratigraphic conculsions based on the distribution chart are as follows:

Jurassic

Samples from Cores 18, 19 and 20 contained few specimens, but Callialasporites dampieri (33)* in these cores determines the age of strata between 3379 and 3664 feet as Jurassic. Abundant spores in a shale from Core No. 17 (3186 - 3196 feet) included C. dampieri and Cicatricosisporites cooksonii (41). C. dampieri was abundant to a degree matched only in the Upper Jurassic of Western Australia (Balme, 1957) and at certain levels in subsurface Blythesdale Group of the Roma area on the eastern margin of the Great Artesian Basin. C. cooksonii first appears at the top of subsurface Walloon Coal Measures of the Roma area, and Balme observed the species to range from the lower Callovian into the Lower Cretaceous. Core No. 17, therefore, is probably Upper Jurassic in age.

Permian spores were found by de Jersey (Appendix 2) in a coal at 3190 feet in Core No. 17. Subsequent processing in the Bureau of Mineral Resources of a coal fragment, nominally from two feet above the Jurassic shale of Core No. 17, also released Permian spores with no signs of intermixed Mesozoic forms. This assemblage is probably Upper Permian in age because of the presence of Apiculatisporis filiformis (100), Verrucosisporites trisectus (105), both of which are restricted to the Newcastle Coal Measures in the Sydney Basin (Balme & Hennelly, 1956), and of Quadrisporites horridus (111) which appears consistently at about the

* Species number in the distribution chart (Plate 2) and check list (Table 1)

transition from the Permian to the Triassic in eastern Queensland and New South Wales. It is thought that the coal fragment originally formed part of a Permian seam which was eroded and transported in Jurassic times.

Cretaceous

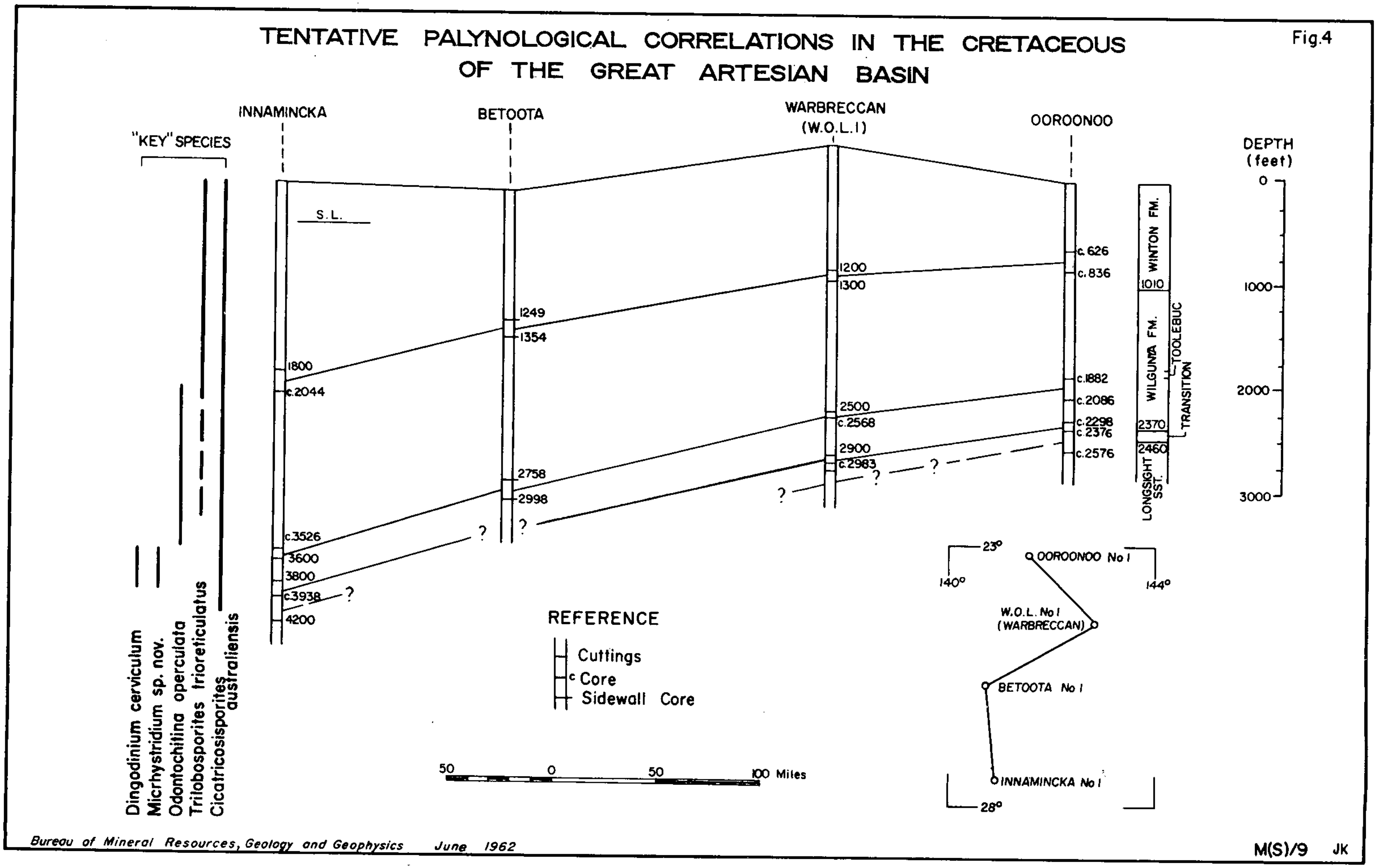
No sudden changes occurred in the spore sequence above Core No. 17 but microplankton persisted between Cores 4 and 12 (836 - 2308 feet) and marked the marine Cretaceous. Non-marine beds between Cores 13 and 16 (2376-2986 feet) must occupy positions within the Lower Cretaceous and the Upper Jurassic, but the horizon of the boundary between the systems cannot be determined precisely. However, Cicatricosisporites australiensis (62) has not yet been observed in proven Jurassic strata (Balme, 1957). It is confined in the Great Artesian Basin to the marine Cretaceous and occasionally some of the freshwater beds immediately below, so that, in accord with the published opinions of Balme (1957) and Cookson & Dettmann (1958), the boundary would lie between Cores 13 and 14 (2386 - 2576 feet).

Few spores have restricted ranges in the marine Cretaceous but the late appearance of Cingulatisporites euskirchensoides (82) and "Polypodiaceaesporites" sp. (83) may be stratigraphically significant. The latter species, a psilate monocolpate pollen, increased steadily in abundance throughout the Cretaceous of the well until it formed a major component of the assemblages above the marine beds. Trilobosporites trioreticulatus (88), Balmeisporites tridictyus (92) and the angiospermous Praecolpate sp. nov. (94) helped to distinguish an upper unit from those below.

The microplankton of Ooroonoo No. 1 vary both in abundance and assemblage composition. Core No. 9 (1882 - 1892 feet) contained the greatest variety of species and greatest percentage abundance of microplankton relative to spores of all samples examined and marked the acme of a rapid increase in abundance of microplankton from the base of the marine beds, which was followed by a more gradual decrease to higher levels. Cookson & Eisenack (1958, 1960a) have described species from isolated samples within the basin, few of which have been dated satisfactorily by other fossils. Nevertheless, the distribution of microplankton at Ooroonoo confirms the sequence suggested by those authors in many instances and additional work will make clear the stratigraphically useful species. For example, Dingodinium cerviculum (2) in Core No. 11 (2288 - 2298 feet) and Core No. 12 (2298 - 2308 feet) was described initially from the Aptian Muderong Shale of Western Australia and from a sample of the Roma Formation from Batavia Downs on the Cape York Peninsula. As this species is known from other test wells in the Great Artesian Basin, it is probably a reliable marker of a lower section of the marine Cretaceous. Likewise Odontochitina operculata (18) is widely distributed and has been recorded from both the Albian and Cenomanian of the Gearle Siltstone (Cookson & Eisenack, 1958). There are indications that species of the genus Odontochitina may provide useful markers of several stages of the Australian Cretaceous (Cookson & Eisenack, 1958; Evans, 1961b). Species of Diconodinium are also widespread in the marine Cretaceous and may be useful for subdivision of the Great Artesian Basin sequence.

Comparison with other Wells in the Great Artesian Basin

Palynological information from the Great Artesian Basin is available in varying detail from Innamincka No. 1, D.F.S. No. 1 (Betoota) and W.O.L. Nos 1, 2, and 3 (Warbreccan). Similarities between the succession in each of these wells and that in Ooroonoo No. 1 suggests a preliminary subsurface correlation of the Cretaceous System (Fig. 4).


TENTATIVE PALYNOLOGICAL CORRELATIONS IN THE CRETACEOUS
OF THE GREAT ARTESIAN BASIN
Fig.4
"KEY" SPECIES
INNAMINCKA
BETOOTA
WARBRECCAN
(W.O.L.1)
OOROONOO
DEPTH
(feet)
0
1000
2000
3000
S.L.
1800
c.2044
c.3526
3600
3800
c3938
4200
1249
1354
2758
2998
1200
1300
2500
c.2568
2900
c.2983
c.626
c.836
c.1882
c.2086
c.2298
c.2376
c.2576
WINTON FM.
1010
WILGUNYA FM.
TOOLEBUC
TRANSITION
2370
2460
LONGSIGHT SST.
Dingodinium cerviculum
Micrhystridium sp. nov.
Odontochitina operculata
Trilobosporites trioreticulatus
Cicatricosisporites australiensis
REFERENCE
Cuttings
Core
Sidewall Core
50
0
50
100 Miles
23°
28°
140°
144°
OOROONOO No I
W.O.L. No I
(WARBRECCAN)
BETOOTA No I
INNAMINCKA No I
Bureau of Mineral Resources, Geology and Geophysics June 1962
M(S)/9 JK

The most distinctive zone yet recognized is at the base of the marine Cretaceous. D. cerviculum, Micrhystridium sp. nov. (3) and Pseudoceratium tetracanthum (11) were noted to a height of 300 feet above the base of the marine beds in Innamincka No. 1, and about 400 feet above the same datum in W.O.L. No. 1 (Warbreccan), while Broomea micropoda (6) and Micrhystridium sp. nov. occurred about 250 feet above the same base in D.F.S. No. 1 (Betoota).

Firm subdivision of the remainder of the marine Cretaceous is not possible. It has a lower concentration of microplankton than the D. cerviculum beds and is characterized by the presence of Odontochitina operculata which is associated with the distinctive but rare Hystrichodinium cf. oligacanthum.

A third palynological unit lies above the highest point of occurrence of microplankton, but distinction between the upper marine and the overlying freshwater beds by spores alone awaits further analysis. Cingulatisporites euskirchensoides, Trilobosporites trioreticulatus and the megaspore Pyrobolospora reticulata (Belford, Appendix 2) are relatively common at about the point of disappearance of marine micro-organisms.

These subsurface horizons cannot be recognized in surface formations because of the severe weathering of outcrop. However, a sample from the lower Wilgunya Formation in the Netting Bore, Paton Downs Station, from no higher than 200 feet above the Longsight Sandstone (Reynolds, 1960, fig. 3) contained Pseudoceratium turneri (12), B. micropoda and D. cerviculum, i.e. an assemblage characteristic of the lower marine horizons of subsurface sections.

Problems of Age Determination

No adequate subdivision of the distribution of Australian Mesozoic microplankton and microspores is yet available in terms of the European time-scale. Only in Western Australia have certain assemblages been directly associated with other marine faunas: Oxfordian - Kimmeridgian microspores (Balme, 1957) and microplankton (Cookson & Eisenack, 1958, 1960b) were described from water bores at Broome in the Canning Basin, in which macrofaunas had also been discovered (Teichert, 1941). Balme and Cookson & Eisenack also described microfloras and microfaunas from subsurface Lower Cretaceous that had been dated primarily on associated foraminifera. Unfortunately no Australian Tithonian or Neocomian beds have yet been examined; only the section in Omati No. 1 Well, Papua, (Cookson & Eisenack, 1958) showed the distribution of microfossils from the Jurassic to the Cretaceous in one well sequence, but macrofossil control is lacking. The Great Artesian Basin is probably the only part of the continent where there is undoubtedly a continuously deposited section from the Jurassic into the Lower Cretaceous and, while difficulties in the application of European time divisions to this sequence remain, there is a case for the erection of palynological zones which would more completely serve the needs of stratigraphic well correlation in the basin. Until a zonal scale is established, the conventional stratigraphic names are used. It was thought by Whitehouse (1955, fig. 12) that the boundary between the Jurassic and the Cretaceous Systems occurs within the Blythesdale Group. Palynologically, this is a more suitable position for the boundary than that chosen arbitrarily by Tweedale (in Hill & Denmead, 1960, p.310) at the base of the Blythesdale Group. For the present, the boundary is chosen at the commencement of the Cicatricosisporites australiensis microflora.

The position of the boundary between the Aptian and Albian remains a problem. While the Roma and Tambo Formations contain distinctive molluscan assemblages (e.g. Dickins,

1960) neither they nor microfossils supply proof of the non-sequence between formations implied by Whitehouse (1955) who considered the Roma to be Aptian and the Tambo to be middle - upper Albian in age. Recognition of the same boundary from a palynological viewpoint must await more evidence; it may lie close to the boundary between the D. cerviculum and O. operculata beds.

The age of the Winton Formation in terms of the European time-scale cannot be obtained from evidence within the Great Artesian Basin. Previously a few plants had been found in the formation and it was not known how much, if any, of the Upper Cretaceous was represented by these beds. No Upper Cretaceous microspores have yet been described from Australia, but comparison of the Winton assemblages with microspores in Victoria (Evans, 1961b), associated with a sequence of Lower and Upper Cretaceous microplankton similar to that described from Western Australia (Cookson & Eisenack, 1960a), indicates that the Winton Formation is mostly Albian, but could be partly Cenomanian, in age.

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TABLE 1

SPECIES CHECK LIST

Microplankton	Chart No.
Aptea cf. polymorpha	10
Baltisphaeridium sp. nov.	23
B. spp.	5
Broomea micropoda	6
Ceratocystidiopsis ludbrooki	21
Chlamydophorella nyei	29
Cyclonephelium compactum	27
C. sp.	19
Cymatiosphaera sp. nov.	15
aff. Deflandrea rotundatum	22
aff. Deflandrea sp.	24
Diconodinium dispersa	30
D. multispina	7
D. sp. nov.	26
D. spp.	25
Dingodinium cerviculum	2
Hystrichodinium cf. oligacanthum	28
Hystrichosphaera ramosa	8
H. sp. nov.	9
Hystrichosphaeridium cf. anthophorum	4
H. complex	17
Micrhystridium sp. nov.	3
Odontochitina operculata	18
Oodnadattia tuberculata	16
Palaeoperidinium sp.	14
Pseudoceratium tetracanthum	11
P. turneri	12
P. sp. nov.	13
Pterospermopsis cf. australiensis	1
Veryhachium sp. nov.	20

Spores	
Aequitriradites spinulosus	81
A. verrucosus	59
Acanthotriletes cf. ericianus	101
Annulispora sp. nov. 1	36
A. sp. nov. 2	57
Apiculatisporis filiformis	100
A. levidensis	60
Apiculati sp. nov. 1	31
A. sp. nov. 2	46
A. sp. nov. 3	95

	Chart No.
Appendicisporites sp.	78
Araucariacites australis	74
Baculatisporites comaumensis	44
Balmeisporites tridictyus	92
aff. Balmeisporites sp.	97
Calamospora diversiformis	106
Callialasporites dampieri	33
Cicatricosisporites australiensis	62
C. cooksonii	41
C. sp.	98
Cingulatisporites cf. caminus	47
C. euskirchensoides	82
Cingulati sp. nov.	96
Classopollis torosus	43
Concavisporites juriensis	80
Cyathidites australis rimalis	64
Cyathidites spp. incl. C. minor	53
Dictyotosporites sp. nov.	67
Disaccites spp.	34
Divisisporites euskirchensis	56
Ginkocycadophytus sp.	85
Foveosporites canalis	89
F. sp.	65
Gleicheniidites circinidites	51
Granulatisporites cf. micronodosus	104
G. trisinus	103
Inaperturopollenites limbatus	38
I. cf. reidi	32
I. turbatus	37
I. sp. nov.	42
Ischyosporites punctatus	55
I. spp.	61
Leiotriletes directus	99
Leptolepidites verrucatus	50
Lycopodiumsporites austroclavatidites	40
L. austroclavatidites tenuis	72
L. cirolumenus	68
L. cf. rosewoodensis	48
L. sp.	90
L. spp.	35
Marsupipollenites fasciolatus	107
Megaspores spp.	86
Microcachryidites antarcticus	52
Murornati sp. nov. 1	45
M. sp. nov. 2	54
M. sp. nov. 3	75
Neoraistrickia ramosus	102

	Chart No.
N. truncatus	49
Nuskoisporites triangularis	108
Perotrilites striatus	73
P. sp. nov. 1	58
P. sp. nov. 2	91
Pilosisporites sp.	69
"Polypodiaceaesporites" sp.	83
Polypodiidites arcus	76
Praecolpate sp. nov.	94
Protosacculina multistriatus	110
Quadrisporites horridus	111
Reticulatisporites cf. pudens	70
Rugulatisporites sp.	39
Schizosporis reticulatus	77
Sphagnumsporites cf. adnatus	79
S. australis	63
S. clavus	84
S. cf. saevus	87
Styxisporites linearis	66
Trilobosporites trioreticulatus	88
Verrucosisporites trisectus	105
Vesicaspora ovatus	109
Vitreisporites pallidus	71
Zonati sp. nov.	93

APPENDIX 3

LIST AND INTERPRETATION OF ELECTRIC AND RADIOMETRIC LOGS

CONORADA OOROONOO NO. 1, QUEENSLAND

by

E.E. Jesson

Bureau of Mineral Resources

The logging of Conorada Ooroonoo No. 1 Well was done with a Failing 'Logmaster' owned and operated by Mines Administration Pty Ltd. The following logs were made:

Electric 16" and 63" normal resistivity, and self-potential logs

Run No. 1 - 1st August, 1960. 200 - 1786 feet (T.D. 1786 feet).
Run No. 2 - 21st August, 1960. 1650 - 3852 feet (T.D. 3852 feet).

Gamma Ray

Run No. 1 - 21st August, 1960. Total depth 3852 feet, but log run to 2110 feet only, because of the high temperature in the hole.

Comment on Logs

The outstanding feature of the resistivity logs is the strong resemblance and almost identical values of the 16" and 63" normal logs. This is to be expected on Run 1, because of the nature of the formations penetrated. In Run 2, however, the 16" and 63" normal logs would be expected to differ, the amount of the difference depending on the degree of invasion by the drilling mud and on the salinity of the formation water. It therefore seems probable that for Run 2, the 63" normal log is of no value because of instrumental faults. Presumably the relay that switches from 16" to 63" normal failed to operate.

The gamma ray log could probably have been improved by the use of higher sensitivity, longer time-constant, and slower logging speed.

Interpretation

The general appearance of the logs suggests that they may be divided into three distinct zones:

Zone 1 - 200 to 1010 ± 10 feet
Zone 2 - 1010 ± 10 to 2410 ± 50 feet
Zone 3 - 2410 ± 50 to 3852 feet (T.D.)

Zone 1 (Winton Formation)

The S.P. log indicates that this zone consists of alternating beds of shale and sandstone, the sandstone containing formation water with a salinity in excess of 5000 ppm. equivalent sodium chloride.

The low resistivity of the sandstone beds and general smoothness of the resistivity log suggest that the sandstone contains some shaly matrix. The flat and comparatively featureless appearance of the gamma ray log is attributed mainly to the presence of shale in the sandstone, but also to the low sensitivity at which the log was run.

Zone 2 (Wilgunya Formation)

Except between 1800 and 1850 feet, the log of this zone is remarkably featureless, as would be expected in a uniform shale formation.

Between 1800 and 1850 feet the electric logs show a permeable horizon which is identified from cuttings as limestone (Toolebuc Member). This limestone is unusual in being more radioactive than the adjacent shales, and for this reason it should be a useful marker bed.

Zone 3 (Longsight Sandstone)

Judging by the electric logs, the boundary between the Longsight Sandstone and Wilgunya Formation would probably be picked at about 2450 feet. The drilling results, on the other hand, suggest that the boundary may coincide with a slight change in resistivity at 2370 feet.

The logs of this zone show that the zone is predominantly sandstone. There are probably a few shale beds, however; for example, between 2950 and 3100 feet there is probably some shale.

The S.P. curve for this whole zone is 'reversed', showing that the formation water is less saline than a filtrate of the drilling mud. Calculations from the recorded values show that the salinity is about 200 ppm. equivalent sodium chloride, and the salinity appears to increase with depth below 3400 feet.

As the logs are incomplete it is not possible to give reliable estimates of the porosities of the sandstone beds. However, if it is assumed that the mud has invaded these beds deeply enough for the 16" normal log to show the resistivity of the invaded zone, then an estimate of porosity can be made. On this assumpption, the porosity of the sandstone beds is generally between 12 and 17 percent. Resistivity peaks like the one at 3370 feet may be due to a lower porosity, probably about 9 percent. If the invasion was not complete, so that the 16" normal log was not representative of the invaded zone, the true porosity is greater than the calculated porosity.

As the 63" normal resistivity log is unreliable, it is not possible to compute the water saturation of the rocks. However, this is probably 100 percent, because the well is off-structure and the Longsight Sandstone is the main aquifer in this part of the Great Artesian Basin.

For the salinity and porosity computations, the formation temperature was estimated by assuming a surface temperature of 75°F. and a temperature gradient of one degree per 28 feet, as given by Ogilvie (1955).

REFERENCE

OGILVIE, C., 1955 - The hydrology of the Queensland portion of the Great Australian Artesian Basin. Appendix H in Artesian Water Supplies in Queensland. Dep. Co-ord. Gen. Pub. Works, Qld Parl. Pap. A, 56-1955.

Plate I

CONORADA PETROLEUM CORPORATION

COMPOSITE WELL LOG

CONORADA OOROONOO No I

TENEMENT: A to P 75P   STATE: QUEENSLAND   BASIN: GREAT ARTESIAN

LOCATION	Lat. 23° 10' 50" S Long. 141° 33' 09" E
ELEVATION	Ground 400' A.S.L. Rotay Table 405' A.S.L.
TOTAL DEPTH	3852'
STATUS	Abandoned
SPUDDED	20 July 1960 ABANDONED 23 August 1960
DRILLED BY	Mines Administration Pty Ltd
DRILLING METHOD	Rotary
HOLE SIZE	12¼" to 210' 5⅝" to 3852'
CASING	Size 9⅝" Weight 40 lb/ft Grade J55 Set 205' Cement to Surface
CEMENT PLUGS	3075'-3025' 2350'-2300' 230-180' 20'-Surface

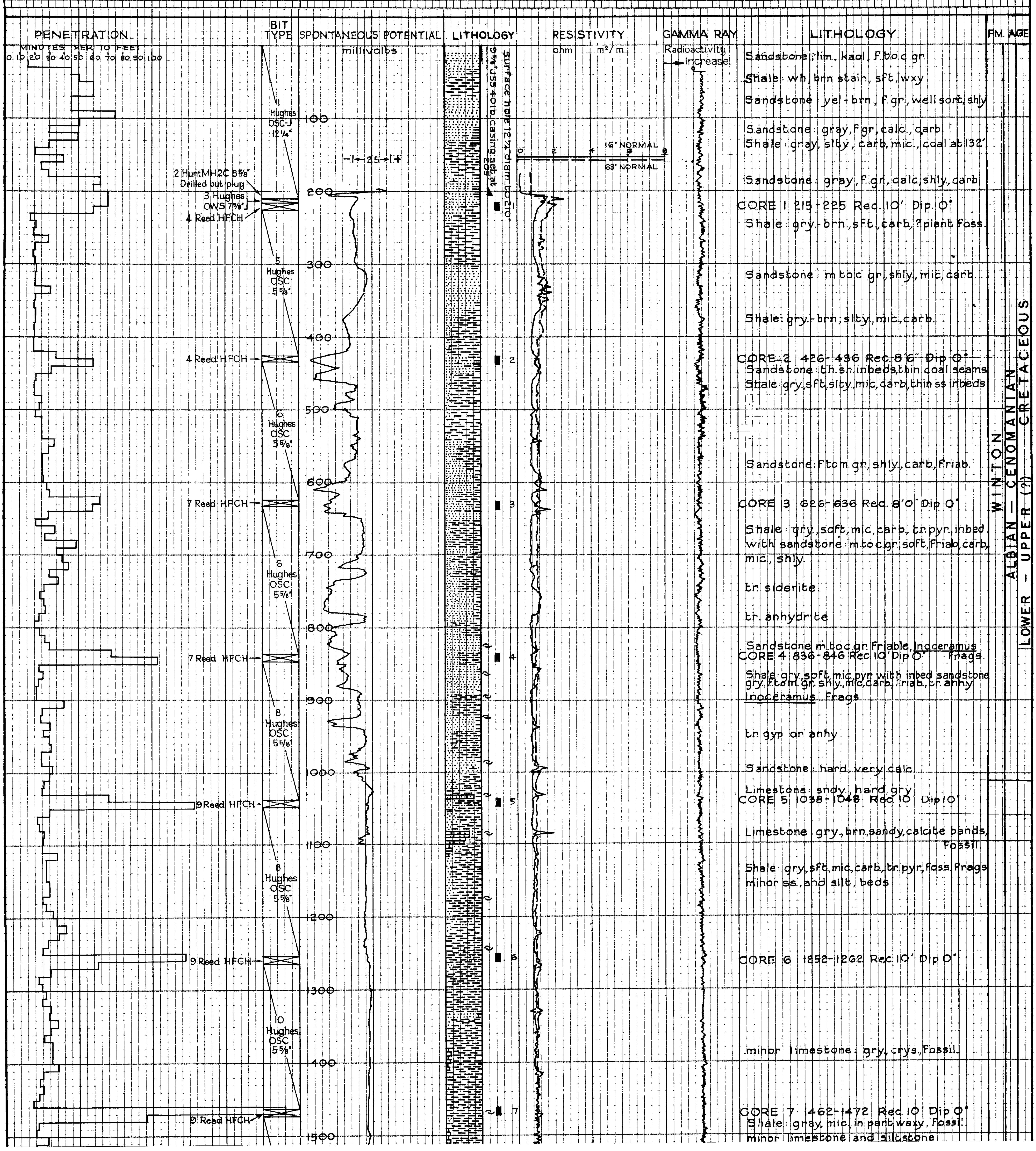
LOG DATA

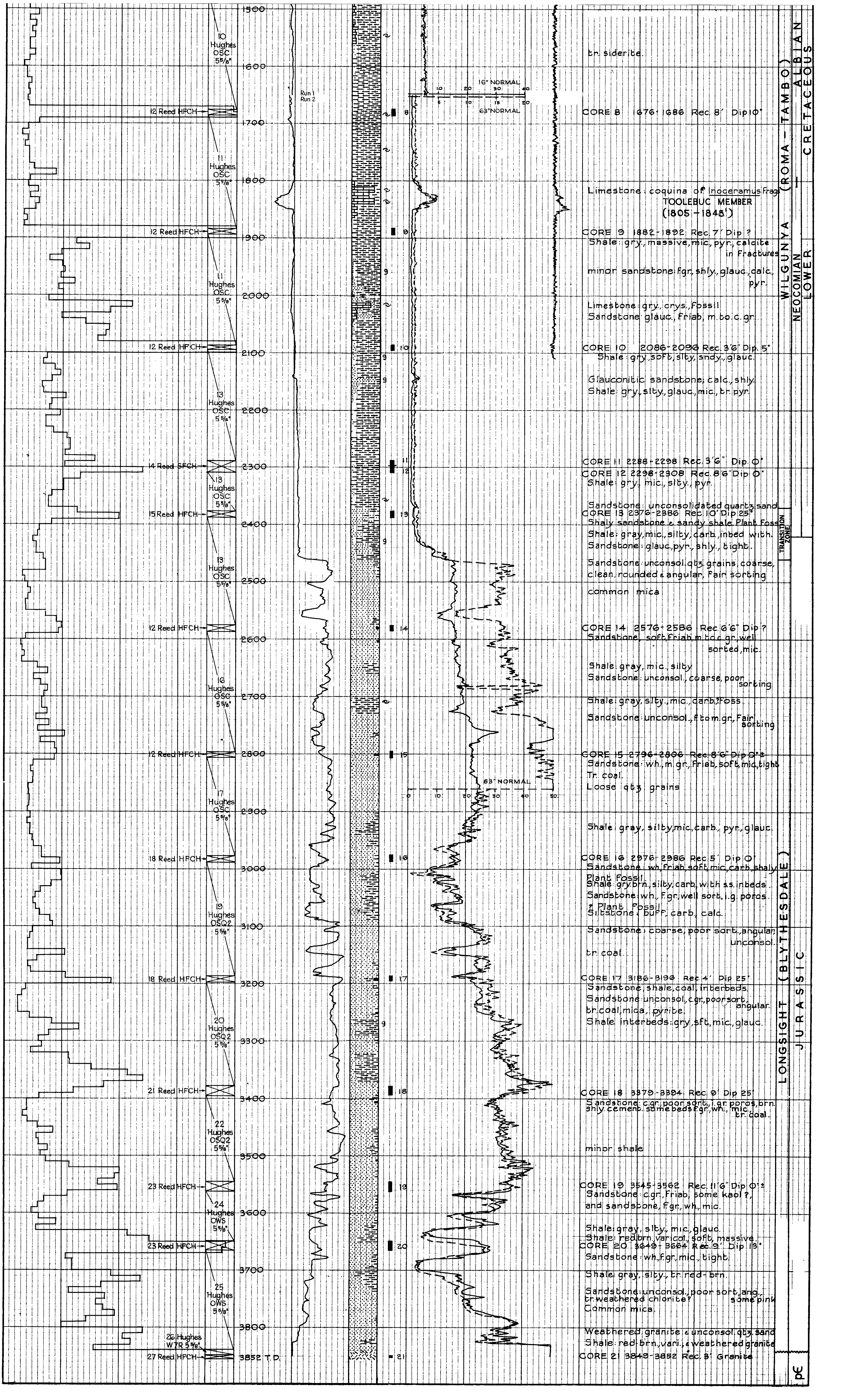
Logging: Mines Administration Pty Ltd.

Type	Electric	Electric	Gamma Ray
Run No	1	2	1
Date	1 Aug 60	21 Aug 60	21 Aug 60
Interval Recorded	1786 – 200'	3852 – 1650'	2110 – 40'
Total Depth (Driller)	1786'	3852'	3852'
(Log)	1790'	3851'	—
Casing Shoe (Driller)	205'	205'	205'
(Log)	202'	202'	—
Casing Size	9⅝"	9⅝"	9⅝"
Hole Size	5⅝"	5⅝"	5⅝"
Mud Type	Bentonite	Bentonite	Bentonite
Mud Resistivity	2·1 @ 54°F	2·1 @ 54°F	2·1 @ 54°F
Logging Speed	—	—	Approx. 40'/min
Max. Temp.	—	—	140°F

REFERENCE

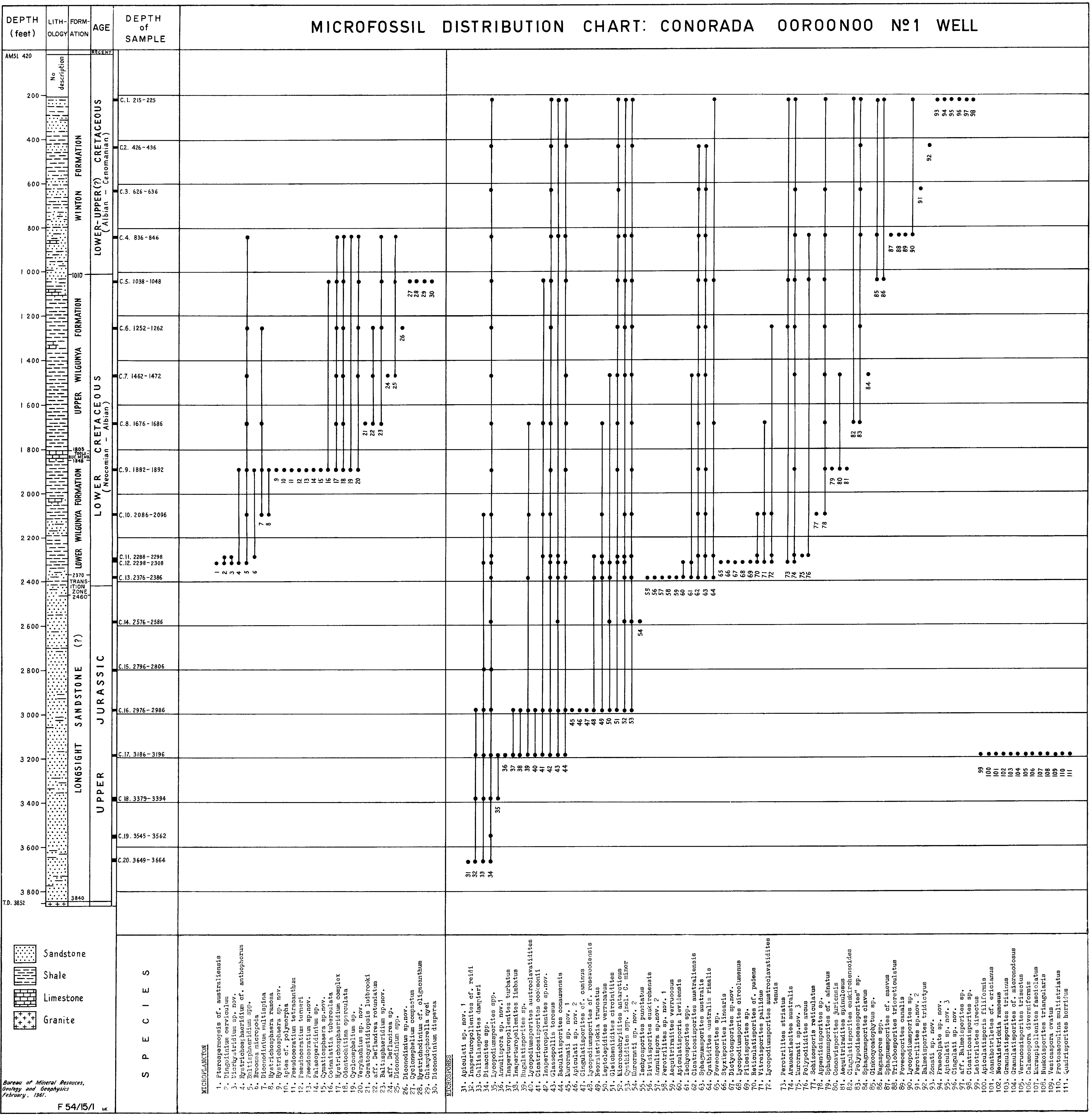
- Casing Shoe
- 2 Core interval and number
- ~ Macrofossils
- g Glauconite
- Sandstone
- Siltstone
- Sandy Shale
- Shale
- Calcareous Shale
- Limestone
- Sandy Limestone
- Granite





10 Hughes OSC 5⅝"
12 Reed HFCH
11 Hughes OSC 5⅝"
12 Reed HFCH
11 Hughes OSC 5⅝"
12 Reed HFCH
13 Hughes OSC 5⅝"
14 Reed SFCH
13 Hughes OSC 5⅝"
15 Reed HFCH
13 Hughes OSC 5⅝"
12 Reed HFCH
16 Hughes OSC 5⅝"
12 Reed HFCH
17 Hughes OSC 5⅝"
18 Reed HFCH
19 Hughes OSQ2 5⅝"
18 Reed HFCH
20 Hughes OSQ2 5⅝"
21 Reed HFCH
22 Hughes OSQ2 5⅝"
23 Reed HFCH
24 Hughes OWS 5⅝"
23 Reed HFCH
25 Hughes OWS 5⅝"
26 Hughes W7R 5⅝"
27 Reed HFCH
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3852 T.D.
Run 1
Run 2
16" NORMAL
10 20 30 40
5 10 15 20
63" NORMAL
63" NORMAL
0 10 20 30 40 50
tr. siderite.
CORE 8 1676-1686 Rec. 8' Dip 10°
Limestone: coquina of Inoceramus frags
TOOLEBUC MEMBER
(1805'-1848')
CORE 9 1882-1892 Rec. 7' Dip ?
Shale: gry., massive, mic, pyr., calcite in Fractures
minor sandstone: f.gr, shly., glauc., calc., pyr.
Limestone: gry., crys., Fossil
Sandstone: glauc., Friab, m. to c. gr.
CORE 10 2086-2096 Rec. 3'6" Dip 5°
Shale: gry., soft, silty, sndy., glauc.
Glauconitic sandstone; calc., shly.
Shale: gry., silty, glauc., mic., tr. pyr.
CORE 11 2288-2298 Rec. 3'6" Dip 0°
CORE 12 2298-2308 Rec. 8'6" Dip 0°
Shale: gry., mic., silty, pyr.
Sandstone: unconsolidated quartz sand
CORE 13 2376-2386 Rec. 10' Dip 25°
Shaly sandstone & sandy shale Plant Foss.
Shale: gray, mic., silty, carb., inbed with.
Sandstone: glauc, pyr., shly., tight.
Sandstone: unconsol. qtz. grains, coarse, clean, rounded & angular, Fair sorting
common mica
CORE 14 2576-2586 Rec. 6'6" Dip ?
Sandstone: soft, Friab, m. to c. gr., well sorted, mic.
Shale: gray, mic., silty
Sandstone: unconsol., coarse, poor sorting
Shale: gray, slty., mic., carb., Foss.
Sandstone: unconsol., f. to m. gr., Fair sorting
CORE 15 2796-2806 Rec. 8'6" Dip 0°±
Sandstone: wh., m. gr., Friab, soft, mic., tight
Tr. coal.
Loose qtz. grains
Shale: gray, silty, mic., carb., pyr., glauc.
CORE 16 2976-2986 Rec. 5' Dip 0°
Sandstone: wh., friab., soft, mic., carb., shaly
Plant Fossil
Shale: gry. brn., silty, carb., with ss. inbeds.
Sandstone: wh., F. gr., well sort, i.g. poros.
? Plant Fossil
Siltstone: buff, carb., calc.
Sandstone: coarse, poor sort, angular, unconsol.
tr. coal.
CORE 17 3186-3196 Rec. 4' Dip 25°
Sandstone, shale, coal, interbeds.
Sandstone: unconsol, c. gr., poor sort, angular.
tr. coal, mica, pyrite.
Shale interbeds: gry., sft., mic., glauc.
CORE 18 3379-3394 Rec. 9' Dip 25°
Sandstone: c. gr., poor sort, i. gr. poros, brn. shly. cement, some beds f. gr., wh., mic. tr. coal.
minor shale
CORE 19 3545-3562 Rec. 11'6" Dip 0°±
Sandstone: c. gr., Friab, some kaol ?, and sandstone, f. gr., wh., mic.
Shale: gray, silty, mic., glauc.
Shale: red-brn., varicol., soft, massive.
CORE 20 3649-3664 Rec. 9' Dip 13°
Sandstone: wh., f. gr., mic., tight.
Shale: gray, silty, tr. red-brn.
Sandstone: unconsol., poor sort, ang., tr. weathered chlorite? some pink
Common mica.
Weathered granite & unconsol. qtz. sand
Shale: red-brn., vari., & weathered granite
CORE 21 3849-3852 Rec. 3' Granite
TRANSITION ZONE
WILGUNYA (ROMA - TAMBO)
LONGSIGHT (BLYTHESDALE)
NEOCOMIAN
ALBIAN
LOWER
CRETACEOUS
JURASSIC
pЄ

Plate 2


MICROFOSSIL DISTRIBUTION CHART: CONORADA OOROONOO No. 1 WELL
DEPTH (feet)
LITHOLOGY
FORMATION
AGE
DEPTH of SAMPLE
Sandstone
Shale
Limestone
Granite
SPECIES
MICROPLANKTON
1. Pterospermopsis cf. australiensis
2. Dingodinium cerviculum
3. Micrhystridium sp. nov.
4. Hystrichosphaeridium cf. anthophorum
5. Baltisphaeridium spp.
6. Broomea micropoda
7. Diconodinium multispina
8. Hystrichosphaera ramosa
9. Hystrichosphaera sp. nov.
10. Aptea cf. polymorpha
11. Pseudoceratium tetracanthum
12. Pseudoceratium turneri
13. Pseudoceratium sp.nov.
14. Palaeoperidinium sp.
15. Cymatiosphaera sp.nov.
16. Coinalattia tuberculata
17. Hystrichosphaeridium complex
18. Odontochitina operculata
19. Cyclonephelium sp.
20. Veryhachium sp. nov.
21. Ceratocystidiopsis ludbrooki
22. aff. Deflandrea rotundatum
23. Baltisphaeridium sp.nov.
24. aff. Deflandrea sp.
25. Diconodinium spp.
26. Diconodinium sp.nov.
27. Cyclonephelium compactum
28. Hystrichodinium cf. oligacanthum
29. Chlamydophorella nyei
30. Diconodinium dispersa
MICROSPORES
31. Apiculati sp. nov. 1
32. Inaperturopollenites cf. reidi
33. Callialasporites dampieri
34. Disaccites spp.
35. Lycopodiumsporites spp.
36. Annulispora sp. nov.1
37. Inaperturopollenites turbatus
38. Inaperturopollenites limbatus
39. Rugulatisporites sp.
40. Lycopodiumsporites austroclavatidites
41. Cicatricosisporites cooksonii
42. Inaperturopollenites sp.nov.
43. Glassopollis torosus
44. Baculatisporites comaumensis
45. Murornati sp. nov. 1
46. Apiculati sp. nov. 2
47. Cingulatisporites cf. caminus
48. Lycopodiumsporites cf. rosewoodensis
49. Neoraistrickia truncatus
50. Leptolepidites verrucatus
51. Gleicheniidites circinidites
52. Microcachryidites antarcticus
53. Cyathidites spp. incl. C. minor
54. Murornati sp. nov. 2
55. Ischyosporites punctatus
56. Divisisporites euskirchensis
57. Annulispora sp.nov. 2
58. Perotrilites sp. nov. 1
59. Aequitriradites verrucosus
60. Apiculatisporis levidensis
61. Ischyosporites spp.
62. Cicatricosisporites australiensis
63. Sphagnumsporites australis
64. Cyathidites australis rimalis
65. Foveosporites sp.
66. Styxisporites linearis
67. Dictyotosporites sp.nov.
68. Lycopodiumsporites circolumenus
69. Pilosisporites sp.
70. Reticulatisporites cf. pudens
71. Vitreisporites pallidus
72. Lycopodiumsporites austroclavatidites tenuis
73. Perotrilites striatus
74. Araucariacites australis
75. Murornati sp.nov. 3
76. Polypodiidites arcus
77. Schizosporis reticulatus
78. Appendicisporites sp.
79. Sphagnumsporites cf. adnatus
80. Concavisporites juriensis
81. Aequitriradites spinulosus
82. Cingulatisporites euskirchensoides
83. "Polypodiaceaesporites" sp.
84. Sphagnumsporites clavus
85. Ginkocycadophytus sp.
86. Megaspores spp.
87. Sphagnumsporites cf. saevus
88. Trilobosporites trioreticulatus
89. Foveosporites canalis
90. Lycopodiumsporites sp.
91. Perotrilites sp.nov. 2
92. Balmeisporites tridictyus
93. Zonati sp. nov.
94. Praecolpate sp. nov.
95. Apiculati sp. nov. 3
96. Cingulati sp. nov.
97. aff. Balmeisporites sp.
98. Cicatricosisporites sp.
99. Leiotriletes directus
100. Apiculatisporis filiformis
101. Acanthotriletes cf. ericianus
102. Neoraistrickia ramosus
103. Granulatisporites trisinus
104. Granulatisporites cf. micronodosus
105. Verrucosisporites trisectus
106. Calamospora diversiformis
107. Marsupipollenites fasciolatus
108. Nuskoisporites triangularis
109. Vesicaspora ovatus
110. Protosacculina multistriatus
111. Quadrisporites horridus
Bureau of Mineral Resources, Geology and Geophysics February, 1961.
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