COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Petroleum Search Subsidy Acts

PUBLICATION No. 51

A. A. O. Combarngo No. 1, Queensland

OF

ASSOCIATED AUSTRALIAN OILFIELDS N.L.

Issued under the Authority of the Hon. David Fairbairn
Minister for National Development

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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

MINISTER: THE HON. DAVID FAIRBAIRN, D.F.C., M.P.

SECRETARY: SIR HAROLD RAGGATT, C.B.E.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

DIRECTOR: J. M. RAYNER

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ASSISTANT DIRECTOR: M. A. CONDON

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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.

A.A.O. Combarngo No. 1 was drilled under the Petroleum Search Subsidy Act 1959, in Authority to Prospect 55P, Queensland. The well was located at latitude 26°51' S., longitude 149°09' E., about 30 miles south-east of Roma and was drilled for Associated Australian Oilfields N.L., by Mines Administration Pty Limited of Brisbane, using a National Ideal 55 drilling rig.

This Publication deals with the results of this drilling operation, and contains information furnished by Associated Australian Oilfields N.L., and edited in the Petroleum Exploration Branch of the Bureau of Mineral Resources. The final report was written by Mines Administration Pty Limited. The methods employed in the drilling operation and the results obtained are presented in detail.

J.M. RAYNER
Director

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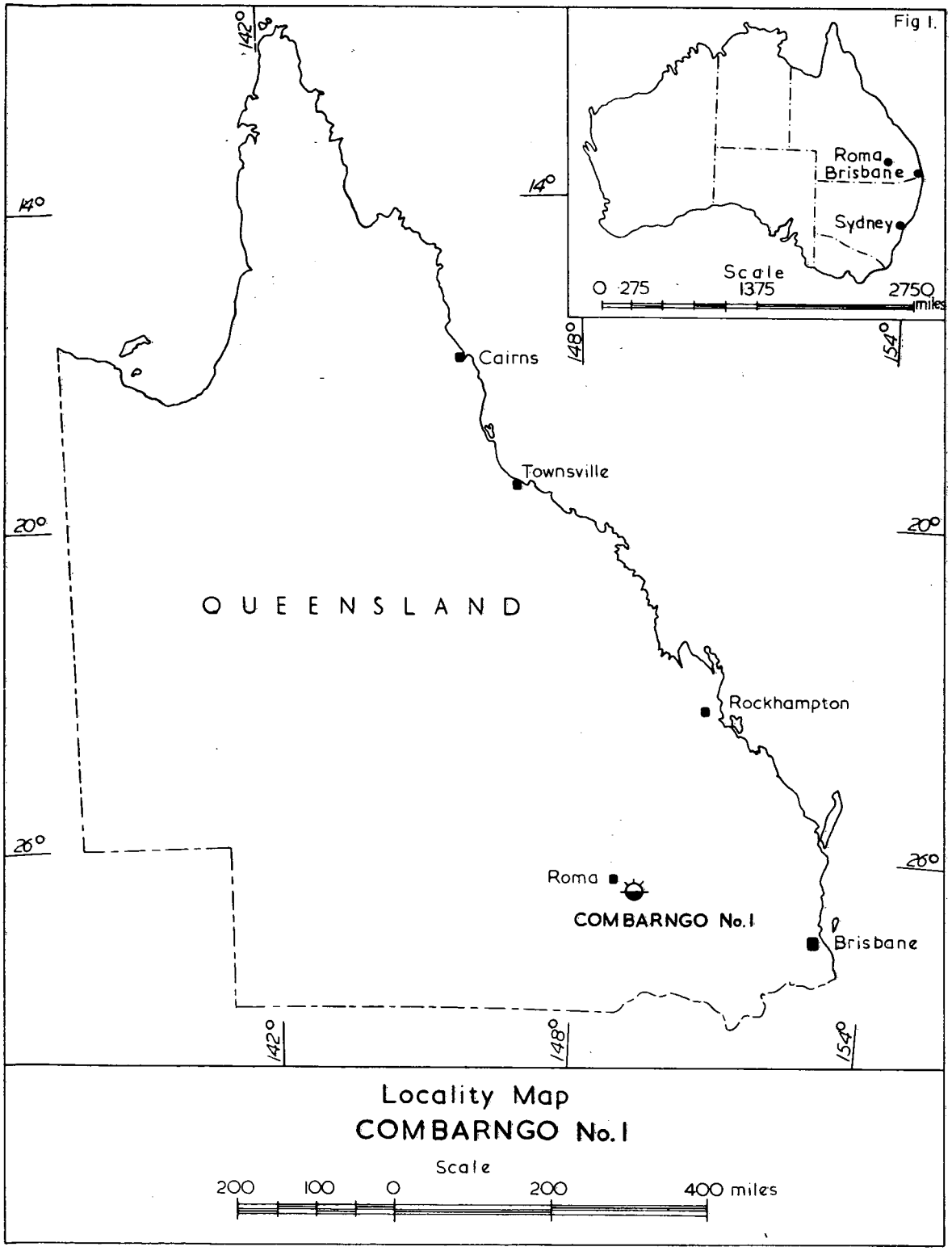

Locality Map

COMBARNGO No.1

Scale

200 100 0 200 400 miles

SUMMARY

A.A.O. Combarngo No. 1 Well was drilled by Associated Australian Oilfields N.L. on a broad seismic "high" at Combarngo, approximately 30 miles south-east of Roma, Queensland. Drilling was commenced on 5th May, 1961, and was completed on 10th June, 1961, at a total depth of 5985 feet. The drilling contractor was Mines Administration Pty Limited, and the rig used was a National Ideal 55. A full programme of logging, testing, and coring was undertaken.

The well penetrated Mesozoic sediments to 5315 feet, Permian sediments from 5315 to 5628 feet, and a volcanic section of unknown age from 5628 feet to total depth. Significant, though small, quantities of a high gravity oil were produced with saline water from the basal Mesozoic sands. Four barrels of 52° API gravity oil were recovered in a drill stem test on the Showground Sandstone. Five formation tests were run, the results of which are summarized in Appendix 7.

After testing, the well was plugged and abandoned; it was subsequently developed as a water bore producing from the Blythesdale Formation.

INTRODUCTION

A.A.O. Combarngo No. 1 Well was drilled for the following reasons:

(i) To investigate the oil potential and facies variation of the basal Mesozoic section;

(ii) To investigate the Latemore Formation and to ascertain if a thickening noted at A.A.O. Pickanjinnie No. 2 persists basinwards; and

(iii) To investigate basement.

The well was situated on a broad seismic "high", having an area of closure of about three square miles, approximately 16 1/2 miles south of A.A.O. Pickanjinnie No. 2.

WELL HISTORY

General Data

Well name and number:	A.A.O. Combarngo No. 1
Location: (co-ordinates):	Latitude 26°51' S; Longitude 149°09' E.
(map reference):	198666, No. 1509, Roma 4-mile Sheet
Name and address of Tenement Holder:	Associated Australian Oilfields N.L., 31 Charlotte Street, Brisbane, Queensland
Details of Petroleum Tenement:	Authority to Prospect 55P, Queensland
District:	Roma, Queensland
Total Depth:	5985 feet
Date drilling commenced:	5th May, 1961
Date drilling completed:	10th June, 1961
Date well abandoned:	9th July, 1961
Date rig released:	16th July, 1961
Drilling time in days to total depth:	37
Elevation (ground) :	918 feet
Elevation (rotary table) :	930 feet (datum for depths)

Status:	Plugged and abandoned; (subsequently completed as a water bore producing from the Blythesdale)
Cost:	£68,585

Drilling Data

Name and address of drilling contractor:	Mines Administration Pty Limited, 31 Charlotte Street, Brisbane, Queensland	
Drilling Plant:		
Make:	National Ideal	
Type:	55	
Rated capacity with 4 1/2" drill pipe:	12,000 feet	
Rated capacity with 3 1/2" drill pipe:	12,000 feet plus	
Motors:		
Make:	General Motors Diesel	
Type:	12107	
B.H.P.:	960	
Drive:	CHS-3 compound	
Mast:		
Make:	Lee C. Moore	
Type:	131-foot cantilever	
Rated capacity:	550,000 lb.	
Pumps: (2)		
Make:	Ideal	
Type:	C-350	
Size:	7 3/4" x 18"	
Motors:	Driven from main compound	
Blowout preventer equipment:		
Make:	Hydril	Shaffer
Size:	12"	12"
Series (A.P.I.):	900	900
Hole sizes and depths:	17 1/2" to 312 feet 8 1/2" to 5985 feet	

Casing details:

Size (in.)	Weight (lb./ft)	Grade	Range	Setting Depth (feet)
13 3/8	48	H-40	2	306
6 5/8	20	J-55	2	5125

Casing cementing details:

Size (in.)	Setting Depth (feet)	No. of Sacks Cement	Cemented to	Method
13 3/8	306	182	Surface	Plug
6 5/8	5125	144	4400'	Plug

Drilling fluid:

Type: Clay base

Average S.G.: 1.25

Treatment: Initial weight and viscosity control by water. Later viscosity and fluid loss control by caustic/myrtan.

Average weekly analysis:

S.G.	1.25
Viscosity	40 secs (Marsh)
Filtrate	8 cc
Cake	2 mm
pH	9
Sand	3%
Gel (int.)	0 g. (A.P.I.)
Gel (10m)	5 g. (A.P.I.)

Water supply: Water was pumped from a bore 5 1/2 miles from the site

Perforation and shooting record:

Casing:

Interval:	5076-5077 1/2'	5082-5083 1/2'	5076-5077 1/2'
Holes per foot:	4	4	4
Size of holes:	1/2"	1/2"	1/2"
Method used:	Schlumberger Jets	Schlumberger Jets	Schlumberger Jets

Open hole: Nil

Plugging back and squeeze cementation jobs:

Length and type of plug: 150 feet (5150-5300 feet)

Number of sacks: 154

Method: Conventional displacement

Tested: Yes - top at 5100 feet, drilled to 5150 feet

Length and type of plug: Squeeze job on perforations - 5076-5077 1/2 feet and 5082-5083 1/2 feet

Number of sacks: 14

Method: Set packer between perforations, circulated cement around outside of casing, pulled packer, reset packer above top perforations, squeezed 10 cubic feet cement to perforations, held 700 p.s.i. for 35 minutes.

Tested: Yes – by D.S.T. No. 5

Length and type of plug:	100 feet (4987-5087 feet)
Number of sacks:	14
Method:	Conventional displacement
Tested:	No
Length and type of plug:	20 feet (4290-4310 feet)
Number of sacks:	3
Method:	Spot and squeeze
Tested:	No
Length and type of plug:	20 feet (3990-4010 feet)
Number of sacks:	3
Method:	Spot and squeeze
Tested:	No
Length and type of plug:	20 feet (3490-3510 feet)
Number of sacks:	3
Method:	Spot and squeeze
Tested:	No
Length and type of plug:	20 feet (1990-2010 feet)
Number of sacks:	3
Method:	Spot and squeeze
Tested:	No
Length and type of plug:	40 feet (1842-1882 feet)
Number of sacks:	12
Method:	Spot and squeeze
Tested:	Yes

Fishing operations:

Depth:	5833 feet
Nature of job:	Junk basket and magnet
Equipment left in hole:	2 bit cones and bearings
Successful:	Yes

Side-tracked hole: None

Logging and Testing

Ditch cuttings:

Method of sampling: Grab samples from shaker - washed, dried, stored in labelled polythene bags.

Interval: 10 feet from surface to 5985 feet

Coring:

Original programme: One core in the Hospital Hill, Links, and Showground Sandstones, one core below the Links Sandstone, and below the Showground Sandstone, thereafter at intervals of not more than 200 feet.

Programme executed: The Hospital Hill and Links Sandstones were not typically developed, and were not cored; otherwise, the programme was carried out.

Total number of cores cut: 10
Footage cored: 93 1/2 feet
Recovery: 74 percent
Equipment used: Hughes "J" Type core barrel, 7 5/8" O.D., cutting a 3-9/16" core

Core No.	Interval (feet)	Recovery (feet)	Percentage
1	4920-4930	9.0	90
2	4930-4940	10.0	100
3	5089-5109	12.5	62
4	5178-5188	9.25	92
5	5350-5360	7.6	76
6	5489-5494	4.5	90
7	5626-5644	8.5	47
8	5785-5788	3.0	100
9	5898-5901.5	3.5	100
10	5945-5949	1.25	31
	Cored 93.5 feet	69.10	74

Sidewall sampling:

Method: Schlumberger

Depth (feet)	Recovery (percent)	Depth (feet)	Recovery (percent)
600	Nil	4534	70
693	100	4563	100
800	100	4600	75
900	100	4660	25
925	100	4680	70
950	100	4710	70
980	100	4740	70
1010	70	4800	50
1090	100	4852	30
1100	100	4872	100
1110	100	5030	35
2250	100	5050	70
2350	100	5070	50
2450	85	5075	70
2550	50	5076	35
2630	85	5076.5	50
2750	Nil	5077	70
2840	100	5077.5	50

Method: Schlumberger (Cont'd)

Depth (feet)	Recovery (percent)	Depth (feet)	Recovery (percent)
2950	70	5078	35
3050	70	5078.5	50
3150	70	5079	35
3260	50	5079.5	50
3350	50	5080	50
3450	70	5080.5	50
3550	75	5081	25
3650	75	5081.5	25
4450	100	5082	70
4487	75		

Electric and other logging:

Electric Log:	306-5986 feet (4 runs)
Laterolog:	4650-5093 feet (1 run)
Microlog/Micro-caliper:	4150-5630 feet (3 runs - not continuous)
Section Gauge:	306-5300 feet (1 run)
Gamma Ray Log:	30-5119 feet (3 runs)

Drilling time and gas log:

Drilling time log: Computed from time to drill 10 feet, the average being plotted as minutes per 5 feet for that interval.

Gas log: 306-5985 feet. A continuous record, using a Rotary Engineering Company 2-bridge detector.

Copies of all logs listed above are available for inspection at the Bureau of Mineral Resources, Canberra.

Formation testing: Five formation tests were made of sands in the Moolayember, Pickanjinnie and Latemore Formations. Details of the tests are given in Appendix 7.

Deviation surveys: Five drift readings were recorded using Totco Drift Indicator.

Depth (feet)	Deviation from Vertical (degrees)
1000	1 1/2
2000	1/2
3000	1
4000	3/4
4978	3/4

Temperature survey:	2350-5126 feet (1 run)
Results:	Run to locate cement top behind casing; this was located at 4400 feet.
Other well surveys:	Velocity survey, upwards from T.D. (see Appendix 8).

GEOLOGY

Summary of previous work[1]

Geological:

The Cretaceous Roma Formation crops out very poorly in the area. In the late 1920's and early 1930's surface geological mapping was carried out. However, because of poor outcrop, no structural mapping was possible.

The results obtained from the drilling of the A.A.O. Pickanjinnie Nos 1 and 2, Latemore No. 1 and Latemore East No. 1 wells, when related by velocity surveys at Pickanjinnie No. 1 and Latemore East No. 1 to the reflection seismic surveys, have led to some prior understanding of the subsurface geology in the Combarngo area.

Briefly, it was predicted that the normal Roma Mesozoic sequence would be penetrated to 5450 feet, that the Permian Latemore Formation would be penetrated to 6000 feet, and that the Combarngo No. 1 Well would bottom in the Timbury Hills Formation.

Geophysical:

The location of the well was based on a reflection seismic survey carried out in early 1961. This showed a broad, low amplitude structure at the Zone B horizon (within the Moolayember Formation). This structure had a vertical closure of 60 feet over an area of about three square miles. The well was situated at the highest point on this structure.

The three reflection zones in the Pickanjinnie area (A, in the Walloon; B, in the Moolayember and C, top of the Latemore) were also mapped in the Combarngo area. In the Combarngo area, as in the Pickanjinnie area, there are no valid reflections which can be tied to the Timbury Hills Formation.

The regional seismic pattern shows that the Combarngo structure has been developed just east of the hinge line between the Pickanjinnie Shelf and the Surat Basin. This position was considered to be favourably situated to trap any up-dip migration from the Surat Basin.

Drilling:

Approximately sixty wells have been drilled in the Roma area. Six are gas or potential gas producers. The majority of wells have been drilled off-structure, but it is

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(1) Footnote by Bureau of Mineral Resources:
The Well Completion Report on A.A.O. Combarngo No. 1, Report No. Q/55P/99, was written in November, 1961.

suspected that inappropriate drilling and completion techniques were responsible for some of the poor results obtained from the few on-structure wells.

Stratigraphy

The stratigraphic sequence penetrated in the well is set out below. Although the terms "Walloon Coal Measures", "Bundamba Group", and "Moolayember Formation" have been used, evidence from this and other wells recently drilled in the area, together with evidence from outcrops in the type areas suggest that a re-definition of the Lower Mesozoic units will be necessary. However, the evidence is still not strong enough to give clear cut definitions and in order to avoid confusion, formal proposals have been postponed.

The section encountered in Combarngo No. 1 is fairly similar to that in the majority of the Roma wells. The table below shows the depth intervals (datum R.T., 12 feet above ground level) of the stratigraphic units encountered in A.A.O. Combarngo No. 1.

Age	Formation	Depth Intervals (feet)	Thickness (feet)
Lower Cretaceous	Roma Formation	12- 965	953+
Lower Cretaceous-Jurassic	Blythesdale Formation (Transition Member	965-1283	318
	(Mooga Member	1283-1425	142
	(Fossil wood Member	1425-1891	466
	(Gubberamunda Member	1891-2216	325
Jurassic	Walloon Coal Measures	2216-3710	1494
Jurassic	Bundamba Group	3710-4350	640
Triassic	Moolayember Formation	4350-5086	736
Triassic	Pickanjinnie Formation	5086-5315	229
Permian	Latemore Formation	5315-5628	313
?	Volcanics	5628-5985	357+

The targets for the drilling operation were the basal sandstone members of the Moolayember Formation.(2) They were encountered at the following depths:

Member	Depth Intervals (feet)	Thickness (feet)
Hospital Hill Sandstone) Links Sandstone)	4714-4731	17
Showground Sandstone	5078-5086	8

(2) Footnote by Bureau of Mineral Resources:

The names Showground Sandstone, Links Sandstone and Hospital Hill Sandstone have been published on several occasions, but have never been formally defined as required by the Australian Code of Stratigraphic Nomenclature. These units are zones of economic interest within the Moolayember Formation. Their present status is covered by article 4 (f) of the American Code of Stratigraphic Nomenclature: "Aquifers, oil sands, coal beds, and quarry layers are examples of informal units even though named". Future work may show that these units can, in fact, be formally defined as members of the Moolayember Formation, in the sense of the Australian Code of Stratigraphic Nomenclature.

Formation Descriptions:

Roma Formation (Lower Cretaceous): 12 to 965 feet (953 feet +)

Lithology:

This unit is made up of interbeds of white, medium-grained, kaolinitic, quartzose sandstone; grey-green and white, fine to very fine-grained, silty, argillaceous, glauconitic, quartzose sandstone; light grey, medium-grained, tight, silty, carbonaceous, quartzose sandstone; white, medium-grained, friable, quartzose sandstone; grey to yellow kaolinitic, sandy siltstone; grey and grey-brown, carbonaceous, micaceous, sandy, slightly calcareous siltstone; grey, sandy mudstone; grey, silty, calcareous mudstone; dark grey, micaceous, pyritic, in part calcareous shale; rare coal.

Palaeontology:

No macrofossils were found in this unit, but microfossils have been found in some sidewall cores.

Electrical Characteristics:

No electrical logs were run to 306 feet, the surface casing shoe. Below this depth, the S.P. and resistivity curves all have relatively low amplitudes and illustrate the interbedded, though generally argillaceous nature of the unit.

Petroleum Manifestations:

None.

Blythesdale Formation (Lower Cretaceous-Jurassic): 965 to 2216 feet (1251 feet)

The Blythesdale Formation may be subdivided into four members :

	Thickness (feet)
Transition Member	318
Mooga Member	142
Fossil wood Member	466
Gubberamunda Member	325

The above subdivision has been possible from a study of the electric logs, but because of the normal bad contamination resulting from fast drilling, it cannot be made from the cuttings. Similarly, it is not possible to distinguish the base of the overlying Roma Formation from cuttings examination. Hence, only a blanket lithological description of the Blythesdale Formation can be given.

Lithology:

The formation is composed mainly of light grey to white, fine, medium and coarse-grained, partly calcareous and kaolinitic, but mainly friable and porous quartzose sandstone. There are minor interbeds of grey, carbonaceous, micaceous, quartzose siltstone, and dark grey to black, in part carbonaceous shale grading to coal.

A.A.O.
PICKANJINNIE No. 1

A.A.O.
COMBARNGO No. 1

Section Penetrated

Section Predicted

— + 1000

— MSL

— -1000

— -2000

— -3000

— -4000

— -5000

Roma Formation

Transition Member

Mooga Member

Fossilwood Member

Blythesdale Formation

Gubberamunda Member

Walloon Coal Measures

Bundamba Group

Hospital Hill Sandstone

Moolayember Formation

Showground Sandstone

Pickanjinnie Formation

Timbury Hills Formation

Latemore Formation

? ? ? ? ? ?

Volcanics

?

N.B. Although it was anticipated that the normal four members of the Blythesdale would be present, no attempt was made to predict their tops.

Correlation
A.A.O. COMBARNGO No. 1
to
A.A.O. PICKANJINNIE No. 1

Scale

Horizontal (not to scale)

Vertical 1000′ = 2″

Palaeontology:

No macrofossils were found in this unit, but microfossils have been found in some sidewall cores.

Electrical Characteristics:

The Transition Member (965-1283 feet) appears to be fairly arenaceous and this feature is reflected in the resistivity curves. The Mooga Member (1283-1425 feet) is somewhat similar, and has been recognized by the generally higher resistivities below 1283 feet. Permeability in the sands is generally good, although it would appear that they are not wholly water saturated. All curves in the Fossil wood Member (1425-1891 feet) are of fairly low amplitude and indicate that the unit is composed of interbeds of shale and sandy shale. In the Gubberamunda Member (1891-2216 feet) the S.P. curve indicates a dominantly sandy section with variable permeability. Most of this section is completely water saturated and it is the main artesian aquifer in the region.

Petroleum Manifestations:

None.

Walloon Coal Measures (Jurassic): 2216 to 3710 feet (1494 feet)

Lithology:

This formation is mainly argillaceous. It comprises light, medium and dark grey, rarely brown, partly sandy and silty, mainly micaceous and carbonaceous shale, with interbeds of grey, grey-green, buff to medium brown, calcareous, micaceous, kaolinitic, slightly carbonaceous quartzose sandstone; and coal.

Palaeontology:

No macrofossils were found in this unit, but microfossils were found in sidewall cores.

Electrical Characteristics:

The S.P. curve is of low amplitude for the whole unit except between 2365 and 2411 feet, and between 2651 and 2723 feet, where there are deflections of the order of 20 m.v. Apart from corresponding deflections at these two intervals, both the short and long normal curves are of low amplitude. The lateral curve has generally low values, but in this formation is characterized by numerous narrow high deflections caused by thin coal seams.

Petroleum Manifestations:

None.

Bundamba Group (Jurassic): 3710 to 4350 feet (640 feet)

Lithology:

The formation comprises white and white to light grey, fine, medium and coarse-grained, variably porous, in part micaceous, kaolinitic and calcareous, quartzose sandstone, with minor interbeds of grey, dark grey, and grey-brown, sandy, micaceous, carbonaceous shale.

Palaeontology:

No macro or microfossils were found in this unit in this well.

Electrical Characteristics:

All curves have fairly high values. The S.P. deflections indicate fair permeability in the sandstone bands, and the resistivity curves indicate that in certain intervals the fluid saturation is fairly high.

Petroleum Manifestations:

None.

Moolayember Formation (Triassic): 4350 to 5086 feet (736 feet)

It has been the practice in some of the other Roma wells to place the top of the Moolayember Formation at the top of the shaly section which is at 4255 feet in this well. However, the sand development between 4255 and 4350 feet in A.A.O. Combarngo No. 1 is more complete and not readily separated from the Bundamba Group. This interval is inferred to be an interfingering boundary between the Bundamba and Moolayember formations. The normal decrease in the rate of penetration, which has been used as the criterion in the past, is at 4350 feet.

Lithology:

The formation is dominantly argillaceous, although there is a sandstone at its base. This sandstone will be described separately in view of its possible economic significance. The formation consists of dark grey-brown, dark grey and black, silty, carbonaceous, micaceous shale; grey, grey-green and dark grey, tight, calcareous, micaceous, kaolinitic siltstone with minor interbeds of grey and grey-green, very fine-grained, silty, calcareous, micaceous, kaolinitic, quartzose sandstone; light grey to white, fine-grained, tight, silty, calcareous, quartzose sandstone; very minor interbeds of coal.

Three sandstone members are present in the basal part of the section:

(i) Hospital Hill Sandstone: 4714 to 4731 feet (17 feet)

As no Links Sandstone was recognized in this well, this interval is probably the equivalent of both the Hospital Hill Sandstone and the Links Sandstone.

It is a grey-white, medium-grained, tight calcareous quartzose sandstone.

(ii) Unnamed Sandstones: 4834 to 4850 feet (16 feet)
4862 to 4869 feet (7 feet)

These sandstones have not been encountered before in the Roma wells. They are both white, medium to coarse-grained, kaolinitic, slightly glauconitic, quartzose sandstones.

There has been a thickening of section between the base of the Hospital Hill Sandstone and the top of the Showground Sandstone in this well as compared with other wells in the district. The following tabulation illustrates this feature:

Well	Thickness (feet)
Latemore No. 1	185
Latemore East No. 1	150
Pickanjinnie No. 1	124
Pickanjinnie No. 2	86
Combarngo No. 1	347

(iii) Showground Sandstone: 5078 to 5086 feet (8 feet)

This is a white to light grey, coarse-grained, hard, patchily porous, slightly kaolinitic, quartzose sandstone grading locally to a quartz pebble conglomerate.

Palaeontology:

No macrofossils have been found in this unit, but microfossils have been described from conventional and sidewall cores.

Electrical Characteristics:

All curves are of fairly low amplitude over the whole of the unit, except for the sandstone members described above. It should be noted that all resistivity curves have overall higher values below the Hospital Hill Sandstone.

Petroleum Manifestations:

All sands are water filled. However, four barrels of 52^{o} API gravity oil were recovered in a drill stem test on the Showground Sandstone.

Pickanjinnie Formation (Triassic): 5086 to 5315 feet (229 feet)

Lithology:

This unit is made up of interbedded sandstone, siltstone and shale, with minor mudstone and coal. The sandstone is white to pale grey-green, medium to coarse-grained, fairly friable, mainly tight, feldspathic, lithic and quartzose, grading to a grit locally, and is slightly calcareous and pyritic in part; there are also sandstones which are white to pale grey-green, very fine to fine-grained, tight, slightly kaolinitic, and mainly quartzose grading to a siltstone, and minor sandstone, white to brown, very fine to fine-grained, hard, tight, kaolinitic, very slightly calcareous, lithic, quartzose, with some erratic coarse quartz grains. The siltstone is light grey-green and tan, hard, compact, slightly calcareous in part, micaceous, argillaceous, quartzose and sandy, grading to a sandstone above. The shale is brown and grey, in part carbonaceous, micaceous, silty and in part sandy. The mudstone is pale grey-green and compact.

Palaeontology:

No macro or microfossils were found in this unit in this well.

Electrical Characteristics:

All curves on the electrical logs are fairly flat with little indication of permeability.

Petroleum Manifestations:

Pale blue fluorescence was noted over several intervals within this unit.

Latemore Formation (Permian): 5315 to 5628 feet (313 feet)

Lithology:

This unit is made up of interbeds of sandstone, siltstone, shale and mudstone and contains a number of coal seams. The first coal seam was taken to be the top of the Latemore Formation. The sandstone is mainly grey-green to white, fine, medium and coarse-grained, tight, slightly calcareous and kaolinitic, lithic and quartzose, grading in part to siltstone. Relatively minor beds of grey-green and tan, medium to coarse-grained, tight, variably friable, slightly pyritic, quartzose sandstone also occur. The siltstone is grey-green to tan, tight, compact, argillaceous, slightly calcareous and siliceous in part, quartzose. The shale is grey-brown and tan, silty, in part very carbonaceous and grades into a siltstone. There is also a fair proportion of black and dark grey highly carbonaceous shale, which is locally micaceous and pyritic and which grades to coal. There are minor interbeds of buff to tan, very slightly sandy mudstone containing some coaly inclusions, and off-white, buff and tan sideritic mudstone, which grades to siltstone.

Palaeontology:

Glossopteris browniana and ?Palaeovittaria sp. were found in a core from 5352 feet. An abundant microflora was also found in the same core.

Electrical Characteristics:

All curves on the electric log are fluctuatory in character and illustrate the interbedded nature of the unit. The high peaks on the lateral curve are caused by coal seams.

Petroleum Manifestations:

Patchy oil staining and fluorescence were noted throughout the unit.

Volcanics: 5628 to 5985 feet (357 feet+)

Lithology:

Greenish, fine-grained, andesitic tuff and grey-green andesite.

Palaeontology:

No trace of organic remains was found.

Electrical Characteristics:

The S.P. curve is virtually featureless; all resistivity curves are of high values. The top of the volcanic section is not sharply defined, but is taken as the depth where resistivity curves show large increments.

Petroleum Manifestations:

Patchy oil staining and fluorescence were noted in the upper part of this unit.

General:

It is considered that this volcanic suite is probably related to a similar suite in which Union-Kern-A.O.G. Cabawin No. 1 bottomed. Its age is unknown, but it is assumed that by analogy to other andesites in the Bowen Basin, it is either Upper Carboniferous or Lower Permian.

Structure

The structure was outlined by seismic work. A vertical closure of 60 feet was shown over an area of about three square miles. The well was drilled on the crest of the seismic structure. Prior to drilling, it was considered that the fold was a drape structure over a basement "high".

Relevance to Occurrence of Petroleum

The well was sited on the crest of the seismic structure. The occurrence of oil in the basal Mesozoic sand in Combarngo No. 1, suggests that the Permian section is the probable source of oil in the region.

The results of the well further demonstrated the variable nature of the basal Mesozoic sands, and correlation with the similar section near Pickanjinnie is difficult.

Porosity and Permeability of Sediments Penetrated

The results of physical measurements of porosity and permeability are tabulated in Appendix 5.

Estimation of porosity and water saturation at higher intervals has also been made from electric and micrologs:

Depth (feet)	Porosity (Ø) (percent)	Water Saturation (Sw) (percent)
4318-4323	23	100
4726-4732	20	100
4838-4846	26	100
5076-5084	20	55

In the Roma area it has been found that, in general, the greater the S.P. deflection, the higher the porosity.

Contribution to Geological Concepts Resulting from Drilling

Oil in minor quantities was found in the Showground Sandstone. This substantiates the original contention that a structure on or near the hinge line of the Surat Basin would be the best place to trap any up-dip migration. However, as the sandstones contained water with only small quantities of oil, it may be that the vertical closure of the Combarngo structure is inadequate.

A thicker pre-Hospital Hill section has been developed in the Moolayember Formation in this area. All lower Moolayember sands in the Combarngo well appear to be porous.

When the results of this well are compared with the results from the other subsidized well and the three unsubsidized wells, together with the seismic surveys, the following points are apparent:

(i) Most folds are drape structures.

(ii) The tighter the fold, the less probable is the development of a porous arenaceous facies.

(iii) If the fold is gentler, it usually has less closure, and if a porous sandstone has been developed, it will be water-filled.

(iv) A more porous sandstone will be developed on the flank than on the crest of a "high", and it will also usually have a thicker Permian section developed beneath it. However, because of lack of closure these sands will be water-filled.

It appears from a study of the results of this well, Pickanjinnie No. 2 and the subsequently drilled Winnathoola No. 1 that there is a basinwards thickening of the Latemore Formation from Winnathoola to Combarngo. The Latemore Formation is thicker at Pickanjinnie No. 2, but this is probably a local effect, as it was a flank well.

The Latemore Formation did not exhibit marked lithologic differences between Pickanjinnie No. 2 and Combarngo No. 1. It was hoped that some porous arenaceous phases may have developed basinwards.

Local basement was an andesite. It was anticipated that the steeply dipping Timbury Hills Formation would have been encountered. As has been pointed out in other places in this report, reflections below the top of the Latemore Formation are of poor quality and it is impossible to predict basement top depths. Prior to drilling, basement was thought to be at about 6500 feet. It was (for practical purposes) unexpectedly encountered at 5628 feet. Drilling in the andesite to locate the top of the Timbury Hills Formation was not considered feasible.

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APPENDIX 1

CORE DESCRIPTIONS

A.A.O. COMBARNGO NO. 1

by

S.S. Derrington and K.E. Denton*

Core No. 1

Depth Cored: 4920-4930 feet

Total Recovery: 9'0" (90%)

9' 0" SHALE, grey, micromicaceous, silty, with abundant plant remains, blocky-massive in appearance having, however, a good cleavage. Numerous stringers and blebs of light grey SILTSTONE, also containing abundant plant remains.

Overall dip - horizontal

Signs of oil and/or gas - none

Core No. 2

Depth Cored: 4930-4940 feet

Total Recovery: 10'0" (100%)

10' 0" SHALE, grey, micromicaceous, silty, with abundant plant remains; blocky-massive in appearance having, however, a good cleavage. Numerous stringers (up to 2") and blebs of SILTSTONE, grey, also containing plant remains.

Overall dip - horizontal

Signs of oil and/or gas - none

Note: There was no recovery after the interval 4920-4930 feet was cored. Under the terms of the subsidy agreement, the interval 4930-4940 feet was cored. Nineteen (19) feet of core were recovered. Rather arbitrarily it was assumed 9 feet came from the first interval; 10 feet from the second.

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* Mines Administration Pty Limited

Core No. 3

Depth Cored: 5089-5109 feet

Total Recovery: 12'6" (62%)

3'11" SANDSTONE, white to light grey, coarse-grained, hard, patchy porosity apparent, slightly kaolinitic, quartzose, grading to a quartz PEBBLE CONGLOMERATE.

8' 7" SANDSTONE, pale grey-brown grading to pale grey-green, fine-grained, gradational from an argillaceous, kaolinitic, quartz sandstone at the top to a very slightly calcareous, kaolinitic, lithic, quartz sandstone at the base. The lithic grains are green and are mainly of well-rounded chert; quartz grains subrounded and clear. Erratic quartz pebbles to 10 cm and thin pebble bands are present. One small (1/8") siderite band is present, 4 feet from the base of the core.

Overall dip - Apparently horizontal, although there is some ill-defined cross-bedding near the top of the core.

Signs of oil and/or gas - A gassy odour and 40-50% pale blue flourescence were evident in the top coarse sandstone. There were no such signs in the lower tight sandstone.

Note: It was considered that the portion of core not recovered was from the upper coarse sandstone.

Core No. 4

Depth Cored: 5178-5188 feet

Total Recovery: 9'3" (92%)

2' 9" SANDSTONE, green-white, very coarse-grained, grading to a grit, kaolinitic, apparently tight, quartzose. The grains are of white and pink quartz, normally subangular, green and black chert, normally rounded.

4'11" SANDSTONE, green-white, fine to very fine-grained, tight, kaolinitic, quartzose. Blebs of green shale are common in the top 18" of this section, chert pebbles are common in the top 3". The sand grains are of subangular quartz and rounded green chert.

1' 7" SANDSTONE, green-white, medium to coarse-grained, tight, kaolinitic, quartzose, containing rare blebs of green shale. The sand grains are of subangular pink and white quartz and rounded green chert.

Overall dip - There was no visible bedding.

Signs of oil and/or gas - A gassy odour was noted in the top coarse sandstone.

Core No. 5

Depth Cored: 5350-5360 feet

Total Recovery: 7'8" (76%)

0' 3"	CLAYSTONE, grey and fawn, soft, fissile, in part sandy, slightly calcareous, with plant debris.
1' 9"	COAL.
0' 3"	CLAYSTONE, dark grey and fawn, generally as above. Contains some plant debris and some well preserved leaves of Glossopteris.
0' 5"	COAL.
0' 3"	CLAYSTONE, fawn.
0' 2"	COAL.
0' 5"	CLAYSTONE, dark grey-brown and fawn, very sandy in part.
1' 0"	COAL.
0' 5"	CLAYSTONE, fawn.
0' 1"	COAL.
0' 4"	CLAYSTONE, fawn.
0' 5"	COAL.
0' 2"	CLAYSTONE, grey-brown.
1' 9"	COAL.

Overall dip - Horizontal to 5 degrees

The coal was bleeding gas on recovery.

Core No. 6

Depth Cored: 5489-5494 feet

Total Recovery: 4' 6" (90%)

4' 6"	SILTSTONE, grey to light grey, slightly calcareous grading to a silty shale. A 1" thick mudstone band is present, 9" from the base. Minor slump structures are present. Micro-fractures occur; they are filled with calcite. Plant remains are present.

Overall dip - Horizontal

Signs of oil and/or gas - None

Core No. 7

Depth Cored: 5626-5644 feet

Total Recovery: 8'6" (47%)

8' 6" TUFF, greenish, fine-grained, apparently tight. The whole core is fractured; the fracture planes are mainly vertical, but with some at 60 degrees and others horizontal. Spherulites are present and appear to be common near the fracture planes.

Overall dip - There is no visible bedding.

Signs of oil and/or gas - There is patchy oil staining present. A strong gassy odour was noticed when the core was freshly broken. 30% yellow fluorescence giving a fluorescing yellow cut.

Core No. 8

Depth Cored: 5785-5788 feet

Total Recovery: 3'0" (100%)

3' 0" TUFF, white to grey-green, structureless. There are scattered pyrite crystals throughout. Pyritic veins up to 1/2" wide are present along fracture planes (which range from 60 degrees to horizontal). Rare spherulites were noted. Some of the fracture planes are slickensided.

Overall dip - There is no visible bedding.

Signs of oil and/or gas - There was about 10% yellow fluorescence present; however, as it did not cut, it is probably mineral fluorescence.

Core No. 9

Depth Cored: 5898-5901 .5 feet

Total Recovery: 3'6" (100%)

3' 6" TUFF (?), grey to pale green. Scattered pyrite present. Tight, hard, slightly calcareous. There appears to be a dip of 70 degrees to 80 degrees in a dark grey, hard quartzite band (1" thick) towards the base. A brown, waxy substance was noted in some of the fracture planes.

Overall dip - 70 to 80 degrees - although this may be erroneous.

Signs of oil and/or gas - 5% yellow (non cutting) fluorescence was noted.

Core No. 10

Depth Cored: 5945-5949 feet

Total Recovery: 1'3" (31%)

1' 3" PORPHYRY (? ANDESITE), overall colour is grey-brown. Phenocrysts of white tabular feldspar, some of which is twinned and rarely zoned (probably about andesine) set in a very fine-grained, probably microcrystalline ground-mass, which is coloured pale brown. This groundmass is pyritic.

Rare veining is present; it is in part calcitic, but is probably mainly composed of a white zeolite.

Overall dip - No bedding was visible, and there was no evidence of flow structure.

Signs of oil and/or gas - None

APPENDIX 2

PETROLOGICAL REPORTS

by

R.M. Tucker*

1. Petrological report on sample from 5900'0" to 5900'6", Core No. 9, A.A.O. Combarngo, No. 1

Macro: Porphyritic, pink-grey rock with white to green phenocrysts; one inch black banded material, dip 70° down core. Small black band diverging from larger band.

The one inch band contains a fine, pyrite-filled fracture, and also appears to contain altered feldspars.

Fine pyrite also occurs in the narrow black band. The rock has suffered minor pyrite mineralization and silicification along a fracture.

No bedding is evident.

Micro: (Porphyritic, pink-grey rock)

Texture	- Porphyritic
Grains	- Sericitized feldspars, to 4 mm; lath-shaped, no twinning visible - 25%.
Groundmass	- Irregularly shaped quartz grains, to 0.1 mm, with some sericite and fine calcite veining.
	Pyrite - subhedral grains - approx. 1%
Name	- Andesite
Remarks	- Similar to andesite from 5949 feet

Micro: (One inch dark grey band)

Texture	- Fine-grained, irregular
Grains	- Cloudy quartz, anhedral, 0.05 mm, occurring in patches, up to 60%.
	Microcrystalline silica, as fine grains 0.005 mm; also in irregular patches - 30%.
	Pyrite - subhedral to anhedral grains - 5%
	Minor calcite veining.
Remarks	- The section shows no evidence of bedding, and it is considered that the finely crystalline silica is of secondary origin.

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* Geological Survey of Queensland

2. Petrological report on sample from 5945 to 5949 feet, Core No. 10, A.A.O. Combarngo No. 1

Macro: Porphyritic grey rock, with white phenocrysts.

Micro:

Texture - Porphyritic

Grains - Feldspar, (sericitized), euhedral to subhedral, up to 3 mm - 30%

Pyrite - Subhedral grains, up to 1 mm - 5-10%.

Groundmass - Fine grains of quartz, sericite and iron oxides.

Some calcite veining.

Origin: Volcanic flow

Name: (?) Andesite

Remarks: Sulphide mineralization present.

APPENDIX 3

PALAEONTOLOGICAL REPORTS

A.A.O. COMBARNGO NO. 1

CONTENTS

THE PALYNOLOGY OF SAMPLES FROM A.A.O. COMBARNGO NO. 1 WELL

by

N.J. de Jersey and D.W. Dearne*

INTRODUCTION

Drilling began at Combarngo No. 1 in Lower Cretaceous sediments, continued through Jurassic, Triassic and Permian sediments and finished in a dominantly volcanic section, regarded as basement.

The palynological investigation which was requested by Associated Australian Oilfields N.L., was based on samples from conventional and sidewall cores. In all, seven conventional cores and six sidewall cores were submitted for examination.

DETAILED PALYNOLOGY OF SAMPLES

In the following section the palynology of individual samples is described in order of increasing depths.

Sidewall Core from 693 feet

An abundant microflora was obtained from this sample and the following species were identified:

Reticulatisporites pudens
Microcachrydites antarcticus
Cirratriradites cf. spinulosus
Cingulatisporites sp.
Leiotriletes magnus
L. directus
L. cf. crassus
L. sp.
Inaperturopollenites sp.
Sphagnumsporites tenuis
S. cf. adnatus
Pityosporites sp.
P. ellipticus
P. grandis
Araucariacites australis
A. sp.
Osmundacidites comaumensis
O. cf. wellmanii
Gleicheniidites circinidites
G. sp.
Cyclogranisporites sp.
Entylissa nitidus
Leptolepidites verrucatus
Lycopodiumsporites rosewoodensis
L. triangularis
L. austroclavatidites
L. austroclavatidites tenuis
L. sp.
Acanthotriletes pallidus
A. levidensis
A. sp.
Cyathidites australis
C. australis rimalis
C. minor
C. parvus
C. sp.
Polypodiidites sp.
Tholosporites egregius
Pilasporites crassus
Baculatisporites cf. truncatus
Foveosporites cf. canalis
Microreticulatisporites cf. parviretis
Hystrichosphaerideae

* Geological Survey of Queensland

The general nature of the microflora is of an Upper Jurassic to Lower Cretaceous age. The presence of Acanthotriletes levidensis, Reticulatisporites pudens, Microreticulatisporites cf. parviretis, Cirratriradites cf. spinulosus (confined to the Lower Cretaceous of Western and Eastern Australia) and abundant Microcachrydites antarcticus indicate a Cretaceous age for this sample. The presence of microplankton is indicative of a marine environment and the sample is therefore correlated with the Roma Formation.

The occurrence of a distinctive Permian species, Tholosporites egregius, indicates contamination from sediments lower in the well. The significance of such contamination is discussed later (p. 31).

Sidewall Core from 1090 feet

A fairly abundant yield of microspores was obtained from this sample and the following species were identified:

Entylissa nitidus
Inaperturopollenites sp.
Cyathidites minor
C. australis
C. australis rimalis
Polypodiidites sp.
Pityosporites ellipticus
P. sp.
Verrucosisporites sp.
Araucariacites sp.
Granulatisporites minor
Osmundacidites wellmanii
Lycopodiumsporites austroclavatidites
L. rosewoodensis
L. triangularis
Leptolepidites verrucatus
Acanthotriletes levidensis
Sphagnumsporites australis
S. tenuis
Leiotriletes directus
Microcachrydites antarcticus
Cicatricosisporites australis
Corollina torosus

The presence of Cicatricosisporites australis and Acanthotriletes levidensis (confined to the Lower Cretaceous of Western Australia) indicates a Cretaceous age for this sample. This is supported by the general character of the assemblage. The absence of microplankton suggests a non-marine environment and thus a correlation with an horizon near the top of the Blythesdale Group is indicated. In Union-Kern-A.O.G. Cabawin No. 1 Well a correlation is suggested with some horizon in the section from 1500 to 2500 feet from which assemblages similar in general character were obtained.

Sidewall Core from 3650 feet

An abundant microflora was obtained from this sample and the following species were identified:

Inaperturopollenites reidi
I. sp.
I. cf. turbatus
Rugulatisporites ramosus
Sphagnumsporites tenuis
S. cf. australis
S. adnatus
Leiotriletes directus
L. crassus
Lycopodiumsporites triangularis
L. rosewoodensis
L. sp.
Todisporites minor
T. sp.
Araucariacites sp.
Cyathidites minor
Tsugaepollenites segmentatus
T. dampieri

L. magnus
Granulatisporites minor
Pilasporites crassus
P. sp.
Reticulatisporites pudens
Verrucosisporites sp.
V. walloonensis
Ischyosporites sp.
Osmundacidites sp.
O. cf. wellmanii
Leptolepidites verrucatus
Polypodiidites cf. arcus
Pityosporites similis
P. ellipticus
P. sp.

The assemblage indicates, by the presence of such species as Lycopodiumsporites rosewoodensis (10%), Tsugaepollenites segmentatus, T. dampieri (3%) and Rugulatisporites ramosus, a Lower to Middle Jurassic age for the sample.

There is a general similarity to the microfloras of the Walloon Coal Measures in the type area and of the Injune Beds. A comparison with assemblages from Union-Kern-A.O.G. Cabawin No. 1 shows a similarity to microfloras from the section between 4200 and 5600 feet. This suggests that the horizon of this Combarngo sample should be correlated with some horizon within this section.

Core No. 2: Sample from 4936 feet

A good yield of spores and pollens was obtained from this sample, the following species being identified:

Pteruchipollenites spp.
Inaperturopollenites sp.
Punctatosporites sp.
Verrucososporites sp.
Leiotriletes directus
L. magnus
Cyathidites cf. australis
Cingulatisporites spp.
Todisporites cf. minor
Verrucosisporites sp.
Araucariacites sp.

The abundance of Pteruchipollenites (41%), absence of striate bisaccate pollens, and the associated elements in the assemblage indicate an Upper Triassic age for this sample. The assemblage exhibits a general similarity to a microflora recently examined from the Evergreen Shale, which was also considered to be from an horizon near the top of the Triassic.

At Union-Kern-A.O.G. Cabawin No. 1 Well a similar assemblage has been recorded from Cores 21, 22 and 23, over the appropriate interval 7000 to 7400 feet.

In sub-surface samples from the Roma area the microflora has also been recognized by P.R. Evans, who has regarded it as representative of a unit he has provisionally recorded as "Zone 1".

Samples from 5075 ft, 5076 ft 6 in., and 5077 ft 6 in.

Sidewall Core from 5075 feet.

Pteruchipollenites spp.)
Lunatisporites limpidus) common
L. amplus)

Inaperturopollenites sp.
Araucariacites sp.
Granulatisporites micronodosus
Verrucosisporites sp.
Sphagnumsporites sp.
Leiotriletes directus
cf. Calamospora sp.
Entylissa vetus
Osmundacidites sp.
Acanthotriletes sp.
Cyathidites sp.

Sidewall Core from 5076 ft 6 in.

Cingulatisporites sp.
cf. Punctatosporites sp.
Inaperturopollenites sp.
Acanthotriletes sp.
Cicatricosisporites cooksonii
Verrucosisporites sp.
Araucariacites sp.

Sidewall Core from 5077 ft 6 in.

Pteruchipollenites sp.
Inaperturopollenites sp.
Verrucosisporites sp.
Leiotriletes directus
Tholosporites parvitholus
Granulatisporites sp.
Acanthotriletes sp.
cf. Lunatisporites limpidus

The age of these three samples has been quoted as Lower Triassic in a previous unpublished report (de Jersey, 6.7.61). The flora is of a mixed Permian and Triassic character with Pteruchipollenites being the most abundant form. There is a lithological continuity from these samples to Core No. 2 at 4936 feet (S.S. Derrington, verbal communication) which is a conventional core of Upper Triassic age. The presence of Cicatricosisporites cooksonii here and of Permian types in sidewall cores higher up in the well indicates contamination by drilling mud. This proof of contamination of the sidewall cores thus necessitates re-interpretation of the evidence from which the age at this depth has been determined. Although the contamination renders the evidence in these sidewall cores unreliable, it is considered that the weight of evidence favours an Upper Triassic age for these samples (5075 ft to 5077 ft 6 in.). Hence the Permian species, which were previously regarded as survivals into the Lower Triassic, are probably contaminants from sediments lower in the well. This applies particularly to the presence of Tholosporites parvitholus of which only one specimen was found.

Core No. 5: Sample from 5352 feet

An abundant microflora was obtained from this sample; the following species were identified:

Lunatisporites amplus
L. limpidus
L. phaleratus
Striatites cancellatus
Striatopodocarpites fusus
Protosacculina multistriatus
Pteruchipollenites sp.
Apiculatisporites levis
A. filiformis
A. sp.
Acanthotriletes ericianus
A. ramosus
A. tereteangulatus
Granulatisporites micronodosus
Granulatisporites trisinus
Entylissa vetus
E. sp.
Marsupipollenites triradiatus
M. sp.
Limitisporites sp.
Vesicaspora ovata
Verrucososporites sp.
Leiotriletes directus
Inaperturopollenites sp.

The dominance of striate bisaccate types (18%) over Pteruchipollenites (4%), plus the fact that several species confined to the Permian have been described, indicate a Permian age for the sample. A comparison with the Permian microfloras of New South Wales furnishes strong evidence in favour of an Upper Permian age, as five species - Lunatisporites phaleratus, Striatites cancellatus, Apiculatisportes filiformis, Acanthotriletes ramosus and A. tereteangulatus, have not been recorded from formations older than the Newcastle Coal Measures, at the top of the Permian in that State.

The core also contained macrofossils which have been identified by J.T. Woods as a Glossopteris flora of Upper Permian age.

There is a close similarity to the microflora of the Kianga Coal Measures. This is borne out by the absence of Tholosporites in each case, and by the close similarity in the proportions of spinose forms (18%), striate bisaccate pollens (18%) and of Pteruchipollenites (4%). This suggests that the Combarngo sample and the Kianga coal seam are close to the same horizon in the Permian. A sample from the Bandanna Formation recently examined also yielded an assemblage similar in general features, particularly in the absence of Tholosporites and in the abundance and variety of striate bisaccate pollens.

Detailed work recently carried out on the microfloral assemblage from Union-Kern-A.O.G. Cabawin No. 1 enables a comparison of the microflora from this Combarngo sample with the Permian assemblages from Cabawin. In the latter well the non-marine Permian was divisible into two portions:

(i) an upper portion (from about 9870 to 9965 feet) with abundant Tholosporites, and

(ii) a lower portion (from about 9965 to 10,300 feet) in which Tholosporites was rare (1/2 to 1%).

The present sample from Combarngo, in which Tholosporites is rare or absent (not detected in a count of 293 spores), thus contains an assemblage comparable with the lower portion of the fresh water Permian at Cabawin.

The pronounced Permian aspect of the microflora suggests a correlation with the Latemore Formation rather than the Permo-Triassic Pickanjinnie Formation in the Roma area.

The remaining samples submitted for palynological examination proved to be totally devoid of spores and pollens.

CONCLUSIONS

The stratigraphical age determinations and correlations are summarized in Table 1.

The Permian microflora identified from Core No. 5 at 5352 feet has been correlated with the Kianga Coal Measures, the section between 10,114 feet, and 10,270 feet at Union-Kern-A.O.G. Cabawin No. 1 Well and the Bandanna Formation. The microflora is characterized by an abundance of striate bisaccate types and spinose forms together with an absence of Tholosporites. This would appear to be a persistent and easily recognizable horizon in the Upper Permian of Queensland.

The 'Kianga' section between 10,114 feet and 10,270 feet at Cabawin No. 1, was overlain by Upper Permian sediments containing abundant Tholosporites. This in turn passed into Lower Triassic sediments containing a 'mixed' Permian and Triassic flora characteristic of the Narrabeen Stage of New South Wales. The Upper Permian and Narrabeen horizons were not identified in A.A.O. Combarngo No. 1 and are probably represented by a section of the well between 5077 ft 6 in. and 5352 feet, from which only two cores, both of barren sandstone, were available. The presence of Tholosporites as a contaminant of the sidewall cores suggests that the equivalent of the top of the Upper Permian section at Cabawin (containing this genus in abundance) is present although probably of lesser thickness.

The presence of Cicatricosisporites cooksonii (Upper Jurassic to Lower Cretaceous) in a Triassic sidewall core indicated contamination from above while Tholosporites egregius (Upper Permian) identified in a Cretaceous sidewall core indicated contamination from below. Thus, sidewall cores are less reliable than cuttings which are taken during drilling, and hence can be contaminated only from above. Age determinations from sidewall cores from A.A.O. Combarngo No. 1 stress the unreliability of such identifications due to the contamination by drilling mud.

Therefore, in the interests of accuracy, it is recommended that future palynological studies be confined to conventional cores (where practicable) and cuttings.

TABLE 1

Summary of Age Determinations and Correlations

Depth	Nature of Sample	Relative Spore Yield	Lithology	Age	Equivalent Formation
693'	Sidewall core	Abundant	Shale	Lower Cretaceous	Roma Formation
1090'	Sidewall core	Good	Shale		Blythesdale Group
3650'	Sidewall core	Abundant	Shale	Lower to Middle Jurassic	Walloon Coal Measures and Injune Beds
4936'	Core 2	Abundant	Shale & Siltstone	Upper Triassic	Evergreen Shale
5075'	Sidewall core	Good	Shale & Siltstone		
5076'6"	Sidewall core	Poor	Shale & Siltstone	Upper Triassic?	
5077'6"	Sidewall core	Poor	Shale & Siltstone		
5094'	Core 3	Barren	Sandstone		
5182'	Core 4	Barren	Sandstone		
5352'	Core 5	Abundant	Carbonaceous shale	Upper Permian	Kianga Coal Measures Bandanna Formation, Latemore Formation?
5491'	Core 6	Barren	Siltstone		
5631'	Core 7	Barren	Tuff		

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REPORT ON FOSSIL PLANTS FROM A.A.O. COMBARNGO NO. 1 WELL

by

J.T. Woods*

Sample: Core No. 5, from 5352 feet

Determinations: Glossopteris browniana 2 specimens
(?) Palaeovittaria sp. 1 specimen

Age: (?) Upper Permian

Remarks: Glossopteris browniana apparently ranges through the Australian Permian and is useless for close correlation. The other specimen is referred to Palaeovittaria with some doubt, since in the only described species of the genus (P. kurzi) the mid-vein is incomplete, whereas in the present specimen it extends to the apex. Other characters of the leaf are in close agreement. Palaeovittaria has not been recorded from Australia. In India it is known only from the Upper Permian Raniganj Series (Krishnan, 1954). If the determination of this specimen as Palaeovittaria sp. be correct, an Upper Permian age for the horizon could be reasonably inferred.

Additional Remarks:

Further examination of the literature suggests that the leaf determined as ?Palaeovittaria sp. is specifically identical with that described by Walkom (1928) from Belmont, N.S.W., as Glossopteris (?) mitchelli. Both plants should be referred to as Palaeovittaria (?) mitchelli. The occurrence of this form in the Newcastle Coal Measures at Belmont supports the provisional Upper Permian age assigned to the horizon in Combarngo No. 1.

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* Geological Survey of Queensland

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REMARKS ON (?) PALAEOVITTARIA sp. FROM A.A.O. COMBARNGO NO. 1 WELL

by

Mary E. White*

In view of the theory of the evolution of the Angiosperms from the Glossopteridae, forms with parallel lateral venation such as Glossopteris mitchelli are of particular interest. Palaeovittaria kurzi in South Africa has been shown by its reproduction to be very closely related to Glossopteris. It is a form almost without a midrib and a forerunner of monocotyledonous type leaves which have no midrib. Glossopteris mitchelli, which I agree can be referred to Palaeovittaria, shows the evolutionary trend towards a monocotyledonous leaf with midrib.

It is to be hoped that reproductive structures will shortly be found associated with such forms as Glossopteris mitchelli and with the netted-vein descendants of Glossopteris, Linguifolium, Sagenopteris and Phyllopteris etc. The reproductive mechanisms seen in Glossopteris angustifolia (see BMR. Records 1961/60) show an evolutionary advance on the Lower Permian types of reproduction (Plumstead, 1958) towards the Angiosperms. Dr Melville, Director of Kew, agrees that Glossopteris angustifolia is part of a plexus of forms which gave rise to the Angiosperms and certain features of its reproduction are recalled in modern Epacridaceae and Juglandaceae.

The separation of Glossopteris, Palaeovittaria and possibly even some species of Taeniopteris is obviously arbitrary and there are species which can be accommodated in any of the genera. It is also obviously impossible to delineate sharply between Glossopteris and Linguifolium etc. Any classification based on vegetative structures only is bound to have its limitations. It is hoped that systematic collecting of Lower Mesozoic floras might in time yield evidence of reproductive types in all the derivatives of the Glossopteridae which up to now have been known in vegetative form only. A sound classification will then be possible.

It would be of great assistance if all persons collecting or examining plant fossils of this age could watch for "abnormal" forms of the leaves or any associated fossil forms and fragments which might prove to be connected with reproduction. It will be recalled that the fertile material of Glossopteris angustifolia was found in the "debris" of the collection, not with the large, beautifully preserved leaves for which the collection was made.

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* Bureau of Mineral Resources

REFERENCES

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APPENDIX 4

OIL AND WATER ANALYSES

A.A.O. COMBARNGO NO. 1

CONTENTS

OIL ANALYSIS OF SAMPLE OF OIL FROM DRILL STEM TEST No. 1, A.A.O. COMBARNGO No. 1

by

Queensland Government Analyst

Specific Gravity at 60°F	0.855
Distillation Range	°C.
Initial B. Pt.	68
10% distilled at	116
20% " "	140
30% " "	173
40% " "	207
50% " "	243
60% " "	275
70% " "	312

The remaining 30% consisted of lubricating oil which had a consistency of vaseline at 73°F.

The sample consisted of a light brown coloured mobile mineral oil which showed a natural fluorescence.

ANALYSIS OF SAMPLE OF CRUDE OIL FROM DRILL STEM TEST No. 1, A.A.O. COMBARNGO No. 1

by

Petroleum Technology Laboratory
Bureau of Mineral Resources

The analysis of a sample of crude oil from Drill Stem Test No. 1, (interval 5074-5109 feet), was carried out in accordance with standard procedures laid down by the Institute of Petroleum. The results of the analysis are summarized below:

Water content (IP75/57)		Nil
Sediment (IP75/57)		0.1%
Ash (IP4/60)		0.01%
Density of crude at 20°C. (IP59/57 E)		0.8055
Open flash point (IP75/42)	)	90°C.
Fire point (IP75/42)	)	
Distillation (IP78/51T)		
Distillate: Over-point (I.B.P.)		88°C.
25 ml		165°C.
50 ml		254°C.
69 ml		300°C.
Residue: 26 ml		
Loss: 5 ml		

Density of residue: Estimated as 0.94 below 25°C (it is semi-solid below 30°C)

Density of combined distillate at 20°C: 0.7641 gm/cc

Comment:

Distillation residue has very strong asphaltic odour though this odour is also present in the sample of crude. Distillation curve shows that there are five principal fractions (including residue) and that the first and the residue fractions are each 25 percent (by volume) of the crude.

WATER ANALYSES OF SAMPLES OF WATER FROM A.A.O. COMBARNGO No. 1

by

Queensland Government Analyst

The results of analyses of two samples of water collected from A.A.O. Combarngo No. 1 are summarized below.

Sample A was recovered from the drill pipe after Drill Stem Test No. 5 (5076-5077.5 feet) on 29th June, 1961. Sample B was collected from the flow at the surface from the 6 5/8" casing on 11th July, 1961.

Grains per gallon	A	B
Total solids	789.0	73.6
Calcium Sulphate	6.8	0.5
Magnesium Sulphate	4.2	0.6
Magnesium Carbonate	7.6	2.7
Sodium Carbonate	635.0	45.0
Sodium Chloride	96.0	18.5
Hardness	17.5	4.0
Organic matter	Present	Present
pH	8.5	8.0

APPENDIX 5

POROSITY AND PERMEABILITY DETERMINATIONS

A.A.O. COMBARNGO No. 1

by

Petroleum Technology Laboratory
Bureau of Mineral Resources

Porosity and permeability tests were made on samples of cores from A.A.O. Combarngo No. 1. The Ruska field porometer and permeameter, using air and nitrogen as the saturating and flowing media, were employed in making these tests. Extractions were carried out by the Dean and Stark vapour method using toluene as solvent.

In the summary of results, grain density equals the density of the solid matter itself and bulk density equals the density of the bulk of the sample including pore space.

CORE ANALYSIS SUMMARY SHEET

Date of Test	Core No.	Depth	Effective Porosity % by vol.		Permeability Millidarcys		Densities Gms/cc			Saturation			Oil Character		Acid Solubility % by vol.
			V	H	V	H	Virgin Bulk Avg.	Dry Bulk Avg.	Grain Avg.	Water % Pore Space	Oil % Pore Space	Oil tons per acre foot	Fluores. in solvent	Extracted fluores. and colour	
15.2.62 to 20.2.62	3	5097'0" to 5097'4"	5	8	Nil	Nil	Not Deter-mined	2.60	2.78	28	Nil	Nil	Not Deter-mined	No colour in toluene	8
"	4	5178'0" to 5178'4"	20	19	3	3	"	2.22	2.78	18	"	"	"	As above	3
"	7	5642'0" to 5642'4"	8	11	Nil	Nil	"	2.57	2.85	29	"	"	"	Very faint brown-yellow colour in toluene	13
"	9	5898'0" to 5898'4"	2	1	Nil	Nil	"	2.66	2.70	100	"	"	"	No colour in toluene	9
"	10	5945'0" to 5945'6"	2	2	Nil	Nil	"	2.66	2.72	90	"	"	"	As above	6

APPENDIX 6

TABLE OF LOGS FROM

A.A.O. COMBARNGO NO. 1

	Run	Date	Depth Interval (feet)
Electric Log (Schlumberger)	1	23.5.61	306-4909
	2	28.5.61	4809-5177
	3	2.6.61	5077-5630
	4	10.6.61	5530-5986
Laterolog (Schlumberger)	1	26.5.61	4650-5093
Microlog (Schlumberger)	1	23.5.61	(4150-4400 (4600-4909
	2	26.5.61	4809-5091
	3	2.6.61	5400-5630
Gamma Ray Log (Schlumberger)	1	26.6.61	4800-5119
Gamma Ray Log (B.M.R.)	1	11.6.61	30-4800
Section Gauge Log (Schlumberger)	1	11.6.61	306-5300
Temperature Log (Schlumberger)	1	23.6.61	2350-5126

APPENDIX 7

FORMATION TESTS

A.A.O. COMBARNGO NO. 1

Two open hole formation tests and three tests through perforated casing were undertaken in the well. Results of the tests are summarized below:

Test No.	Interval (feet)	Period hrs.	Period mins	Flow	Rate (Mcf/D)	Method	Remarks
1	5074-5109	2	03	Gas	ca.75	Johnston open hole packer	Recovered full pipe; 4 bbl. oil; 68 bbl. water
2	5489-5644	2	02	Gas	ca.10	"	Recovered 6 bbl. mud
3	5076-5077.5	17	00	Water	170 B/D	Johnston hook wall packer	Trace oil with water
4	5082-5083.5	0	10	-	-	"	Test abortive
5	5076-5077.5	2	45	Water	-	"	Recovered 23 bbl. water in pipe

SUMMARY OF FORMATION TESTS

A.A.O. COMBARNGO No. 1

No.	Interval (feet)	Date	Perforation Details	ISI	VO	FSI	HH	ISIP	IFP	FFP	FSIP	Tch	Bch	Results
1	5074-5109	26.5.61	Open hole	NT	123	34	2800	NT	1650	2275	2300	3/4	3/8	GIP, GTS 3 min. flow of gas about 75 Mcf/D gradually decreased to nil in 1 hr. Rec. 270 ft 52° API gravity oil, 5000 ft water (9000 ppm. chloride).
2	5489-5644	2.6.61	Open hole	NT	122	15	-	-	-	-	-	3/4	3/8	GTS 93 min., TSTM, very weakly surging. Rec. 410 ft of GCM. No pressures obtained due to malfunction of stylus of BHPG.
3	5076-5077.5	26.6.61 27.6.61	4 x 1/2" Schlum. jets in 6 5/8" cg.	NT	17 hr	NT	2500	NT	1600	2200	NT	Var. 5/64 20/64	5/16	GTS 2 1/2 hr, TSTM, surging. Water flow 20 cu. ft/hr on 20/64" ck. Rec. 5050 ft of water.
4	5082-5083.5	27.6.61	4 x 1/2" Schlum. jets in 6 5/8" cg.	-	10	-	-	-	-	-	-	3/4	5/16	Test abortive due to communication behind casing between the two sets of perforations.
5	5076-5077.5	29.6.61	4 x 1/2" Schlum. jets in 6 5/8" cg.	NT	165	NT	2500	NT	1620	2125	2125	3/4	5/16	Water did not reach surface. Rec. 4913 ft water with trace oil and emulsion.

NOTE: ISI = Initial Shut In (min.); VO = Valve Open (min.); FSI = Final Shut In (min.); HH = Hydraulic Head (p.s.i.); ISIP = Initial Shut In Pressure (p.s.i.); IFP = Initial Flowing Pressure (p.s.i.); FFP = Final Flowing Pressure (p.s.i.); FSIP = Final Shut In Pressure (p.s.i.); Tch = Top choke (inches); Bch = Bottom choke (inches); TSTM = too small to measure; GTS = Gas to surface; GIP = Good initial puff; NT = not taken; GCM = Gas Cut Mud; BHPG = Bottom hole pressure gauge.

No.	Reason for Testing	Conclusions
1	To evaluate the content of a sand between 5078 and 5086 feet. This appeared porous and had 40% blue-white fluorescence.	The sand was porous and permeable. It contained and produced water with minor gas and high gravity oil.
2	To evaluate the content of sands in the interval 5489 to 5644 feet. Some appeared porous and patchy fluorescence was common.	These sands were tight. Insignificant quantities of gas were produced.
3	Log interpretations suggested the top 18" of sand tested in DST. No. 1 were dry. Casing was run and perforated opposite this zone, and DST. No. 3 was run to test this suggestion.	Water with minor gas was produced. It appears that the water cannot be shut off.
4	Log interpretations suggested a water free zone might be present 5082 to 5083 1/2 feet. DST. No. 4 was to test this idea.	The test was abortive because of an inefficient cement bond between the two sets of perforations. These were subsequently squeeze-cemented.
5	To determine if the squeeze cementing had shut off water coming from below the re-perforated interval 5076-5077 1/2 feet.	As water was produced, it was concluded that the oil and water could not be separated in this sand.

APPENDIX 8

VELOCITY SURVEY REPORT

A.A.O. COMBARNGO NO. 1

by

H.A. Lukowitch*

INTRODUCTION

A survey was conducted on 10th June, 1961 at the A.A.O. Combarngo No. 1 Well for the purpose of determining subsurface velocities.

The well was drilled with rotary tools to a total depth of 5985 feet and the velocity survey was conducted to a depth of 5975 feet. Except for surface pipe, no casing had been set in the well at the time of the survey.

FIELD PROCEDURE

The standard method of conducting a velocity survey was used. Three shot holes were drilled 600 feet north of the well and also 600 feet south of the well. (See Shooting Plan, Fig. 3). All shot holes were drilled to a depth of 200 feet and the centre holes at each side were cased to total depth.

A pressure-sensitive well geophone was used for the survey and a Schlumberger cable was used to lower and raise the well geophone in the hole. The well geophone was checked to ensure that it was working properly before being lowered into the hole.

The depths to twelve pre-determined horizons were surveyed. Well depths were measured with a Schlumberger cable with reference to the rotary table. No difficulties were encountered in lowering or raising the well geophone in the hole.

The trace arrangement on the test records was as follows :

Trace No. 1	-	Well Geophone, Low Gain of 6%
Trace No. 2	-	Well Geophone, Medium Gain of 25%
Trace No. 3	-	Well Geophone, High Gain of 100%
Trace No. 4	-	Time Break.
Trace No. 5	-	Up-hole Geophone.
Trace Nos. 6 to 11	-	Regular Reflection Spread

The reflection profile was recorded using a 500-foot spread south of the well, with six geophone stations spaced 100 feet apart. The reflections were recorded on Traces 6 to 11 on the lower part of the record with the geophone station for Trace 11 located at Shot Point 2.

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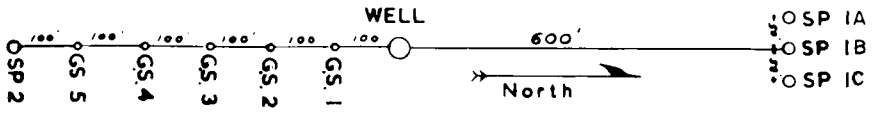
* Austral Geo Prospectors Pty Ltd.

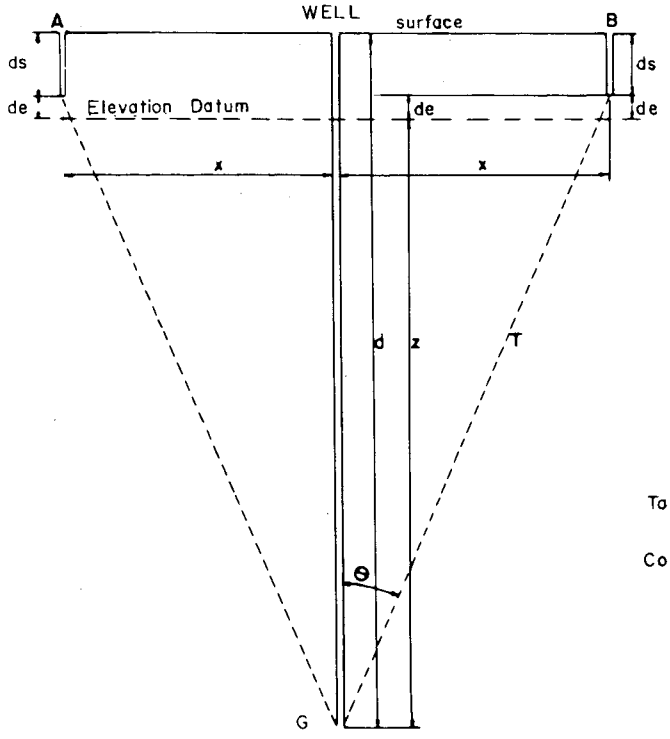
SHOOTING PLAN



LEGEND

- ◯ Well
- O Shotpoint
- o Geophones

CROSS-SECTION



LEGEND

SP	Shotpoint
G	Well Geophone
ds	Depth of Shot
de	Elevation Correction
ve	Velocity de
va	Average Velocity
d	Depth of Well Geophone
z	Depth Below Datum
x	Distance from Shotpoint to Well
T	Recorded Travel Time
Θ	Angle Between Well and Travel Path
tc	Recorded Travel Time Corrected to Vertical

$$\text{Tan } \Theta = \frac{x}{z + de}$$

$$\text{Cos } \Theta = \frac{z + de}{T} \quad \text{or} \quad z + de = T \cos \Theta$$

$$tc = T \cos \Theta - \frac{de}{ve}$$

$$va = \frac{z}{tc}$$

$$vi = \frac{\Delta z}{\Delta tc}$$

To supplement the velocity survey, an up-hole velocity survey was conducted to a depth of 240 feet to determine the near surface velocities.

INTERPRETATION AND RESULTS

Twenty-four velocity records were submitted with this report. (Copies of the records are available for inspection at the Bureau of Mineral Resources, Canberra). The quality of the "first-breaks" is good and the data used for the computations are considered reliable. The travel time was taken from Trace No. 3 in all instances because of the high gain which allows for more accurate information.

It will be observed that the amount of energy recorded by the well geophone below the Latemore Formation has greatly diminished and signifies that absorption of energy has occurred below this depth. The interval velocity from the Latemore Formation to the volcanic material is measured as 10,270 feet per second, part of which can probably be attributed to the volcanic tuff encountered in the well.

Velocity Determinations

The observed travel times (T) were corrected to an elevation datum of 800 feet above sea level using a sub-weathering velocity of 8000 feet per second. The observed travel times were also trigonometrically corrected to a vertical travel path to facilitate plotting of a time-depth curve. Average and interval velocities were calculated as shown in Figure 5. "Time lags", due to the shattering effects of repeated charges in the shot holes, were investigated and found not to affect seriously the velocity determinations. It will be noted that abnormal up-hole times are recorded at Shot Point 1 but that the final calculated values are in close agreement with those from Shot Point 2. In all instances, except one, the times were observed from opposite sides of the well and the results were averaged for the final velocity determinations.

Identification of Reflections

The measured energy from which the velocity is calculated is a "first arrival" of energy to the well geophone. The times normally picked in reflection work are trough times which are later than the "first arrival" times. The amount of such lag behind the "first break" is variable, being primarily a function of the instruments, the form of the energy envelope, the recorded frequency, and the velocity itself.

The calculated "first-arrival" time (t) for Trace No. 11 of the velocity record from Shot Point 1 is approximately equal to twice the observed time T, plus the up-hole time and elevation correction of Shot Point 2 at the opposite side of the well.

Expressed by formula, $(t) = 2T_1 + ts_2 + te_2$

The reflections may be identified on Trace No. 11 of the reflection record by a study of the "first arrival" times (t) which are marked by arrows, together with their respective time and depth values. The troughs of the reflection associated with the desired formations are usually 0.035 to 0.050 second behind the calculated "first arrival" times of that particular horizon.

VELOCITY DATA

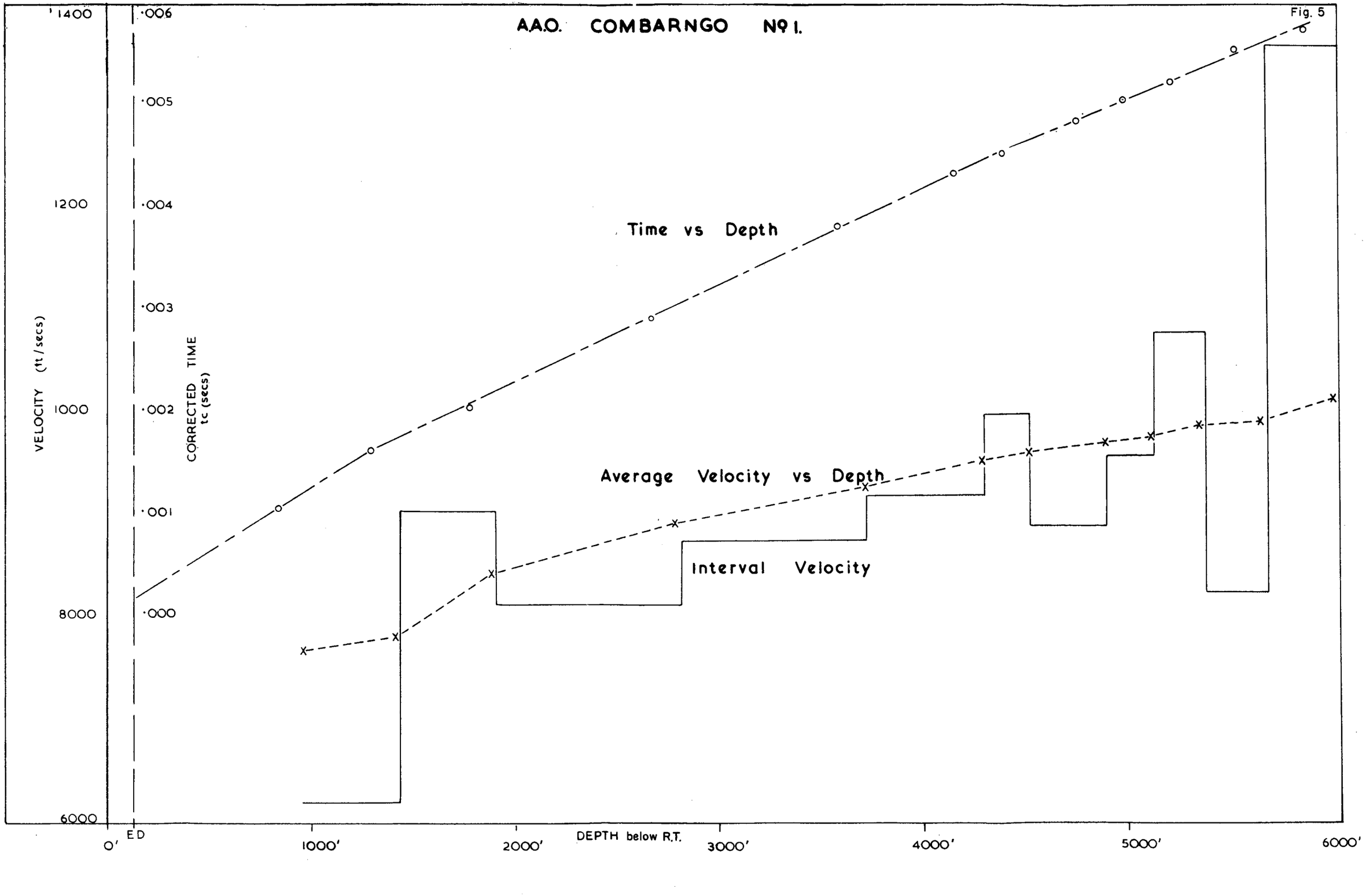
Fig. 4

WELL ELEVATION = +930' (R.T.) ELEVATION DATUM = +800' Ve = 8000 ft/sec.

S.P. Nº	Depth below R.T.	FORMATION	Charge	Elev.	ds	de	ts	z	T	Tan θ	Cos θ	Tcos θ	te	tc	va	Interval Velocity vi
2	960	T. Mooga	5	913	107	+6	·039	830	·139	600/836	·8124	·113	-001	·112		
1	960		15	920	197	-77	·069	830	·122	600/753	·7820	·095	+010	·105	7,690	
1	960		5	920	116	+4	·062	830	·134	600/834	·8117	·108	-001	·107		8,198
2	1415	T. Fossil Wood	5	913	108	+5	·039	1285	·181	600/1290	·9066	·164	-001	·163	7,812	
1	1415		7½	920	125	-5	·060	1285	·182	600/1280	·9054	·165	+001	·166		11,050
1B	1890	T. Gubberamunda	5	920	199	-79	·066	1760	·210	600/1681	·9417	·198	+010	·208	8,482	
2B	1890		5	913	199	-86	·058	1760	·208	600/1674	·9414	·196	+011	·207		10,170
2A	2775	Top Shale	5	913	199	-86	·057	2645	·291	600/2559	·9741	·283	+011	·294	8,967	
1A	2775	(Walloon Coal)	5	920	199	-79	·065	2645	·294	600/2566	·9737	·286	+010	·296		10,390
2	3700	T. Basal S.S. (W.C.)	5	913	131	-18	·047	3570	·387	600/3552	·9860	·382	+002	·384	9,297	11,200
2	4260	T. Moolayember	25	913	131?	-18	·032	4130	·434	600/4112	·9895	·429	+002	·431	9,562	
1	4260		20	920	186	-66	·066	4130	·434	600/4064	·9892	·429	+008	·437		12,000
2	4500	Zone 'B' reflection	15	913	134	-21	·047	4370	·455	600/4349	·9906	·450	+003	·453	9,626	
1	4500		20	920	149	-29	·066	4370	·456	600/4341	·9906	·451	+004	·455		10,880
2	4870	Top Zone I (Moolayember)	10	913	135	-22	·047	4740	·488	600/4718	·9920	·484	+003	·487	9,713	
1	4870		20	920	146	-26	·066	4740	·490	600/4714	·9920	·486	+003	·489		11,580
2	5090	T. Pickanjinnie	7½	913	132	-19	·047	4960	·506	600/4941	·9927	·502	+002	·504	9,793	
1	5090		15	920	144	-24	·065	4960	·510	600/4936	·9927	·506	+003	·509		12,770
1	5320	T. Latemore	50	920	140	-20	·066	5190	·525	600/5170	·9933	·521	+003	·524	9,896	
1	5320		15	920	143	-23	·067	5190	·526	600/5167	·9933	·522	+003	·525		10,270
1	5628	T. Volcanic Tuff	15	920	133	-13	·065	5498	·556	600/5485	·9940	·553	+002	·555	9,915	
2	5628		10	913	134	-21	·046	5498	·554	600/5477	·9940	·551	+003	·554		15,770
2	5975	10' from T.D. in volcanics	25	913	115	-2	·046	5845	·578	600/5843	·9947	·575	0	·575	10,139	
1	5975		25	920	140	-20	·066	5845	·578	600/5825	·9947	·575	+003	·578		

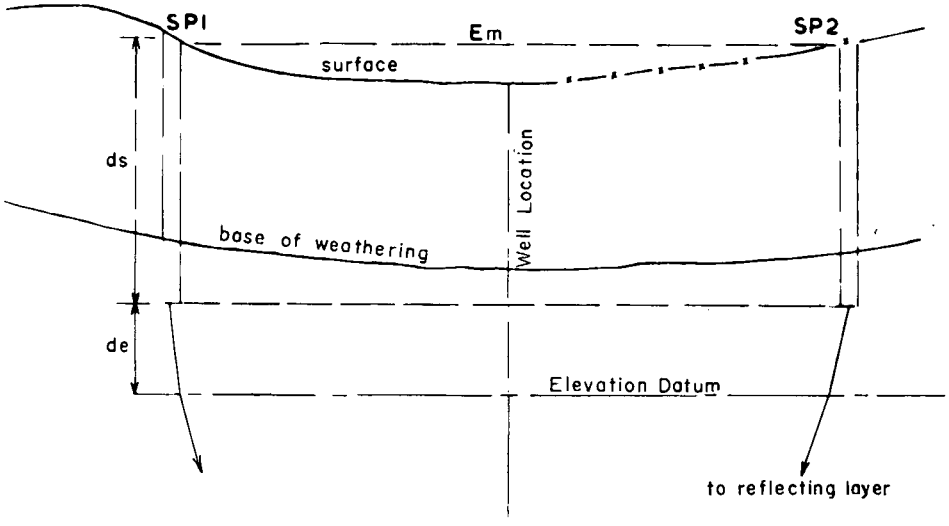
Fig. 5

A.A.O. COMBARNGO No 1.



WEATHERING AND ELEVATION CORRECTIONS
A.A.O. COMBARNGO NO. 1

REFLECTION PROFILE



LEGEND

SP	Shotpoint
x	Geophone
Em	Average Elevation of SP1 and SP2
ds	Depth of Charge
ts	Up Hole Time
de	Elevation Correction
ve	Velocity de
Σt	Total Correction for Correcting Recorded Time at SP2 to Datum
Σt	$\frac{de}{ve} + ts$

Formation	d	T_1	$2T_1$	ts_2	te_2	(t)
Top Mooga	960	.122	.244	.058	000	.302
T. Fossil wood	1415	.182	.364	.058	-.018	.404
T. Gubbermunda	1890	.210	.420	.058	+.001	.479
T. Shale (W.C.)	2775	.294	.588	.058	+.001	.647
T. Basal Sst. (W.C.)	3700	.387	.774	.066	-.014	.826
T. Moolayember	4260	.434	.868	.058	-.003	.923
Zone "B" reflection	4500	.456	.912	.058	-.012	.958
Top Zone 1 Moolayember	4870	.490	.980	.058	-.013	1.025
T. Pickanjinnie	5090	.510	1.020	.058	-.013	1.065
T. Latemore	5320	.526	1.052	.058	-.013	1.097
T. Volcanic Tuff	5628	.556	1.112	.058	-.016	1.154
10' from T.D. in Volcanics	5975	.578	1.156	.058	-.014	1.200

Times (t) are computed for the velocity record at Shot Point 1, at a depth of 186 feet, to the geophone station at Shot Point 2, using a hole depth of 199 feet and uphole time of 0.058 to calculate first break times to Trace No. 11.

APPENDIX 9

ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES

The following additional data relating to A.A.O. Combarngo No. 1, have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference:

(i) Well logs including the following:

(a) Electric Log

Run 1, 306-4909 feet (2" = 100 ft)
Run 2, 4809-5177 feet (2" = 100 ft)
Run 3, 5077-5630 feet (2" = 100 ft)
Run 4, 5530-5986 feet (2" = 100 ft)

(b) Laterolog

Run 1, 4650-5093 feet (2" = 100 ft)

(c) Microlog

Run 1, 4150-4400 feet (5" = 100 ft)
Run 1, 4600-4909 feet (5" = 100 ft)
Run 2, 4809-5091 feet (5" = 100 ft)
Run 3, 5400-5630 feet (5" = 100 ft)

(d) Gamma Ray Log

Run 1, 4800-5119 feet (5" = 100 ft)

(e) Section Gauge Log

Run 1, 306-5300 feet (2" = 100 ft)

(f) Temperature Log

Run 1, 2350-5126 feet (2" = 100 ft)

(ii) Daily drilling reports for period 5th May, 1961 to 9th July, 1961.

(iii) Drill Stem Test Reports Nos 1-5.

(iv) Cementation Reports Nos 1-11.

Plate I.
Sheet I.

COMPOSITE WELL LOG

COMPANY *ASSOCIATED AUSTRALIAN OILFIELDS N.L.*

PETROLEUM TENEMENT *AUTHORITY TO PROSPECT 55 P* WELL NUMBER *COMBARNGO No. I.*

STATE *QUEENSLAND* 4-MILE SHEET *ROMA* BASIN *BOWEN* WELL STATUS *ABANDONED*

LOCATION - Lat *26° 51' S* Long *149° 09' E*
ELEVATION Reference Pt (R.T.) *930'* ASL
Ground *918'* ASL

Date Spudded *5 May 1961*
Date Drilling Stopped *10 June 1961*
Date Rig Off *16 July 1961*
Total Depth Driller *5985'* E Log *5987'*

Hole Size

In	From	To
17½"	0'	312'
8½"	312'	5985'

Casing

In	Wt	Gr	Depth	Cmt	Cmt'd To
13⅜"	48lb	H-40	306'	182Sx	Surface
6⅝"	20lb	J-55	5125'	144Sx	4400'

Cement Plugs

From	To	Sacks
5125'	5300'	154
4987'	5087'	14

For details of other plugs see report

Perforation

Type	Size	From	To	No/ft
Jet	½	5076'	5077½'	4
"	"	5082'	5083½'	4
"	"	5076'	5077½'	4

Well Head Fittings *Doughnut between 13⅜ & 5" WWC with 3x2" valved outlets*

Drilled by *Mines Administration Pty Ltd.* Cemented by *Minad*
Logged by *Schlumberger* Mud logging by *Minad*
Drilling Method *Rotary*

ELECTRIC LOG DATA

Run Number	1	2	3	4
Date	23 May	28 May	2 June	10 June
Footage Logged	4603	368	553	456
Logged From	306	4809	5077	5530
Logged To	4909	5177	5630	5986
Total Depth - Electric Log	4910	5178	5631	5987
Total Depth - Driller	4920	5188	5644	5985
Casing Shoe - Electric Log	306	306	306	306
Casing Shoe - Driller	306	306	306	306
Bit Size	8½"	8½"	8½"	8½"
Mud - Kind	Bentonite	Bentonite	Bentonite	Bentonite
Treatment	Myr/Caus	Myr/Caus	Myr/Caus	Myr/Caus
Water Loss ccs/30min	8·4	8·4	10·2	13
Weight lbs/cu.ft	76	78	77	76
Viscosity (Marsh) Sec	45	38	50	39
pH	8	9·5	9	8·5
Resistivity Ω m²/m & Temp	4·7@61°F	4·3@67°F	4·3@61°F	4·1@63°F
	2·1@140°F	2·0@144°F	1·9@150°F	1·5@160°F
Max Recorded Temp	140° F	144°F	150° F	160° F
Electrode Spacing	16"	16"	16"	16"
Symmetrical	64"	64"	64"	64"
	18'8"	18'8"	18'8"	18'8"
Non-Symmetrical				
Recorded by	A Baudot	A Baudot	A Baudot	A Baudot (Schlumberger)

RADIOMETRIC LOG DATA

Type of Log	Gamma	Gamma
Run Number	1	1
Date	11·6·61	26·6·61
Total Depth - Driller	5985	5121
Top of Logged Interval	30	4800
Bottom of Logged Interval	4800	5119
Type of Fluid in Hole	Mud	Oil
Fluid Level	0'	0'
Maximum Recorded Temperature	139°F	-
Neutron Source, Strength & Type	-	-
Source Spacing - In	-	-
Length of Measuring Device	-	4'
O.D of Instrument - In	-	3⅝
Time Constant - Secs	1	6
Logging Speed - Ft/Min	35	13 6
Statistical Variation - In	-	½
Sensitivity Reference		
Recorded by	BMR	Schlum

CASING RECORD

Run No	Size - In	Wt - Lbs	Interval - Ft	To
1	13⅜"	48	0	306
2	6⅝"	20	306	5125

OPEN HOLE RECORD

Bit Size - In	Interval - Ft	To
17½	0	312
8½	312	5985

OTHER BORE-HOLE LOGS

Temperature 2350 - 5126
Micro - Caliper 4150-4400; 4600-4909; 4809-5091, 5400-5630
Velocity 0 to T.D.
Laterolog 4650-5093
Section Gauge 306 - 5300

WELL SYMBOLS

- Gas show slight
- Gas show strong
- Oil show slight
- Oil show strong
- Oil and gas show
- Fluorescence
- Circulation loss partial, and s g mud
- Circulation loss complete, and s g mud.
- Flow into well and s g mud
- Blowout
- Core interval number and recovery
- Sidewall core
- Perforated interval
- Formation test interval and no (OH / in csg)
- Plugged interval
- Fossils: Macro, Micro, Plant, Spore, pollen

LITHOLOGIC REFERENCE

Conglomerate, Greywacke, Dolomite, Coal, cal Calcareous
Breccia, Siltstone, Calcarenite, Igneous rocks gr Granite, gl : Glauconitic
Tillite, Claystone, Calcilutite, Volcanic rocks a Andesite, py : Pyritic
Quartz sandstone, Shale, Marl, Metamorphic rocks gn Gneiss, c : Carbonaceous
Arkose, Limestone, Evaporite s Salt, mi Micaceous, ch Cherty

Lithology by: S.S. Derrington, K.E. Denton

Plate 1.
Sheet 2.