



**BELLBIRD-1 (W477)**

**TABLE OF CONTENTS**

- 1.0 Final Well Report
  
- 2.0 Well Card
  
- 3.0 Lithology
  - (a) Stratigraphic Column
  - (b) Weekly Drilling Reports
  
- 4.0 Palynology
  
- 5.0 Enclosures
  - (a) Cross Section
  - (b) Structure Map
  - (c) Continuous Dipmeter

1.0 *Final Well Report*



**ARCO LIMITED / WOODSIDE (LAKES ENTRANCE)**

**OIL CO. N. L.**

**BELLBIRD NO. 1 WELL**

**FINAL WELL REPORT**

**by**

**GERALD FLEIT**

**ARCO LIMITED**

BELLBIRD NO. 1

C O N T E N T S

**COMPLETION REPORT**

**SUMMARY**

**INDEX MAP**

**INTRODUCTION**

**WELL HISTORY**

**DRILLING DATA**

**LOGGING AND TESTING**

**G E O L O G Y**

**Summary of Previous Work**

**Geological and Drilling  
Geophysical**

**Summary of the Regional Geology**

**Stratigraphic Table**

**Stratigraphy**

**Structure**

**Relevance to the Occurrence of Petroleum**

**Porosity and Permeability of the Drilled Section**

**Contribution to Geological Concepts Resulting  
from Drilling**

**ENCLOSURES :**

**Electric Logs**

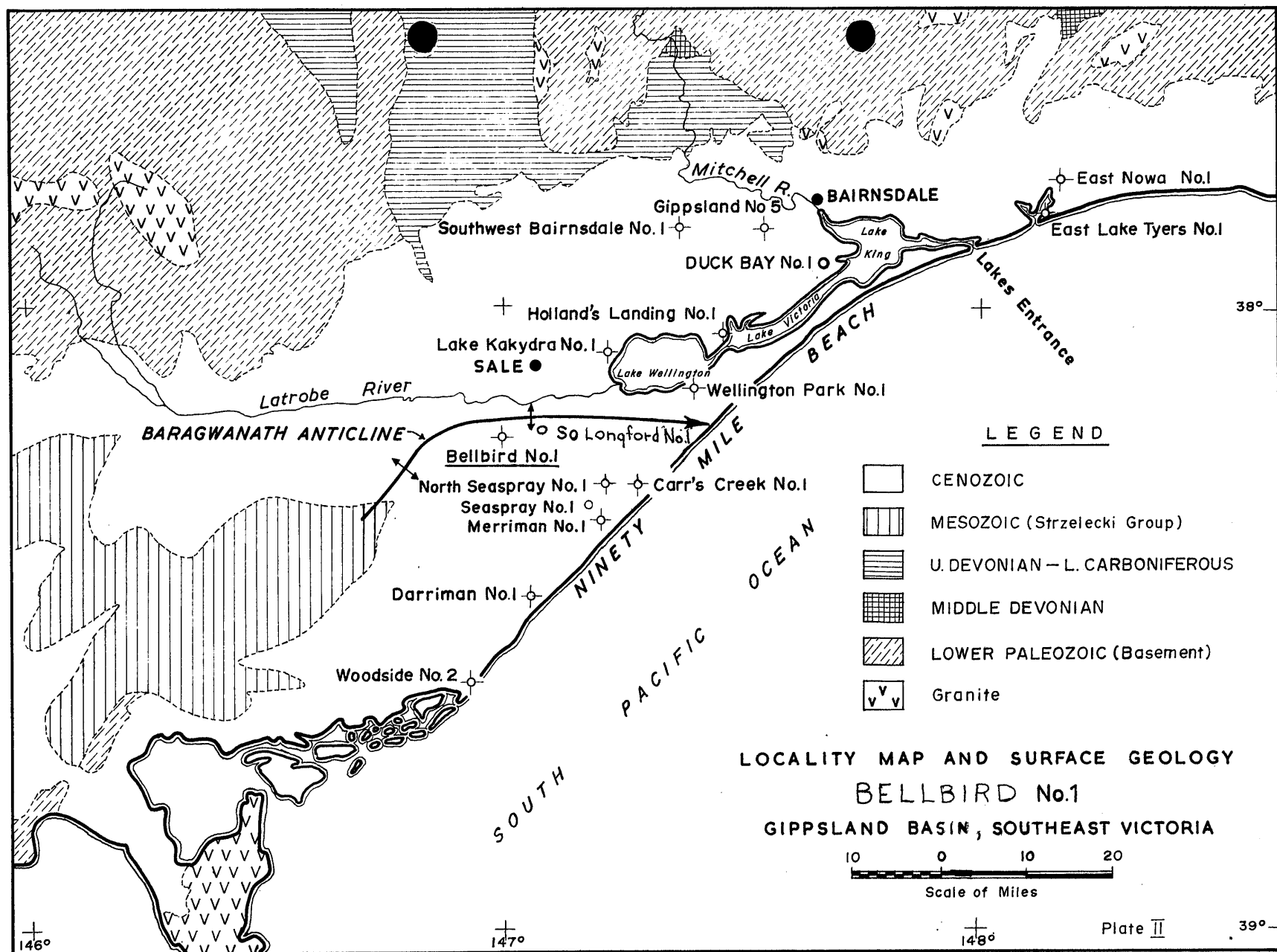
**Lithologic Log**

## S U M M A R Y

The Bellbird No. 1 was spudded 18th November, 1963 and completed as a dry hole at a total depth of 2500 feet on 11th December, 1963. There were no hydrocarbon shows or significant porosity and permeability.

The Bellbird No. 1 is the first of a series of stratigraphic holes to examine the hydrocarbon possibilities of the basal Tertiary and Upper Mesozoic formations. The northeast portion of the Baragwanath anticline is the location for the stratigraphic drilling.

The Tertiary section encountered was thin and fresh water-bearing. The outstanding characteristics in the Mesozoic section are the predominance of claystones and clay cemented greywackes, the absence of reservoir and source rocks and the moderate east north-east dip.





INTRODUCTION

The Baragwanath anticline is a large north-east south-west trending surface structure on the north flank of the Gippsland Basin. The structure is reflected in the Tertiary rocks on the surface in the Longford area. A series of stratigraphic tests have been proposed to examine the lithology and structure above and below the Tertiary - Mesozoic unconformity.

The Bellbird No. 1 is located about 5 miles southwest of the community of Longford. This well is situated on Tertiary closure on the Baragwanath anticline. The structure has been mapped on top of the Latrobe Valley Coal Measures by utilizing a series of coal evaluation holes drilled by the Victorian State Electricity Commission. Gravity work has confirmed the presence of the anticline in the Tertiary section.

WELL HISTORY

GENERAL DATA :

Well Name and Number	<u>BELLBIRD NO. 1</u>
Location	Longitude 147°00'56" East Latitude 38°12'54" South
Name and Address of Tenement Holder	Lakes Oil Limited 792 Elizabeth St. Melbourne, Victoria
Details of Petroleum Tenement	PPL. No. 184
District	Gippsland
Total Depth	Driller 2501' Schlumberger 2502'
Date Drilling Commenced	18th November, 1963
Date Drilling Completed	10th December, 1963
Date Well Abandoned	11th December, 1963
Date Rig Released	11th December, 1963
Drilling Time in days to total depth	22
Elevation (above MSL)	Ground 436 KB 441
Status	Dry, plugged and abandoned
Cost	Not available

**Drilling Data :**

<b>Name and Address of Drilling Contractor</b>	Woodside (Lakes Entrance) Oil Co. N.L. 792 Elizabeth St. Melbourne, Victoria		
<b>Drilling Plant</b>	<b>Make</b>	Mindrill	
	<b>Type</b>	5000	
	<b>Rated Capacity</b>	4500 feet with 2 $\frac{1}{8}$ " drill pipe	
<b>Mast</b>	<b>Make</b>	Mindrill	
	<b>Type</b>	Twin leg telescopic	
	<b>Rated Capacity</b>	40,000 lbs.	
<b>Pumps</b>	<b>Make</b>	Bofec	
	<b>Type</b>	SPIZ/165 Duplex	
	<b>Size</b>	6" x 12"	
	<b>Make</b>	Mindrill	
	<b>Type</b>	4 $\frac{1}{2}$ " x 5"	
	<b>Size</b>	4 $\frac{1}{2}$ " x 5"	
<b>Blowout Preventer Equipment</b>	<b>Make</b>	Baash Ross	Master Gate
	<b>Model</b>	Auto Lock	Manual
	<b>Size</b>	6 $\frac{1}{2}$ "	6"
	<b>Working Press.</b>	2000 psi	2000 psi
<b>Hole Size and Depth</b>	12"	0 - 30'	
	8 $\frac{1}{2}$ "	30 - 573'	
	6"	573 - 2501'	
<b>Casing and Liner Details</b>	<b>Size</b>	9 $\frac{1}{2}$ "	
	<b>Weight</b>	36 lbs/ft	
	<b>Grade</b>	J-55	
	<b>Setting Depth</b>	30'	
	<b>Size</b>	7"	
	<b>Weight</b>	20 lbs/ft	
	<b>Grade</b>	J-55	
	<b>Setting Depth</b>	573'	
<b>Casing and Liner Cementing Details</b>	<b>Size</b>	9 $\frac{1}{2}$ "	
	<b>Setting Depth</b>	30'	
	<b>Quantity cement used</b>	10 sacks	
	<b>Cemented to</b>	Surface	
	<b>Method used</b>	Poured from cement mixer	
	<b>Size</b>	7"	
	<b>Setting Depth</b>	573'	
	<b>Quantity cement used</b>	84 sacks	
	<b>Cemented to</b>	No returns, annulus filled with cement and sand by pouring from the surface	
	<b>Method used</b>	Plug	

Drilling Fluid	Type	Water base bentonite low pH	
		Average Weight	Depth
	No. recorded weight	30' - 750'	
	9.5 lbs/gal	750' - 937'	
	9.7 "	937' - 1046'	
	9.8 "	1046' - 1223'	
	9.5 "	1223' - 1337'	
	9.8 "	1337' - 1643'	
	10.1 "	1643' - 1719'	
	10.3 "	1719' - 2231'	
	10.6 "	2231' - 2501'	

Mud and Chemicals used during Drilling	Type	Quantity	Weight
	Bentonite	215 sx	21,500 lb.
	Lo Vis	22 "	1,100 "
	Mica	13½ "	675 "
	Caustic Soda		161 "
	Sawdust	9 "	45 "
	C.M.C.	3½ "	175 "
	Tylose	1 "	50 "
	Calgon		15 "

A medium weight, low-medium viscosity, fresh water bentonite mud was used during the drilling operation. The mud was maintained at a viscosity of 55-60 sec/qt. water loss at 6 cc. filter cake 2/32" and a pH of 8-10. Lost circulation zones were encountered in the unconsolidated sands of the Tertiary section. Lost circulation was also noted while drilling at lower depths in the Mesozoic. Loss of returns was believed to be coming from the Tertiary section below the surface casing. A partial cause may have been mud weights in excess of 10.4 lbs/gal.

#### Water Supply :

Water was hauled by truck from the Latrobe River at a point approx. 4 miles from the location.

#### Perforation and Shooting Record :

None.

#### Plugging Back :

The only plugs set were for the purpose of abandonment. Two 100 ft. cement plugs, each using 16 sacks of cement, were set at 523-623 ft. and 890-900 feet. A surface plug was topped by a cap welded on 7" pipe.

#### Fishing Operations :

None.

#### Side Tracked Holes :

None

LOGGING AND TESTINGDitch Cuttings :

Standard sample catching procedures were followed in collecting 10 feet samples while drilling and 5 feet samples while coring. Complete sets of samples were sent to the Bureau of Mineral Resources and the Victorian Department of Mines.

Coring :

Four cores were cut -

Core No. 1	987'-1001', recovered 13' of 14' greywacke and mudstone.
" " 2	1265'-1276', recovered 9'4" of 11' greywacke
" " 3	1719'-1729', recovered 9'7" of 10' claystone and greywacke.
" " 4	2232'-2248', recovered 15'9" of 16' greywacke

Sidewall Cores :

There were no sidewall cores.

Electric Logging :

Schlumberger tools logged the hole.

The electrical Survey and Microlog were run from 573'-2500' on scales of 2" and 5" equals 100 feet. The dipmeter was run from 573' - 2500'.

Drilling Time, and Gas Log :

Continuous gas detector and drilling time charts were maintained at the wellsite with Core Lab equipment.

Formation Testing :

None.

Deviation Surveys :

Hole deviation was checked at intervals of 500 feet or less by "Totco" device. The hole deviation increased to 1° at total depth.

G E O L O G YSUNMARY OF PREVIOUS WORKGeological and Drilling :

Only a few wells have probed the Mesozoic at the east end of the Baragwanath anticline. The nearest wells along the axial trend that reached the Mesozoic are six miles to the west. The Tanjil Pt. Addis No. 1, 4½ miles to the east, bottomed in questionable Jurassic beds. This well is on the south-west flank of the structure. There are many coal evaluation bores in the vicinity of the Bellbird No. 1. These wells were drilled into the Latrobe

Valley coal measures and average 200-300 feet in depth.

The known nature of the anticline precluded doing field work.

### GEOPHYSICAL

Previous geophysical work in the Gippsland sedimentary area includes a regional gravity survey made in 1949 by R.H. Ray Company for Oilco Ltd. followed by a semi-regional gravity survey by the Bureau of Mineral Resources in East Gippsland in 1951.

The Bureau of Mineral Resources conducted a detailed gravity survey in 1960 south of the Rosedale - Sale road and west of the South Gippsland highway, at the request of the Victorian State Electricity Commission.

The Bureau of Mineral Resources made an aero-magnetic survey of the on-shore area of the Gippsland Basin in 1951-1952. Austral Geo Prospectors carried out the Bairnsdale - Sale survey for Woodside (Lakes Entrance) Oil Co. N. L. from mid-May to mid-September, 1960 between the north shore of Lake Wellington and the Princes Highway. From mid-March to early June, 1961, this same contractor working for the same client, evaluated the Sale area which lies between Lake Wellington and the coast. From early January to early June, 1962, this same contractor extended the latter survey for Arco Limited - Woodside to include control along the coast from Lakes Entrance to Woodside and west of the South Gippsland highway to Longford.

### SUMMARY ON THE REGIONAL GEOLOGY

The Gippsland Basin is one of several small basins along the south coast of Australia. The basin is defined and delineated by the presence of Tertiary coal measures and marine sediments. The basin proper can be considered as that area west of the Lakes Entrance granite high, south of the Tertiary - Paleozoic contact on the north side of the basin and east of a line between the Wilson's Promontory granite and the town of Warragul. The position of the south boundary is not known as it lies in the area of the Bass Strait.

The Longford area of the Gippsland Basin is underlain in the subsurface by the Strzelecki group, a non-marine sequence consisting of shale, mudstone, sandstone, siltstone and graywacke of Lower Cretaceous - Jurassic age. The thickness of this sequence is probably in excess of 10,000 feet.

The Latrobe Valley coal measures overlie the Strzelecki group. This section is of Eocene - Oligocene age and consists of coal, clay and unconsolidated sands. This stratigraphic unit, where not affected by erosion, has a total thickness of about 1200 feet in the Longford area.

The formations overlying the Latrobe Valley coal measures, from bottom to top are the Lakes Entrance formation, Gippsland Limestone, Tambo River formation, Jemmy's Point formation, and the Haunted Hills gravels. These units extend in age from Oligocene to Pliocene and have an aggregate thickness of about 2000 feet. The formations above the Latrobe Valley are not represented in the Bellbird No. 1 due to Tertiary erosion and non-deposition.

### STRATIGRAPHIC TABLE

T A B L E I

Age			
L.Oligocene to L.Eocene	Latrobe Valley Coal Measures	931'	<u>Sand, coal and clay.</u>
Lower Cretaceous	Strzelecki Group	1610' 1570'	<u>Greywacke, Clay- stones and Shale</u>
		2501'	

### STRATIGRAPHY

0 - 931 feet

#### Latrobe Valley Coal Measures

Lower Oligocene to Upper Eocene

Sand, red to lt. gry., f-cse. gd. qtz, angular to sub-angular, clean with occasional pebbles. Traces of brown Coal and Shale and Clay.

Tertiary sediments have been deeply eroded along the axis of the Baragwanath anticline. All formations in the Tertiary, with the exception of 931 feet of Latrobe Valley coal measures, have been eroded from the vicinity of the Bellbird No. 1.

931 - 2501 feet

#### Strzelecki Group

Lower Cretaceous

Greywacke, medium gray-green, very fine to fine grained, clay cement, quartzitic, chloritic, feldspathic, with dark green mineralization, carbonaceous, friable to tight, fair to poor sorting and slightly micaceous.

Shale, medium gray - gray brown, firm, carbonaceous, slightly silty.

Claystone, light cream - gray, slightly silty, moderately fractured, sticky and with some waxy lustre.

The Strzelecki group in the Bellbird No. 1 is characterized by thick claystones and greywackes. This section is comparable to the Strzelecki group in the wells to the south-east (North Seaspray No. 1 and Carr's Creek No. 1). The porous sand found in the Mesozoic of the Merriman No. 1 is not present in the Bellbird No. 1.

### STRUCTURE

The north-east - south-west trending Baragwanath anticline is the major structural feature in the Longford area. The feature has been substantiated in the Tertiary by coal bores drilled by individual concerns and the State Electricity Commission of Victoria, and gravity surveys. Seismic surveys, as yet, have not been able to map continuous reflections from within the Strzelecki group. The problem is further complicated by the presence of a pronounced unconformity between the Tertiary and the Mesozoic.

The Bellbird No. 1 was drilled on the axis of the anticline and encountered the top of the Mesozoic 300 feet deeper than anticipated. The dipmeter survey in the Tertiary show inconclusive dips. The Mesozoic beds, however, have an average dip of  $11\frac{1}{2}^{\circ}$  north  $79^{\circ}$  East. The Mesozoic dip conforms very closely to the axial plunge of the Baragwanath anticline in the Tertiary beds. The Bellbird No. 1 may be on the north flank of a Mesozoic structure although this idea presupposes many unknowns.

### RELEVANCE TO OCCURRENCE OF PETROLEUM

There were no shows of oil or gas in the Bellbird No. 1. The gas sand present in the North Seaspray No. 1 was absent, either by erosion or non-deposition.

The sands in the Tertiary Latrobe Valley coal measures are fresh water-bearing.

The Mesozoic section has almost a total absence of source and reservoir beds. There is a very small chance that there are hydrocarbons in the area of the axis of the Baragwanath anticline even if structural closure is present in the Mesozoic beds.

### POROSITY AND PERMEABILITY OF SEDIMENTS PENETRATED

Clean, porous water sands are present from the surface to 931 feet. The Mesozoic section from 931 - 2501 feet consists of tight claystones and greywackes. The microlog indicates 5 feet of porosity at 1545 - 50 feet, 3 feet at 1988 - 91 feet and 7 feet at 2459 - 66 feet. The interval 2459 - 66 averages 14% porosity and calculates 100% water saturation.

### CONTRIBUTION TO GEOLOGICAL CONCEPTS

The important geological information obtained from the Bellbird No. 1 is listed below :

1. The Bellbird area is unfavorable for Tertiary objectives because of the thin section and the fresh water-bearing nature of the porous sands.
2. The Bellbird area is unfavorable for Mesozoic objectives because of the absence of significant source and reservoir rocks.
3. The favorable sedimentary section at the top of the Mesozoic in the Merriman No. 1 does not extend to the Bellbird No. 1.
4. It is not possible to determine the presence or absence of structure below the Tertiary - Mesozoic unconformity.
5. The Mesozoic section consists almost entirely of claystones and greywackes which contain abundant volcanic material.



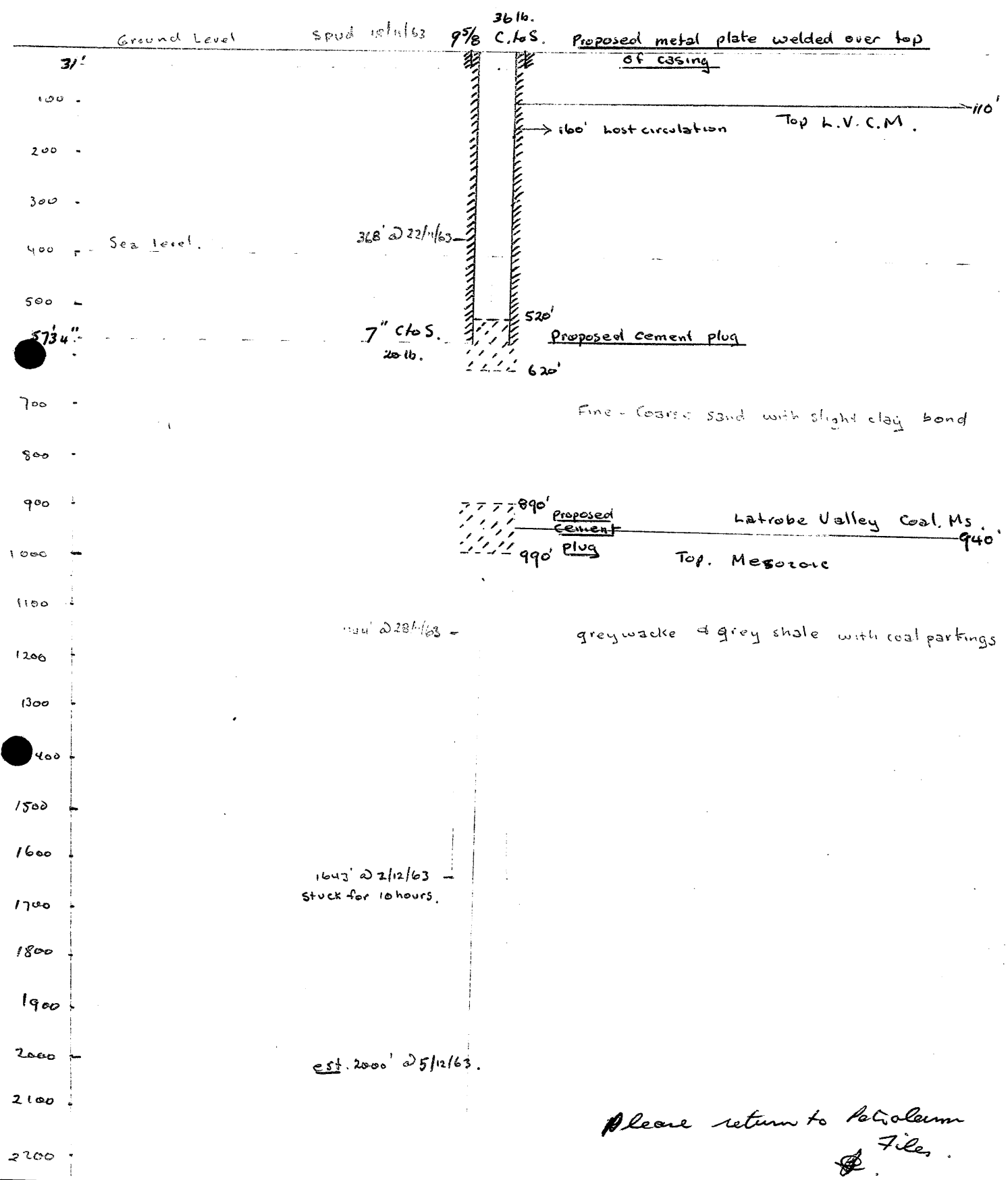
2.0 Well Card





### 3.0 Lithology

BELL BIRD, No 1. Abandonment Programme.



Please return to Petroleum Files.

WOODSIDE - ARCO.

Bellbird No. 1

18.11.63 spud. 10.30 AM approx.

21.11.63 Entered Katoke Valley C.M. at ca 103.  
110

lost circulation at ~ 160 & experiencing difficulty in re-establishing it

22.11.63. 9.30 AM. at 368' & drilling ahead.  
out of coal measures at 224'.

25.11.63. 7" casing set at 570' - at 590' still in Katoke Valley C.M.  
- coarse sand & shaly sands.

28.11.63 at 1144'. Top Mesozoic 940 (300' deeper than anticipated)

Cone 987-1001 - greywacke & shale ± coal parting. 0°-5° dip.

2.12.63 @ 1643. in greywacke & shale grey. stuck for 10 hours.

(Abandonment programme. Plugs at 890-990' and 520-620')

11.12.63. T.D. 2500.0'

Bellbird No. 1.

9-12-63.

At. 2365' in grey wacke & claystone

Cored 2232 - 2248'

Recovered 15' 9"

Core in claystone - no visible bedding.

Mr. Kirk.

Waiting on Schlumberger  
To drill on and core while waiting.

ARCO - Baraqueanath Anticline  
Grat-wells.

1. Bellbird No 1.
2. South Longford No. 1 (expected structurally down dip from Bellbird. 1)

Target depth ca 2000' or top of dense  
Mesozoic greenwacke

No Tertiary coring, but will Mesozoic  
if porosity encountered  
E logs = dip meter.

Setting surface string <sup>of antic. diam</sup> which will enable  
to set further strings if necessary.

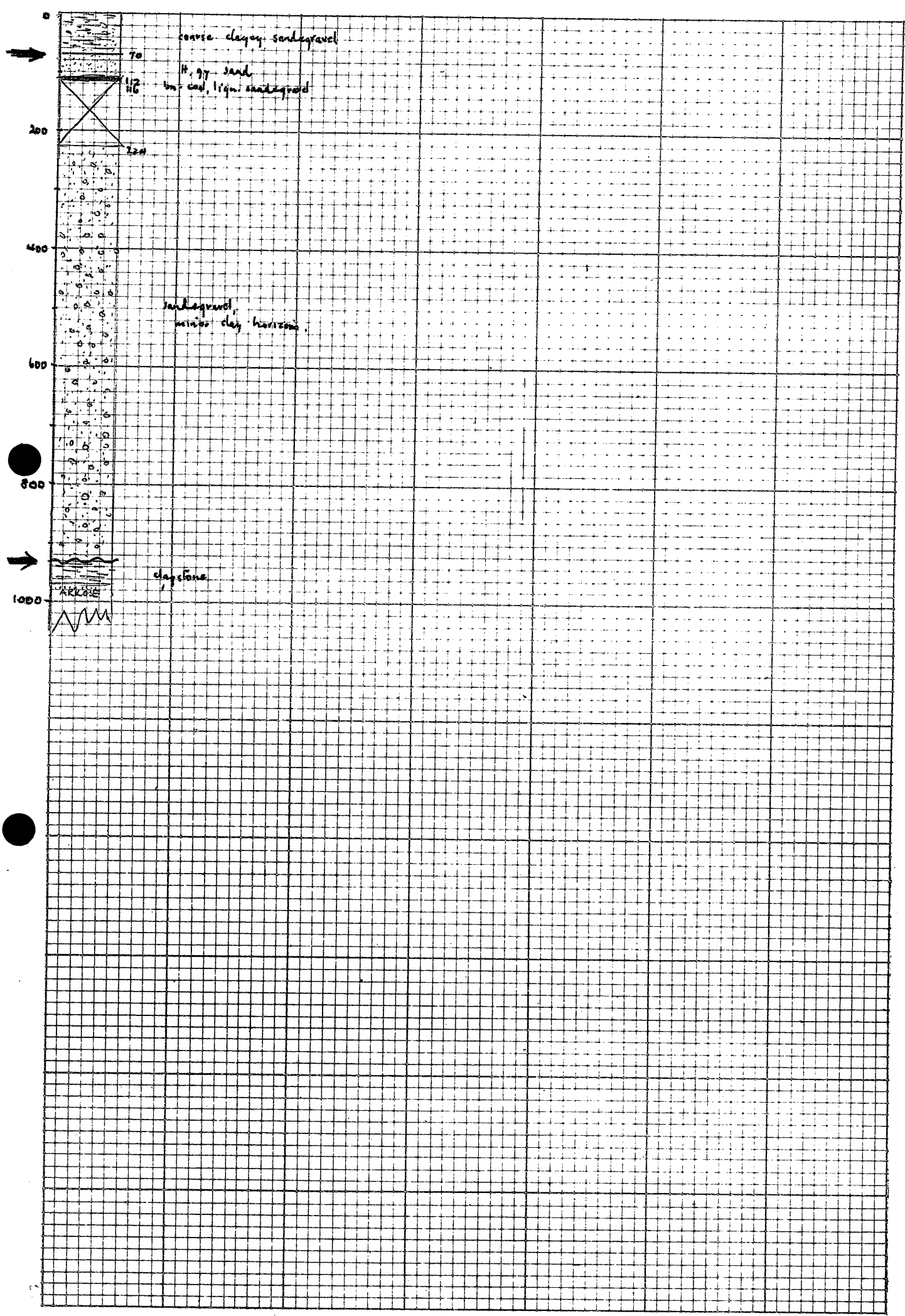
Phone message V. Bychock.  
8/11/63.



ELLBIRD No. 1

Elev. 441 ft (DF.)

Provisional



BELLBIRD NO. 1

Location:

Elev<sup>n</sup>: DF 441ft.

T.D: 2500ft.

L.V.C.M. range: 70-

+2

Lith. Log:

0-70 : coarse sand & gravel, coated with white to orange clay.

70-112 : lt. gy. even-grained sub-angular sand.

113m

112-116 : brown coal, brown ligneous sand & gravel.

116-224 : no samples.

24-930 : predominantly <sup>fine to</sup> coarse <sup>gravelly</sup> sand, ~~sands~~ with minor clayey streaks.

930-970 : pinkish brown sandy claystone.

970 <sup>etc</sup> : greenish arkose/siltstone.

939 - 164m

3 m

- 40-50 : coarse gravel coated with orange clay mud
- 50-60 : " "
- 60-70 : white gritty clay
- 70-80 : lt. gy even gr<sup>d</sup> (angular) sand.
- 80-90 : " ; sl. coarser
- 90-100 : " " —
- 100-110 : " " finer
- 110-220 : <sup>br.</sup> ligneous sand + bn. coal fragments, some gravel.
- 220-30 : coarse gravel + sand, bn. coal chips (? contain sandst assoc.)
- 230-40 : " "
- 240-50 : gy. sand, some grit, occ. bn. coal chips (as for 90-100).
- 50-60 : gy. sand, grit + gravel
- 360 : (s) (gr) (gr) v. minor coal frags.
- 250-60 : s + gri.
- 260-70 : s → gra.
- 270-80 : " " "
- 280-90 : s, minor gra.
- 290-300 : gri + s, minor gra.
- 300-10 : " " "
- 310-20 : " " "
- 320-30 : " " "
- 330-40 : " " "
- 340-50 : " " more gra. (coarse grit)
- 350-60 : " " more gra.
- 360-430 : as above
- 360-70 : s, + minor gri.
- 370-80 : sl. more gri.
- 380-90 : gri. + s.
- 390-400 : " " "
- 400-10 : gra. gri. muds
- 410-20 : " " "
- 420-30 : " " "
- 430-480 : as above, dirty (grey powder prob. drill. mud?)
- 430-440 : coarse s. + gri.
- 440-50 : some gra.
- 450-60 : " " "
- 460-70 : " " "
- 470-80 : " " "
- 480-500 : grey sand, grit + minor gravel, v. rare traces of bn. coal.
- 500-510 : as above, dirty + gravelly.
- 510-20 : sands <sup>minor</sup> grit weakly cemented by grey clay (dark dirty bn. coal frag.)
- 520-30 : as above, v. little gravel.
- 530-550 : sand + grit (clean, minor gravel).
- 550-620 : dark grey sand + minor grit, cemented by clay.
- 620-670 : dirty, grey sand + grit, incl. chips of clayey material, partially gravel.
- 670-940 : " " " " v. little grav. (650-60 670-80)
- sand v. angular + flaky.

clean sands above ↑

\* some gravel @ 720-50  
790-810 (cemented here)  
\* pinkish tinge @ about 855  
sl. more gritty below this.  
~~more gritty below this~~

940-30 : dirty pinkish br. clay sand, finer sand than above,  
v. clayey 950-60.

970 - : quick arkose or <sup>siltstone</sup> ~~massive~~ ~~stone~~ ~~(or something)~~.

PAH · 230 · Tues. 7

- 40-50 : coarse gravel & some orange clay
- 50-60 : " "
- 60-70 : white gritty clay
- 70-80 : lt. gy even gr. <sup>3/16"</sup> sand
- 80-90 : " l. coarser
- 90-100 : " " "
- 100-110 : " " finer
- 110-120 : <sup>gy.</sup> lignose sand + br. coal fragments some gravel
- 120-130 : coarse gravel sand, some <sup>br. coal</sup> fragments - conduct assoc.
- 130-140 : " " "
- 140-150 : gy. sand, some grit + br. coal chips (as for 90-100).
- 150-160 : gy. sand, grit + gravel
- 160-170 : " " " " " "
- 170-180 : " " " " " "
- 180-190 : " " " " " "
- 190-200 : " " " " " "
- 200-210 : " " " " " "
- 210-220 : " " " " " "
- 220-230 : " " " " " "
- 230-240 : " " " " " "
- 240-250 : " " " " " "
- 250-260 : " " " " " "
- 260-270 : " " " " " "
- 270-280 : " " " " " "
- 280-290 : " " " " " "
- 290-300 : " " " " " "
- 300-310 : " " " " " "
- 310-320 : " " " " " "
- 320-330 : " " " " " "
- 330-340 : " " " " " "
- 340-350 : " " " " " "
- 350-360 : " " " " " "

Clean sands above

- 360-430 : as above
- 430-440 : as above, dirty (grey powder)
- 440-450 : as above, dirty (grey powder)
- 450-460 : as above, dirty (grey powder)
- 460-470 : as above, dirty (grey powder)
- 470-480 : as above, dirty (grey powder)
- 480-490 : as above, dirty (grey powder)
- 490-500 : as above, dirty (grey powder)
- 500-510 : as above, dirty (grey powder)
- 510-520 : ~~sands~~ <sup>minor</sup> grit, mostly cemented by grey clay (dark dirty br. coal frags.)
- 520-530 : as above, v. little gravel.
- 530-550 : sand & grit (clean, minor gravel)
- 550-620 : dark grey sand & minor grit, cemented by clay
- 620-670 : dirty, <sup>br.</sup> sand & grit, with chips of clayey material, partially gravel
- 670-740 : " " " " " " <sup>little</sup> grav. <sup>650-60</sup> ~~670-60~~  
sand v. angular at base.

\* some gravel @ 720-50  
790-810 (cemented here)  
min. frags @ about 855  
sl. more gritty below this.  
~~more frags @ 870~~

Apres/Woodward Billboard #21 (HOT - 540191259).  
(12. considered)

Geographic Log of Well Completion Report. (Measured from log.)  
2) Weekly reports.

- 0' - 931' (a) Sand, red to light grey, fine to coarse grained, quartzose, angular to sub-angular, clean with occasional pebbles, traces of brown mud and small amounts of silt and clay.  
(110' - 115' bed): (Clay for shale: 520' - 530' : 550' - 565' : 580' - 595' & 800' - 810').
- (b) 0' - 112' Sand, light grey, medium to coarse grained.  
112' - 116' Brown mud & fine gravel.  
116' - 224' No returns.  
224' - 940' Predominantly sand, light grey & milky quartz, fine to very coarse grained and pebbly with minor clay streaks.

- 931' - 1260' (a). Alternating beds of greywacke & claystone:-  
Greywacke is medium grey green, very fine - fine grained, quartzitic with chlorite, white feldspar and dark grey minerals, kaolinitic cement, friable, tight, poorly sorted and slightly micaceous with occasional flake & laminations.  
Claystone is medium green grey, slightly silty, moderately fractured, sticky, waxy with irregular uneven bedding & occasional waxy lamination.
- (b) Core No 1: 987' - 1001' Re 15': grey-green, medium to fine greywacke interbedded claystone. Dip 0° - 5°.
- (a) Graphical log does not show a break at 1260'.  
Greywacke at

- 1260' - 1570' (a) Greywacke & claystone as above with carbonaceous material common to scattered.  
Shale medium grey to grey brown, fine carbonaceous slightly silty.
- (b) Core No 2 1265' - 1276' Re 9 1/2": greywacke - grey green fine grained, argillaceous, tight.
- 1570' - 2190' (a) Greywacke medium grey-green, speckled with white, very fine to fine grained, consists of quartz, green andesite feldspar, chlorite argillaceous material, round shale particles and occasionally calcareous cement, friable, slightly hard, much more consolidated than above section.  
Shale light-medium grey, firm, often streaked and waxy, blocky, non-friable and slightly carbonaceous.  
Claystone light cream-grey, sticky, makes joints of the samples and marks the greywacke.
- (b) Core 3 1719' - 1729' Re 9 6" Laminated claystone & greywacke dip 10° - 15°.

Cochungosun  
426 parish No.

Section No. 2.  
871/7

2190' - 2501'. (a) Alternating greywacke and limestone as above with  
(TD 2501') greywacke more sandy.

(b) Core No. 2232' - 2248' Re. 15'9". Uniform fine-grained, tight,  
greywacke. no bedding.

(c) (a) Graphic log shows only limestone / or shale & greywacke.  
Greywacke beds intervals are: - (Measured from Graphic Log).

975' - 1000' : 1125' - 1150' : 1195' - 1320' : 1350' - 1360' : 1370' - 1400'.

1500' - 1545' : 1555' - 1640' : 1740' - 1775' : 1795' - 1845' : 1950' - 2000'.

2065' - 2085' : 2140' - 2320' : 2345' - 2400' : 2440' - 2460' : 2485' - 2501' (TD).

PETROLEUM ACT 1958 (SECTION 45).

RECORD OF WORK AT .BELLBIRD.NO..1..... bore on  
~~\*Petroleum Exploration Permit~~  
 \*Petroleum Prospecting Licence) Number ...184.....during week  
~~\*Petroleum Mining Licence~~  
 ending 25th. November.... 1963.....  
 \* Strike out words not applicable.

DEPTH	DESCRIPTION OF STRATA
0' - 112'	Sand, light grey, medium to coarse grained
112' - 116'	*Brown coal and fine gravel
116' - 224'	No returns.
224' - 590'	Predominantly Sand, light gray and milky quartz, fine to very coarse grained and pebbly with minor clayey streaks.

NOTES BY DRILLER IN CHARGE: (State in notes whether water, gas or petroleum has been met with, and, if so, give depth and nature of occurrence, also depth to which casing has been inserted and cemented.)

Spudded at 1.45 a.m. Nov. 18/1963 - Set 9 $\frac{5}{8}$ " J55 36lb casing - cemented to surface with 12 sacks construction cement.

Lost circulation at 116' - Mixed thick mud - sawdust - vermiculite - total 60/bbl - no returns

Mixed 3 bbls Diesel with 12 bbls Bentonite - no returns. Placed <sup>15</sup> burlap bags in hole and 50 banksia cones - pumped on top of cones and burlap 20 sacks cement and vermiculite followed by 40 cu.ft. mud. WOO. 12 hrs.

Regained circulation 12.30 p.m. Nov. 22. Ran 573.4ft. 7" - 20 lb. casing - cemented with 84 sacks cement - no returns - top of cement at lost circulation zone - cementing out side casing. Drilling rate 1' to 10' per minute.

\* S.E.C. Bore No. 16 located 114' south Bellbird - had 99' brown coal (Signed).....

~~Legal Manager~~ (H. M. Hunt)..... Co.  
ARCO LIMITED

Date ...4.../.12.../.63....

N.B. The Act also requires the Minister to be notified immediately water, gas or petroleum is encountered.

Analyses of water, gas and oil should be submitted if available.

*Mr. Kenley (Copy of notes files)*  
5.12.63



MINES DEPARTMENT  
VICTORIA

2/4

PETROLEUM ACT 1958 (SECTION 45).

RECORD OF WORK AT .....BELLBIRD NO. 1..... bore on

~~\*Petroleum-Exploration-Permit~~)  
 \*Petroleum Prospecting Licence) Number ...184.....during week  
 \*Petroleum Mineral-Lease )  
 ending 2nd December..... 19.63.....

\* Strike out words not applicable.

DEPTH	DESCRIPTION OF STRATA
590' - 940'	Tertiary - Sand; fine to very coarse light gray to white quartz grains - often pebbly - There was total 731 feet of sand below coal.
940'	Tentative Top of Mesozoic
943' - 1643'	Predominantly gray claystone or mudstone interbedded with lesser amounts of grey - green graywacke
<u>CORE NO. 1</u>	987'-1001' - Rec. 13' : grey-green, medium to fine graywacke interbedded claystone - Dip $0^{\circ} - 5^{\circ}$
<u>CORE NO. 2</u>	1265'-1276' - rec. 9'4" : graywacke - grey-green, fine-grained, argillaceous - tight

NOTES BY DRILLER IN CHARGE: (State in notes whether water, gas or petroleum has been met with, and, if so, give depth and nature of occurrence, also depth to which casing has been inserted and cemented.)

Totco 1461 feet -  $1^{\circ}$

B.O.P. Tested 1405' - Satisfactory

Signed *(Signature)* ... H. M. K. R. K.

Acting  
~~Legal~~ Manager, ... ARCO LIMITED ..... Co.

Date ...10.../12.../63....

N.B. The Act also requires the Minister to be notified immediately water, gas or petroleum is encountered.

Analyses of water, gas and oil should be submitted if available.

PETROLEUM ACT 1958 (SECTION 45).

RECORD OF WORK AT ..... BELLBIRD NO. 1 ..... bore on  
~~\*Petroleum Prospecting Licence~~  
 \*Petroleum Prospecting Licence) Number ...184.....during week  
~~\*Petroleum Prospecting Licence~~  
 ending ..9th December... 19.63....

\* Strike out words not applicable.

DEPTH	DESCRIPTION OF STRATA
From 1643' to 2185'	Predominantly claystone with lesser amounts of graywacke.
2185' to 2376'	Predominantly gray-green, fine-grained graywacke with lesser amounts claystone
1719' to 1729	CORE NO. 3 - rec. 9'6" Laminated claystone and graywacke - Dips <u>10° - 15°</u>
2232' to 2248'	CORE NO. 4 - rec. 15'9" Uniform fine-grained, tight, graywacke - no bedding

NOTES BY DRILLER IN CHARGE: (State in notes whether water, gas or petroleum has been met with, and, if so, give depth and nature of occurrence, also depth to which casing has been inserted and cemented.)

Totco - 1719 feet - 3/4°  
2040 " - 3/4°  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Signed *(App.) W. B. Hink...*

Acting ~~Driller~~ Manager, ARCO LIMITED..... Co.

Date ..10.../12.../63.....

N.B. The Act also requires the Minister to be notified immediately water, gas or petroleum is encountered.

Analyses of water, gas and oil should be submitted if available.

PETROLEUM ACT 1958 (SECTION 45).

RECORD OF WORK AT ...BELLBIRD NO. 1..... bore on  
 \*Petroleum-Exploration-Permit)  
 \*Petroleum Prospecting Licence) Number ....184.....during week  
 \*Petroleum-Mineral-Lease )  
 ending December 16th.... 1963....  
 \* Strike out words not applicable.

DEPTH	DESCRIPTION OF STRATA
2365' - 2500'	Fine grained, tight graywacke and claystone 50 - 50
2500	TOTAL DEPTH
	Electric logging completed December 11th - 7 a.m.
	Electrical survey 2" - 5" scales 573'-2500'
	Microlog                    2" - 5"    "    573' - 2500'
	Dipmeter                                    573' - 2500'
931'	Top Mesozoic

NOTES BY DRILLER IN CHARGE: (State in notes whether water, gas or petroleum has been met with, and, if so, give depth and nature of occurrence, also depth to which casing has been inserted and cemented.)

Well plugged and Abandoned December 11th, 1963

Plug No. 1 - 890' to 990'

" " 2 - 523' to 623'

Signed *Covering Dr. Signed by H. M. Kirk*

Acting Legal Manager, ...ARCO LIMITED..... Co.

Date ...13.../12.../63.....

N.B. The Act also requires the Minister to be notified immediately water, gas or petroleum is encountered.

Analyses of water, gas and oil should be submitted if available.

Arcs/WoodsideBellbird No.1.

(ie confidential).

Ex.(a) Graphic Log of Well Completion Report.

(b) Weekly reports. (KB = 441 feet)

0' - 931' (a) Sand, red to light grey, fine to coarse grained, quartzose, angular to sub-angular, clean with occasional pebbles, traces of brown coal and small amounts of shale and clay.

(110'-115' coal): (Clay<sup>Ⓢ</sup> for shale:- 520'-530': 550'-565':580'-595':800'-810').

(b) 0'-112' Sand, light grey, medium to coarse grained.

112'-116' Brown coal and fine gravel.

116'-224' No returns.

224'-940' Predominantly sand, light gray milky quartz, fine to very coarse grained and pebbly with inner clayey streaks.

931' - 1260' (a) ~~Alternating~~ Alternating beds of greywacke and claystone:-

Greywacke is medium grey green very fine - fine grained, quartzite with chlorite, white feldspar and dark grey minerals, Kaolinite cement, friable, tight, poorly sorted and slightly micaceous with occasional flakes and laminations.

Claystone is medium green grey, slightly silty, moderately fractured, sticky, with irregular to even bedding and occasional waxy lustre.

(b) Core No.1. 987'-1001' Rec.13': grey-green, medium to fine greywacke interbedded claystone. Dip 0°-5°.

(a) Graphic log does not show a break at 1260'.

1260'-1570' (a) Greywacke and claystone as above with carbonaceous material common to scattered.

Shale medium grey to grey brown, firm carbonaceous slightly silty.

(b) Core No.2. 1265'-1276' Rec.9'4":

greywacke-grey green fine grained, argillaceous tight.

1570'-2190'(a) Greywacke medium grey-green, speckled with white, very fine to fine grained, consists of quartz, green andesite feldspar, chlorite, argillaceous material, round shale particles and occasionally calcareous cement, friable, slightly hard, much more consolidated than above section.

Ⓢ Measured from Log.

Shale light-medium grey, firm, often transl and waxy, blocky, non-fissile and slightly carbonaceous.

Claystone light cream-grey, sticky, makes gumbo of the samples and masks the greywacke.

(b) Core 3 1719'-1729' Rec 9'6". Laminated claystone and greywacke Dip 10'-15'.

2190'-2501' (a) Alternating greywacke and claystone as above with (TD 2501') greywacke more sandy.

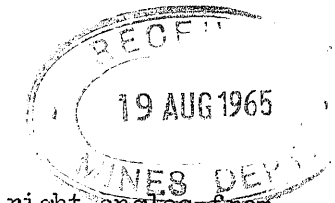
(b) Core No.4 2232'-2248' Rec 15'9". Uniform fine-grained, tight, greywacke, no bedding.

(a) Graphic log shows only claystone/or shale and greywacke. Greywacke tests intervals are:- (Measured from Graphic Log.)

975'-1000' : 1125'-1150' : 1195'-1330' : 1350'-1360' : 1370'-1400' ;  
1500'-1545' : 1555'-1640' : 1740'-1775' : 1795'-1845' : 1950'-2000' :  
2065'-2085' : 2140'-2320' : 2345'-2400' : 2440'-2460' : 2485'-2501'(TD).

Date: 21st July, 1965

CORE ANALYSIS RESULTS



Notes:- (i) Unless otherwise stated, the porosities and permeabilities were determined on two small plugs (V & H) cut at right angles from the core or sample. Ruska porosimeter and permeameter were used, with <sup>air</sup>mercury at 750 p.s.i.g. and dry nitrogen, respectively, as the saturating and flowing media. (ii) Residual oil and water saturations were determined using Sozhet type apparatus. (iii) Acetone test precipitates and fluorescence of solvent after extraction are recorded as, nil, trace, fair, strong or very strong.

Well or Area	Core or Sample No.	Depth in ft. From:- To:-	Lithology	Effective Porosity in % by Vol.		Absolute Permeability in Millidarcys		Avg. density in gms./cc.		Fluid Saturation in % Pore Space		Acetone Test		Solvent after Extraction		Remarks
				V	H	V	H	Dry Bulk	APPARENT Grain	Water	Oil	Colour	Precipitate	Colour	Fluor.	
BELLBIRD NO. 1	1	987' 1001'	NO SAMPLE	RECEIVED		BY CORE		AND CUTTINGS		LABORATORY						
"	2	1269' 1271'	Sandstone	17	15	Nil	Nil	2.32	2.77	6	Nil	Nil	Nil	Nil	Nil	
"	3	1726' 1729'	Sandstone	N.D.	23	N.D.	"	2.18	2.83	10	"	"	"	"	"	
"	4	2345' 2347'	Sandstone	14	13	N.D.	"	2.33	2.69	8	"	"	"	"	"	

Additional Information:

General File No. 62/399  
Well File No.

## 4.0 Palynology

## PALYNOLOGICAL REPORT ON CORE SAMPLES FROM WELLS SUNK

IN THE GIPPSLAND BASIN by: M.E. Dettmann 14/4/66  
To: Enro Expl. Aust.

Core samples taken from seven wells sunk by Woodside and partners in the Gippsland Basin yielded microfloras (see Tables 1 and 2) that provide a basis for correlation of the well sequences, both with each other and with sequences from elsewhere in the Gippsland Basin. The wells and the intervals investigated comprise: Carrs Creek No.1 between 4522 and 5507 feet; North Seaspray No.1 between 3484 and 3771 feet; Duck Bay No.1 between 2831 and 3896 feet; Seaspray No.1 between 4872 and 5556 feet; Lake Reeve No.1 between 6080 and 6635 feet; Bellbird No.1 between 995 and 2245 feet; and Woodside South No.1 between 3279 and 5816 feet. The majority of the samples yielded identifiable spores and pollen grains, but the concentration and preservation of the plant microfossils ranged from good in some samples to poor in others. As outlined below the microfloras obtained from the sediments investigated conform with Lower Permian, Lower Cretaceous, and Lower Tertiary microfloral assemblages that have been described from Australian deposits by Balme (1964), Dettmann (1963), and Harris (1965).

Carrs Creek No.1 well

The samples from 5500-07 feet and 5360-80 feet yielded poor concentrations of poorly preserved spores and pollen. Species present in the lower samples include Cicatricosporites australiensis (Cookson) and Aequitriradites spinulosus (Cookson & Dettmann) which indicate a Cretaceous age.

The uppermost sample examined (4522-52 feet) yielded a more diverse microflora in which Dictyotosporites speciosus Cookson & Dettmann is a component. This species indicates the presence of the Speciosus Assemblage that is Valanginian-Aptian in age (Dettmann 1963). The Speciosus Assemblage



Bellbird No.1 well

The lowest sample investigated (2235-45 feet) was found to be devoid of identifiable spores and pollen grains. The succeeding sample (1719-24 feet) yielded Cicatricosisporites australiensis and Reticulatisporites pudens and on this basis a Lower Cretaceous age is assigned to the sample.

The combined occurrence of Dictyotosporites speciosus and Crybelosporites striatus in core no.1 (995-1000 feet) indicates the presence of the younger (Aptian) category of the Speciosus Assemblage. Equivalent microfloras have been recorded previously from Wellington Park No.1 well between 3818 and 4340 feet (see Dettmann 1965a, p.2).

Woodside South No.1 well

The four samples examined from between 4532 and 5816 feet provided only poor concentrations of poorly preserved spores and pollen grains. Cicatricosisporites australiensis was observed in each of the samples and on this basis a Cretaceous age is assigned to the sediments. The presence of Januasporites spinulosus Dettmann in core no.21 (499-5010 feet) and the existence of Aptian and Albian microfloras in stratigraphically higher deposits indicates that the section between 4532 and 5816 feet is of Lower Cretaceous age.

The Aptian category of the Speciosus Assemblage occurs at 3489-509 feet in Woodside South No.1 well. An equivalent assemblage has been recorded from Bellbird No.1 well at 995-1000 feet.

Core no.13 (3279-99 feet) yielded a well preserved microflora that contains Coptospora paradoxa and conforms with the Aptian-Albian Paradoxa Assemblage. Comparable assemblages are present in deposits at 6080-96 feet in Lake Reeve No.1 well and at 5536-56 feet in Seaspray No.1 well.



6.0 Enclosures . . . .

File/Well/Depth Increment & Status	Trace	Units	Depth Range		Data Range		Missing Data Depth Ranges	
BELLBIRD_1.TRACES	CALI	IN	569.5000	2509.5000	4.91	8.03	No Data Gaps	
BELLBIRD 1	LAT	OHMM	600.5000	2505.5000	4.94	621.33		
0.5000 f OPEN	LN	OHMM	600.5000	2503.5000	6.34	417.38		
	SN	OHMM	600.0000	2505.5000	4.97	243.60		
	SP	MV	600.5000	2508.5000	16.16	66.84		
	Total Data :		9561.5000 f		Total Gaps :		0.0000	
DUCK_BAY_1.TRACES	CALI	IN	408.0000	4298.0000	7.18	18.63	No Data Gaps	
DUCK BAY 1	DT	US/F	407.5000	4227.0000	51.68	204.94		
0.5000 f OPEN	GR	SAPI	150.5000	4203.5000	4.97	135.48		
	LAT	OHMM	428.0000	4235.5000	0.19	371.46		
	LN	OHMM	411.5000	4237.5000	1.22	199.92		
	SN	OHMM	410.5000	4240.0000	1.06	114.34		
	SP	MV	411.5000	4244.5000	27.62	97.27		
	Total Data :		26998.5000 f		Total Gaps :		0.0000	
DUTSON_DOWNS_1.TRACES	CALI	IN	357.5000	6112.5000	5.85	20.85	No Data Gaps	
DUTSON DOWNS 1	DT	US/F	372.5000	6100.0000	51.68	222.53		
0.5000 f OPEN	GR	SAPI	97.5000	6105.5000	3.80	196.13		
	LAT	OHMM	396.0000	6123.5000	0.43	267.43		
	LN	OHMM	379.5000	6123.5000	0.64	118.57		
	NEUT	NAPI	97.5000	6115.0000	331.94	1493.82		
	SN	OHMM	377.0000	6122.0000	1.04	65.93		
	SP	MV	373.0000	6131.0000	21.25	119.86		
	Total Data :		46482.5000 f		Total Gaps :		0.0000	
NORTH_SEASPRAY_1.TRACES	CALI	IN	506.0000	5007.0000	6.17	20.25	No Data Gaps	
NORTH SEASPRAY 1	DT	US/F	500.0000	5002.5000	37.75	210.47		
0.5000 f OPEN	GR	SAPI	2903.0000	4442.0000	12.04	116.71		
	LAT	OHMM	536.0000	5012.5000	0.16	465.76		
	LN	OHMM	520.0000	4996.5000	1.08	207.25		
	SN	OHMM	520.0000	5014.0000	0.87	96.41		
	SP	MV	520.0000	5012.5000	0.73	61.39		
	Total Data :		28482.0000 f		Total Gaps :		0.0000	
SOUTH_LONGFORD_1.TRACES	CALI	IN	511.0000	2450.5000	5.65	9.46	No Data Gaps	
SOUTH LONGFORD 1	LAT	OHMM	542.5000	2453.5000	5.24	541.21		
0.5000 f OPEN	LN	OHMM	526.0000	2451.5000	6.53	387.92		
	SN	OHMM	521.0000	2453.5000	1.14	177.49		
	SP	MV	515.0000	2457.0000	5.56	94.57		
	Total Data :		9650.5000 f		Total Gaps :		0.0000	
SPOON_BAY_1.TRACES	CALI	IN	324.5000	4600.0000	7.24	15.13	No Data Gaps	
SPOON BAY 1	DT	US/F	319.0000	4600.0000	53.87	285.52	2651.5000	2679.5000
0.5000 f OPEN	GR	SAPI	20.5000	4600.0000	6.26	256.94	2667.0000	2679.0000
	IND	OHMM	343.0000	4603.5000	0.83	73.85		
	SN	OHMM	340.0000	4611.0000	1.07	99.75		
	SP	MV	340.0000	4610.0000	-6.55	92.11		

PE907653

This is an enclosure indicator page.  
The enclosure PE907653 is enclosed within the  
container PE907652 at this location in this  
document.

The enclosure PE907653 has the following characteristics:

- ITEM\_BARCODE = PE907653
- CONTAINER\_BARCODE = PE907652
  - NAME = Cross Section
  - BASIN = GIPPSLAND
  - PERMIT = PPL /184
  - TYPE = WELL
  - SUBTYPE = CROSS\_SECTION
- DESCRIPTION = Baragwanath Anticline Cross Section  
A-A' (enclosure from Final Well Report)  
for Bellbird-1
- REMARKS =
- DATE\_CREATED = 19/11/63
- DATE\_RECEIVED =
  - W\_NO = W477
  - WELL\_NAME = Bellbird-1
- CONTRACTOR =
- CLIENT\_OP\_CO = ARCO LTD./WOODSIDE (LAKES ENTRANCE) OIL  
CO. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)

PE907654

This is an enclosure indicator page.  
The enclosure PE907654 is enclosed within the  
container PE907652 at this location in this  
document.

The enclosure PE907654 has the following characteristics:

ITEM\_BARCODE = PE907654  
CONTAINER\_BARCODE = PE907652  
NAME = Structure Map  
BASIN = GIPPSLAND  
PERMIT = PPL /184  
TYPE = SESIMIC  
SUBTYPE = HRZN\_CNTR\_MAP  
DESCRIPTION = Baragwanath Anticline Control for Top  
of Latrobe Valley Coal Measures  
(enclosure from Final Well Report) for  
Bellbird-1  
REMARKS = Shows...coal bores, base of tertiary  
seismic data, wells bottomed in  
mesozoic, wells bottomed in Latrobe  
valley coal measures, gippsland  
limestone surface, cross section lines,  
parish boundary and contour intervals.  
DATE\_CREATED = 19/11/63  
DATE\_RECEIVED =  
W\_NO = W477  
WELL\_NAME = Bellbird-1  
CONTRACTOR = ARCO LIMITED  
CLIENT\_OP\_CO = ARCO LTD./WOODSIDE (LAKES ENTRANCE) OIL  
CO. LTD.

PE605051

This is an enclosure indicator page.  
The enclosure PE605051 is enclosed within the  
container PE907652 at this location in this  
document.

The enclosure PE605051 has the following characteristics:

- ITEM\_BARCODE = PE605051
- CONTAINER\_BARCODE = PE907652
- NAME = Continuous Dipmeter
- BASIN = GIPPSLAND
- PERMIT = PPL /184
- TYPE = WELL
- SUBTYPE = WELL\_LOG
- DESCRIPTION = Continuous Dipmeter (enclosure from  
Final Well Report) for Bellbird-1
- REMARKS =
- DATE\_CREATED = 11/12/63
- DATE\_RECEIVED =
- W\_NO = W477
- WELL\_NAME = Bellbird-1
- CONTRACTOR = SCHLUMBERGER
- CLIENT\_OP\_CO = ARCO LTD./WOODSIDE (LAKES ENTRANCE) OIL  
CO. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)