W597. ALBATROSS-1.

Burmah

B.O.C. of Australia Limited
(Incorporated in the territory of Papua)
A Burmah Group Company

37-49 Pitt Street, Sydney 2000
Telephone 27-5651
Telegrams Burmur, Sydney. Telex 21119

Ref: 53.23
9th November 1970

Woodside Oil N.L.,
151 Flinders Street,
MELBOURNE, VIC.3000.

Planet Exploration Co. Pty. Ltd.,
United Insurance Building,
280 George Street,
SYDNEY, N.S.W. 2000.

Australian Oil & Gas Corp. Ltd.,
261 George Street,
SYDNEY, N.S.W. 2000.

Continental Oil Co. of Aust. Ltd.,
I.B.M. Centre,
168 Kent Street,
SYDNEY, N.S.W. 2000.

Dear Sirs,

We enclose the completion report for Albatross No.1 from Endeavour Oil Company N.L. The report is very satisfactory although we are of the opinion that the logs do not provide as conclusive a picture of gas saturation as Endeavour would have us believe.

Yours faithfully,

for GENERAL MANAGER
B.O.C. OF AUSTRALIA LIMITED

encl.

GD:BCO'H

ENDEAVOUR OIL COMPANY NO LIABILITY

ALBATROSS #1

COMPLETION REPORT

by

R.G.C. JESSOP, J.B. HOCKING, L. J. CAIRNS

October, 1970

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I SUMMARY

The Albatross #1 well was drilled in Victorian Permit #8 in the Gippsland Basin, offshore from Lakes Entrance, by Endeavour Oil Company N.L. under a farmout agreement with the titleholders: Australian Oil & Gas Corporation Limited, B.O.C. of Australia Limited, Continental Oil Company Limited, Planet Exploration Company Pty. Ltd. and Woodside Oil N.L.

The well was spudded from the "GLOMAR III" on June 30, 1970, in 142 feet of water and drilled to a total depth of 4,124 feet. It was plugged and abandoned as a dry hole on July 17, 1970.

The well was favourably located on a seismically determined feature at the top of the Latrobe Valley Coal Measures ('H' horizon). Lateral closure of some 8 square miles was controlled by wedge-out of the Latrobe Valley Coal Measures to the north and by dip to the west, east, and south.

An expected Tertiary sequence, comprising the Gippsland Formation, the Lakes Entrance Formation, and the Latrobe Valley Coal Measures, was penetrated before drilling terminated in Lower Cretaceous sediments of the Strzelecki Group. Drilling confirmed the Latrobe Valley wedge-out limit.

Minor dry gas shows of up to 10 units methane were recorded on the hot-wire detector whilst drilling through the Latrobe Valley Coal Measures. Subsequent log evaluation indicated two thin zones with minor, but significant, gas saturation, viz. the interval 2,327 to 2,333 feet with 28% gas saturation, and the interval 2,408-2,423 feet with 20-31% gas saturation. No formation tests were conducted.

Formation water salinities within the two units comprising the Latrobe Valley Coal Measures were surprisingly high, viz. 6,250 ppm salt (Upper Unit) and 4,250 ppm salt (Lower Unit), indicating that flushing by meteoric waters, if any, was incomplete.

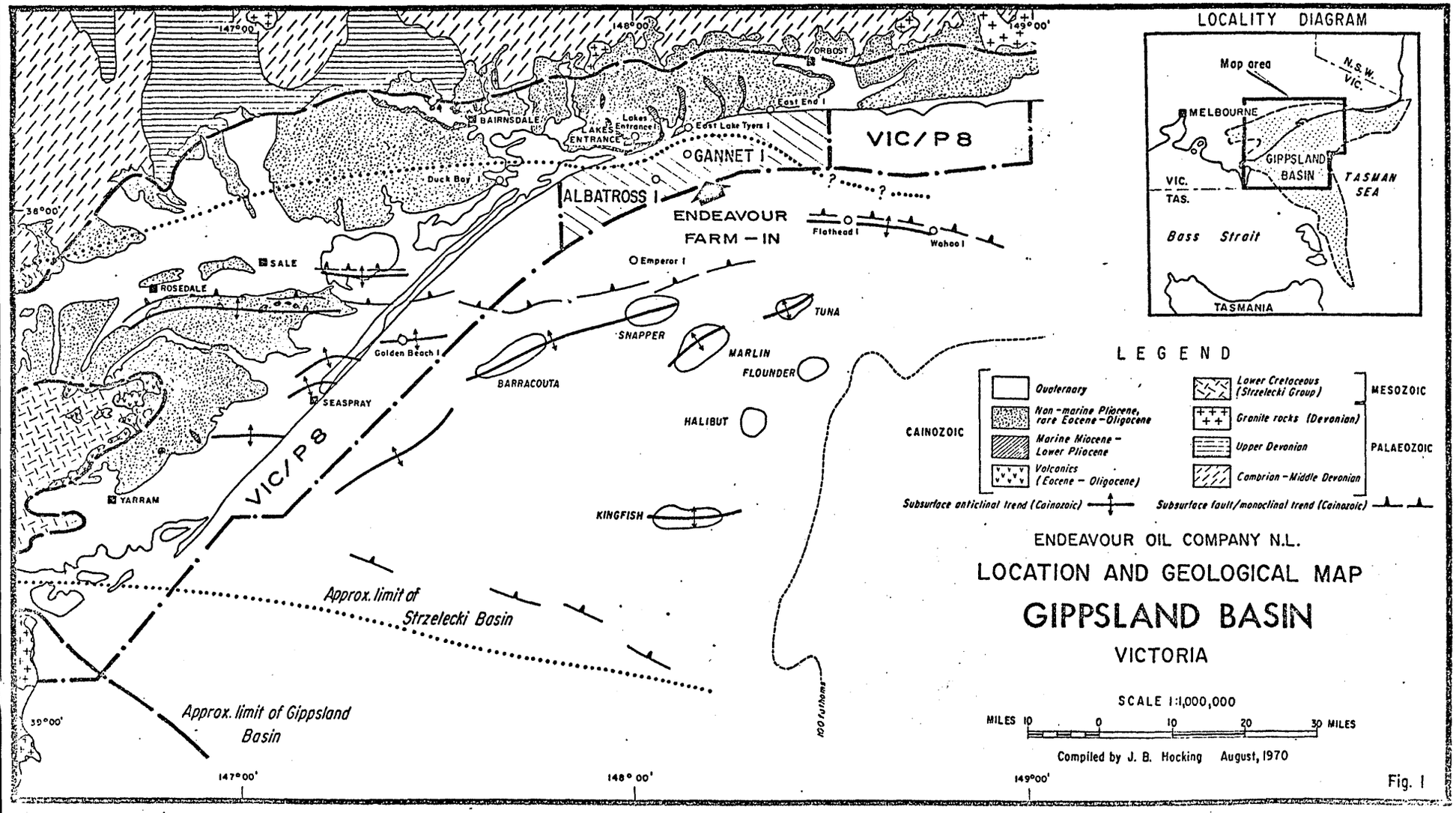
147°00'
148°00'
149°00'
38°00'
39°00'
BAIRNSDALE
LAKES ENTRANCE
Lakes Entrance I.
East Lake Tyers I.
East End I.
ORBOST
GANNET I.
VIC/P8
ALBATROSS I.
ENDEAVOUR FARM-IN
Duck Bay I.
Flathead I.
Wahoo I.
Emperor I.
SALE
ROSEDALE
TUNA
SNAPPER
MARLIN
FLOUNDER
BARRACOUTA
Golden Beach I.
SEASPRAY
HALIBUT
YARRAM
KINGFISH
VIC/P8
Approx. limit of Strzelecki Basin
Approx. limit of Gippsland Basin
100 fathoms
LOCALITY DIAGRAM
Map area
N.S.W.
VIC.
MELBOURNE
GIPPSLAND BASIN
TASMAN SEA
VIC.
TAS.
Bass Strait
TASMANIA
LEGEND
Quaternary
Non-marine Pliocene, rare Eocene-Oligocene
Marine Miocene - Lower Pliocene
Volcanics (Eocene - Oligocene)
CAINOZOIC
Lower Cretaceous (Strzelecki Group)
Granite rocks (Devonian)
Upper Devonian
Cambrian - Middle Devonian
MESOZOIC
PALAEOZOIC
Subsurface anticlinal trend (Cainozoic)
Subsurface fault/monoclinal trend (Cainozoic)
ENDEAVOUR OIL COMPANY N.L.
LOCATION AND GEOLOGICAL MAP
GIPPSLAND BASIN
VICTORIA
SCALE 1:1,000,000
MILES 10 0 10 20 30 MILES
Compiled by J. B. Hocking August, 1970

Fig. 1

11 INTRODUCTION

The Albatross #1 well was drilled on shot point 666 on line 8 of the Offshore Lakes Entrance (1969) Seismic Survey about 6½ miles south-south-east of the town of Lakes Entrance, Victoria.

The Albatross well was designed as a stratigraphic test of an 'H-K' seismic wedge-out on the broad, western flank of a southerly plunging Paleozoic basement nose.

Closure to the north, along line 6, was provided by the wedging-out of the 'H-K' interval and represented the depositional edge of horizon 'H'. A closed area of about 8 square miles was mapped at the 'H' level.

The 'H-K' seismic interval was presumed to represent the uppermost Latrobe Valley Coal Measures sand facies, underlying the marls of the Lakes Entrance Formation, and resting above a coal/shale reflector 'K' within the Latrobe Valley Coal Measures.

The eastern edge of the southerly plunging Paleozoic nose is marked by a major, north-south trending normal fault downthrown to the east. The fault is pivoted near Lake Bunga on the coast: the amount of throw increases southward.

The major movement along the fault pre-dated Latrobe Valley Coal Measures deposition. This was evidenced by:

(a) Thinning of the Tertiary sequence over the nose; and

(b) The north-south trend of the fault being comparable with Paleozoic structural trends and contrary to the general east-west Mesozoic/Tertiary structural grain.

The basement nose was, therefore, structurally high prior to and during the deposition of the Tertiary sediments. The well was favourably located primarily to test an up-dip accummulation of hydrocarbons within the Latrobe Valley Coal Measures provided adequate sealing of the reservoirs was present.

A secondary and rather tenuous objective was thought to exist near the base of the Mesozoic Strzelecki Group in sandstones comparable with the "Pretty Hills Sandstone" of the Otway Basin.

111 WELL HISTORY

(1) General Data:

(a) Well Name and Number

Albatross # 1

(b) Location

Latitude:	37°57'39.902" S
Longitude:	148°03'01.004" E
X-Co-ordinate:	592,262 metres
Y-Co-ordinate:	5,797,968 metres
Water Depth:	142 feet

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(c) Name and Address of Tenement Holders:

Australian Oil & Gas Corporation Limited,
261 George Street, Sydney, N.S.W.

B.O.C. of Australia Limited,
37-49 Pitt Street, Sydney, N.S.W.

Continental Oil Company Limited,
168 Kent Street, Sydney, N.S.W.

Planet Exploration Company Pty. Ltd.,
Corner Hunter & George Streets, Sydney, N.S.W.

Woodside Oil N.L.,
151 Flinders Street, Melbourne, Victoria.

(d) Details of Petroleum Tenement:

Petroleum Permit Vic/P8 issued under the Petroleum(Submerged Lands) Acts of the Commonwealth of Australia and the State of Victoria, covering an area of 1507 square miles. Endeavour Oil Company N.L. subsequently farmed into a portion of this permit (See Fig. 1).

(e) District:

Offshore Lakes Entrance, Eastern Victorian waters.

(f) Total Depth:

4118 feet (Driller)
4124 feet (Schlumberger)

(g) Date Drilling Commenced:

June 30, 1970.

(h) Date Drilling Completed:

July 15, 1970.

(i) Date Rig Released:

July 18, 1970.

(j) Drilling Time to Total Depth:

16 days.

(k) Elevation:

Permanent datum - Mean sea level
Well datum (K.B.) - 32 feet above mean sea level

(l) Status:

Dry, plugged and abandoned.

(m) Cost:

Not available.

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(2) Drilling Data

(a) Operator: Endeavour Oil Company N.L.,
24 Collins Street,
MELBOURNE, Victoria, 3000,
AUSTRALIA.

(b) Drilling Contractor: Global Marine of A/asia Pty.Ltd.,
360 Lonsdale Street,
MELBOURNE, Victoria, 3000,
AUSTRALIA.

(c) Drilling Vessel: GLOMAR 111

(d) Drawworks:

Make -	National
Type -	1625 DE
Rated Capacity -	25,000
Power -	2 each GE 752 R1 Electric Motors

(e) Derrick: Global Marine Design 136' x 56' x 34'
1,000,000 lb. hooklead capacity

(f) Pumps: (2)

Make -	National
Type -	G-1000-C
Size -	7-3/4" x 16"
Power -	Dual GE 752 R1 Electric Motors independently driven.

(g) Blow-Out Prevention Equipment:

Make -	Hydril	Hydril	Cameron Triple 'U'
Size -	20"	13-3/8"	13-3/8"
Working Pressure -	2000 lb.	5000 lb.	5000 lb.

(h) Operations:

(i) Glomar 111 was picked up at Esso Emperor #1 location at 10.00 hours on June 29, 1970.

(ii) Glomar 111 moved to Endeavour Albatross #1 location and surveyed into position on June 29, 1970.

(iii) All anchors set and tested at 05.15 hours on June 30, 1970.

(iv) Albatross #1 spudded at 10.00 hours on June 30, 1970.

(v) Drilling completed at 4,124 feet and logging commenced at 15.30 hours on July 15, 1970.

(vi) All plugs set and sub-sea equipment recovered at 23.00 hours on July 17, 1970.

(vii) Anchors picked up and rig released at 06.00 hours on July 18, 1970. Albatross #1 abandoned.

(i) Operational Period:

A period of 18 days and 20 hours elapsed from the time Glomar 111 was picked up till the drilling vessel was released from the Albatross #1 location.

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(j) Hole Sizes and Depths (from R.K.B.):

(i) 36" to 214'

(ii) 26" to 710'

(iii) 17½" to 1750'

(iv) 12¼" to 4124' (T.D.)

(k) Casing and Cementing:

Size	30"	20"	13-3/8"
Weight	319	94	61
Grade	B	X-52	J-55
Range	2	3	3
Thread	Welded	Vetco"L"	Buttress
Setting Depth (R.K.B.)	200'	678'	1703'
Cement (sxs)	Included in 20"	1100	1340
Cemented to (R.K.B.)	Ocean Floor	Ocean Floor	Ocean Floor
Class	A	A	A
Method used	Duplex Show & Drill Pipe Stinger		Two Plug Displacement

Slurry details - 30" x 20": 900 sax 2.5% pre-mix gel at 12.5 lbs/gal. followed with 200 sax neat mixed with seawater at 15.6 lbs/gal.

Slurry details - 13-3/8": 700 sax 2.5% pre-mix gel at 12.9 lbs/gal., followed with 640 sax neat mixed with fresh water at 15.6 lbs/gal.

Pile Joint Assembly: Utilizing a Cameron sub-sea suspension system the 30" x 20" housings were pre-fabricated as one unit employing one joint each of 30" and 20" conductor pipe with the lowermost thread being 20" Vetco Type"L" threaded connection. On completion of drilling 36" and 26" surface hole the 20" casing was run and the 30" and 20" pile joint attached to the top joint of 20" and the entire assembly lowered to the landing base with the 20" string attached. The 20" casing and pile joint assembly were cemented simultaneously, with returns to ocean floor, through a drill pipe stinger and Baker 20" Duplex Shoe.

(l) Drilling Fluid:

Salt water was utilised in drilling to 710' with returns dumped on the ocean floor.

After setting 20" pipe to 678' a fresh water, bentonite, Spersene, XP-20 mud was instituted and the system maintained to T.D.

The caustic soda was used for pH control and barytes for weight control.

Average Mud Properties:

Day	Wt.	Vis.	W.L.	pH	F.C.	Sand %	Solids %
5	9.3	48	10.2	7.5	3/32"	2.2	-
6	9.4	67	8.2	9.0	1/32"	.25	10
7	9.7	61	7.6	9.0	1/32"	.25	11
12	10.2	42	3.5	9.5	1/32"	.4	-
13	10.3	42	5.2	9.5	1/32"	.25	-
14	10.2	49	5.4	10.5	1/32"	.5	11
15	10.1	45	7.2	9.3	2/32"	1.0	11
16	10.1	45	45	9.3	1/32"	1.0	11

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Materials Consumed:

Bentonite	750 sax
Caustic	2445 lbs.
C.M.C.	25 sax
Spersene	60 sax
CC-16	35 sax
XP-20	84 sax
Calgon	100 lbs.
Bi-carbonate	1 sax
Q-Broxin	244 sax
Barytes	2027 sax
Alum Stearate	1 sax

(m) Fuel and Water:

Transported by supply boat from Barry Beach Marine Terminal to drilling vessel.

Usage:

(i)	Potable Water	56,500 gals.
(ii)	Drill Water	5,100 bbls.
(iii)	Fuel	28,500 gals.

(n) Fishing Operations: Nil

(o) Formation Testing: Nil

(p) Coring:

Core #1 Interval 2320' to 2327' Recovery 8% (7")

The core was cut at the top of the Latrobe Valley Coal Measures using a Christensen barrel with an 8-15/32" type C14A diamond core head which was recovered in 80% condition.

The bit appeared to be continually balling and progress was slow. Core recovery was poor.

(q) Drilling Bits (R.K.B. Depths):

No.	From	To	Size	Make	Type	Footage	Hrs.	Condition
	Ocean Floor	214'	36"	SEC	H.O.	48	¼	T1-B1-1G
1	214'	710'	17½"	REED	YTIAJ	427	10-3/4	T1-B1-1G
	214'	710'	26"	SEC	H.O.	427	10-3/4	T1-B1-1G
2	710'	1750'	12¼"	HTC	X3A	1040	5-3/4	T4-B2-1G
1(R.R.)	710'	1750'	17½"	REED	YTIAJ	1040	4-3/4	Opening Hole
2(R.R.)	1750'	2320'	12¼"	HTC	X3A	570	6½	T5-B3-1G
3	2320'	3032'	12¼"	SEC	S-44	705	11	T4-B3-1G
4	3032'	3531'	12¼"	SEC	S-44	499	10	T1-B1-1G
5	3531'	4004'	12¼"	SEC	S-44	473	13	T6-B8-1G
6	4004'	4124'	12¼"	SEC	S-44	114	5	T1-B1-1G

(r) Abandonment:

(i) Plug #1 2500-2160' 255 sax neat cement mixed with seawater.

Tagged with 10,000 lbs. weight

(ii) Plug #2 1800-1600' 242 sax neat cement mixed with seawater.

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(iii) Plug #3 430'-220' 165 sax neat cement mixed with seawater.

(iv) Casing was severed with explosive charge at 210' (i.e. 36' below ocean floor), all sub-sea equipment recovered.

(t) Supply Vessels:

M.V. "Point Coupee" was used for all anchor handling work and general supply work during the operation.

M.V. "San Pedro Strait" was used for general supply duties during the operation.

Both vessels assisted with location surveys and buoy laying.

(3) Logging and Testing:

(a) Ditch Samples:

Ditch samples were collected at 10-foot intervals whilst drilling. No samples were collected whilst coring. Four sets of washed and dried cuttings samples were taken and distributed as follows:-

Endeavour Oil Company N.L. (2 splits).
B.O.C. of Australia Ltd. (1 split), and
Victorian Mines Department (1 split).

One set of unwashed cuttings samples was also collected and stored with Endeavour Oil Company N.L.

(b) Coring:

The original coring programme called for a core to be cut at the top of the Latrobe Valley Coal Measures with subsequent cores to be cut at the discretion of the wellsite geologist.

One core (Core #1) was cut near the top of the Latrobe Valley Coal Measures as programmed. The details of the core were as follows:-

Core No.	Interval	Cut	Recovery	% Recovery
#1	2320'-2327'	7'	7"	8.3

Representative samples of the core were distributed amongst Endeavour Oil Company N.L., B.O.C. of Australia Ltd. and the Victorian Mines Department.

(c) Sidewall Sampling:

No sidewall samples were shot.

(d) Wireline Logging:

Wireline logs were run by Schlumberger Seaco Inc. and included an Induction Electrical Log, Borehole Compensated Sonic-Gamma Ray Log, Microlog-Caliper-Microlaterolog, Compensated Formation Density Log, Continuous Dipmeter Log. All logs were recorded on the 2 inch = 100 feet and 5 inch = 100 feet scales.

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Details of the logging runs are as follows:-

Induction Electric Log (IES)

Run 1: 1751'-678'
Run 2: 4123'-1702'

Microlog-Caliper-Microlaterolog (MLC-MLL)

Run 1: 1750'-678'
Run 2: 4122'-1702'

Borehole Compensated Sonic-Gamma Ray (BHC-GR)

Run 1: 1750'-678'
Run 2: 4121'-1702'

Compensated Formation Density Log (FDC)

Run 1: 1752'-678'
Run 2: 4123'-1702'

Continuous Dipmeter Log (CDM)

Run 1: 4121'-1702'

(e) Drilling Time and Gas Log:

Continuous monitoring of the drilling mud and the rate of penetration was carried out by Core Laboratories (Australia) Limited. In addition to the normal hot wire mud gas recorder, a gas chromatograph, and a hydrogen sulphide detector were used. Cuttings gas was monitored regularly using a Waring blender.

No signigicant shows of gas were recorded whilst drilling.

(f) Formation Testing:

No formation tests were conducted.

(g) Deviation Surveys:

Deviation surveys were taken using a double recorder Totco inclinometer. The results are as follows:-

$\frac{1}{2}^{o}$ - 709'
1^{o} - 1750'

(h) Temperature Surveys:

None conducted.

(i) Other Well Surveys:

None conducted.

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1V GEOLOGY

(1) Summary of Previous Work

The following remarks refer only to work done in and around, or with relevance to, Endeavour's Vic/P8 farm-in area.

(a) Geological:

Since the discovery of hydrocarbons at Lakes Entrance in 1924 a total of more than 60 Government and company wells have been drilled in that area, most of them in the ensuing 25 years (Boutakoff, 1964). One of the highlights of the Lakes Entrance activity was the sinking of a 1,117 foot shaft by the Commonwealth and State Governments during the Second World War. However, little more than 8,000 barrels of heavy oil have been produced from the Lakes Entrance field, along with some methane gas, the main reservoir being the tight but locally permeable Greensand Member of the Lakes Entrance Formation. The underlying clean sands of the Colquhoun Gravels Member, which rest unconformably on Palaeozoic basement, are flushed by relatively fresh artesian water. An additional well drilled in 1966 by Woodside Oil, namely Lakes Entrance #1, failed to make any further contributions to the geology or hydrocarbon potential of the area (Jessop, 1966). Wells drilled east of Lakes Entrance, for example Arco-Woodside's East Lake Tyers #1, also encountered a marginal Lakes Entrance Formation sand facies above Palaeozoic basement, but were dry (Ingram, 1962).

In 1967 Arco-Woodside's Duck Bay #1 well was drilled south of Bairnsdale in a position roughly 17 miles west of the Albatross #1 location along the general depositional strike. A 400 foot L.V.C.M. section, mostly sands, was encountered. In addition, the well penetrated a Strzelecki wedgeout (with basal volcanics), a previously unknown Permian section, and then bottomed in Ordovician bedrock (Arco-Woodside, 1966). It was abandoned as a dry hole.

Other offshore wells in the vicinity of Albatross #1 (excluding Gannet #1) include Esso-B.H.P.'s Flathead #1, about 27 miles east, and Emperor #1, about 12 miles south. Both encountered hydrocarbon shows which are of no apparent commercial value. The closest of the Esso-B.H.P. fields, Snapper, is about 16 miles south of the Albatross location.

(b) Geophysical:

(i) Gravity and Magnetics: In 1949 the Robert H. Ray Company conducted a gravity survey in the onshore Lakes Entrance area for Lakes Oil Ltd. (Boutakoff, 1964, Fig. 3) and some years later the Bureau of Mineral Resources carried out a regional gravity survey of East Gippsland that included the same area (Dooley & Mulder, 1953).

Airborne magnetic surveys of both onshore and offshore Gippsland were made by the B.M.R. in

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1951-52 and 1956 and are summarised by Quilty (1965). Interpreted depth to magnetic basement (presumably Palaeozoic) is slightly more than 4,000 feet at the Albatross #1 location.

The gravity and magnetic surveys confirm a fact that is also revealed by field mapping and drilling, namely that the Palaeozoic bedrock is relatively shallow in the onshore Lakes Entrance area and has a north-south structural trend.

(ii) Seismic: Although the first onshore seismic survey in Gippsland was completed in 1952, this and subsequent surveys were restricted to central and southern Gippsland with none in the Lakes Entrance area.

In early 1963 Western Geophysical shot 463 miles offshore for Arco Ltd. in the present Vic/P8 area between Corner Inlet (in the south-west) and Marlo (in the north-east) (Western Geophysical Co., 1963). The lines concerned were G-1 and MA-1 to MA-37. Single-fold and two-fold coverage was achieved and the main reflector mapped was the top-of-L.V.C.M. coals which could be traced throughout most of the area. One of the exceptions was in the offshore Lakes Entrance area where the strong coal reflector was lost due to shallow basement influence.

In October, 1967, G.S.I. completed a second marine seismic survey in Vic/P8 for B.O.C. of Australia Ltd. The survey was programmed to provide further detail on the Golden Beach structure, which was located by the 1963 Arco survey and subsequently drilled by B.O.C., and also to investigate pre-L.V.C.M. features. Because of six-fold digital coverage along these lines, which were labelled 67-40 to 67-48, the record quality was far superior to earlier efforts. Line 67-40 in particular, which ran for 70 miles and paralleled the coast some 1 to 2 miles offshore, provided excellent control with high calibre data down to and beyond the L.V.C.M. coals. In addition to this line acting as an excellent framework on which to base previous onshore and offshore seismic, it was especially significant in Endeavours' operations since it enabled the major reflectors to be carried into the 1969 survey grid in the Vic/P8 farm-in.

In October, 1969, a marine seismic survey was conducted for Endeavour in the Vic/P8 farm-in by the United Geophysical Corporation. A total of 512 miles were shot on a tight rectangular grid (Lines 1 to 42) and yielded data capable of twelve fold or 2400% subsurface coverage. Processing and interpretation by Geocom Inc. led to the mapping of the 'G' (top of Lakes Entrance), 'H' (top of L.V.C.M.), 'K' (top L.V.C.M. coal), 'L' (deeper L.V.C.M. coal), and 'S' (top of

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Strzelecki) horizons (Frankovitch, 1969; Warner, 1970). Isochron maps of the 'G-K', 'H-K', and 'K-S' intervals were also constructed. Emphasis was placed on mapping the updip wedgeout of 'H-K'. The mapping of 'H' was considerably enhanced by the predominantly one-half mile by one-mile seismic grid.

(2) Summary of Regional Geology

(a) Stratigraphy:

The Gippsland Basin is generally accepted as an Upper Cretaceous-Cainozoic basin, one that occupies some 16,000 square miles of south-east Victoria (the southernmost part extending into Tasmanian waters) of which all but one-fifth is offshore (Fig. 1). The basin is bounded on the north and south-west by Palaeozoic rocks and on the west by recently uplifted Lower Cretaceous rocks, and is open-ended to the east. It deepens in an easterly direction where the maximum sediment thickness reaches 15,000 feet or more.

In early to middle Palaeozoic times the region was part of the Tasman Geosyncline, a complex mobile belt that produced tightly folded and faulted low-grade metasediments and metamorphics intruded by early Devonian granitic rocks, plus minor Devonian extrusives. Stabilisation during the latter part of the Palaeozoic led to sedimentation in restricted, gently-deformed, fault-controlled basins, especially during the late Devonian. Permian sediments are known only from Duck Bay #1 well south of Bairnsdale (Arco-Woodside, 1966).

Whereas the main Palaeozoic structural grain is north-south, a pronounced east-west trend developed during the Mesozoic with the formation of a 'graben' of sedimentation, referred to here as the "Strzelecki Basin"(the ancestral Gippsland Basin), which averages 50 miles width and extends 100 miles across south-east Victoria from Westernport to the indented continental slope (Weeks & Hopkins, 1966). Sedimentation in this basin occurred during the early Cretaceous - there is no record of either Triassic or Jurassic - and consisted of more than 10,000 feet of fluvio-lacustrine sandstones (generally chloritic, feldspathic, lithic arenites of fine to medium size) as well as siltstones, shales and minor coals (*Strzelecki Group*) (Edwards & Baker, 1943). A basal unit of chloritised volcanics, believed to be a major provenance for Strzelecki sandstones, exists in Duck Bay well, and elsewhere marginal congolomerates are encountered in outcrop.

Gippsland Basin sedimentation commenced in middle to late Cretaceous times within the eastern half of the former Strzelecki Basin and extended westwards into the Seaspray area during the Palaeocene (Richards & Hopkins, 1969). Because of the waning influence of the north and south bounding fault systems during the Eocene, sedimentation expanded across virtually the entire present-day basin area so that through much

of the basin the Eocene sediments are unconformable on Strzelecki or Palaeozoic basement. Collectively, the late Cretaceous to Eocene sediments form a fluvio-deltaic complex that exceeds 10,000 feet in the eastern part of the basin *("Latrobe Valley Group"* also known as 'Latrobe Delta Complex'). It is characterised in all but the western marginal areas by poorly sorted, fine to gravelly quartzose sandstones that tend to be associated with shales and siltstones in the Upper Cretaceous-Palaeocene *(Golden Beach Beds)* and with coals in the Eocene *(Latrobe Valley Coal Measures)*. Along the western margin, coals of the L.V.C.M. are prolific and appear to persist with time through to the early Miocene. In this same area the Latrobe is characterised by a near-basal unit of volcanics, generally altered basalts *(Thorpdale Volcanics)*, that overlie a thin unit of Latrobe clastics *(Childers Formation)*; these units croup out around the edges of the South Gippsland Hills and extend eastwards into the subsurface. Volcanics are also encountered offshore near the base of the Latrobe.

Basin subsidence and tilting at the beginning of the Oligocene resulted in a major marine transgression from the south-east, accompanied by widespread erosion and some canyon cutting. The transgression extended north-westwards to Sale, the dominant lithology being foraminiferal calcareous mudstones, although glauconitic sands are developed along the north and south margins *(Lakes Entrance Formation)* (Hocking & Taylor, 1964). At Lakes Entrance, due north of Endeavour's Vic/P8 farm-in, the sands of the Lakes Entrance Formation *(Colquhoun Gravels/Greensand Member)* unconformably overlie Palaeozoic bedrock. The maximum Lakes Entrance Formation thickness in the basin, excluding canyon-fill, is about 2,000 feet in the eastern part. The formation does not crop out.

The maximum marine transgression, almost to Rosedale in the northwest, occurred during the Miocene at which time up to 6,000 feet of a limestone-marl sequence was deposited *(Gippsland Formation)*. Bioclastic (mostly bryozoal) limestones and marly limestones, and also some basin-edge littoral sands, predominate in the more marginal areas of the basin whereas marls, including canyon-fill, are dominant in the deeper parts. Onshore, Lower Miocene limestones are exposed in the Sale-Yarram area (Hocking, 1970), whereas Middle-Upper Miocene limestones and sands are exposed between Bairnsdale and Orbost (Carter, 1964).

At the close of the Miocene and in the early Pliocene a period of marine regression produced up to 500 feet of glauconitic sandy marls *(Tambo River Formation)* and overlying shelly sands and sandy marls *(Jemmy's Point Formation)* in onshore Gippsland. Outcrops are located in river and coastal sections in and around the Lakes Entrance area. Because of lack of sample returns, these and younger formations have not been recorded offshore.

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The return to continental conditions in onshore Gippsland occurred in the middle to late Pliocene with the deposition of a sand-clay unit with some carbonaceous layers which is 700 feet thick at Sale *(Boisdale Beds)*; the sands are the main fresh water aquifers of Gippsland (Jenkin, 1962). Overlying the Boisdale Beds around the onshore margins of the basin is a 150 feet thick sand-clay unit with characteristic gravel interbeds *(Haunted Hill Gravels)* that was deposited during the Plio-Pleistocene. The latter unit, and the final Quarternary veneer, account for most of the outcrop in the Gippsland Basin onshore.

(b) Structure:

Gippsland Basin sediments have been deformed by two major periods of anticlinal folding with some associated faulting, the first in the late Eocene to early Oligocene and the second during the late Pliocene and Pleistocene. The former, coincident with the major marine transgression, led to the development of predominantly east-west trending anticlinal structures across the central basin deep (Fig. 1). The fold belt appears to owe its origin to draping of the Cainozoic section over differentially displaced fault blocks in the underlying Strzelecki. The areas to the north and south,including the Vic/P8 farm-in, differ in that they show little or no structural deformation other than minor draping over buried basement topographic highs.

The Plio-Pleistocene earth movements caused uplift in the onshore marginal areas (including formation of the Mesozoic South Gippsland Hills) with modification and basinward tilting of pre-existing structures.

(c) Hydrocarbons:

The main oil and gas accumulations of the Gippsland Basin are on the Gippsland Shelf within the east-central basin deep. The accumulations are in permeable sands of the L.V.C.M., especially at the top where the overlying Lakes Entrance marls provide a suitable cap. Trapping is in the large closed anticlines referred to above. Oligocene erosion and canyon cutting has often modified the shape of the structures and in some cases the canyon-fill contributes to the closure. The coals and shales of the Latrobe appear to be a major source for the oil and gas (Richards & Hopkins, 1970).

At Lakes Entrance the non-commercial heavy oil and gas accumulations of the Lakes Entrance Formation appear to be indigeneous. Trapping is within permeable sand lenses that are superimposed on a south trending Palaeozoic bedrock nose.

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(3) Stratigraphic Table:

The sequence found in the Albatross #1 well is as follows:-

	Age	Rock Unit	Depth below datum (K.B.)	Depth below Sea level	Thickness
Tertiary	Miocene	Gippsland Formation	First returns at 710'	- 678'	1350+'
Tertiary	Oligocene	Lakes Entrance Formation	2060'	-2028'	260'
Tertiary	Eocene	Latrobe Valley Coal Measures -			
		("upper unit"	2320'	-2288'	51') 114'
		("lower unit"	2371'	-2339'	63')
		— UNCONFORMITY —			
Mesozoic	Lower Cretaceous	Strzelecki Group	2434'	-2402'	1690+'
		TOTAL DEPTH -	4124'	-4092'	

(4) Stratigraphy

The representative lithologies, and the lithologic and stratigraphic subdivisions, are shown on the enclosed Composite Log. Additional stratigraphic information is given below.

(a) Tertiary:

The criteria for selection of Tertiary formation boundaries in the Gippsland Basin are reasonably well established (miscellaneous well completion reports; Hocking, 1965), and have been adhered to in this report except where otherwise stated.

Sample returns commenced at 710 feet, so one can only speculate on the nature of the section above this depth. Base on correlation with onshore wells, it is probable that thin Jemmy's Point/Tambo River Formation (Upper Miocene-Pliocene) representatives exist beneath the ocean floor. However, the first returns at 710 feet are from high in the Gippsland Formation.

Gippsland Formation (710-2060'):

In the Albatross well the Gippsland Formation is broadly divisible into five rock units on the basis of lithology and wireline log response. Similar subdivisions are also recognisable in other wells in the area, such as Duck Bay #1 and Lakes Entrance #1. The vertical trend is from bioclastic (bryozoal) calcarenitic limestones at the top, passing with depth through argillaceous calcarenitic limestone, interbedded limestone and marl, then a predominantly marl section at the base.

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The Lower-Middle Miocene boundary is between 1600 and 1700 feet (see Appendix 3) and is arbitrarily taken as 1650 feet. It does not coincide with a rock unit boundary, although the limestones are predominantly Middle Miocene (and possibly even Upper Miocene at the top) and the marls predominantly Lower Miocene.

Lakes Entrance Formation (2060-2320'):

The boundary between the Gippsland and Lakes Entrance Formations is both conformable and gradational in the Albatross #1 well, as it is in most other Gippsland wells. Hocking (1965) and others (.e.g. Woodside Oil N.L., 1970) have taken the boundary in the earlier Gippsland wells as the top of a low resistivity 'shaly' section. In Albatross #1 such a boundary is very difficult to pick and cannot be related to other criteria. Instead it seems practical to place the boundary at 2060 feet, corresponding with :-

(i) the first appearance of pale greenish grey mudstone cuttings;

(ii) a sharp break in resistivity (macro and micro), sonic, and formation density, reflecting the contact between recrystallised limestones above and mudstones below:

(iii) the top of the Oligocene (see Appendix 3); and

(iv) a seismic reflector, based on the sonic contrast, that has regional significance.

The Lakes Entrance Formation at Albatross is unlike that at Lakes Entrance itself where the threefold Micaceous Marl/Greensand/Colquhoun Gravels subdivision is recognisable (Hocking and Taylor, 1964). Instead, it resembles that found in wells beyond the northernmost basin margin, for example, those at Seaspray.

The formation can be divided into two units of mudstone, the lower one (at 2259') being distinguished from that above by its higher calcareous content (reflected on the wireline logs), lighter colour, and increased glauconite content. The lower unit is also sandy below 2280'. In fact, the calcareous sandstone at 2280' could be taken as the top of the 'sandy unit' of Hocking (1965).

Unlike Duck Bay #1 and the onshore Lakes Entrance wells, Albatross #1 did not penetrate thick basal Lakes Entrance Formation sands. However, there is a 1 to 2 foot thick, tight, fossiliferous sideritic/limonitic sandstone at the base of the formation in Albatross which is very similar to that in onshore Lakes Entrance wells.

Latrobe Valley Coal Measures (2320-2434'):

The Latrobe top is represented by a very thin, pyritised, gravelly sandstone, suggesting a possible disconformity

with the overlying basal sideritic/limonitic sandstone of the Lakes Entrance Formation. The pyritic sandstone was recovered in Core #1.

The Latrobe has been divided into two arbitrary units in the Albatross #1 well, based on lithology and wireline log characteristics:-

(i) 'Upper unit' (2320-2371') - muddy (mostly kaolinitic), gravelly sandstones are interbedded with thin, mud-free sandstones. The latter are friable and extremely porous and permeable. As mentioned, the top of the unit is pyritised.

(ii) 'Lower unit' (2371-2434') - the clean sandstones are predominant, but the unit is also characterised by occasional very thin coal seams and mudstone beds.

The Latrobe Valley Coal Measures is appreciably thinner than at Duck Bay #1 (399 feet) and is completely lacking in any coal seams of substantial thickness which had been predicted in the well prognosis (Fig. 3).

Environmentally, the formation consists of fluviatile sands with minor associated swamp deposits in the lower unit. The Continuous Dipmeter interpretation, though very tenuous, suggests possible southwest-trending channel sands at the Albatross location.

(b) Mesozoic

Strzelecki Group (2434-4124' (T.D.)):

The top of the Strzelecki Group is clearly identified by the contrasting lithology and wireline log characteristics compared with the overlying Latrobe Valley Coal Measures. The top, at 2434', is an unconformity.

The Strzelecki lithologies resemble those found elsewhere in Gippsland, though the sandstones tend to be calcareous rather than chloritic.

Four units are recognisable in which a particular lithology is predominant, namely sandstone (2434-3045'), siltstone (3045-3370'), sandstone (3370-3698'), and shale-siltstone (3698-4124'(T.D.)). These subdivisions are arbitrary and are probably not correlateable over long distances.

Thin, hard tuffaceous sandstone beds occur in the lowest, shale-siltstone unit suggesting some Lower Cretaceious vulcanicity in the area. However, these beds are younger than the basal Lower Cretaceous volcanics (originally thought to be Lower Permian) found in Duck Bay #1 well.

The Strzelecki section at Albatross #1 is of Aptian-Albian age (Appendix 4). The beds are not as old as those encountered above Palaeozoic rocks elsewhere

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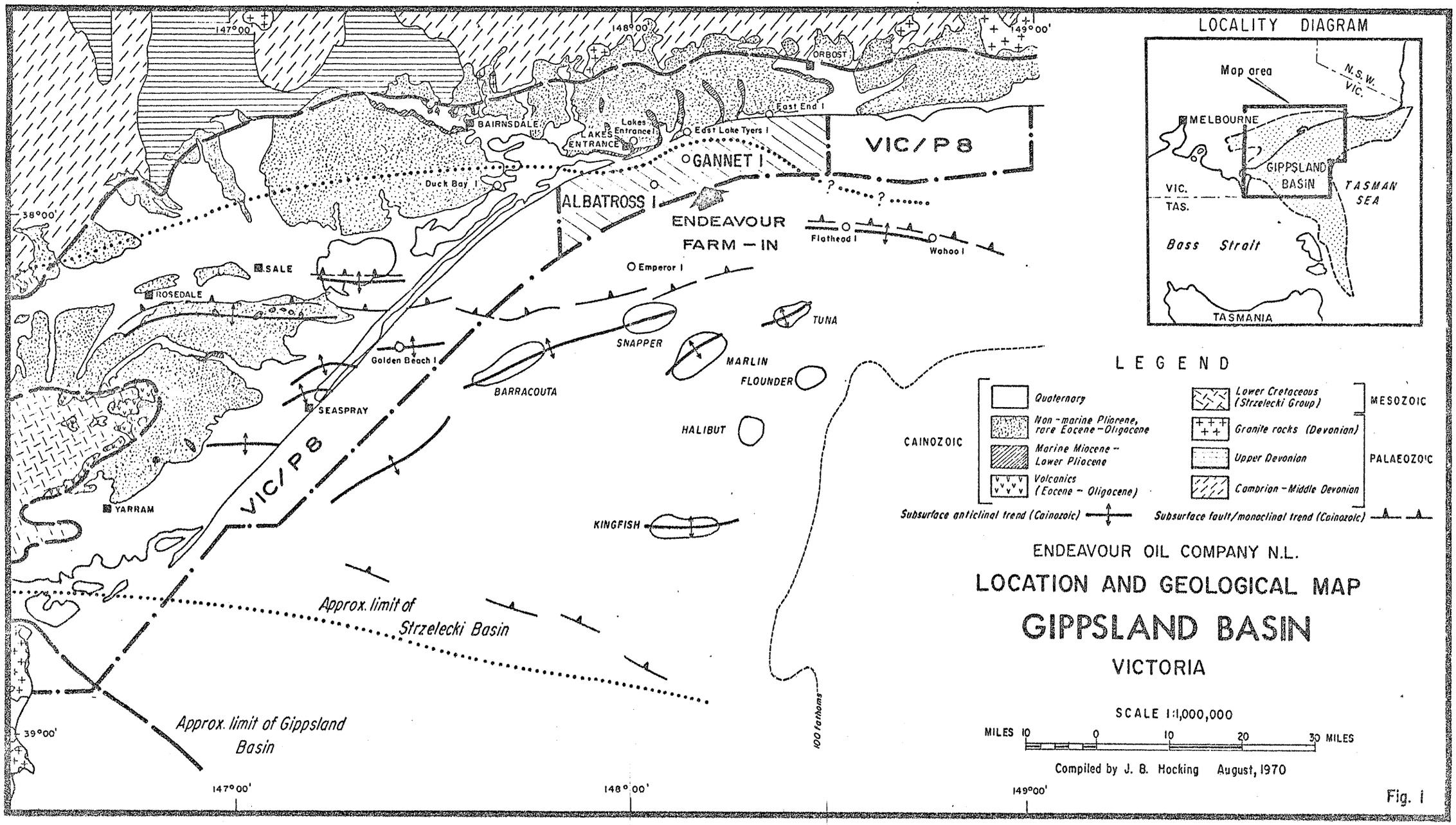
147°00'
148°00'
149°00'
38°00'
39°00'
ORBOST
BAIRNSDALE
LAKES ENTRANCE
Lakes Entrance I
East End I
East Lake Tyers I
VIC/P8
GANNET I
Duck Bay I
ALBATROSS I
ENDEAVOUR FARM — IN
Flathead I
Wahoo I
Emperor I
SALE
ROSEDALE
Golden Beach I
SEASPRAY
YARRAM
TUNA
SNAPPER
MARLIN
FLOUNDER
BARRACOUTA
HALIBUT
KINGFISH
VIC/P8
Approx. limit of Strzelecki Basin
Approx. limit of Gippsland Basin
100 fathoms
LOCALITY DIAGRAM
Map area
N.S.W.
VIC.
MELBOURNE
GIPPSLAND BASIN
TASMAN SEA
VIC.
TAS.
Bass Strait
TASMANIA
LEGEND
CAINOZOIC
Quaternary
Non-marine Pliocene, rare Eocene–Oligocene
Marine Miocene – Lower Pliocene
Volcanics (Eocene – Oligocene)
MESOZOIC
Lower Cretaceous (Strzelecki Group)
PALAEOZOIC
Granite rocks (Devonian)
Upper Devonian
Cambrian – Middle Devonian
Subsurface anticlinal trend (Cainozoic)
Subsurface fault/monoclinal trend (Cainozoic)
ENDEAVOUR OIL COMPANY N.L.
LOCATION AND GEOLOGICAL MAP
GIPPSLAND BASIN
VICTORIA
SCALE 1:1,000,000
MILES 10 0 10 20 30 MILES
Compiled by J. B. Hocking August, 1970

Fig. 1

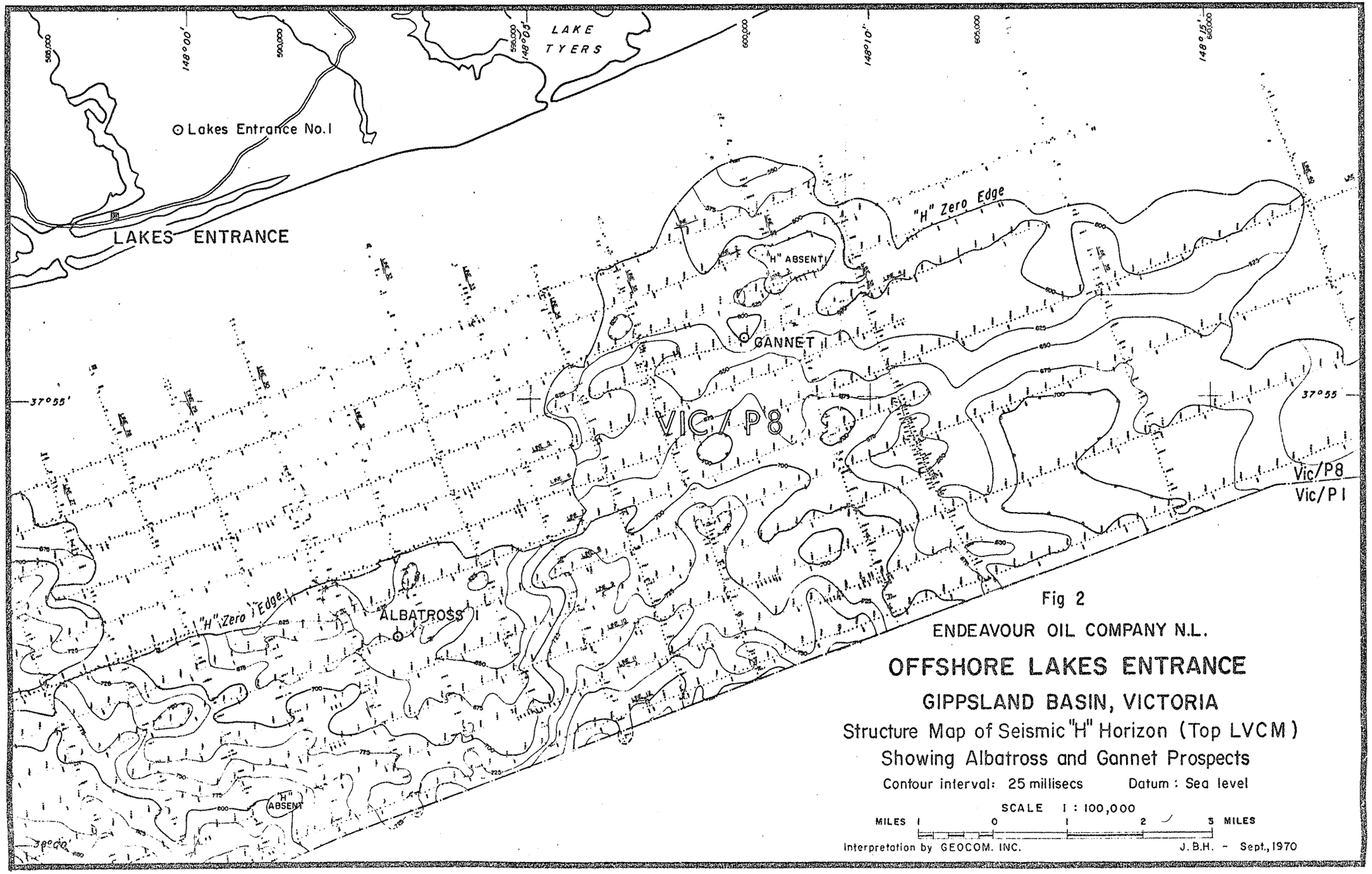

Fig 2

ENDEAVOUR OIL COMPANY N.L.

OFFSHORE LAKES ENTRANCE

GIPPSLAND BASIN, VICTORIA

Structure Map of Seismic "H" Horizon (Top LVCM)

Showing Albatross and Gannet Prospects

Contour interval: 25 millisecs Datum : Sea level

SCALE 1 : 100,000

MILES 1 0 1 2 3 MILES

Interpretation by GEOCOM. INC. J.B.H. - Sept., 1970

along the northern margin of the basin (e.g. Duck Bay #1; Tyers outcrops), and so it is probable that the Albatross well was not close to Palaeozoic bedrock at the time total depth was reached.

(5) Structure:

The Albatross #1 well was drilled primarily to test a wedge-out of the upper Latrobe Valley Coal Measures sands ('H-K' seismic unit) on the broad, western flank of a southerly plunging basement nose. Lateral closure, as mapped on the top of Latrobe ('H' horizon), is defined by wedge-out to the north and by dip to the west, south and east (Fig. 2). The closed area is about 8 square miles and the total vertical relief over the area is approximately 250 feet.

The growth of the structural nose has been largely controlled by a major, north-south trending fault on its eastern flank, downthrown to the east. The fault cuts the deeper Strzelecki section,but is expressed at the 'H' level only by a steep gradient (between lines 32 and 33, Fig. 2). The main movement on the fault appears to be prior to Latrobe deposition, since:-

(i) it does not cut the uppermost Strzelecki or younger units;

(ii) there is some regional thinning (either by erosion and/or non-deposition) of the uppermost Strzelecki and Tertiary units over the upthrown side;

(iii) possible Latrobe channel-sand trends, suggested by the Continuous Dipmeter, are coincident with the regional dip direction which must have already been established at that time; and

(iv) the north-south trend of the fault is contrary to the general east-west Mesozoic/Tertiary structural trends, and instead is comparable to those of the Palaeozoic rocks in the area; in fact, the fault and the south-plunging nose are southerly extensions of comparable Palaeozoic features defined west of Lake Bunga onshore.

Regional dips at the Albatross #1 location, measured by the Continuous Dipmeter survey, are consistent with the seismic structural picture. Tertiary dips are generally from 2^{o} to 3^{o} S.W. and Strzelecki dips are from 3^{o} to 4^{o} S.S.W.-S. There is negligible angular discordance at the Tertiary-Lower Cretaceous unconformity.

(6) Occurrence of Hydrocarbons:

The hot-wire detector recorded 8 to 10 units of gas, predominantly methane, whilst drilling through the Latrobe Valley Coal Measures.

Evaluation of the wireline logs (see Appendix 1) indicated two thin zones with minor, but significant, gas saturation:-

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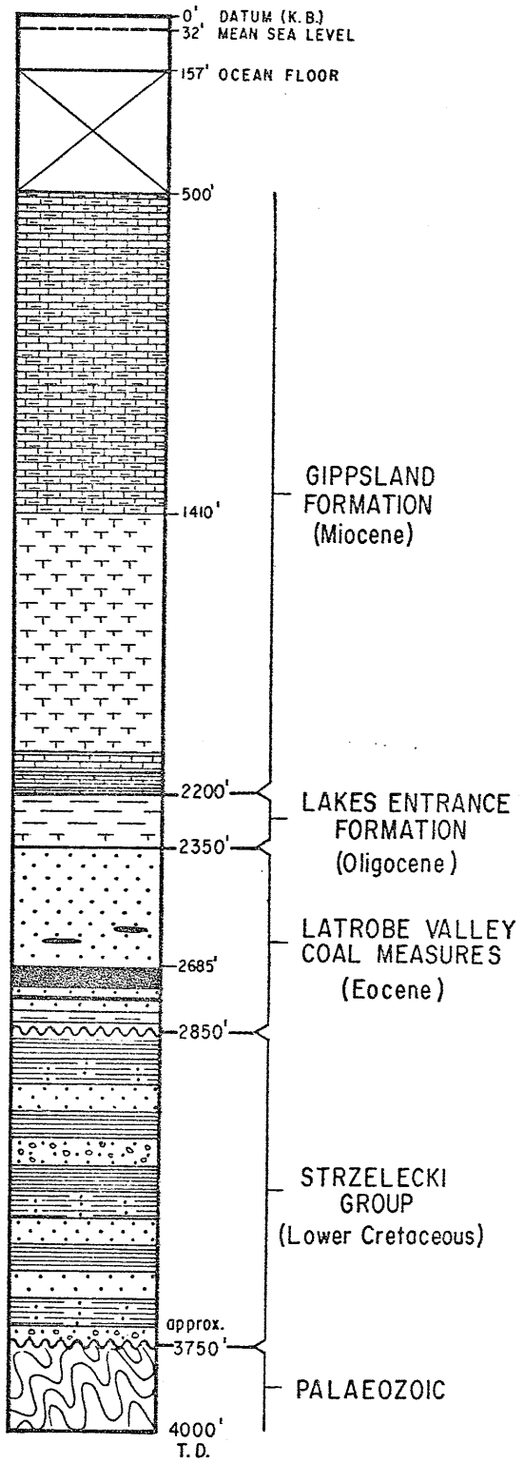
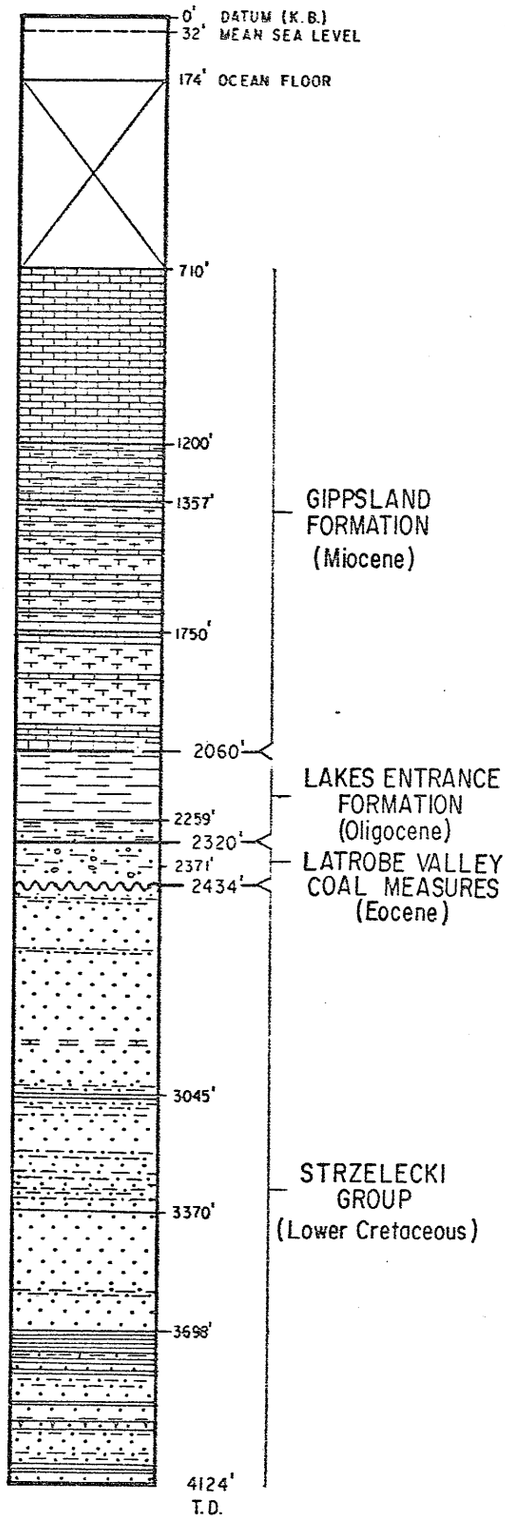
SECTION BEFORE DRILLING



SECTION AFTER DRILLING



LEGEND

- Limestone
- Limestone, argillaceous
- Marl
- Mudstone
- Shale
- Siltstone
- Coal
- Sandstone
- Sandstone, gravelly
- Sandstone, tuffaceous
- Calcareous

ENDEAVOUR OIL COMPANY N. L.

ALBATROSS No.1

GIPPSLAND BASIN

SECTIONS BEFORE AND AFTER DRILLING

VERTICAL SCALE 1" = 500'

Prepared by J. B. Hocking Oct., 1970

Fig. 3

(Latrobe, 'upper unit' 2,327-2,333'(6') - Sw = 72%
(Latrobe, 'lower unit' 2,408-2,423'(15') - Sw = 69-80%

The measured gas saturation and the thickness of the gas-bearing zones were insufficient to warrant testing.

No other gas shows were recorded. No fluorescence was observed in the drill cuttings examined throughout the entire section or in Core #1 cut at the top of the Latrobe Valley Coal Measures.

Formation water salinities in the Latrobe Valley Coal Measures, determined from cross-plots, are noticeably higher than those normally encountered near the northern margin of the basin:-

('upper unit' - 6,250 ppm NaCl
('lower unit' - 4,250 ppm NaCl (see Appendix 1).

In onshore Gippsland the upper Latrobe waters average 500 ppm and those of the basal Lakes Entrance Formation sands near Lakes Entrance (Colquhoun Gravels) are between 1,500 and 2,000 ppm, but occasionally up to 2,700 ppm (Jenkin, 1962).

It is apparent that the structural nose at the Albatross prospect was favourably developed for early migration and accumulation of hydrocarbons (see Structure). There is also strong evidence that a Latrobe wedge-out exists at the Albatross location which is adequately sealed by tight, calcareous mudstones of the Lakes Entrance Formation above and cemented sandstones of the Strzelecki Group below. The effectiveness of the seal is also suggested by the imbalance of the water salinities within the Latrobe (with the higher salinity at the top probably derived from Lakes Entrance Formation compaction.)

A suitable trap now appears to exist at the Albatross prospect. However, the time of migration and accumulation, and possibly the continuity or discontinuity of Latrobe sand bodies may have been critical in controlling the ultimate entrapment of hydrocarbons.

(7) Porosity and Permeability:

The limestones of the Gippsland Formation generally have good porosity and permeability, especially the uppermost, friable biocalcarenite section. Recrystallisation tends to inhibit porosity, especially below 1,357 feet.

The Gippsland Formation marl section and the Lakes Entrance Formation mudstones are tight and impermeable.

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The sands of the Latrobe Valley Coal Measures have intermediate to high porosity and permeability. Porosity values from wireline logs are commonly 25% to 26% for the cleaner sands and sometimes exceed 30%, particularly in the basal 25 feet where some gas saturation was measured (see Appendix 1).

The Strzelecki Group section is tight and impermeable with the possible exception of some sandstones where a small negative SP deflection is registered.

(8) Contributions to Geological Knowledge:

Albatross #1 was the first Gippsland Basin well to be drilled a short distance offshore from the abandoned Lakes Entrance oilfield. The continental shelf due south of Lakes Entrance has long been regarded as having petroleum potential, not only because of the proximity of the Lakes Entrance field to the north, but more so in recent years owing to the discovery of Esso-B.H.P.'s fields to the south. Although a dry hole, Albatross #1 well has provided the following valuable geological information about the area:-

(a) The principal objective, the Latrobe Valley Coal Measures, was penetrated as expected,but contained only minor gas saturation. The thickness of the Latrobe (114 feet) was less than predicted (500 feet) owing to the misinterpretation of seismic reflector 'K'.

(b) Coals were absent from the Latrobe section, with the exception of rare, very thin seams, and have apparently wedged-out downdip.

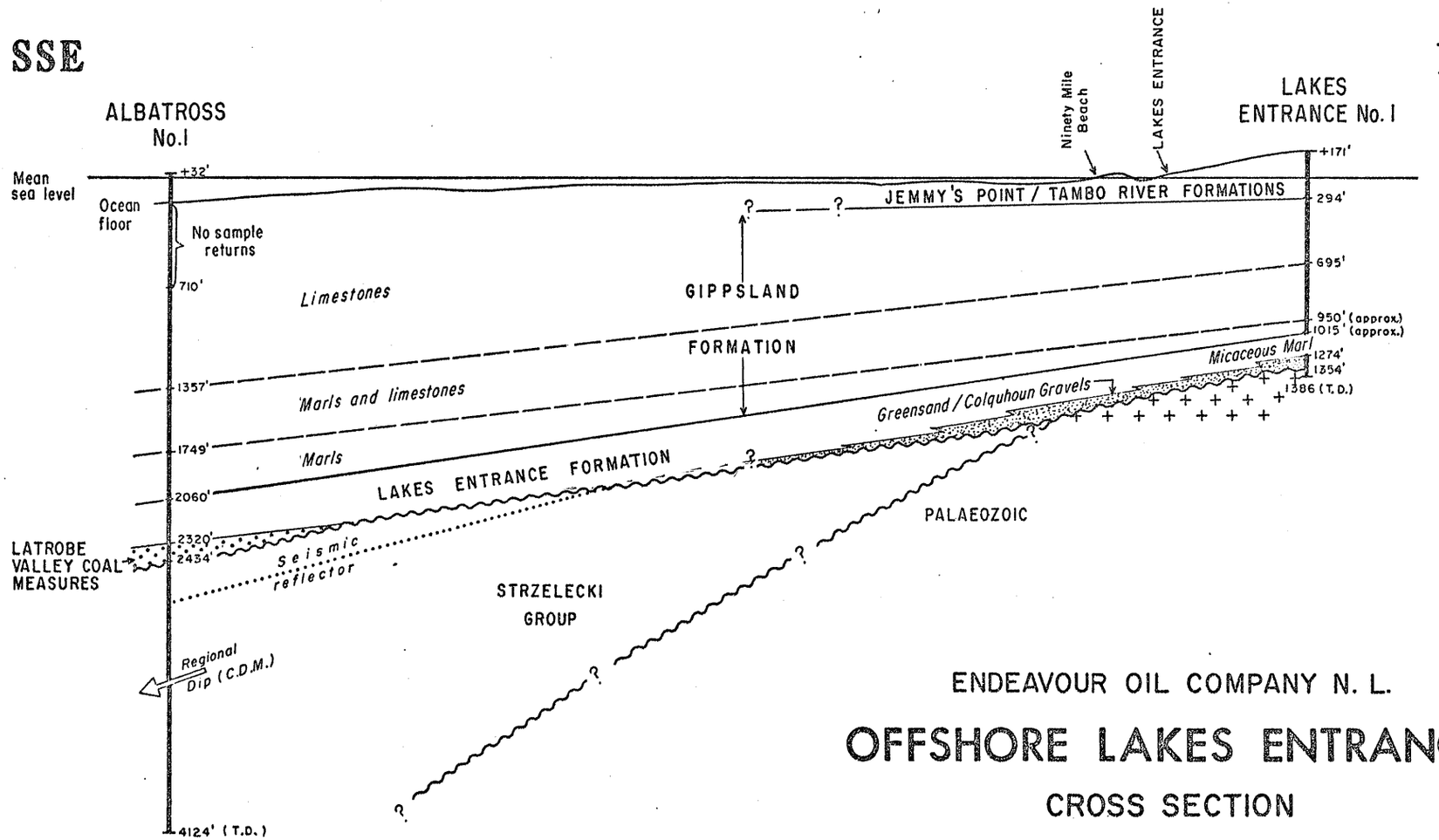
(c) The well confirmed the wedging-out of the entire Latrobe section in an updip position along the northern margin of the basin; the wedge-out edge is about 5 miles south of the Lakes Entrance coastline.

(d) An adequate seal of the Latrobe wedge, between the overlying calcareous mudstones of the Lakes Entrance Formation and the underlying tight sandstones of the Strzelecki Group, was confirmed.

(e) The salinities of the formation waters within the Latrobe sands were significantly higher (viz. 6,250 ppm and 4,250 ppm) than previously recorded along the margins of the Gippsland Basin, thus upgrading the trapping mechanism at the Albatross prospect.

(f) The Gippsland and Lakes Entrance Formations encountered in onshore wells farther west are duplicated at Albatross #1. However, the marginal sandy facies of the Micaceous Marl/Greensand/Colquhoun Gravels Members of the Lakes Entrance Formation at Lakes Entrance, only 6 miles north of Albatross,

../20



ENDEAVOUR OIL COMPANY N. L.

OFFSHORE LAKES ENTRANCE

CROSS SECTION

ALBATROSS No.I – LAKES ENTRANCE No.I

VERTICAL SCALE 1" = 1,000' HORIZONTAL SCALE 1" = 1 MILE

VERTICAL EXAGGERATION 5·28 TIMES

Prepared by J.B. Hocking Oct.,1970

Fig. 4

were missing at the well. (Fig. 4)

(g) The Strzelecki Group is considerably thicker than predicted (+1690 feet). Horizon 'K' (presumed coal/shale reflector within the Latrobe) and horizon 'S' (predicted top of Strzelecki) are now regarded as intra-Mesozoic reflectors at the Albatross location (see Fig. 3, Enclosure 2). Horizon 'P' (predicted base of Strzelecki/top of Palaeozoic) was not intersected.

(h) The Palaeozoic bedrock was not reached at total depth (4124 feet) and so the secondary, basal Strzelecki sand/conglomerate objective was not achieved. No permeable sand or conglomerate beds were penetrated in the Strzelecki section.

The offshore Lakes Entrance area must still be regarded as having petroleum potential, since drilling at Albatross #1 has not completely downgraded prospects in the area.

V REFERENCES

Arco-Woodside, 1966. Summary of data and results for Southwest Bairnsdale #1 well and Duck Bay #1 well. *B.M.R. Petrol. Search Subsidy Act, Publication, 77*

Boutakoff, N., 1964. Lakes Entrance oil and the continental shelf. *The 1964 A.P.E.A. Journal: 99-110*

Carter, A.N., 1964. Tertiary foraminifera from Gippsland, Victoria, and their stratigraphical significance. *Geol. Surv. Vict. Memoir, 23*

Dooley, J.C. & Mulder, J.M., 1953. Discussion of gravity results, East Gippsland, Victoria. *B.M.R. Record, 1953/77*

Edwards, A.B. & Baker, G., 1943. Jurassic arkose in southern Victoria. *Proc. Roy. Soc. Vict. 55(2): 195-228*

Frankovitch, C.J., 1969. Processing procedure, Offshore Lakes Entrance area, for Endeavour Oil Company N.L. *Geocom Inc., Houston (unpublished)*

Hocking, J.B., 1965. Characteristics of the Tertiary formations of southern and south-eastern Gippsland. *Geol. Surv. Vict. unpublished rept., 1965/5*

Hocking, J.B. & Taylor, D.J., 1964. The initial marine transgression in the Gippsland Basin, Victoria. *The 1964 A.P.E.A. Journal: 125-132*

Hocking, J.B., 1970. Geology of Lower Miocene calcareous deposits in the Sale-Yarram region, South Gippsland. *Vict. Mining & Geol. Journal, 6(6): 80-90*

../21

Ingram, Frank T., 1962. East Lake Tyers #1 well completion report. *Arco Ltd. - Woodside (Lakes Entrance) Oil N.L. (unpublished)*

Jenkin, J.J., 1962. Underground water in East Gippsland. *Mines Dept. Vict. Underground Water Invest. Rept., 6*

Jenkin, J.J., 1968. The geomorphology and upper Cainozoic geology of south-east Gippsland, Victoria. *Geol. Surv. Vict. Memoir, 27*

Jessop, R.G.C., 1966. Lakes Entrance #1 well completion report. *Woodside (Lakes Entrance) Oil N.L. (unpublished)*

Quilty, J.H., 1965. Gippsland Basin airborne magnetic surveys, Victoria, 1951-52 and 1956. *B.M.R. Report, 95*

Richards, K.A. & Hopkins, B.M., 1969. Exploration in the Gippsland, Bass and Otway Basins, Australia. *E.C.A.F.E. Symposium (Canberra), preprint*

Warner, Douglas F., 1970. Final report of Offshore Lakes Entrance seismic survey for Endeavour Oil Company N.L. *Geocom Inc., Houston (unpublished)*

Weeks, L.G. & Hopkins, B.M., 1967. Geology and exploration of three Bass Strait basins, Australia. *Bull. A.A.P.G., 51(5): 742-760*

Western Geophysical Co., 1963. Final report, Ninety Mile Beach marine seismic survey for Arco Ltd. (unpublished).

Woodside Oil N.L., 1970. Colliers Hill #1 completion report (unpublished).

APPENDIX (1)

WIRELINE LOG INTERPRETATION

ALBATROSS #1

INDUCTION ELECTRIC LOG

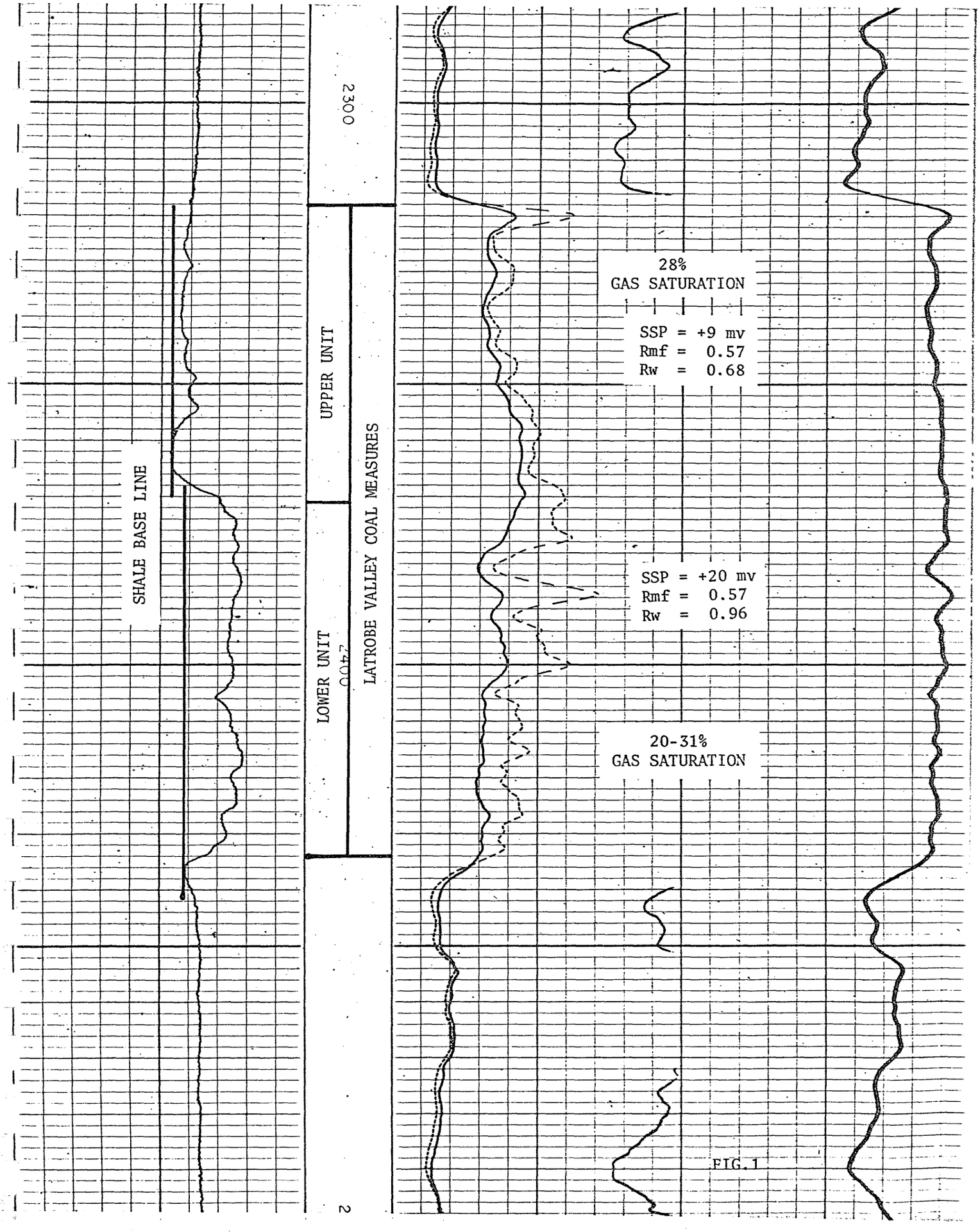


FIG. 1

ALBATROSS #1

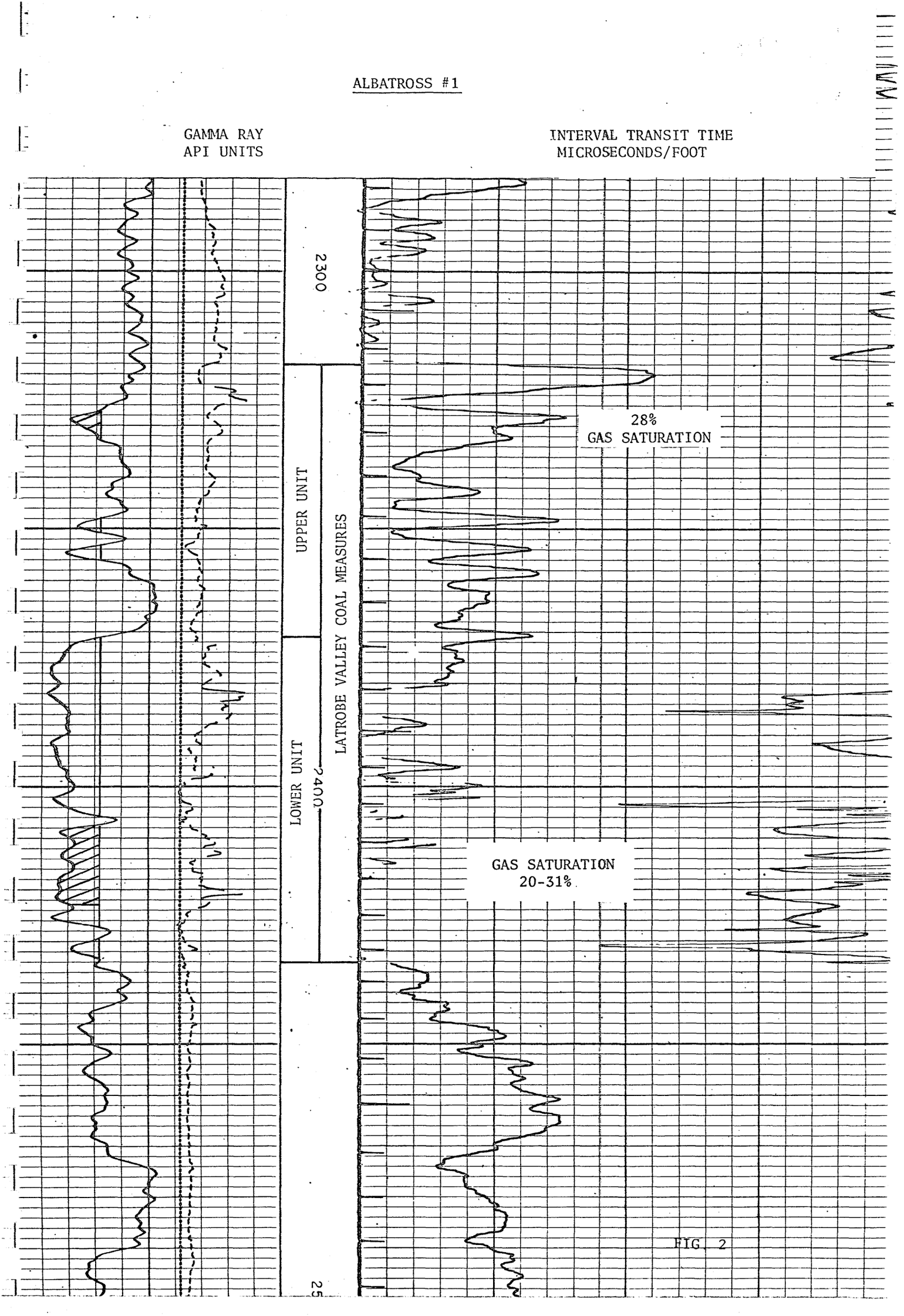


FIG. 2

ACbatross #1

R_{IL} vs R_{MLL}

$R_w = 0.96$

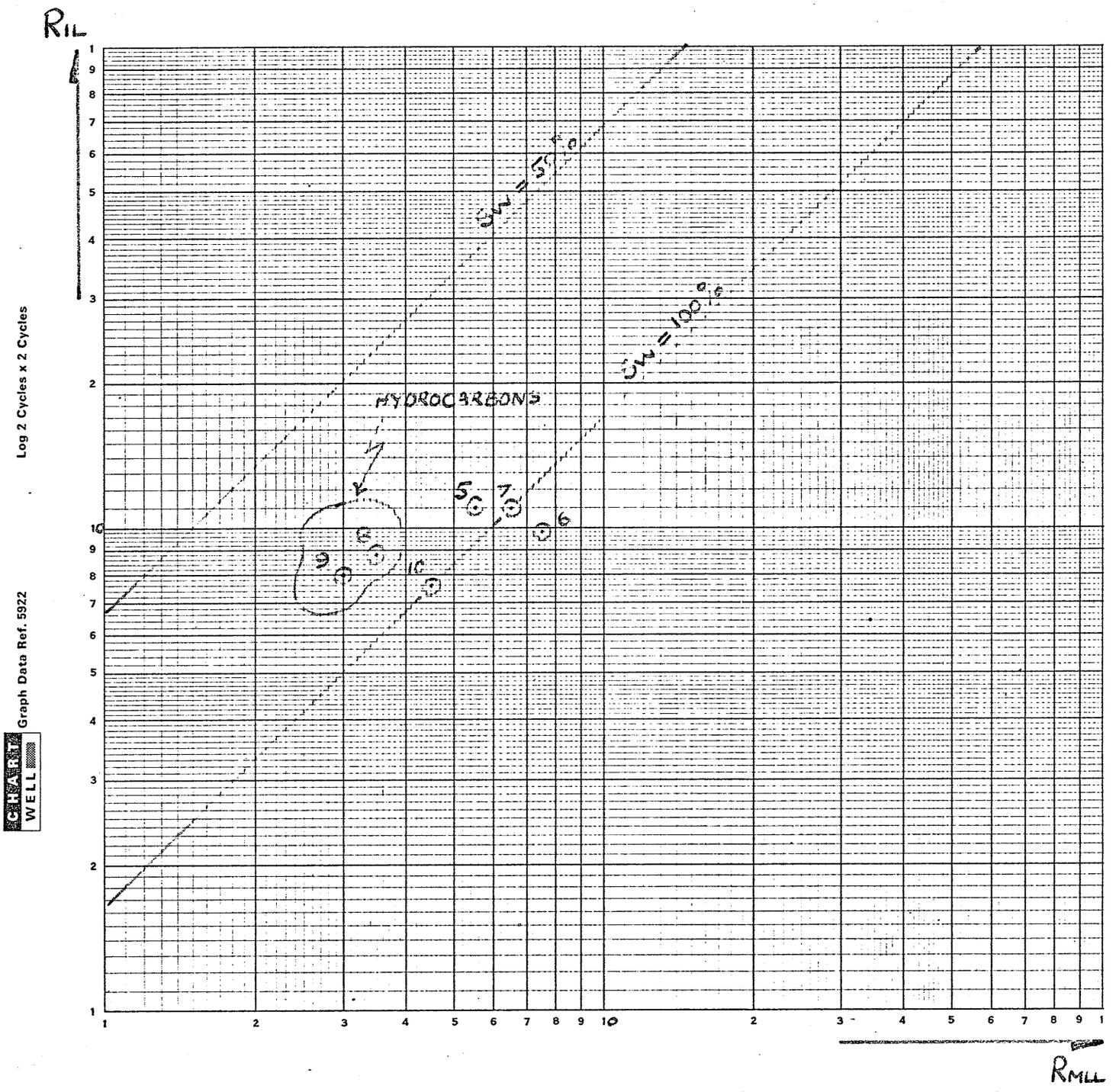


FIG. 3

Albatross #1
Rwa vs SP

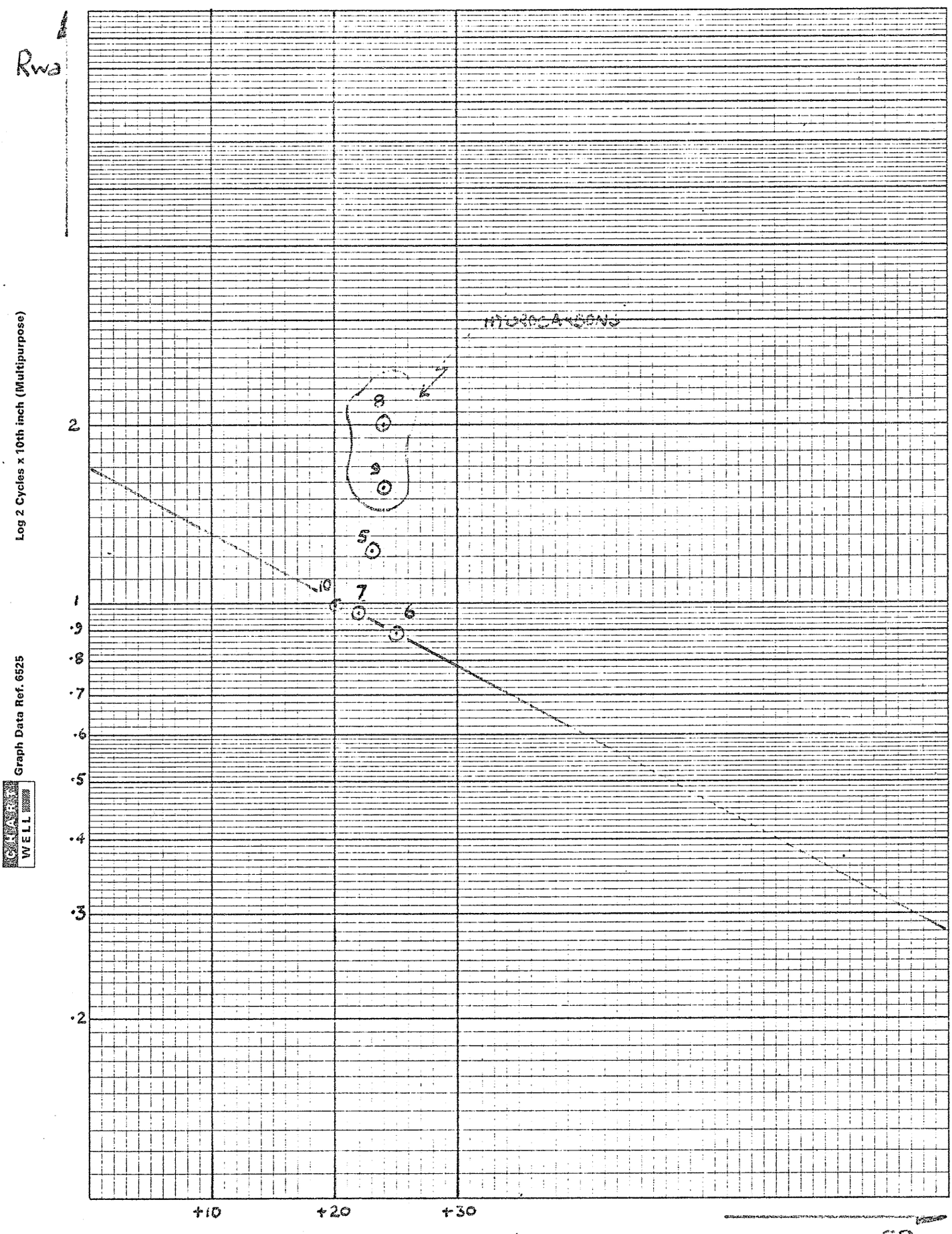


FIG. 4

SCHLUMBERGER

Albatross #1
FDC vs R_{IL}

RESISTIVITY VS POROSITY

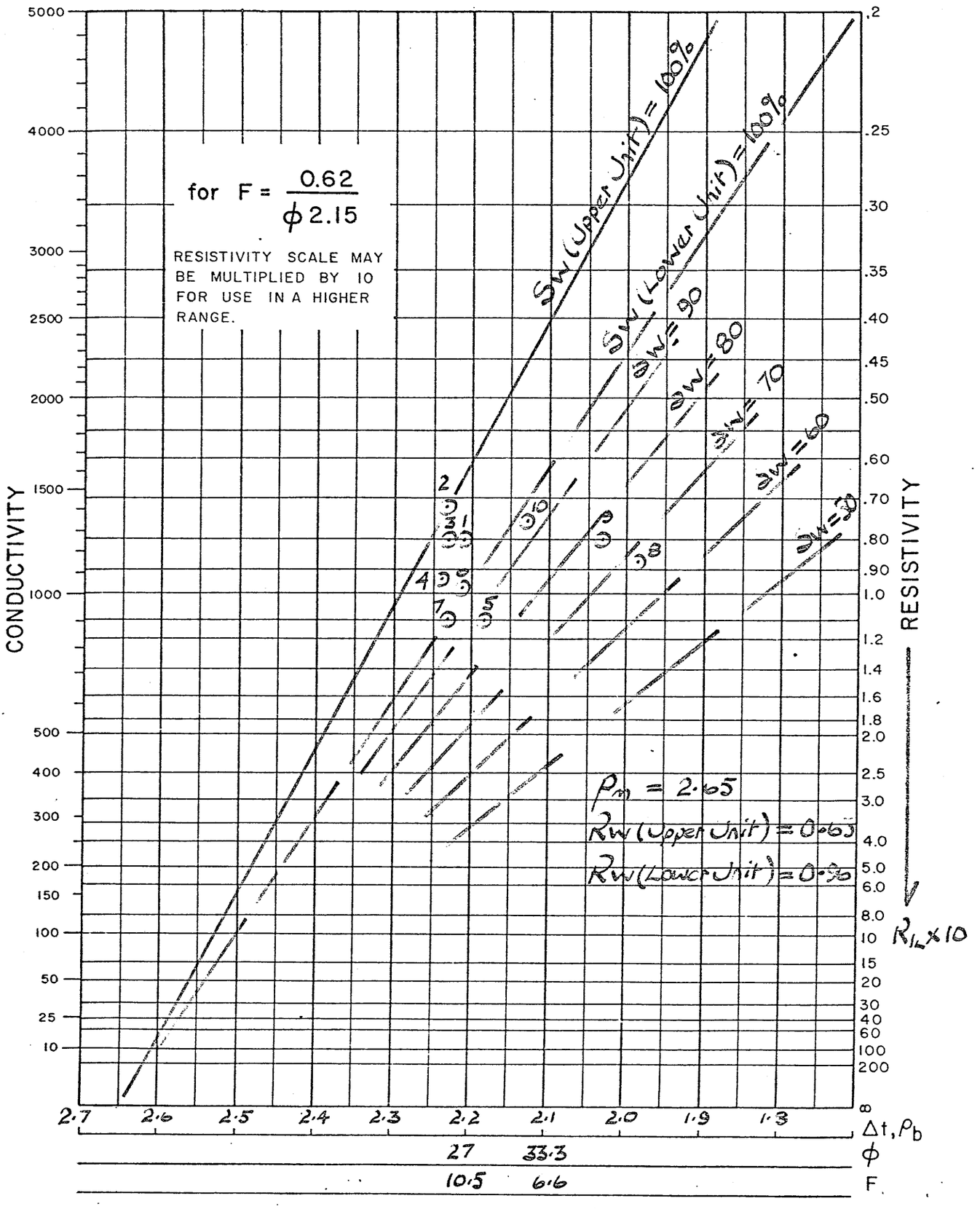


FIG. 5

SCHLUMBERGER

Albatross #1
FDC vs R_{MLL}

RESISTIVITY VS POROSITY

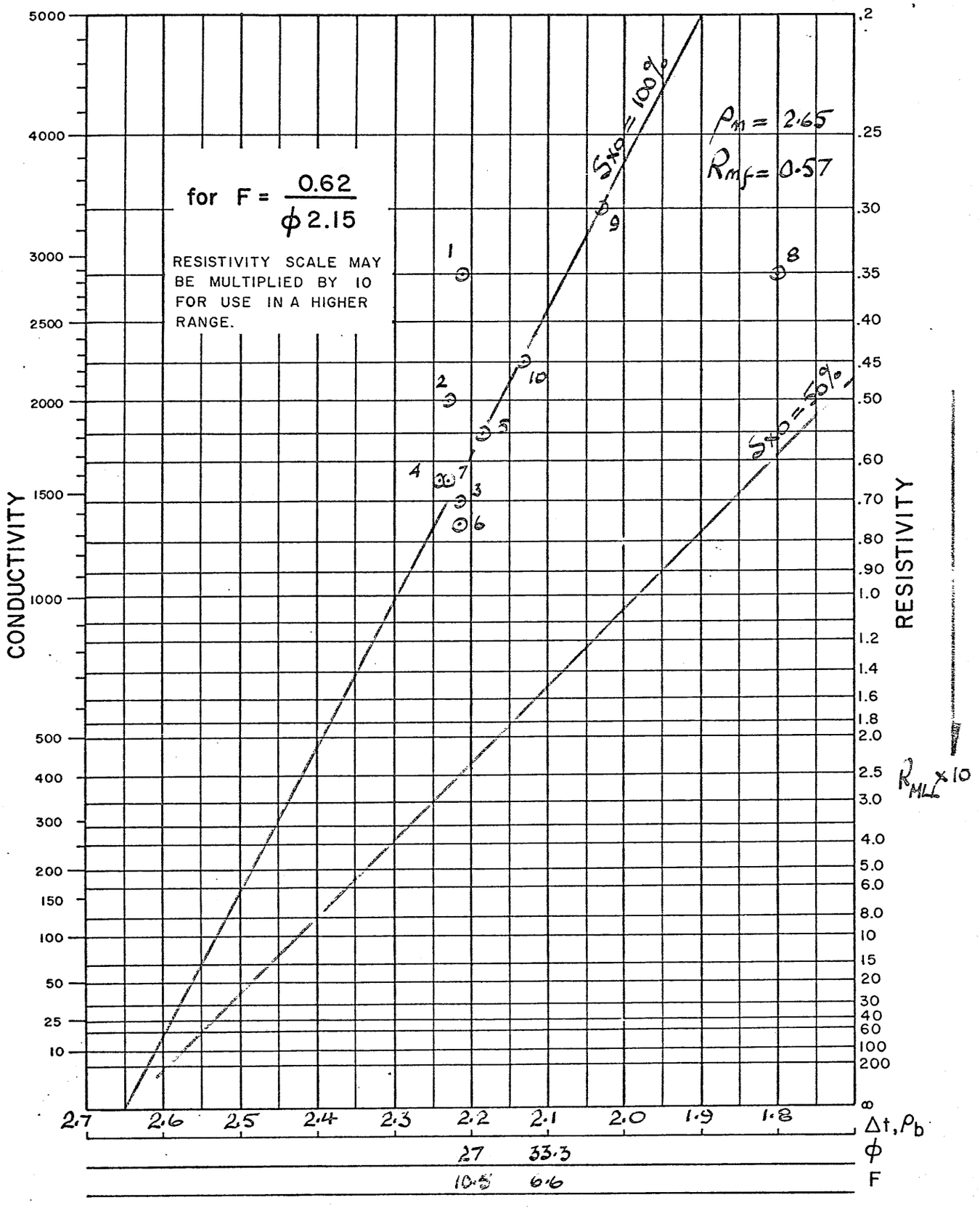


FIG. 6

ALBATROSS #1

Depth	#	SSP	R_{IL}	R_{MLL}	Δt	ρ_b	F_D	F_R	ϕ_D	ϕ_R	F_R/F_D	Rmf	Rw	Rwa	Sw
2328-30	1	+ 8	8.0	3.5	109	2.21	10.6	6.15	26.5	34.5	0.58	0.57	0.68	0.75	72
2342-44	2	+ 6	7.2	5.0	125	2.23	11.5	8.75	25.5	29.0	0.76	0.57	0.68	0.63	91
2348-50	3	+ 9	8.0	7.0	117	2.22	11.0	12.3	26.0	25.0	1.12	0.57	0.68	0.73	100
2354-56	4	+10	9.4	6.5	117	2.24	12.0	11.4	25.0	26.0	0.95	0.57	0.68	0.79	91
2372-75	5	+23	11.0	5.5	122	2.18	9.0	9.65	28.5	28.0	1.02	0.57	0.96	1.22	89
2390-96	6	+25	9.8	7.5	140	2.22	11.0	13.15	26.0	24.0	1.20	0.57	0.96	0.89	100
2400-02	7	+22	11.0	6.5	124	2.23	11.5	11.4	25.5	26.0	0.99	0.57	0.96	0.96	100
2410-12	8	+24	8.8	3.5	145	1.98	4.4	6.15	40.5	34.5	1.40	0.57	0.96	2.00	69
2414-16	9	+24	8.0	3.0	155	2.03	5.1	5.45	37.5	36.5	1.07	0.57	0.96	1.57	80
2430-33	10	+20	7.6	4.5	165	2.13	7.7	7.9	31.5	30.5	1.02	0.57	0.96	0.99	100

APPENDIX (2)

CORE DESCRIPTION

Endeavour Oil Company N.L.

CORE DESCRIPTION

Well: ALBATROSS #1

Core No: 1 Fm.: L.V.C.M.

Interval Cored: 2320-27 ft. Cut: 7 ft. Recovered: 7 in. ft. %Rec: 8.3

Type and Size Core Head: Christ. C-144 Desc. by: J.K. Morris and J.B. Hocking Date: 13.7.70.

Depth & Coring Rate (min/ ft)	Graphic (=)	Shows	Interval (ft.)	Descriptive Lithology
2320 2 4 6 8	p	Nil	2320'-2320'7"	SANDSTONE: Pinkish grey (5YR), soft to hard, very coarse-grained with gravel maximum, poorly sorted, angular to subangular, abundant clear quartz, cemented by brassy yellow pyrite in approximately 60% of core, and by soft white kaolinitic clay in remainder. Pyrite cementation is irregular and there is no indication of bedding or other sedimentary structures. Porosity is negligible. Neither fluorescence nor petroliferous odour was detected.
2325			2307'7"-2327'	NOT RECOVERED
2330				

REMARKS: It is suspected that only those portions of the core cemented by pyrite have been recovered. The remainder, probably a poorly consolidated sand, has presumably been washed out.
Note that the penetration rate averaged 8 minutes per foot.

APPENDIX (3)

MICROPALEONTOLOGICAL REPORT

MICROPALEONTOLOGICAL REPORT ON ALBATROSS #1 WELL

Cuttings from the Albatross #1 Well were submitted by Endeavour Oil Co. N.L. for selective micropaleontological examination. The main aim of such examination was the subdivision of the Tertiary marine sequence into Oligocene, Lower Miocene and Middle to Upper Miocene intervals; if possible, further subdivision into Carter's "Faunal Units" was to be attempted.

The following samples were examined micropaleontologically in late July and early August, 1970 :

Depth			
	710'	-	720'
	900'	-	910'
	1100'	-	1110'
	1300'	-	1310'
	1400'	-	1410'
	1500'	-	1510'
	1600'	-	1610'
	1700'	-	1710'
	1800'	-	1810'
	1900'	-	1910'
	2000'	-	2010'
	2100'	-	2110'
	2200'	-	2210'
	2290'	-	2300'
	2300'	-	2310'
	2310'	-	2320'
	3750'	-	3760'
	3770'	-	3780'

In all cases only a small amount of sample was available for preparation and the foraminiferal faunas are rather sparse. Commonly only a few specimens of diagnostic foraminifera are present; this, in combination with the fact that some downward contamination of samples has obviously occurred, makes precise recognition of time-stratigraphic units difficult.

The youngest strata represented by the sample are Middle Miocene, very likely equivalent to Carter's FU 11 or even younger. Although no *Orbulina universa* was noted, it is highly improbable that FU 10 here comprises several hundred feet of strata.

The base of Middle Miocene, equated with the base of FU 10, is tentatively placed between 1600' and 1700'. Lowest occurrence of *Orbulina suturalis* was noted at 1500' - 1510', but *Globorotalia barisanensis* was observed at 1600' - 1610'.

The base of Miocene, equated with the base of FU 6, is tentatively placed between 2000' and 2100'. *Globoquadrina dehiscens* was noted at 2000' - 2010'; its presence in two lower samples is regarded as due to contamination.

The lowest beds of the marine sequence probably represent FU 4 rather than FU 5, although no undoubtedly diagnostic foraminifera were observed.

All foraminifera noted in samples from 3750'-3760' and 3770'-3780' are Oligocene and Lower Miocene contaminants.

Dr. C. Abele
Senior Geologist,
Paleontology Section,
Victorian Mines Department.

(Mines Department Unpublished Report 1970/38)

APPENDIX (4)

PALYNOLOGICAL REPORT

PALYNOLOGICAL EXAMINATION ALBATROSS #1 WELL

Samples were treated by the hydrofluoric acid - Schulze's solution method, and the residues examined under the microscope for acid insoluble microfossils.

Depth	Microfossils
3110-3120 ft.	*Cyathidites* sp., *Leptolepidites verrucatus*, *Ceratosporites equalis*, *Cicatricosisporites australiensis* etc.
3740-3750 ft.	*Ceratosporites equalis*, *Cyathidites* etc.
4080-4090 ft.	*Dictyotosporites speciosus*, *Cyathidites* cf. *Rouseisporites recticulatus* etc.

The microspores present in the 3 samples are typical of the Speciosus Assemblage Zone of Dettmann (1963). Cf. *Rouseisporites reticulatus* found in the deepest (4080-4090 ft.) sample suggests that the *R.reticulatus* Unit of Dettmann and Playford (1969) may be present. This is of Aptian age. In any case the range of the specimens is Aptian-Albian, and corresponds to Zone C of Douglas (1969).

References.

Dettmann Mary E. 1963	Proc. Roy. Soc. Vic. 77
Dettmann Mary E. & Playford G.	Strat. & Pal. ANU. (Dorothy Hill Essays).
Douglas J.G. 1969	Mem. Dept. Min. Vict.28.

J. DOUGLAS.
SUPERVISING GEOLOGIST.
Victorian Mines Department

PE601467

This is an enclosure indicator page.
The enclosure PE601467 is enclosed within the container PE902802 at this location in this document.

The enclosure PE601467 has the following characteristics:

ITEM_BARCODE	= PE601467
CONTAINER_BARCODE	= PE902802
NAME	= Corelab Grapholog Mudlog
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Corelab Grapholog Mudlog
REMARKS	=
DATE_CREATED	= 05/07/1970
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Co
CLIENT_OP_CO	= Endeavour Oil Co NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE601469

This is an enclosure indicator page.
The enclosure PE601469 is enclosed within the container PE902802 at this location in this document.

The enclosure PE601469 has the following characteristics:

ITEM_BARCODE	= PE601469
CONTAINER_BARCODE	= PE902802
NAME	= Predicted section & drilling rate - graphic log
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Predicted section & drilling rate - graphic log
REMARKS	=
DATE_CREATED	= 31/05/1970
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Co NL
CLIENT_OP_CO	= Endeavour Oil Co NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE601470

This is an enclosure indicator page.
The enclosure PE601470 is enclosed within the container PE902802 at this location in this document.

The enclosure PE601470 has the following characteristics:

ITEM_BARCODE	= PE601470
CONTAINER_BARCODE	= PE902802
NAME	= Synthetic Seismogram Endeavour Wildcat
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= SYNTH_SEISMOGRAPH
DESCRIPTION	= Synthetic Seismogram Endeavour Wildcat
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Co NL
CLIENT_OP_CO	= Endeavour Oil Co NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE601471

This is an enclosure indicator page.
The enclosure PE601471 is enclosed within the container PE902802 at this location in this document.

The enclosure PE601471 has the following characteristics:

ITEM_BARCODE	= PE601471
CONTAINER_BARCODE	= PE902802
NAME	= Synthetic Seismogram Endeavour Wildcat
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= SYNTH_SEISMOGRAPH
DESCRIPTION	= Synthetic Seismogram Endeavour Wildcat
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Co NL
CLIENT_OP_CO	= Endeavour Oil Co NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE601472

This is an enclosure indicator page.
The enclosure PE601472 is enclosed within the container PE902802 at this location in this document.

The enclosure PE601472 has the following characteristics:

ITEM_BARCODE	= PE601472
CONTAINER_BARCODE	= PE902802
NAME	= Synthetic Seismogram Endeavour Wildcat
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= SYNTH_SEISMOGRAPH
DESCRIPTION	= Synthetic Seismogram Endeavour Wildcat
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Co NL
CLIENT_OP_CO	= Endeavour Oil Co NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE601473

This is an enclosure indicator page.
The enclosure PE601473 is enclosed within the container PE902802 at this location in this document.

The enclosure PE601473 has the following characteristics:

ITEM_BARCODE	= PE601473
CONTAINER_BARCODE	= PE902802
NAME	= Synthetic Seismogram Endeavour Wildcat
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= SYNTH_SEISMOGRAPH
DESCRIPTION	= Synthetic Seismogram Endeavour Wildcat
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Co NL
CLIENT_OP_CO	= Endeavour Oil Co NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE603718

This is an enclosure indicator page.
The enclosure PE603718 is enclosed within the container PE902802 at this location in this document.

The enclosure PE603718 has the following characteristics:

ITEM_BARCODE	= PE603718
CONTAINER_BARCODE	= PE902802
NAME	= Albatross 1 Composite Well Log sheet 1 of 2
BASIN	= GIPPSLAND
PERMIT	= VIC/P8
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Albatross 1 Well Completion Log (sheet 1 of 2 from WCR)
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Company N.L
CLIENT_OP_CO	= Endeavour Oil Company N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE603291

This is an enclosure indicator page.
The enclosure PE603291 is enclosed within the container PE902802 at this location in this document.

The enclosure PE603291 has the following characteristics:

ITEM_BARCODE	= PE603291
CONTAINER_BARCODE	= PE902802
NAME	= Composite Well Log
BASIN	= GIPPSLAND
PERMIT	= VIC/P8
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Albatross 1 Composite Well Log. Enclosure 1 of WCR. Sheet 2 of 2.
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W597
WELL_NAME	= Albatross-1
CONTRACTOR	= Endeavour Oil Company N.L.
CLIENT_OP_CO	= Endeavour Oil Company N.L.

(Inserted by DNRE - Vic Govt Mines Dept)