W467

Natural Resources and Environment

AGRICULTURE • RESOURCES • CONSERVATION • LAND MANAGEMENT

WELLINGTON PARK - 1

WELL COMPLETION REPORT

	2 Referred to	3 Date	4 Clearing Officer's Initials	1 Folio No.	2 Referred to	3 Date	4 Clearing Officer's Initials

WELLINGTON PARK NO. 1

VICTORIA.

ARCO LIMITED / WOODSIDE (LAKES ENTRANCE) OIL CO. N. L.

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ATTACHMENT: BMR PUBLICATION PE905503

WELLINGTON PARK NO. 1 WELL

of

ARCO LIMITED / WOODSIDE (LAKES ENTRANCE) OIL CO. N. L.

by

FRANK T. INGRAM.

S U M M A R Y

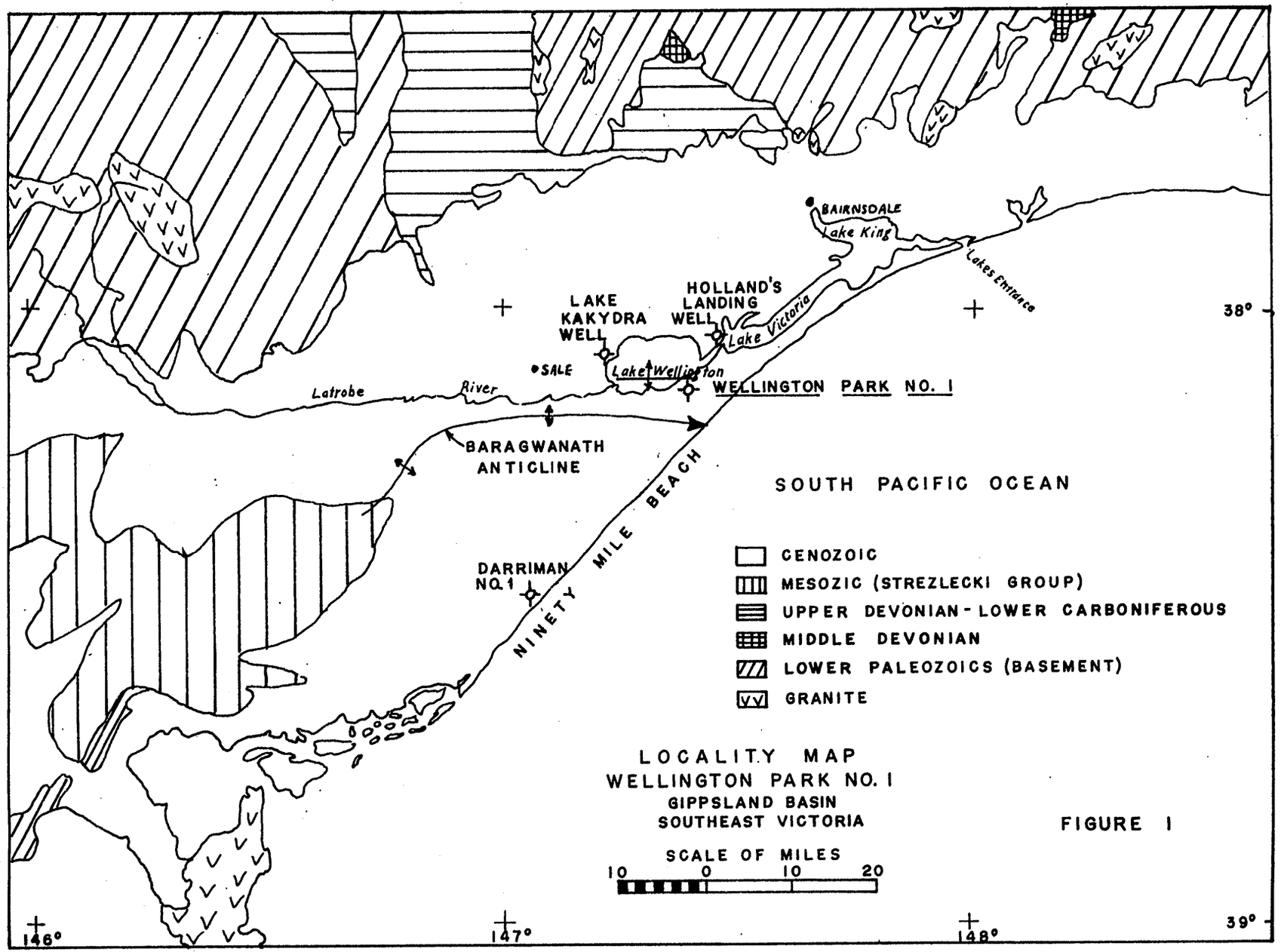
The Wellington Park No. 1 was the first deep test in the Gippsland Basin, and was drilled by ARCO LIMITED and WOODSIDE (LAKES ENTRANCE) OIL CO. N. L. The well penetrated Quaternary sediments from the surface to 120 feet, Tertiary sediments from 120 feet to 3370 feet and Mesozoic non-marine sediments from 3370 feet to a total depth of 12,011 feet. Paleozoic sedimentary rocks, one of the main objectives, was not reached because of the extreme thickness of the Mesozoic section.

Drilling commenced on December 6, 1961 and the well was completed as a dry hole on April 7, 1962. A comprehensive program of drilling engineering, mud logging, coring, cuttings examination and electric logging was conducted, but no significant shows of oil or gas were encountered.

INTRODUCTION

Oil shows and minor quantities of gas have been reported from numerous wells drilled in the Gippsland Basin. Small amounts of low gravity oil have actually been produced from Tertiary strata in the Lakes Entrance area. With the exception of the Lakes Entrance wells, and possibly the Darriman No. 1 well, no wells had been drilled in the basin on known structural highs before the spudding-in of Wellington Park No. 1 (Fig. 1).

A seismic survey during 1961 in the Lake Wellington area revealed the presence of an east-west trending anticline with closure against a fault on the north flank. A location



LOCALITY MAP
WELLINGTON PARK NO. 1
GIPPSLAND BASIN
SOUTHEAST VICTORIA

FIGURE 1

1-A

was picked on the south-east side of this structure. The well was scheduled to 12,000 feet in order to test basal Tertiary sands, possible marine Cretaceous strata, as found in south-western Victoria, and Paleozoic rocks, as exposed on the north side of the Gippsland Basin.

WELL HISTORY

GENERAL DATA

Well Name and Number -	WELLINGTON PARK NO. 1
Location -	Latitude 38°8'25"S, Longitude 147°22'30"E, on southeast shore of Lake Wellington.
Name and address of tenement holder -	WOODSIDE (LAKES ENTRANCE) OIL CO. N.L., 792 Elizabeth Street, Melbourne, Victoria.
Details of petroleum tenement -	Petroleum Exploration Permit 44 issued by the State of Victoria.
District -	Central Gippsland
Total Depth -	12,011 ft. (Schlumberger)
Date Drilling commenced -	December 6, 1961
Date Drilling completed -	April 3, 1962
Date Well completed -	April 7, 1962
Date Rig released -	April 7, 1962
Drilling time in days to total depth -	119
Elevation -	Ground 2.0 feet a.s.l. Kelly Bushing 21.1 feet a.s.l.
Status -	Dry and abandoned. Cement plug at 5082 feet to 5379 feet and 20 feet to 70 feet. The 13⅜ in. casing was capped by a half collar with welded ¼ in. steel plate.

DRILLING DATA

Name and address of drilling contractor	OIL DRILLING AND EXPLORATION LIMITED, 93 York Street, SYDNEY, N.S.W.

Drilling plant -

Make:	National "Ideal"
Type:	55
Rated capacity with 4½ in. drill pipe:	10,000 feet
Rated capacity with 3½ in. drill pipe:	12,000 feet
Motors (3):	Caterpillar, Type D375, 335 b.h.p.

Derrick -

Make:	Muskogee
Type:	Standard 136' x 30' base
Capacity:	800,000 pounds

Pumps -

Make (2):	Gardner Denver
Type:	GR - GXP
Size:	7¾ in. x 16 in.

Blowout preventer equipment -

Make (2):	Cameron
Size:	12 in.
Series:	900
Working Pressure:	3000 pounds
Make:	Hydril
Size:	12 in.
Series:	900
Working Pressure:	3000 pounds

Hole sizes and depths -

12¼ in. - surface to 736 feet and reamed to 17½ in.
8¾ in. - 736 feet to 5379 feet and reamed to 12¼ in.
8¾ in. - 5379 feet to 12,011 feet

Casing and liner details -

Size:	20 in. conductor pipe
Weight:	94 lb/ft.
Grade:	H-40
Range:	1
Setting depth:	19 ft.
Size:	13⅜ in.
Weight:	48 lb/ft.
Grade:	H-40
Range:	2
Setting Depth:	726 ft.
Size:	9⅝ in.
Weight	36 lb/ft.
Grade:	J-55
Range:	2
Setting Depth:	5379 feet

Casing and liner cementing details -

Size:	20 in.
Setting depth:	19 ft.
Cement:	Driven by pile driver

Size:	13⅜ in.
Setting depth:	726 feet
Quantity cement used:	460 sacks plus 1½% calcium chloride
Cemented to:	Surface
Method used:	Plug and float-collar
Size:	9⅝ in.
Setting depth:	5379 feet
Quantity cement used:	625 sacks plus 1% calcium chloride
Cemented to:	3250 feet
Method used:	Plug and float-collar

Drilling Fluid -

The surface hole was drilled with a water-base bentonite mud with barite added to prevent the flow of near-surface artesian water. From the base of the surface casing to total depth, a water-base bentonite mud treated with spersene, XP-20, caustic soda and soda ash was used. This type of mud gave excellent results in spite of the high temperatures encountered, and the hole remained in good condition, except for occasional joint blocks falling from the bore hole wall below 8800 feet.

The spersene - XP-20 mud program was chosen for its simplicity and stability - important considerations in wildcat areas far removed from readily available supplies. Bentonite was used as the base for the spersene and XP-20, and added certain filtration properties. Spersene (chrome lignosulfate), having a high tolerance for heat and contamination, was used as a dispersing agent. XP-20 (chrome lignite) added flow and filtration properties, while being in addition the main stabilizing agent in the system. One requirement for the stability of this system is a high pH, and this was maintained by daily treatments of caustic soda. Soda ash was used to keep the filtrate calcium ions at a low level, thereby improving the water-loss properties.

Diesel fuel was added to the system after drilling out below the intermediate casing at 5379 feet. The diesel content varied between 3% and 8% of the total mud volume, and improved bit life while helping to prevent sticking of drill pipe and collars in the hole. The presence of diesel in the mud system did not cause contamination of the cuttings, or adversely affect

the operation of the gas detector.

The daily mud treatment depended, to a large extent, on the amount of new hole drilled each day. From 726 feet to 3800 ft. the average daily treatment was about 10 sacks of spersene, 5 sacks of XP-20, 20 sacks of bentonite, 200 lbs. of caustic soda and 100 lbs. of soda ash. From 3800 feet to total depth, the average daily treatment was about 6 sacks of spersene, 3 sacks of XP-20, 200 lbs. of caustic soda, 10 sacks of bentonite and 150 lbs. of soda ash.

The overall average weight of the mud was 9.7 lbs. per gallon.

The average mud properties at intervals was as follows :

Depth	Wt. lbs/gal	Vis. sec/ft.	W.L. cc/30 min.	pH
726' - 2,000'	8.8	34	30.0	9
2,000' - 3,000'	9.6	50	9.0	9
3,000' - 4,000'	9.5	38	9.0	9.5
4,000' - 5,000'	9.8	40	6.0	10.0
5,000' - 6,000'	8.9	38	5.5	10.5
6,000' - 7,000'	9.9	39	5.8	10.0
7,000' - 8,000'	10.2	39	7.5	10.2
8,000' - 9,000'	10.2	38	8.5	10.5
9,000' - 10,000'	10.0	42	11.0	10.5
10,000' - 11,000'	9.5	42	7.0	8.5
11,000' - 12,011'	9.5	46	6.1	9.5

Water Supply -

A water well was drilled on the edge of the location with a percussion type water well drilling rig. Artesian water was encountered at 77 feet, and the well was drilled to a total depth of 102 feet. A Pomona pump assembly was installed at a depth of 45 feet below ground level inside 6 in. casing. With a 12 horsepower engine, the well tested approximately 6,000 gallons per hour. Water was pumped from the water well into a reserve pit, which furnished the rig with an abundant supply of water throughout the operation.

An analysis of the water was made by Mr. John C. Kennedy of the Victorian State Laboratories, as follows :

Type Solid.		Parts per million.
Chloride	(Cl)	497
Carbonate	(CO_3)	Nil
Bicarbonate	(HCO_3)	143
Sulphate	(SO_4)	70
Nitrate	(NO_3)	Nil
Calcium	(Ca)	30
Magnesium	(Mg)	35
Iron - total	(Fe)	12.4
Iron - soluble	(Fe)	1.6
Silica - soluble	(SiO_2)	18
Total Solids in Solution		1104

Perforation and shooting record -

No perforations were made.

Plugging back and squeeze cementation jobs -

There was no plugging back or squeeze cementing performed.

Fishing operations -

A total of 8 fishing jobs were performed, all with success. These are listed below :

1. Depth - 4091 feet: Drill pipe backed off drill collars while reaming. Screwed back into drill collars with drill pipe and worked fish free. Time required - 4 hrs.
2. Depth - 6720 feet: Drill collars twisted off. Went in with overshot and jars and recovered 14 drill collars and bit. Time required - 7 hours.
3. Depth - 7642 feet: Drill collars washed out and twisted off. Went in with overshot and jars and reoovered 18 drill collars and bit. Time required - 15 hours.
4. Depth - 8745 feet: Drill collars twisted off. Went in with overshot and jars and recovered 8 drill collars, bit and totco. Time required - 11 hours.

5. Depth - 9276 feet: Drill collars twisted off. Went in with overshot and jars and recovered 8 drill collars and bit. Time required - 10 hours.
6. Depth - 10,951 feet: Drill collars twisted off. Went in with overshot and jars and recovered 8 drill collars on first run and 3 drill collars and bit on third run. Time required - 42 hours.
7. Depth - 11,933 feet: Drill pipe twisted off. Went in with overshot and jars and recovered 10½ joints of drill pipe, 18 drill collars and bit. Time required - 25 hours.
8. Depth - 12,011 feet: Lost dipmeter sonde in tight hole at 10,162 feet. Went in with overshot and jars and recovered sonde with only minor damage to sonde. Time required - 10 hours.

No equipment was left in the hole.

Side-tracked hole -

The hole was not side-tracked.

LOGGING AND TESTING

Ditch Cuttings -

Cuttings were collected at 10 foot intervals while drilling, and at 5 foot intervals while coring. The cuttings were collected from the shale shaker in such a way as to be representative of the interval drilled or cored. From the surface to 5,379 feet, the samples were "lagged" before being collected, so that the depths shown on the sample bags are the true depths. From 5,379 feet to total depth, the samples were not lagged before being collected and the true depths were determined afterwards. All depths shown on sample bags below 5,379 feet are "unlagged" depths.

Coring -

The original coring program called for a core each 200 feet below the base of the Tertiary, except in the Otway Group (Strezlecki Group equivalent) where the interval was increased to 500 feet. In addition, cores were to be taken at each change of formation and at each indication of oil, gas, porosity or permeability.

The original program was complied with; the only exception was to increase the interval between cores from 500 feet to 750 feet after reaching a depth of 10,546 feet, while still in the Strezlecki Group. A total of 17 cores was cut having a total footage of 216 feet. A total of 159.5 feet was recovered, resulting in a 74 per cent recovery. A Hughes "J" type barrel with Hughes "J" type soft formation or hard formation core heads were used. The diameter of the cores was 3-9/16 in.

See Appendix 1 for descriptions of cores.

Side-wall sampling -

One run was made with the Schlumberger 30-shot sample taker, and 24 cores were recovered. The cores are described in appendix 2.

Electrical and other logging -

Electrical logs, micrologs and laterologs were run from 726 feet to total depth. It was planned to run the sonic log over the same interval; but, because of a malfunctioning sonde, the interval 3756 feet to 5379 feet was not logged before the 9⅝" casing was set. The continuous dipmeter was run in the intervals 728 feet to 3940 feet, and 5379 feet to total depth. One temperature survey was made inside the 9⅝" casing.

A Core Lab logging unit was in operation from 726 feet to total depth. The unit was operated in three shifts by a Core Lab operator, one Woodside (Lakes Entrance) Oil Co. N.L. geologist and one Arco Limited geologist. See appendix 3 for details of logging.

Drilling time and gas log -

Drilling time was recorded in the Core Lab unit, and also by a geolograph located on the rig floor.

A continuous recording of the gas content in the drilling mud was made by Core Lab using both a hot wire device and a chromatograph. The drilling time log and gas log curves are plotted on the Core Lab "graphalog".

Formation testing -

A total of 5 open hole drill stem formation tests were

made, of which 3 were successful. The first test failed because of mechanical trouble. The second test failed because the wall packer ripped immediately on opening the tool. The 3 succeeding tests were conducted using a water cushion, which prevented the sudden release of pressure inside the drill pipe and below the wall packer. No oil was recovered and only traces of methane were present in the fluids recovered.

In brief, the drill stem tests were as follows :-

D.S.T. No. 1 - A,	7348 feet to 7389 feet,	tool failed to open.
D.S.T. No. 1 - B,	7321 feet to 7389 feet,	packer failed.
D.S.T. No. 2 -	8761 feet to 8888 feet,	recovered very slightly gas cut formation water and mud filtrate.
D.S.T. No. 3 -	9669 feet to 9796 feet,	recovered only rat hole mud.
D.S.T. No. 4 -	9886 feet to 9930 feet,	recovered formation water and mud.

The test tool assembly consisted of a Johnston single rubber packer for testing in 8¾ in. open hole, a Johnston type "D" test tool and a type "T" bottom hole pressure recorder. The tool was opened by dropping a sinker bar down the drill pipe.

See details in appendix 4 for complete information on formation testing.

Deviation surveys -

The magnitude of hole deviation was measured before making a trip for a new bit by dropping a totco down the drill pipe. Both magnitude and direction of deviation were obtained by the continuous dipmeter survey.

The deviation was 2° or less from the surface to about 7800 feet. In the interval 7,800 feet to 10,200 feet the deviation gradually increased to $4\frac{1}{2}^{\circ}$ and then decreased to $\frac{3}{4}^{\circ}$. From 10,200 feet it increased to 7° at 11,154 feet, and then decreased gradually to 3° at total depth.

The direction of deviation, as determined by the continuous dipmeter was northwest from 726 feet to 2,600 feet

southeast from 2600 feet to 3700 feet, northwest from 5379 feet to 5900 feet and southeast from 5900 feet to total depth.

Temperature surveys -

A temperature survey was made to determine the top of the cement in the annulus after cementing the 9⅝ in. casing. This survey determined the top of the cement to be at 3250 feet, and also recorded a temperature of 175°F opposite the brown coal bed at 3270 feet to 3370 feet.

Other temperatures, determined by Schlumberger logging tools and the Johnston formation tester, are listed below :

3,840	feet	(Schlum.)	127°F
5,382	"	(Schlum.)	152°F
7,389	"	(Johnston)	195°
7,388	"	(Schlum.)	190°
8,888	"	(Johnston)	254°
9,639	"	(Schlum.)	208°F
9,796	"	(Johnston)	264°F
9,930	"	(Johnston)	290°F
11,382	"	(Schlum.)	240°F
12,011	"	(Schlum.)	276°F

The estimated bottom hole temperature at total depth would be 325°F after 24 hours of no circulation when equilibrium had been established. The maximum flow line temperature was 165°F.

Other well surveys -

A conventional seismic velocity survey was made when the well reached the total depth of 12,011 feet. Velocity measurements were made at four different depths with a well geophone supplied by the Bureau of Mineral Resources, Geology and Geophysics.

The first measurement was taken with the geophone at 12,000 feet, to determine the time required for the energy to travel from the base of the shot hole to the total depth of the well. The second measurement was made at a depth of 5396 feet and the third at 3740 feet. These two measurements were made in order to fill in a gap not surveyed by the sonic tool because of electronic difficulties. The fourth measurement was made at 740 feet to obtain velocity information from the shot

hole depth to the base of the surfacecasing, which interval was not logged by the sonic tool.

See Appendix 5 for further details on the velocity survey.

After the velocity survey, a seismic refraction profile was made through the well site. The objective of this profile was to determine the depth of any high velocity rocks which might represent Paleozoic sediments, such as Middle Devonian limestones. The length of the profile line was restricted to 55,000 feet, which length provided velocity control down to a minimum depth of about 13,500 feet. Down to this depth no high velocity layers were found, and the base of the Strezlecki Group can only be conjectured. See appendix 6 for details on the refraction survey.

G E O L O G Y

SUMMARY OF PREVIOUS WORK

Geological and Drilling -

The area in which the well was drilled is flat-lying and covered by Quaternary sand and clay. Consequently, no surface geological work was attempted.

The geology of the Tertiary sediments in the Gippsland Basin is well known from numerous water wells, wells drilled for oil by private companies and core holes drilled by the Victorian Department of Mines. The Bureau of Mineral Resources and the Victorian Department of Mines have established the stratigraphy and paleontology of the Tertiary sediments, and numerous published and unpublished reports are available on this subject.

The geology of the Mesozoic section in the Gippsland Basin, prior to drilling the Wellington Park No. 1 well, was known from reports on outcrops in the Strezlecki Ranges, and from wells that went through the Tertiary sequence. At least 13 wells have gone into Mesozoic rocks, but only 6 of these penetrated more than about 100 feet of the section. The

deepest well before the Wellington Park No. 1 was the Woodside No. 2, which bottomed in sediments of the Strezlecki Group at 8,862 feet.

The Paleozoic rocks, which are believed to underlie the Mesozoic section in the Lake Wellington area, are exposed along the north side of the Gippsland Basin. Numerous reports, by private companies and the Victorian Department of Mines, describe the stratigraphy and structure of these rocks. Only one well in the vicinity of the Wellington Park No. 1, the Frome Lakes Pty. Ltd. No. 5, located 6 miles south of Bairnsdale, has encountered these Paleozoic rocks.

Geophysical -

A seismic reflection survey was conducted in 1960 by Austral Geo Prospectors Pty. Ltd., and consisted of 83 miles of traverse within the area bounded by Sale, Bairnsdale, Lake Wellington and the Princes Highway. In 1961 another seismic reflection survey was conducted by the same company, and consisted of 135 miles of traverse between Lake Wellington and Ninety Mile Beach. On the basis of this second survey a well location was chosen near the southeast edge of Lake Wellington.

STRATIGRAPHY -

20 feet - 120 feet

Quaternary (?)

Sand, white, yellow and red, medium - coarse grained, subangular to sub-rounded with occasional pebbles, and Clay, blue, green and light brown, soft, sticky.

120 feet - 380 feet

Haunted Hill Gravels

Upper Pliocene

Sand, clear, milky, smoky and red quartz grains, fine to coarse grained, igneous and metamorphic rock fragments common, traces of lignite and pyrite, occasional pebbles, slightly micaceous.

380 feet - 460 feet

Jemmy's Point formation

Lower Pliocene

Sand, as above with abundant remains of gastropods, pelycepods, bryozoa and foraminifera. Good trace of Siltstone, argillaceous, soft.

460 feet - 725 feet

Tambo River formation

Upper Miocene

Marl, brown, gray and gray green, silty and slightly sandy, friable to slightly hard, glauconitic, abundant fossil fragments. Sand, as above, probably cavings.

725 feet - 1600 feet

Gippsland Limestone

Miocene

Marl, light to dark gray, soft to firm, varying argillaceous content, partly sandy, glauconitic, abundant bryozoa and other fossils, and intercalated Limestone, tan, gray and cream, fine grained, firm to slightly hard, very fossiliferous, traces of intergranular porosity.

1600 feet - 2150 feet

Gippsland Limestone

Miocene

Marl, light to medium gray, brown and tan, friable to soft and gummy, very fossiliferous, glauconitic, becoming more argillaceous at base, partly silty.

2150 feet - 2385 feet

Lakes Entrance formation

Oligocene

Shale, green to gray green and brown, soft, gummy, very calcareous, abundant foraminifera, glauconitic throughout, very glauconitic at base.

2385 feet - 3370 feet

Latrobe Valley Coal Measures

Upper Eocene to Lower Oligocene

Sand, brown, light gray and gray green, fine to coarse grained quartz, clean to argillaceous and lignitic, calcareous in top 10 feet, fair to good porosity; Brown Coal, earthy, often silty and shaly; Siltstone, brown to gray green, argillaceous, soft (calcareous and hard at 3029 - 36 feet and 3162-73 feet); Clay, light to dark brown, lignitic; and trace of Dolomite, brown, fine grained, sucrosic, brittle to medium hard, tight, at 3029 - 36 feet.

3370 feet - 3800 feet

Unconsolidated unit at top of Strezlecki Group. Lithologically resembles Waare Formation in Otway Basin.

Lower Cretaceous (?)

Sandstone, red brown, light gray and green gray, fine to coarse grained, quartzose, angular to sub-angular, weathered feldspar and white kaolin in matrix common, friable, fair porosity, carbonaceous, abundant plant fossils, poorly sorted; Claystone and Mudstone, light gray to light brown and cream, soft, often laminated with black coal, also thin seams of black coal. This unit is gradational downward into consolidated arkose of the Strezlecki Group. (Very poor samples due to unconsolidated nature of sediments and abundance of cavings of Tertiary shale, marl and coal.)

3800 feet - 4290 feet

Strezlecki Group

Lower Cretaceous

Arkose, light gray, fine to medium grained, abundant biotite, weathered feldspar and kaolin, grading downward into Graywacke, gray green, fine to medium grained, friable to slightly hard, carbonaceous, cross-bedded with Shale, lavender, silty, firm, carbonaceous. Also thin coal seam.

4290 feet - 4920 feet

Strezlecki Group

Lower Cretaceous

Mostly Shale, medium gray, gray green and lavender gray, firm, slightly to very carbonaceous, abundant plant fossils, partly silty; and Siltstone, light to medium gray, lavender and gray green, firm to slightly hard, argillaceous, slightly micaceous; with occasional thick beds of Graywacke, light gray to gray green, chloritic, abundant pink to orange feldspar, very fine to fine grained with some medium grained, friable to medium hard, carbonaceous laminae common, slightly to very calcareous, slightly micaceous, tight.

4920 feet - 5090 feet

Strezlecki Group

Lower Cretaceous

Shale, Siltstone and Graywacke, similar to above with traces of Shale, light gray, translucent, waxy, with white specks scattered throughout (possibly tuffaceous shale).

5090 feet - 5215 feet

Strezlecki Group

Lower Cretaceous

Shale, light to dark brown and medium gray, soft and gummy to firm, partly bentonitic, partly silty, carbonaceous; and Siltstone, light to medium gray, argillaceous, carbonaceous, firm.

5215 feet - 5410 feet

Strezlecki Group

Lower Cretaceous

Graywacke, gray green, light to medium gray and trace of tan, very fine to fine grained, friable to medium hard, slightly calcareous, carbonaceous, slightly micaceous, tight; Shale, medium to dark gray and medium brown, firm, carbonaceous; and Siltstone, light to medium gray, argillaceous, firm, carbonaceous.

5410 feet - 5590 feet

Strezlecki Group

Lower Cretaceous

(Very poor samples, cuttings going through shale shaker). Siltstone and very fine grained Sandstone, light gray, friable, partly calcareous, carbonaceous specks common; and Shale, light to medium gray and brown, silty, carbonaceous. Trace of quartz pebbles.

5590 feet - 7000 feet

Strezlecki Group

Lower Cretaceous

Graywacke and Subgraywacke, light to dark gray green and light gray, very fine to fine grained, approximate mineral content - quartz 30%, orange and light gray feldspar 30%, chlorite 30%, dark gray minerals and aphanitic rock fragments 5%, mica and other minerals 5%, carbonaceous, tight, slightly calcareous, cross-bedded, Siltstone, light to medium gray, argillaceous, medium hard, carbonaceous; and Shale - Mudstone, medium to dark green gray and dark gray brown, often with conchoidal fracture, dense, plant fossils common, interbedded with siltstone. Traces of calcite from fracture.

7000 feet - 8782 feet

Strezlecki Group

Lower Cretaceous

Graywacke and Subgraywacke, much the same as above, but without orange feldspar. Also Siltstone and Shale, as above. Traces of calcite and gypsum from fractures.

8782 feet - 11,220 feet

Strezlecki Group

Lower Cretaceous

Graywacke, medium to dark gray green, as above, but harder and slightly siliceous; Siltstone, gray green to gray brown, partly argillaceous, partly siliceous.

medium hard to very hard, carbonaceous; and Shale, dark gray brown, partly siliceous, hard, brittle, carbonaceous. Fractures common and filled with calcite and gypsum.

11,220 feet - 11,246 feet

Strezlecki Group

Lower Cretaceous

Graywacke, light gray to gray green, very fine to medium grained, very gypsiferous at top, but gypsum decreasing downward, friable to medium hard, trace of porosity; and Siltstone, dirty white to light gray, very gypsiferous at top, friable. Also, abundant gypsum veins.

11,246 feet - 12,011 feet

Strezlecki Group

Jurassic (?) - Lower Cretaceous

Graywacke, medium to dark gray green and brown green, very fine to fine grained, siliceous, hard to very hard, dense, tight, carbonaceous, grain composition of light gray quartz, light gray feldspar, dark minerals and rock fragments, matrix of silica and chlorite; Siltstone, light to dark gray brown, partly siliceous, medium hard to very hard, carbonaceous; and minor Shale, dark brown, silty, siliceous, hard, carbonaceous.

STRUCTURE -

The Wellington Park structure was located and delineated by the seismic reflection survey conducted by Austral Geo Prospectors Pty. Ltd. in the early part of 1961. Three horizons yielded reflections that were used to construct subsurface structural contour maps of the area. The first of these horizons is located in the lower part of the Gippsland Limestone, the second at or near the top of the Latrobe Valley Coal Measures, and the third on top of the Mesozoic section. Reflection quality was generally fair to good.

Individual interpretations from the record data were made by Austral Geo Prospectors, Mr. E. J. Jasinski, Geophysicist with the Atlantic Refining Co. (parent company for Arco Ltd.) in Dallas, Texas, and Mr. N. B. Sauve, Consulting Geophysicist for Woodside (Lakes Entrance) Oil Co. N.L. Each of the separate interpretations indicated an east-west trending anticline along the south shore of Lake Wellington with closure against an east-west normal fault cutting through, or just north of the structural "high".

The Wellington Park structure is parallel to the larger structure a few miles south of Lake Wellington known as the Baragwanath Anticline. The Baragwanath Anticline is the eastward extension of the Carrajung uplift, where Mesozoic rocks crop out to form the Strezlecki Ranges. The Wellington Park structure is much smaller by contrast with the Baragwanath structure. As its limits are now known, the area of closure measures about 9 miles in length by 4 miles in width. The maximum closure against the fault is about 400 feet.

Seventeen cores taken below 3700 feet exhibited dips varying from 0 to 31°. The greatest angle of dip was seen in core number 12, at 9011 feet to 9021 feet. These dips are thought to be due to drag along a normal fault which was indicated in the interval 8768 feet to 8780 feet. The evidence for this fault was the sudden loss of circulation into fractures at 8798 feet, the abundance of fractures from 8260 feet to 8800 feet (shown as cycle skipping on the sonic log) and the increase of the average velocity at 8800 feet from about 13,000 feet/second to 15,400 feet/second.

Another possible fault was cut in the interval 10,088 feet to 10,110 feet. The evidence for this was a fair drilling break and fault gouge in the cuttings. The sonic log indicated abundant fractures in the interval 10,050 feet to 10,345 feet, but there was no change in average velocity through this interval. The direction of movement along this fault zone, if present, is not known.

Correlation of core dips with dip magnitudes obtained by the continuous dipmeter tool were good.

Three changes of dip direction were recorded in the well. The direction changed from northwest to an average south direction at the base of the Tertiary at 3370 feet. No continuous dipmeter log was run in the interval 3772 feet to 5379 feet, and somewhere in this interval, the dip direction changed from south to northwest. From 5909 feet to 8535 feet, the dip direction was about due north. Below 8535 feet the dip directions are too erratic to interpret, but this is believed to be due to a lack of well-defined bedding, rather than any change in bedding attitudes.

The change in dip directions at 3370 feet is due to a gentle angular unconformity between Mesozoic and Tertiary sediments. The change that occurs in the interval 3772 feet to 5379 feet possibly is due to another gentle angular unconformity at about 3800 feet where the first consolidated sediments were encountered.

RELEVANCE TO OCCURRENCE OF PETROLEUM -

Only one indication of oil was found while drilling the Wellington Park No. 1 well, and this occurred as a bright yellow fluorescence in core number 9 in the interval 7379.2 feet to 7380.5 feet. The fluorescence occupied 10 to 20% of the area on a freshly broken core surface, and a faint light brown stain was visible. With CCl_4 a bright yellow cut was obtained. No gas was recorded in the drilling mud while coring. Porosity of the core was determined to be only 5.8%, while the permeability was less than 1 millidarcy. Two attempts to test this cored interval failed, but it is felt that if the test had succeeded no fluid or gas would have been recovered.

A small amount of methane was present in the fluids recovered during drill stem tests numbers 2 and 4, but no free gas was present above the fluid. No zones of interest were present on the electric logs, and no gas shows were recorded other than those related to trips.

The only marine sediments in the well were found in

the Tertiary section extending from the top of the Jemmy's Point formation to the base of the Lakes Entrance formation (380 feet to 2385 feet). These beds are highly fossiliferous and could possibly serve as source beds for petroleum.

The section from 2385 feet to 3800 feet, while being of a non-marine character, contains sands with fair to good porosity. However, only fresh water, with no evidence of oil or gas, was found in these sands.

The section from 3800 feet to total depth is non-marine, tight and impervious. Any producible hydrocarbons in these beds would have to occupy fractures, but two formation tests taken in fractured intervals produced only slightly gas cut water. The gas consisted entirely of methane and was probably generated by carbonaceous material, a common constituent of sediments in the Strezlecki Group.

It was hoped that the well would penetrate the Mesozoic sequence and encounter prospective Paleozoic strata. Paleozoic strata may well underlie the Mesozoic beds in the Lake Wellington area, but from present knowledge, the economics of drilling to such depths makes it unattractive at the present time.

POROSITY AND PERMEABILITY OF SEDIMENTS PENETRATED -

The unconsolidated sands and gravel from the surface down to 460 feet are very permeable and contain artesian fresh waters. The marls, limestones and calcareous shales from 460 feet to 2385 feet can be considered as being impervious. The Latrobe Valley Coal Measures contain sands varying from "clean" to very argillaceous, with porosities (microlog) in the 15% to 35% range. The Mesozoic section of poorly consolidated sediments from 3370 feet to 3800 feet also consist of "clean" to "dirty" sands, but with lower porosities on the order of 10% to 20%.

From 3800 feet to total depth, porosities decrease with depth from about 15% to about 3% to 5%. Permeabilities, as determined from core analyses by the Bureau of Mineral Resources, Geology and Geophysics and Core Lab, are all less than 1

millidarcy. Thus, the little porosity present in this interval is mostly unconnected porosity.

See appendix 6 for detailed core analyses.

CONTRIBUTION TO GEOLOGICAL CONCEPTS RESULTING FROM DRILLING -

Because of the lack of recognizable "key" beds in the Strezlecki Group, and due to the structural complexity in the areas of outcrop, estimates of the thickness of this sequence have ranged from 2,000 feet to 20,000 feet. The information gained from drilling the Wellington Park No. 1 proves a thickness of at least 8,641 feet for the Strezlecki Group in the Lake Wellington area. The information gained from the refraction survey profile through the well suggests the thickness may be greater than 10,000 feet.

The Strezlecki Group, equivalent in lithology and approximate age to the Otway Group in southwestern Victoria, is now thought to be mostly Lower Cretaceous in age, with possible Upper Jurassic in the basal part. Palynological work on cores from the Wellington Park No. 1 suggests that the well was still in Lower Cretaceous at 11,246 feet. The last core at 11,969 feet to 11,975 feet was barren of recognizable spores.

The section from 3,370 feet to 3,800 feet, consisting of poorly consolidated sands, shales, mudstones and minor coal, has been included within the Strezlecki Group. Lithologically, and in thickness, these sediments are similar to those of the Waare formation in the Otway Basin of southwestern Victoria where they represent a transition from marine Middle Cretaceous above to the non-marine Otway Group below. These same poorly consolidated beds were encountered in the Rosedale No. 1 well in the interval 2345 feet to 2800 feet.

There is no sharp boundary at the base of the poorly consolidated unit; rather, it appears to be gradational downward into kaolinitic arkose, which in turn grades into gray green graywacke.

Spores extracted from core No. 1 at 3738 feet to 3739 feet have been identified by Mr. John Douglas of the Victorian

Department of Mines, and a Tertiary age assigned. Mr. Douglas places the Tertiary - Mesozoic boundary between cores 1 and 2, or in the interval 3739 feet to 3817 feet. See appendix 7 for detailed palynological description of cores.

If this age determination is correct, it means the Wellington Park No. 1 penetrated an abnormally thick section (1415 feet) of Latrobe Valley Coal Measures. The Holland's Landing well, 8 miles to the northeast and the nearest well to the Wellington Park No. 1 penetrated only 763 feet of Latrobe Valley Coal Measures. The Lake Kykydra well, 10 miles northwest of Wellington Park No. 1, penetrated only 481 feet. Thus, if the interval 3370 feet to 3800 feet in the Wellington Park No. 1 is Tertiary in age, it represents a very rapid thickening of the Coal Measures toward the south.

The porous sands from 2385 feet to 3800 feet contain fresh water, with less than 500 ppm NaCl. The formation water, being fresher than the drilling mud, has resulted in a reversed SP curve on the electrical log in this section.

Micropaleontological work by Mr. D. J. Taylor of the Victorian Department of Mines places the lower boundary of the Gippsland Limestone and the upper boundary of the Lakes Entrance formation at 2150 feet. By using 725 feet as the lithological top of the Gippsland Limestone and 2385 feet on the electrical log as the base of Lakes Entrance formation, the thickness of these two units can be compared with those in the Holland's Landing well. On comparison, the Gippsland Limestone and the Lakes Entrance formation in the Wellington Park No. 1 well are thinner by 230 feet and 551 feet respectively. Apparently the Wellington Park structure was a slightly positive feature during Oligocene and Miocene time, resulting in a thinner section being deposited over the structure.

APPENDIX 1

CORE DESCRIPTIONS

WELLINGTON PARK No. 1

NO. OF CORES	.. 17	TOTAL FOOTAGE CORED	.. 316'
TOTAL FOOTAGE RECOVERED	.. 159.5'	RECOVERY	.. .. 74%

CORE NO. 1 : 3719' - 3739' (20') recovered 6.5'

3719' - 19.5' — Mudstone, lt. gry., friable, non calc., silty, soft, sly. mic., breaks into powder (possibly compressed fine cavings).

3719.5' - 29.5' — Not recovered.

3729.5' - 33.5' — Siltstone and v.f.g. Sandstone, lt. gry., friable, argill. and carb., abundant carb. plant remains, non calc., fair porosity, sly. pyritic.

3733.5' - 39' — (3.5' not recovered) Sandstone, lt. gry., f. - crs. gd. with occasional pebbles, friable, vy. argill. (kaolinitic?), poorly sorted, ang. - sub. ang. grains, poor - fair porosity, sly. cross-bedded, no reliable dip, no show.

CORE NO. 2 : 3826' - 3840' (14'), recovered 11.5'

3826' - 28.5' — Mudstone, med. gry., silty, vy. mic., fine brn. carb. fragments common, firm, few lt. and med. gry. laminae sly. cross-bedded, occasional inclusion of lt. gry. silt, two well developed sets of fractures with dips of 45°, well developed slickensides, dip essentially flat, no show.

3828.5' - 37.5' — Arkose, lt. grn. gry., speckled dk. grn., dk. gry. with dirty gry. background, v.f. - f.g., matrix mostly kaolin (?), grains consist mostly of quartz, biotite and dk. grn. minerals, carb. fragements common, badly weathered feldspar grading into kaolin, vy. sly. calc., vy. poorly sorted, friable - sly. hd., moderately cross-bedded, rare slickenside: dip essentially flat, no show.

CORE NO. 3 : 4332' - 4344' (12'), recovered 9.5'

4332' - 41' — Subgraywacke, med. gry. grn., v.f. - f.g., composed of feldspar, qtz., chlorite and unidentified gry. and blk. grains, sly. - vy. calc., mic., subrnd., sly. hd., poorly cemented, tight, specks and flakes of carb. material with woody texture common, vertic

Core No. 3 (contd.)

and 45° dipping fractures common and often filled with calcite, some slickensides along fractures, some cross-bedded laminae but bedding mostly obscure, dip essentially flat, small amount of hard gray wax seen along one fracture, no fluor., vy. slight blue cut with CCl4.

4341' - 41.5' Shale, dk. grn. gry., waxy, partly silty, firm vy. badly crumpled, abundant slickensides, non calc., no fossil.

CORE NO. 4 : 4847' - 4857' (10') recovered 1.5'

4847' - 48.5' Graywacke, drk. gry. grn., abundant fine specks of wh. mineral (probably weathered feldspar) throughout, v.f. - f.g., med. hd., vy. sly. calc., vague carb. laminae, tight, dips on carb. laminae of 20° - 60°, vertical and oblique fractures common and usually filled with calcite veins 1 - 2 mm thick, no show.

CORE NO. 5 : 5301' - 5321' (20') recovered 11.8'

Graywacke, drk. gry. grn., mottled lt. and dk., v.f. - f.g., friable - sly. hd., sly. - mod. calc., composed of chlorite, quartz, white and orange feldspar and dark unidentified rock fragments, occasional blk. carb. laminae, dense, steeply dipping fractures with thin calcite filling, vague crossbedding, dip 0-20°, no show.

CORE NO. 6 : 5812' - 5832' (20') recovered 20'

Graywacke, gry. grn., v.f.g. and vy. silty, vy. sly.calc., sly. hd., coal laminae common, matrix mostly chlorite with grains of lt. gry. and pink feldspar, lt. gry. quartz, mica and dk. gry. unidentified minerals, kaolinitic (?) in places, sly. pyritic, trace of gry.brn. vy. calc. graywacke, vertical and steeply dipping dis-continuous fractures filled with pink calcite veins 1 - 5 mm thick, dip of coal laminae constant at 6 - 7° - no visible crossbedding, tight, no show.

CORE NO. 7 : 6310' - 6323' (13') recovered 13'

6310' - 12.5' Graywacke, gry. grn. with abundant orange feldspar, v.f.g. med. hd., sly. calc., tight, with bands of laminated lt. gry. Siltstone and med. gry. Shale, intricate cross-bedding and wavy bedding, small scale cut and fill structures, slumping and faulting, non calc., firm - med. hd., dip 0-10°, no show.

6312.5' - 23' Graywacke, gry. grn., v.f.g., consisting of 30% orange and lt. gry. feldspar, 30% quartz, 40% chlorite, 5% dk. gry. mineral (or aphanitic rock fragments), 5% mica, and other minerals, sly. calc., med. - strongly crossbedded, occasional coal laminae with dips of 5-10°, tight, no show.

CORE NO. 8 : 6843' - 6855' (12') recovered 12'

6843' - 45' Siltstone, lt. - med. gry., sly. - mod. argill., laminated to thin-bedded, med. hd., non calc., mod. mic., abundant carbonized wood fragments, one band of Subgraywacke, lt. gry., with orange feldspar, v.f.g., med. hd., non calc., sly. mic., no show.

6845' - 55' Mudstone, med. - dk. grn. gry. and dk. gry. brn., partly silty, med. hd., dense, often breaks with conchoidal fracture, well preserved plant fossils, silty beds are mod. mic. and cross-bedded, coal laminae common, two zones of slickensides, vertical worm borings (?), reliable dips of 4 - 8°, no show.

CORE NO. 9 : 7379' - 7389' (10') recovered 1.5'

7379' - 79.2' Siltstone, laminated lt. gry. and dk. gry., lt. gry. has salt and pepper appearance, sly. - mod. argill., hd., crossbedded, sly. mic., sly. sandy, no show.

7379.2' - 80.5' Subgraywacke, lt. gry. - lt. grn.-gry., v.f.g., sly. - vy. calc., dense, hd., tight, carb. specks common, occasional carb. laminae, crossbedded, porosity 5.8% (Core Lab), permeability too low to measure, spotty yellow fluor. in 10-15%, poorly visible lt. brn. stain, good bright yellow cut with CCl4, no fractures or reliable dips. Specks of blk., shiny brittle substance (carb.?) commonly yields slight yellow cut with CCl4.

CORE NO. 10 : 7935' - 7953' (18') recovered 12'

Subgraywacke, lt. - med. gry. grn., abundant blk. carb. specks throughout, v.f.g., med. hd., vy. sly. - vy. calc., mic., abundant fine white soft angular fragments (kaolin or tuffaceous material), tight, occasional carb. laminae and white laminae (volcanic ash?) reliable dips of 5 - 7°, med. crossbedded; with small amount of intercalated Siltstone, gry. grn., hd., sly. calc. No show.

CORE NO. 11 : 8407' - 8417' (10') recovered 4'

8407' - 09' Interbedded Siltstone, med. gry. with abundant specks of kaolin (?), dense, hd.; and Graywacke, grn. gry., v.f. - f.g., sly. calc., hd., with abundant anastomosing laminae of blk. coal, irregular bedding, abund. carbonized wood frag., one fair dip of 7°.

8409' - 11' Interbedded, thin bedded and laminated Siltstone, med. - drk. brn. gry., hd.; Shale, dk. brn. gry., sly. silty, vy. carb.; and Graywacke, med. gry., v.f.g. and silty, vy. calc., abund. angular specks of kaolin (?), hd., bedding even to mod. crossbedded, fair dips of 7 - 11°. No shows.

CORE NO. 12 : 9011' - 9021' (10') recovered 8'

9011 - 16' Interbedded, laminated to thinbedded Siltstone, brn.,

Core No. 12 (contd.)

brn. gry. and gry. grn., argill., sly. mic., vy. sly. calc. and Silty Shale, drk. gry. - gry. brn., sly. carb., med. hd., dense, vy. sly. crossbedded, vy. good dips of 26-31°, numerous fractures filled with thin calcite veins.

9016' - 18' Graywacke, med. gry., f.g., silty, vy. calc., med. hd., with numerous calcite plated slickensides, no show.

9018' - 19' Interbedded Siltstone, dk. gry., argill, med. hd.; Shale, dk. gry. sly. silty, dense; and Graywacke, med. gry., f.g., sly. calc., med. hd., with gypsum crystals along fractures, no reliable dips, no show.

CORE NO. 13 : 9506' - 16' (10') recovered 8'

9506' - 12' Graywacke, med. gry. grn., v.f.g., silty, med. hd. - hd., sly. - med. calc., brn. mica common, abund. streaks and specks of kadin (?), occasional fragments, up to 3" in diameter, of dk. brn. Siltstone with random orientation, abundant vertical and oblique fractures filled with calcite and traces of gypsum, no reliable dip, but appears to be less than 10°, no show.

12' - 14' Laminated and thin-bedded Siltstone, gry. grn. - gry. brn., sly. calc., sly. argill., med. hd., sly. mic. and carb.; and Silty Shale, dk. brn., med. hd., brittle, carb., med. crossbedded, rare fractures, occasional bedding plane slickensides with traces of calcite and gypsum, fair dips of 0 - 15°, no show.

CORE NO. 14 : 10,004' - 10,015' (11') recovered 10'

Graywacke, med. gry. grn., v.f.g. and vy. silty, vy. sly. argill., sly. mic. and pyritic, med. hd. - hd., abund. carb. plant remains and carb. laminae, traces of depositional slumping, abund. vert. fractures filled with white and pink calcite and oblique irregular fractures filled with gypsum crystals, moderate crossbedding, occasional silty laminae, dips mostly 0 - 5°, normal fault at 10,007' with 1" wide breccia zone, displacement unknown but probably only minor, tight, no show.

CORE NO. 15 : 10,536' - 10,546' (10') recovered 7'

Laminated and thin bedded Shale, drk. gry. brn., silty, carb., med. hd.; and Siltstone, med. gry. brn., argill., med. hd., sly. - med. carb., sly. mic.; one band of Siltstone, med. grn. gry. with abund. blk. mineral grains, siliceous, hd., sly. calc. sly. - med. crossbedded with some depositional slumping, occasional oblique fracture filled with calcite and traces of gypsum, one fracture plane coated with unidentified bright orange mineral, reliable dips of 11° - 15°.

CORE NO. 16 : 11,236' - 11,246' (10') recovered 5'

Graywacke, lt. - dk. grn. and gry. grn., v.f. - f.g. with some med. grains, silty, poorly sorted, grains of gry.

Core No. 16 (contd.)

quartz: lt. gry. feldspar, dk. grn. mineral (chlorite and/or serpentine), brn. mica, gray rock fragments and occasional yellow translucent vitreous mineral, matrix of chlorite gypsum and argill. material, sly. calc., grains ang. - subrnd., abund. irregular gypsum filled fractures with steep dips, good traces of black brittle vy. fn. granular material in laminae and specks non fluorescent but yielding fair yellow cut with CCl4, occasional inclusion of dk. brn? gry. Shale, poorly reliable dips of 10 - 15°, no show.

CORE NO. 17 : 11,969' - 11,975' (6') recovered 5'

Graywacke, med. gry. grn. - med. brn. grn., v.f. - f.g., silty, siliceous, hd. - vy. hd., dense, carb. flakes and laminae (well carbonized), silica and chlorite matrix, grains of grn. and yellow grn. serpentine and/or chlorite, wh. feldspar, gry. quartz, brn. and dk. gry. rock fragments, occasional small inclusion of brn. siliceous Siltstone, sly. mic., bedding obscure, occasional steep closed fracture, poor - fair dips of 0 - 25°, no show.

Appendix 2 (contd.)

Core No.	Depth	Effective Porosity % by Vol. V	H	Absolute Permeability Millidarcys V	H	Densities Gms/cc Dry Bulk Avg.	Grain Avg.	Saturation Water % Pore Space	Oil % Pore Space	Oil Character Extracted fluores. and colour	Acid Solubility % by Vol.	REMARKS
10*	7935' to 7953'		4.3			2.49	2.60	85.0	0.0			
10	7938' to 7940'	5	5	less than 1	less than 1	2.46	2.57	39	Nil	No colour in Toluene	5	
11	8407' to 8408'	7	3	" 1	" 1	2.47	2.51	100	Not measurable but may be	"	Very faint discoloration	Small fracture in pencil. Numerous coal partings
12	9012' to 9014'	2	2	" 1	" 1	2.55	2.61	100	Nil	"	2	
13	9507' to 9509'	2	2	" 1	" 1	2.56	2.61	100	"	"	Nil	
14	10,011' to 10,013'	3	4	" 1	" 1	2.46	2.56	79	Not measurable but may be present	Faint yellow colour in Toluene	"	
15	10,541' to 10,543'	2	3	" 1	" 1	2.63	2.67	100	As above	As above	"	
16	11,238' to 11,240'	9	8	" 1	" 1	2.37	2.58	22	Nil	No colour in Toluene	9	
17	11,970' to 11,972'	5	4	As above	As above	2.51	2.62	36	"	As above	4	

* Analyses by Core Laboratories. Remainder by Bureau of Mineral Resources, Geology and Geophysics.

APPENDIX 2

C O R E A N A L Y S E S

Core No.	Depth	Effective Porosity % by Vol. V	Effective Porosity % by Vol. H	Absolute Permeability Millidarcys V	Absolute Permeability Millidarcys H	Densities Gms/cc Dry Bulk Avg.	Densities Gms/cc Grain Avg.	Saturation Water % Pore Space	Saturation Oil % Pore Space	Oil Character Extracted fluores. and colour	Acid Solubility % by Vol.	REMARKS
1*	3719' to 3739'		10.1			2.18	2.43	84.9	0-0			
1	3730' to 3731'	20	22	less than 1	4	2.07	2.59	5	Not determined	Yellow colour in Toluene	Nil	Numerous coal partings giving colour to solution
2	3824' to 3825'	22	22	"	1 less than 1	2.11	2.70	29	Nil	No colour in Toluene	7	
3	4337' to 4339'	19	22	"	1 " 1	2.25	3.33	11	"	No colour in Toluene	7	Densities rechecked
4	4847' to 4857'	7	6	"	1 " 1	2.37	2.54	77	"	As above	Nil	
5	5304' to 5306'	12	15	"	1 " 1	2.41	2.80	21	"	No colour in Toluene	10	
6	5817' to 5819'	12	10	"	1 " 1	2.49	2.81	26	"	"	9	
7	6319' to 6321'	10	10	"	1 " 1	2.45	2.73	33	"	"	6	
8	6844' to 6946'	9	10	"	1 " 1	2.43	2.69	48	"	"	2	
9*	7379' to 7389'		5.8		0.0	2.45	2.61	86.0	0.0			
9	7379.0' to 7379.5'	8	10	"	1 " 1	2.35	2.56	34	Not determined	No colour in Toluene	Nil	

APPENDIX 3

SIDE-WALL CORE DESCRIPTIONS

Depth	Recovery	Description
2420' 737.6m	½"	Sand, bra., med, grnd. w/occ. crs. grain, argill., no show.
2446' 745.5	2"	Sand, chocolate brn., med. grnd., vy. argill., loosely consol., no show.
2450' 746.8	1"	Sand, chocolate brn., fn. - med. grnd., vy. argill., loosely consol., no show.
2531' 771.4	½"	Sand, med. gray, fn. - crs., argill., poorly sorted, loosely consol., no show.
2661' 811.1	2"	Sand, lt. gray, fn. grnd., well sorted, good por., clean, no show.
2800' 862.4	1½"	Sand, grn. gray, fn. grnd., well sorted, sltly. argill., good por., no show.
2900' 883.9	¼"	Sand, as above, no show.
2972' 905.9	1½"	Sand, gray grn., vy. fn. grnd., sltly. mica., sltly. carb., no show.
3001' 914.7	2"	Laminated Siltstone, wh. - brn. and brn. coal, partly silty, soft, no show.
3086' 940.6	1"	Siltstone, gray grn., argill., soft, no show.
3092' 942.4	2"	Siltstone, gray grn., argill., soft w/laminae of brn. coal, no show.
3130' 954.0	2"	Brown Coal, soft, earthy, sltly. mica.
3142' 957.7	2"	Brown Coal, as above.
3180' 969.3	1½"	Sand, grn. gray, fn. grnd., sltl. argill., loosely consol., well sorted, no show.
3220' 981.5	1½"	Coal, red brn., earthy, soft.
3254' 991.8	2"	Sand, green gray, vy. fn. - fn. grnd., loosely consol., carb., no show.
3335' 1016.5 ~~3225'~~	1½"	Brown coal, earthy.
3360' 1024.1	1"	Brown coal, earthy.
3410' 1039.4	1"	Sandstone, dk. red. brn., fn. - crs., argill. and sltly. feldspathic, poorly sorted, friable, sulfur odor on fresh break, no show.
3523' 1073.8	1½"	Claystone, lt. gray to cream, soft and pliable when wet, carb. streaks.
3566' 1086.9	Frag.	Black coal, brittle, shiny lustre.
3656' 1114.3	2"	Interlaminated lt. brn. claystone, carb., soft black coal, brittle.

Appendix 3 - Page 2

Depth	Recovery	Description
3720'	1133-9 2"	Claystone, lt. brn., plastic w/carb. specks.
3794'	1156-4 2"	Sandstone, grn. gry., speckled with carbonized plant frag., soft, blk. coal lamina - also cores @ 3200', 3244', 3390', 3454', 3504' and 3576' not recovered.

CONTRACTOR ODE RIG NO. 55 DEHE

COMPANY Woodside · Orco.

BIT RECORD

LEASE Wed[illegible]t Park WELL NO. [illegible]1

STATE Victoria COUNTY FIELD Hyperland

SPUD DATE UNDER SURFACE UNDER INTER SET SAND STRING SECTION TOWNSHIP RANGE

TOOL PUSHER DRILLER DRILLER DRILLER SHEET NO.

RUN NO.	SIZE	MAKE	TYPE	JET SIZE	SERIAL	DEPTH FROM	DEPTH TO	FEET	HOURS	Weight 1000 Pounds	RPM	Vertical Dev.	Pump Pressure	SPM No. 1	SPM No. 2	LINERS No. 1	LINERS No. 2	MUD Wt.	MUD Vis.	REMARKS
37	8¾"	HTC	OWVJ	9/16	29735	8518	8606	88	16	16	90	4°	1100	68		6"		10.3	40	
38	"	"	"	"	29493	8606	8678	72	16	20	100	4°	1400	68		6"		10.3	40	
39	"	"	"	5/8"	26667	8678	8745'	67	15'	25'	80	3°	1400	65		6"		10.5	44	Twisted off
40	"	"	OWJ	3/4	56348	8745'	8841	96	16	23'	80	3½	1400	65						
41	"	"	"	"	56226	8841	8880	39	9	30	80	3½	1400	65						Reaming last
42	"	"	"	"	56228	8880	9011	131	19	30	80	3	1400	65						Reamed to bottom
43	"	"	OWJ	5/8	29478	9011	9146	135	18	30	80	3°	1410	66						
44	"	"	"	9/16	28355	9146	9276	130	18	30	80	"	"	"						
45	"	"	"	"	27359	9276	9396	120	18	"	"	3°	"	"						
46	"	"			56347	9396	9507	111	16	"										Taken Packed - Core
~~47~~	~~"~~	~~Sec~~	~~M 44~~	~~Reg~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~													
47	"	Sec	M 44	Reg	56485	9535'	9635'	128	16	"	"	1°								
48	"	"	"	"	58074	9635'	9707	75	16	"	"	1½°								
49	"	HTC	OWV	5/8"	56353	9707	9788	81	16	"	"	"								
50	"	"	OWJ	5/8	0310346	9788	9867	67	11	"	"	2°								
51	"	"	"	R	56225	9867	9930	63	10	"	"	2°								Ran DST
52	"	"	OWJ	"	0310441	9930	9942	12	10											Pipe Stuck Recovered
53	"	"	"	"	31511	9942	10,004	62	16											Packed to Core
54	"	"	"		92796	10,004	10,135	131	16			1½°								
55	"		"	"	92778	10,135'	10,201	66	16			3/4°								Bad hole
56	"	"	WTJ	"	36760	10,201	10,281	80	16			2°								"
57	"	"	OWJ	"	67176	10,281	10,355	74	16			2°								"
58	"	"	" C	"	92773	10,355	10,450	95	17			3°								"
59	"	"	" C	"	92790	10,450	10,536	86	17			3°								Cutter Lab
60	"	"	" C	"	92771	10,536	10,632	96	17			4°								"

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS 1. TEXAS

April 27, 1962

REPLY TO
3615 GULF FREEWAY
HOUSTON, TEXAS

Arco Limited
793 Elizabeth Street
Melbourne, Victoria, Australia

Subject: Mud and Cuttings Analysis
Arco-Woodside Wellington Park
No. 1 Well
Wildcat
Victoria, Australia

Gentlemen:

Attached you will find one Grapholog for your well, Arco-Woodside Wellington Park No. 1, located at 147° 22' 30" east and 38° 8' 25" south in the state of Victoria, Australia. The log carries a continuous lithological percentage evaluation of cuttings from surface to the total depth of 12,001 feet, together with a continuous drilling rate curve and a hydrocarbon analysis of any gases in the mud and drill cuttings from 750 to 12,001 feet. In addition, lithological descriptions, bit types deviation surveys, cores and drill stem tests are recorded.

Very little evidence of oil and gas was detected during drilling of this well. Only three intervals, 7380 to 7400, 9669 to 9796, and 9886 to 9930 feet, showed even minor significant traces, deserving mention.

Minor traces of fluorescence and cut in carbon tetrochloride on crushing were observed in cuttings samples from the interval, 7380 to 7400 feet. A core was cut from part of the interval, and sample analysis revealed a porosity of 5.8 per cent, no measurable permeability and no oil saturation. Further visual examination of the core revealed the fluorescence and cut to be associated with localized small deposits of carbonaceous material and to have likely emanated from that source.

The two intervals from 9669 to 9796 and 9886 to 9930 feet both indicated small amounts of methane gas during drill stem tests. Methane was also

detected in the mud while initially drilling through the first interval. Since minor lost circulation was encountered during cutting parts of both sections, the gas in each case would be assumed to be associated with salt water flows from fractured areas in the zones. Methane gas was also detected after a trip at 9707 feet, but as little flow was measured on a subsequent drill stem test of the interval, it could be assumed that the gas possibly came from a very small localized fracture system or more probably from the previous lost circulation zone.

Other very minor indications of petroleum hydrocarbons were evidenced during drilling of this well but generally could be attributed to dead oil traces, associated carbonaceous materials in the formation and other insignificant sources.

We are pleased to be of service.

Very truly yours,

Core Laboratories, Inc.

J E Furen (PP)

J. E. Furen,
District Manager

JEF:BM:pb
7 cc. - Addressee
2 cc. - The Atlantic Refining Company
Dallas, Texas

APPENDIX 4

LIST OF ELECTRICAL AND OTHER LOGS

ELECTRICAL LOGS :

Run No. 1	728'	-	3,840'	2" = 100' & 5" = 100'
2	3,740'	-	5,382'	" "
3	5,379'	-	7,388'	" "
4	7,288'	-	9,639'	" "
5	9,539'	-	11,382'	" "
6	11,282'	-	12,008'	" "

MICROLOGS :

Run No. 1	728'	-	3,836'	2" = 100' & 5" = 100'
2	3,736'	-	5,380'	" "
3	5,379'	-	7,387'	" "
4	7,277'	-	8,888'	" "
5	8,788'	-	9,793'	" "
6	9,693'	-	11,374'	" "
7	11,250'	-	12,006'	" "

LATEROLOGS :

Run No. 1	728'	-	3,838'	2" = 100' & 5" = 100'
2	3,738'	-	5,379'	" "
3	5,379'	-	7,335'	" "
4	7,285'	-	9,634'	" "
5	9,534'	-	11,376'	" "
6	11,276'	-	12,002'	" "

SONIC LOGS :

Run No. 1	728'	-	3,756'	2" = 100' & 5" = 100'
2	5,375'	-	9,622'	" "
3	9,520'	-	11,930'	" "

CONTINUOUS DIPMETER LOGS :

Run No. 1	726'	-	3,940'	Plotted results
3	7,994'	-	9,440'	" "
2	5,375'	-	7,994'	" "
4	9,340'	-	11,368'	" "
5	11,268'	-	11,998'	" "

TEMPERATURE LOG :

Run No. 1	27'	-	5,311'	2" = 100'

CORE LABORATORIES INC. "GRAPHALOG" MUD LOG

726 feet to 12,011 feet — 2" = 100'

The "Graphalog" consists of the following data :

1. Drilling rate curve
2. Lithologic descriptions
3. Hot wire device gas curve

(continued)

Appendix 4 (2)

4. Methane, ethane plus propane and butane plus pentane curves as determined by a continuous logging chromatograph device.
5. Fluorescence.
6. Gas content of cuttings after being pulverized in blendor
7. Drilling bit and drilling mud data

APPENDIX 5

FORMATION TESTS AND FLUID ANALYSES

OPEN HOLE DRILL STEM TESTS

D.S.T. No. 1-A :

7348 feet to 7389 feet

Tool failed to open. Disc in Johnston tester did not break.

D.S.T. No. 1-B :

7321 feet to 7389 feet

Packer failed immediately because of enlarged hole.

D.S.T. No. 2 :

8761 feet to 8888 feet

⅜ in. bottom choke, 7/16 in. top choke, 2700 feet of water cushion. Tool open for 2½ hours.
BHIFP 1,300 p.s.i.; BHFFP 3155 p.s.i.; No BHSIP (tool shut-in for ½ hour but valve failed to close); IMP 4470 p.s.i.; FMP 4470 p.s.i.
Recovery : 2700 feet of water cushion and 5100 feet of formation water and mud filtrate, slightly gas (methane) cut. Bubble hose was connected intermittently during test to Core Lab gas detector, but no gas was recorded. Sample of fluid agitated in blendor yielded 20 units of methane. BHT of 254°F.

FLUID ANALYSIS*

Chloride	8,230 ppm
Carbonate	Not determined
Bicarbonate	" "
Sulphate	1,761 ppm
Calcium	2,002 ppm
Magnesium	83 ppm
Total hardness (as $CaCo_3$)	5,340 ppm
Total solids in solution	17,000 ppm (by conductivity)
Resistivity (at wellsite)	.41 ohms at 74°F

Appendix 5 (2)

(Titration of carbonate and bicarbonate was not possible owing to color of solution masking the indicator.)

D.S.T. No. 3 :

9669 feet to 9796 feet

⅜ in. bottom choke, 7/16 in. top choke

3,800 feet of water cushion

Tool open ½ hour, shut-in ¼ hour

BHIFP 1645 p.s.i.; BHFFP 1645 p.s.i.; BHSIP 1645 p.s.i.; IMP 5,270 p.s.i.; FMP 5,270 p.s.i.

Recovery : 3800 feet of water cushion and 30 feet of drilling mud. Tight formation. BHT 264°F.

D.S.T. No. 4 :

9886 feet to 9930 feet

⅜ in. bottom choke, 7/16 in. top choke, 3800 feet of water cushion. Tool open 1½ hours, fair blow decreasing to weak at end of test.

BHIFP 1935 p.s.i.; BHFFP 2840 p.s.i.; No BHSIP (tool was shut-in for ½ hour but valve failed to close); IMP 5050 p.s.i.; FMP 5050 p.s.i.; BHT 290°F.

Recovery : 3800 feet of water cushion and 2185 feet of drilling mud, mud filtrate and formation water.

Resistivity of fluid .44 ohms at 75°F (Resistivity of drilling mud .62 ohms at 68°F before D.S.T.)

* Analysis by John C. Kennedy, Department of Mines, Victoria.

APPENDIX 6

VELOCITY SURVEY

WELLINGTON PARK NO. 1

by VICTOR BYCHOK - ARCO LIMITED

The ARCO LTD. - WOODSIDE (LAKES ENTRANCE) OIL COMPANY N.. L. - Wellington Park No. 1 Well is located 38° 8'25" S and 147° 22'30" E, Buln Buln County, Victoria. Geologically it is located within the Gippsland Basin. The well was drilled to a total depth of 12,011' and bottomed in rocks of Jurassic age. Prior to abandoning the well, a conventional seismic velocity survey was recorded by Austral Geo Prospectors Pty. Ltd. Seismic Party No. 3. Depth measurements were made at four intervals in order to relate the Schlumberger sonic surveys. The sonic surveys were not logged continuously because of electronic difficulties encountered in the Schlumberger sonde during the run from 3756 ft. to 5379 ft. The conventional seismic survey data have been integrated with the Schlumberger sonic surveys in order to present a complete velocity determination to a depth of 12,000 ft.

SCHLUMBERGER SONIC SURVEY

Schlumberger sonic surveys were recorded on the following dates for the depths indicated :

Date	Depth Interval Measured
12 December, 1961	728' to 3756'
18 February, 1962	5379' to 9622'
3 April, 1962	9520' to 11,930'

The depth interval from 3756' to 5379' was not logged because of electronic difficulties with the sonde. The sonde could not be repaired at the location; therefore, casing was set and no sonic survey made for this interval. The conventional seismic survey was recorded to tie the two non-continuous sonic surveys together and also to obtain a velocity measurement from the surface to 728'. A special

Schlumberger sonic tool was used for the survey logged on 3 April, 1962, because of the very high bottom hole temperatures measured in the well.

SEISMIC VELOCITY SURVEY

A conventional seismic velocity survey was recorded by Seismic Party No. 3, Austral Geo Prospectors Pty. Ltd. on 4 April, 1962. A well geophone belonging to the Bureau of Mineral Resources, Geology and Geophysics, was used to measure the time required for the energy to travel from the shot depth to the following well depths: 740 ft., 3740 ft., 5396 ft., and 12,000 ft. Prior to the initiation of this survey, a polarity check on the well geophone was recorded in order to determine the direction of the time breaks. The velocity-time breaks were recorded thru individual amplifiers and on individual traces thru a low, medium, and high sensitivity gain settings. Reflection spreads were recorded across the well in order to relate the seismic reflected events to the sub-surface geologic formations. These relationships are indicated on the seismograms which are a part of this report.

Statistics for the seismic velocity survey are as follows :

Recording time	9 hours
Number of shots taken	10
Drilling time	16 hours
Holes drilled	12
Footage drilled	480 ft.
Survey time	13 hours
Dynamite used	125 pounds
Detonators used	15
Booster Caps used	10

A drill was kept on standby during the survey to redrill holes. The shot holes would not stand up for a second shot, therefore it was necessary to redrill any holes required for extra shooting.

CONCLUSIONS

The results of the interpration of the surveys are presented as curves for the following measurements :

(1) Time vs depth

(2) Interval velocity vs depth

(3) Average velocity vs depth

The known geologic formations, as logged in the well, are indicated on the tabular presentation. The seismic velocity time breaks are not sharp, but the velocity data are graded as reliable.

ARCO LIMITED.

Victor Bychok

Victor Bychok.
RESIDENT GEOPHYSICIST.

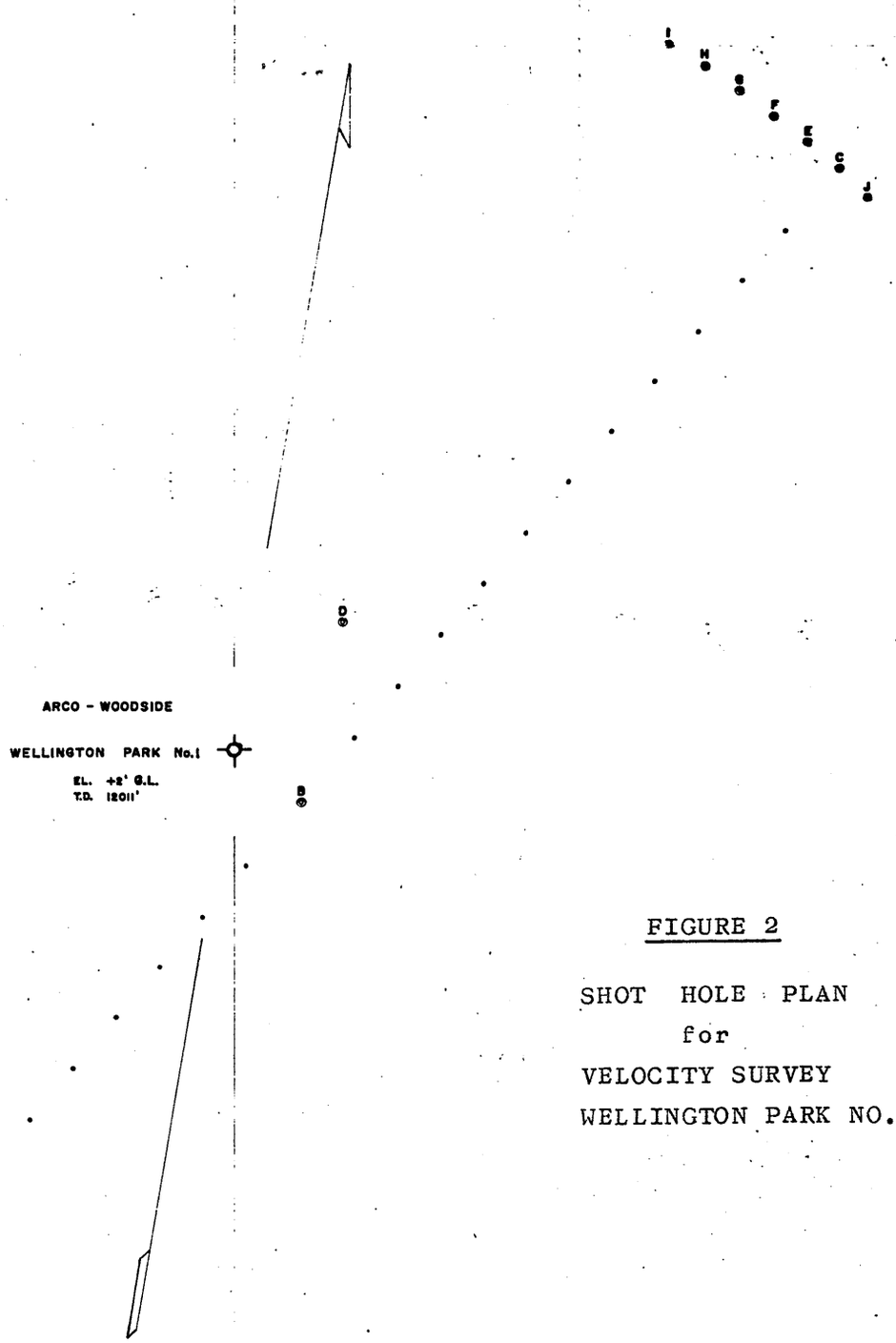


FIGURE 2

SHOT HOLE PLAN
for
VELOCITY SURVEY
WELLINGTON PARK NO. 1

AUSTRAL GEO PROSPECTORS PTY. LTD.
FOR Arco - Woodside
AREA: Sale, Victoria
SHEET No ____ of ____ SHEETS
SCALE 1 inch = 100 feet
DATE 4 April 1962
SURVEYOR B. Llewelyn
PARTY CHIEF W.B. Miller

FIGURE 3
VELOCITY DATA

ARCO-WOODSIDE — Wellington Park No.1

WELL ELEVATION = +19 K.B. (5.79m)

ELEVATION DATUM = Sea Level

Two Way time = this x 2

Ve = 5000 '/s

S.P. No.	Depth	FORMATION	Charge	Elev.	ds	de	ts	z	T	Tan θ	Cos θ	Tcos θ	te	tc x2	va	Interval Velocity Vi
	221·9m 728	Gippsland Lime	Sonic					709						(248) 0.124	5720	
D	225·6 740		10	3	38	-35	.009	721	0.088 ?	0.2915	0.9601	0.084	+0.009			8150
	487·7 1600	Lakes Entrance	Sonic					1581						(462) 0.231	6844	7650
	726·9 2385	Latrobe Valley Coal Measures	Sonic					2369						(668) 0.334	7093	8252
	1027·2 3370	Base Tertiary	Sonic					3351						(906) 0.453	7397	8043
E	1140·0 3740		10	3	38	-35	.010	3721	0.508 P+	0.2713	0.9651	0.490	+.009	(998) 0.499	7457	11,265
G	1644·7 5396		10	3	38	-35	.010	5377	0.648 P+	0.1872	0.9829	0.637	+.009	(1292) 0.646	8324	12,988
	1981·2 6500		Sonic					6481						(1442) 0.731	8866	13,514
	2286·0 7500		Sonic					7481						(1610) 0.805	9293	13,514
	2590·8 8500		Sonic					8481						(1758) 0.879	9648	13,698
	2895·6 9500		Sonic					9481						(1904) 0.952	9959	14,706
	3200·4 10500		Sonic					10481						(2040) 1.020	10,275	16,456
	3596·6 11800		Sonic					11781						(2198) 1.099	10,720	
I	3657·6 12000		10	3	38	-35	.010	11981	1.075 P-	0.08371	0.9965	1.0712	+.009	(2160) 1.080	11,094	
J	3657·6 12000		10	3	38	-35	.010	11981	1.090 P-	0.08371	0.9965	1.086	+.009	(2190) 1.095	10,942	

T.D. = 12011

4 APRIL, 1962

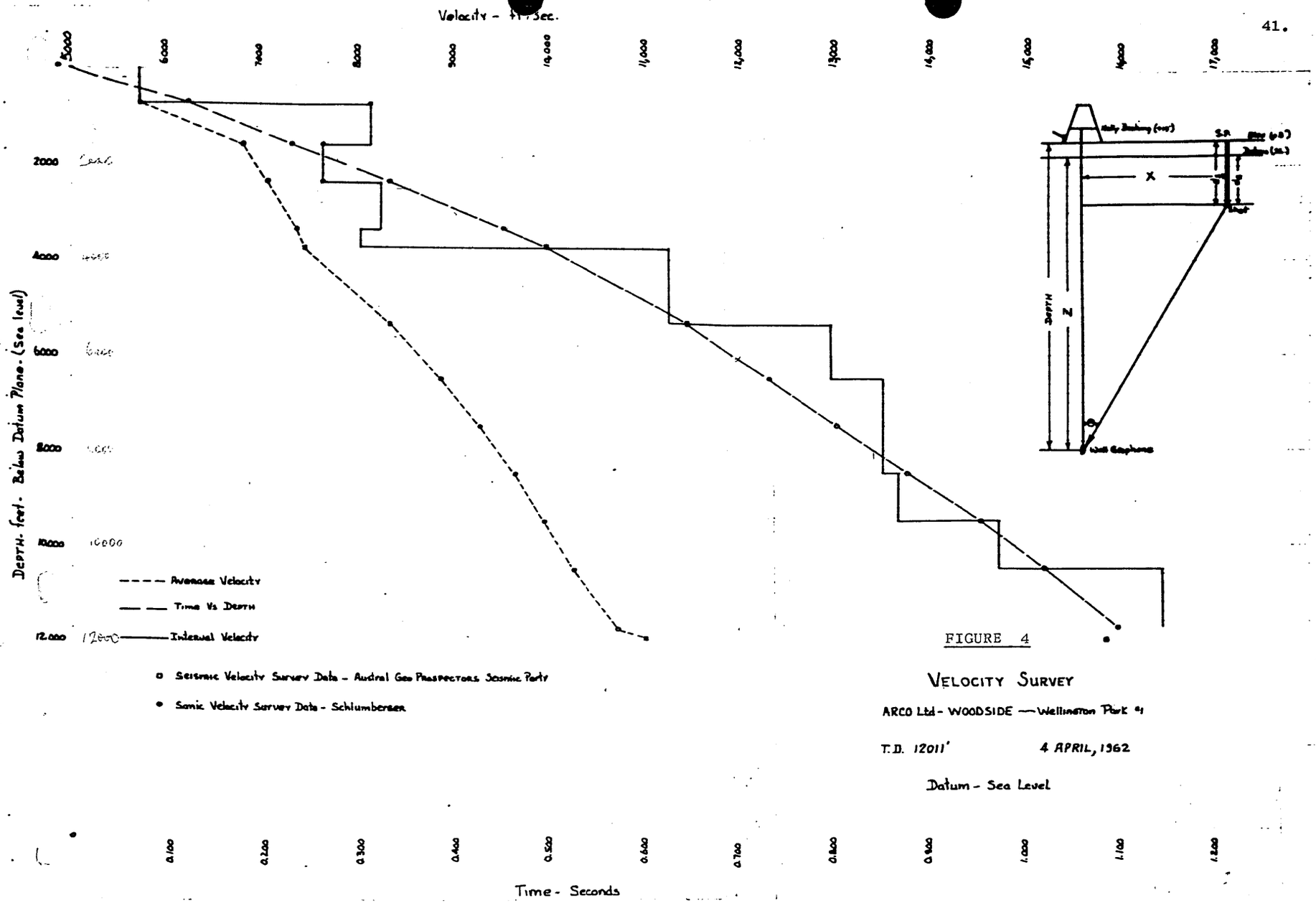


FIGURE 4

VELOCITY SURVEY

ARCO Ltd - WOODSIDE — Wellington Park #1

T.D. 12011' 4 APRIL, 1962

Datum - Sea Level

SEISMIC REFRACTION SURVEY

by

W. B. MILLER,
AUSTRAL GEO PROSPECTORS PTY. LTD.

With the aim of determining if a high velocity layer, ostensibly representative of a Lower Paleozoic (Devonian?) limestone, was within easy drilling range of the rig which had attained a depth of 12,011' at Wellington Park No. 1, a single-ended (non-reversed) refraction profile was shot.

A five-thousand foot, eleven-trace refraction spread with the first station at the well was recorded from shotpoints spaced at five-thousand foot intervals from 10,000' to 50,000' in line of profile and on the opposite side of the well from the spread. In addition, a well velocity geophone, the impulses from which were recorded at high and low gain while taking each refraction record, was maintained in the bore at a depth of 12,000 feet during the entire course of the survey.

Good primary breaks were obtained from shooting the close shotpoints but these progressively deteriorated in quality as the shotpoints moved outward, until at 50,000 feet no true first breaks were recorded. Reliable well detector breaks were obtained at the 10,000 and 15,000 foot distances, while only poor breaks were recognized beyond 15,000 feet.

A time-distance plot of the surface spread data yields velocities of 9000 ft/sec and 16,350 ft/sec. The breaks recorded in the well detector at the 10,000 foot and 15,000 foot distances give a velocity of 16,150 ft/sec, while the highly questionable breaks picked at the 20,000 foot and 25,000 foot distances suggest a velocity of 17,750 ft/sec.

Assuming a 6800 ft/sec first velocity and applying a two-layer solution to the data, we get a depth to the first layer of 1350 feet and a second-layer depth of 5733 feet.

APPENDIX 7

PALYNOLOGICAL REPORT

by

Mr. John Douglas
Department of Mines, Victoria.

Reports dated 23/3/62 and 28/6/62.

Core samples from Wellington Park No. 1 bore were treated by the hydrofluoric acid - Schulze's solution method, and residues examined for acid insoluble microfossils.

Assemblages isolated are tabulated below :

Age	Depth*	Microfossils
	3142'	Largely devoid of plant reproductive bodies
	3220'	" " " " "
	3254'	" " " " "
Tertiary	3410'	" " " " "
	3523'	" " " " "
	3654'	" " " " "
	3738' - 3739'	Proteacidites sp. Nothofagus sp.
	UNCONFORMITY	
	3817' - 3826'	Cicatricosisporites sp. Styxisporites sp. Osmundacidites sp. bisaccate gymnosperms, etc.
	4336' - 4340'	Barren
	5301' - 5306'	None isolated
	6310' - 6312'	Lycopodiumsporites austroclavatidites gymnosperm pollen
Lower	6320' - 6323'	Largely barren
Cretaceous	6853' - 6855'	" "
	7379' - 7380'	" "
	7935' - 7937'	" "
	7943' - 7945'	" "
	8407' - 8411'	Cirratritadites sp. Cyathidites sp., etc.

Appendix 7 (2)

Age	Depth	Microfossils
Lower Cretaceous	9,506' - 9,512'	Largely barren
	10,004' - 10,006'	" "
	10,540' - 10,543'	" "
	11,236' - 11,237'	" "
	11,239' - 11,241'	Trilete sporomorphs of undetermined affinities, conifer pollens, etc.
	11,972' - 11,974'	Barren

The boundary between Mesozoic and Tertiary deposits lies between the 3738-3739 ft. and 3817-3826 ft. samplings. Proteacidites and Nothofagus sp. are not entirely restricted to the Tertiary in Victoria, and have been recorded from Upper Cretaceous sediments, but the presence of these species and the absence of any Cretaceous forms is sufficient evidence to establish the 3738-3739 beds in the Tertiary.

The Cicatricosisporites microflora is typical of the lower beds of the Upper Cretaceous and Lower Cretaceous in western Victoria.

As no Cretaceous microplankton were isolated, Upper or Lower Cretaceous marine beds do not appear to have been penetrated, and the 3817-3826 ft. horizon is presumed to be portion of the Lower Cretaceous non marine sequence known from outcrop further west.

The determination of "Lower Cretaceous" age for cores below 3817-3826 feet remains unaltered after the new samplings. Samplings between 6320 ft. and 11,236 ft. were largely barren. A few sporomorphs and conifer pollens at 11,239-41 feet, although of little diagnostic value, indicate that these deepest beds are still Lower Cretaceous in age.

* Depths from 3124 feet to 3654 feet represent side-wall cores, remainder are conventional cores.

PALYNOLOGICAL REPORT

by

P. R. EVANS*

Palynological examination of core 11 (8408-8410 ft) indicated that the well was still in the Cretaceous. Two samples from core 15 (10,536-10,539 ft) were barren of recognizable spores, probably because of the metamorphic effects of depth of burial.

The Cretaceous age of core 11 is based on the presence of Cicatricosisporites australiensis which is unknown below the Transition Beds of the Blythesdale Group in the Great Artesian Basin (Evans, 1961a). The general assemblage is Lower Cretaceous in character, but the stage it represents has not been resolved.

The relative abundance of C. australiensis is comparable with that observed in a lower part of the Otway Group of F.B.H. Flaxman's Hill No. 1 (Evans, 1962) and in certain outcrop samples from the Merino Group in Western Victoria (Evans, 1961b).

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EVANS, P. R., 1961a - A palynological report on Conorado Ooroonoo No. 1 well, Queensland. Bur. Min. Resour. Aust. Rec. 1961/22 (unpubl.).

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* Bureau of Mineral Resources, Geology and Geophysics.

APPENDIX - 8

MICROPALEONTOLOGICAL REPORT

by

MR. D. J. TAYLOR,
Department of Mines, Victoria.

Cores and side-wall cores as well as rotary cuttings, were examined from the interval 750 feet to 12,000 feet in Wellington Park No. 1 well.

Mesozoic : No Mesozoic Foraminifera or other Mesozoic fauna were found in the samples examined. It is assumed that marine Mesozoic sediments are not present in any part of the drilled section.

Tertiary : No Tertiary Foraminifera were found in any cores or side-wall cores. Difficulty was encountered in ascertaining the biostratigraphic sequence on rotary cuttings, as the foraminiferal biostratigraphic schemes of Carter (1959 & 1962) and Jenkins (1960) on the earliest appearances (first appearance up the sequence). However Carter (1962) lists the Foraminifera which characterise the various rock units. Therefore it is assumed if certain species are present in a sample and those species characterise a rock unit, then that sample is from that rock unit.

The characteristic faunal content down the sequence is as follows.

? to 950 feet : *Orbulina universa*, *Biorbulina bilobata*, *Globoretalia menardii miotumida* and *Triloculina tricultara*. This fauna indicates that Carter's faunal unit 11 is present and this faunal unit is within the Bairnsdalian Stage. Therefore the top member of the Gippsland Limestone must be present above 950 feet. The Tambo River Formation could also be present but it contains a much poorer pelagic fauna than the one present at 960 feet. The pelagic fauna of this interval corresponds with the pelagic fauna above 600

feet in the Lakes Entrance Oil Shaft (refer Jenkins, 1960).

950 feet to 1920 feet: Amphistegina lessonii occurs in abundance below 950 feet and is associated with Operculina victoriensis and Lepidoclina howchini below 1200 feet. These species are present within Carter's faunal units 10 and 9. Faunal unit 10 suggests Balcombian Stage, whilst 9 suggests the Batesfordian Stage. As the Batesfordian is characterised by L.howchini it would appear that this stage is present below 1200 feet. It is difficult to draw a boundary between the two Stages in this section with the available samples, but both stages are definitely present.

1920 feet to 2150 feet : The appearance of Astrononion centroplax (sensu stricto) is taken as the top of the Longfordian Stage. The three faunal units within this stage cannot be differentiated because they are based on the first appearance of species up the sequence. On faunal evidence the base of the Gippsland Limestone is placed at 2150 feet.

2150 to 2360 feet: The first appearance of Victorella conoidea (= "V.plecta") is the first indication of the Janjukian Stage and is the characteristic species of the Lakes Entrance Formation. It should be noted that the green sands at the base of the Lakes Entrance Formation are not present in this section.

2360 feet to ? : There are no first appearances of species below 2360 feet. The Eocene pelagic species Globigerina linaperta, Globigerinoides index and Hantkenina alabamensis are absent from all samples examined. It is believed that there was no marine sedimentation in the Lake Wellington area before the Oligocene (Janjukian Stage).

The top of the Latrobe Valley Coal Measure is placed at 2360 feet (approx.) on lithological grounds. Carter (1962) considers that this formation does not contain Foraminifera.

The marine Tertiary sequence in Wellington Park No. 1 Well is tabulated below.

Depth	Faunal Units (Carter 1959)	Aust. Stages (Carter 1959)	Rock Units (Carter 1962) Formation	Member
		Mitchellian	Tambo River	
? to 950'	11	Bairnsdalian		Bairnsdale
950' to 1900'	10 & 9	Balcombian & Batesfordian	GIPPSLAND LIMESTONE	Wuk Wuk Marls & Glencoe Lst.
1900' to 2150'	8 to 6	Longfordian		Longford Lst.
2150' to 2360'	5	Janjukian	LAKES ENTRANCE	

CONCLUSION :

The Marine Tertiary sequence appears to be typical of the Miocene and Oligocene sediments of the Gippsland Basin. The Foraminifera indicate that a full section of Gippsland Limestone is present. It should be noted that the four members of the Gippsland Limestone are delineated on faunal content, thus may only be equivalents with regard to lithology. The absence of the greensands suggests that the Lakes Entrance Formation may not be fully developed.

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Appendix 8 (4)

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W467

Geochem

26 JUN 1987

WELLINGTON PARK 1
WEL-1
Gippsland Basin 38 08 s. lat. 147 22 e. long.

#	M	FT	%I-C	%O-C	%N	%H	S1	S2	TMAX	PI	HI	GP
1	1009	3310	4.6	56.35	0.53	4.54	6.89	292.3	449	0.02	514	299.2
2	1037	3400	bdl	63.40	0.58	4.88	10.54	333.2	449	0.03	526	343.7
3	1049	3440	bdl	52.60	0.48	4.09	8.43	284.1	452	0.03	540	292.5
4	1085	3560	bdl	66.60	0.58	5.31	10.84	428.7	449	0.02	644	439.5
5	1110	3640	bdl	58.60	0.56	4.53	9.13	459.5	455	0.02	784	468.7
6	1166	3826	6.5	51.62	0.45	4.18	5.72	264.9	446	0.02	513	270.6
7	1262	4140	23.3	10.00	0.17	1.20	0.63	38.7	468	0.02	387	39.3
8	1296	4250	12.6	23.19	0.25	2.16	1.95	110.3	450	0.02	476	112.2
9	1320	4330	14.7	35.34	0.38	3.18	3.96	195.7	424	0.02	554	199.6
10	1491	4890	6.5	7.13	0.13	0.95	0.79	27.6	430	0.03	387	28.4
11	1503	4930	12.7	5.41	0.11	0.84	0.49	17.0	428	0.03	315	17.5
12	1613	5290	1.2	60.06	0.63	4.98	13.64	304.6	479	0.04	507	318.2
13	1683	5520	4.2	27.50	0.48	2.10	4.96	120.9	467	0.04	440	125.9
14	1790	5870	15.6	0.47	0.05	0.45	0.17	0.3	446	0.35	67	0.5
15	1872	6140	1.5	2.12	0.11	0.61	0.42	3.7	473	0.10	174	4.1
16	1966	6450	5.1	0.93	0.06	0.50	0.69	1.1	472	0.38	119	1.8
17	2098	6880	2.9	1.19	0.09	0.52	0.36	1.8	439	0.16	154	2.2
18	2244	7360	2.0	6.87	0.18	0.93	1.29	18.4	470	0.07	268	19.7
19	2277	7470	2.8	2.89	0.11	0.56	0.47	4.1	446	0.10	141	4.5
20	2384	7820	1.3	1.71	0.08	0.54	0.65	2.3	472	0.22	132	2.9
21	2433	7980	1.7	5.58	0.17	0.82	2.08	13.4	478	0.13	239	15.4
22	2521	8270	1.2	3.42	bdl	0.32	3.06	11.1	478	0.22	324	14.2
23	2607	8550	1.5	2.50	bdl	0.56	0.95	3.2	497	0.23	129	4.2
24	2732	8960	1.2	0.81	bdl	0.46	0.29	0.8	447	0.26	101	1.1
25	2768	9080	0.5	0.20	bdl	0.73	0.28	0.5	477	0.36	247	0.8
26	2887	9470	2.0	0.51	bdl	0.46	0.30	0.5	447	0.37	101	0.8
27	2933	9620	0.9	0.41	bdl	0.43	0.19	0.3	494	0.38	74	0.5
28	3043	9980	0.9	0.78	bdl	0.49	0.19	0.5	487	0.28	64	0.7
29	3110	10200	0.6	0.70	bdl	0.45	0.25	0.4	510	0.37	63	0.7
30	3216	10550	0.6	0.49	bdl	0.43	0.18	0.2	ndm	0.46	45	0.4
31	3314	10870	0.8	0.51	bdl	0.47	0.22	0.5	ndm	0.33	89	0.7
32	3338	10950	1.2	0.53	bdl	0.49	0.36	0.2	ndm	0.62	45	0.6
33	3473	11390	0.4	0.64	bdl	0.43	0.23	0.2	ndm	0.50	35	0.4
34	3490	11447	1.0	0.32	bdl	0.55	0.21	0.3	ndm	0.41	92	0.5
35	3564	11690	1.0	0.34	bdl	0.46	0.23	bdl	ndm	---	---	0.3
36	3659	12001	1.9	0.40	bdl	0.45	0.20	bdl	ndm	---	---	0.2

Pyrolysis run with CDS Pyroprobe and modified interface: TMAX inaccurate.
M is sample depth in meters.
FT is sample depth in feet.
%I-C is inorganic carbon as % calcium carbonate in rock.
%O-C is organic carbon as % carbon in rock.
%N is % nitrogen in rock.
%H is % hydrogen in rock.
S1 is pyrolysis free-hydrocarbon signal (mg hydrocarbons/g rock).
S2 is pyrolysis kerogen signal (mg S2 hydrocarbons/g rock).
PI is production index [S1/(S1+S2)].
TMAX is temperature at which S2 signal is maximum (deg C).
HI is hydrogen index (mg hydrocarbons/g O-C).
GP is genetic potential (kg hydrocarbons/ton rock) (S1+S2).
'bdl' means 'below detection limit'; '---' means 'not determined'.
'ndm' means 'no definitive maximum'.

...MICAL LABORATORIES—
Departments of Agriculture, Health, and Mines, Victoria
JCK:SH
Phone: 63 0321

STATE LABORATORIES
MACARTHUR STREET
MELBOURNE, C.1

14th November, 1961

An. PG/3/11

Report on Sample No. 1146/61 U.W.R.S. 2413

Sample : Bore water
Locality : Parish of Booran
Sender : Woodside Oil Co. N.L.
792 Elizabeth Street,
Melbourne.

Particulars :

No.	1146
U.W.R.S.	2413
Bore	P.W.B.
Sample	No.1
Depth (feet)	88 - 102
Date	2.11.61
Owner	Woodside Oil Co. N.L.
Position	Wellington Park near Seacombe.
Military Co-ords.	Sale 315969
Aquifer	Coarse sand and gravel
Static level	A.N.S., flowing at 7000 g.p.h.

Results : Parts per million

Total solids in solution		1104
Chloride	(Cl)	497
Carbonate	(CO_3)	Nil
Bicarbonate	(HCO_3)	143
Sulphate	(SO_4)	70
Nitrate	(NO_3)	Nil
Calcium	(Ca)	30
Magnesium	(Mg)	35
Iron-total	(Fe)	12.4
Iron-soluble	(Fe)	1.6
Silica-soluble	(SiO_2)	18
Total hardness (as $CaCO_3$)		221
pH		6.5

A hypothetical combination is given as follows :

		P.P.M.
Calcium bicarbonate,	$Ca(HCO_3)_2$	121
Magnesium bicarbonate,	$Mg(HCO_3)_2$	59
Ferrous bicarbonate,	$Fe(HCO_3)_2$	5
Magnesium sulphate,	$MgSO_4$	88
Magnesium chloride,	$MgCl_2$	27
Sodium chloride,	NaCl	786

Comments.

The water contains 0.11% of dissolved mineral matter which consists mainly of sodium chloride.

It could be used for human consumption although a less mineralized water is preferable.

It is a "hard" water and this would be noticed when using it for washing purposes, but it could be "softened" either by a lime-soda treatment or by the use of a zeolite-type base-exchange unit.

It also contains enough soluble iron to cause staining of clothes during washing, but if the water were stored for several days before use, it is most likely that nearly all the iron would be precipitated and that the water would not cause any further staining worries.

John C. Kennedy

Senior Chemist.
Mines Department.

CHEMICAL LABORATORIES—
Departments of Agriculture, Health, and Mines, Victoria
JCK:PD
Phone: 63 0321

STATE LABORATORIES
MACARTHUR STREET
MELBOURNE, C.1

14th November, 1961.

An.PG/3/11

Report on Sample No. 1147/61

U.W.R.S. 2414

Sample : Swamp Water
Locality : Parish of Booran
Sender : Woodside Oil Co.,
792 Elizabeth Street,
MELBOURNE.

Particulars :

No.	1147
U.W.R.S.	2414
Sample	No. 1
Date	2.11.61
Owner	Woodside Oil Co.
Position	Wellington Park near Seacombe
Military Co-ords.	Sale 315969

Results:

		parts per million
Total solids in solution		12570
Chloride	(Cl)	6618
Carbonate	(CO_3)	Nil
Bicarbonate	(HCO_3)	15
Sulphate	(SO_4)	1430
Nitrate	(NO_3)	Nil
Calcium	(Ca)	208
Magnesium	(Mg)	522
Iron - Total	(Fe)	3.2
Iron - Soluble	(Fe)	2.8
Silica - Soluble	(SiO_2)	24
Total hardness (as $CaCO_3$)		2670
pH		4.5

A hypothetical combination is given as follows:-

		p.p.m.
Calcium bicarbonate,	$Ca(HCO_3)_2$	12
Ferrous bicarbonate,	$Fe(HCO_3)_2$	8
Calcium sulphate,	$CaSO_4$	697
Magnesium sulphate,	$MgSO_4$	1175
Magnesium chloride,	$MgCl_2$	1117
Sodium chloride	NaCl	9537

Comments :

The water contains 1¼% of dissolved mineral matter which is approximately ⅓ of the salt concentration of sea-water.

It would not be suitable for human consumption nor for domestic purposes.

John C. Kennedy

Senior Chemist,
Mines Department.

PE603893

This is an enclosure indicator page.
The enclosure PE603893 is enclosed within the container PE905504 at this location in this document.

The enclosure PE603893 has the following characteristics:

ITEM_BARCODE	= PE603893
CONTAINER_BARCODE	= PE905504
NAME	= Composite Well Log
BASIN	= GIPPSLAND
PERMIT	= PEP44
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Composite Well Log for Wellington Park-1
REMARKS	=
DATE_CREATED	= 7/04/62
DATE_RECEIVED	= 11/10/67
W_NO	= W467
WELL_NAME	= WELLINGTON PARK-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LTD/WOODSIDE(LAKES ENTRANCE) OIL COMPANY N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

PE904017

This is an enclosure indicator page.
The enclosure PE904017 is enclosed within the container PE904015 at this location in this document.

The enclosure PE904017 has the following characteristics:

ITEM_BARCODE	= PE904017
CONTAINER_BARCODE	= PE905504
NAME	= Stratigraphic Column
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= STRAT_COLUMN
DESCRIPTION	= Generalised Stratigraphic Column for Wellington Park-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W467
WELL_NAME	= Wellington Park-1
CONTRACTOR	=
CLIENT_OP_CO	= Arco Ltd/Woodside Oil Co

(Inserted by DNRE - Vic Govt Mines Dept)

PE904018

This is an enclosure indicator page.
The enclosure PE904018 is enclosed within the container PE904015 at this location in this document.

The enclosure PE904018 has the following characteristics:

ITEM_BARCODE	= PE904018
CONTAINER_BARCODE	= PE905504
NAME	= Geological Section
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= CROSS_SECTION
DESCRIPTION	= Geological Section through well before/after drilling
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W467
WELL_NAME	= Wellington Park-1
CONTRACTOR	=
CLIENT_OP_CO	= Arco Ltd/Woodside Oil Co

(Inserted by DNRE - Vic Govt Mines Dept)

PE905500

This is an enclosure indicator page.
The enclosure PE905500 is enclosed within the container PE905504 at this location in this document.

The enclosure PE905500 has the following characteristics:

ITEM_BARCODE	= PE905500
CONTAINER_BARCODE	= PE905504
NAME	= Geological Section
BASIN	= GIPPSLAND
PERMIT	= PEP44
TYPE	= WELL
SUBTYPE	= CROSS SECTION
DESCRIPTION	= Geological section through Dutson Downs-1(before and after drilling), from Wellington Park-1 WCR
REMARKS	=
DATE_CREATED	= 30/04/66
DATE_RECEIVED	=
W_NO	= W467
WELL_NAME	= WELLINGTON PARK-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LTD/WOODSIDE(LAKES ENTRANCE) OIL COMPANY N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

PE602064

This is an enclosure indicator page.
The enclosure PE602064 is enclosed within the container PE905504 at this location in this document.

The enclosure PE602064 has the following characteristics:

ITEM_BARCODE	= PE602064
CONTAINER_BARCODE	= PE905504
NAME	= Grapholog/Mud Log
BASIN	= GIPPSLAND
PERMIT	= PEP/44
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log - corelab Grapholog for Wellington Park-1
REMARKS	=
DATE_CREATED	= 7/04/62
DATE_RECEIVED	=
W_NO	= W467
WELL_NAME	= Wellington Park-1
CONTRACTOR	= Core Laboratories Inc
CLIENT_OP_CO	= Arco Ltd/Woodside Oil Co

(Inserted by DNRE - Vic Govt Mines Dept)

PE905501

This is an enclosure indicator page.
The enclosure PE905501 is enclosed within the container PE905504 at this location in this document.

The enclosure PE905501 has the following characteristics:

ITEM_BARCODE	= PE905501
CONTAINER_BARCODE	= PE905504
NAME	= Drill progress Curve
BASIN	= GIPPSLAND
PERMIT	= PEP44
TYPE	= WELL
SUBTYPE	= DIAGRAM
DESCRIPTION	= Well Drill Curve for Wellington Park-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W467
WELL_NAME	= WELLINGTON PARK-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LTD/WOODSIDE(LAKES ENTRANCE) OIL COMPANY N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

PE603892

This is an enclosure indicator page.
The enclosure PE603892 is enclosed within the container PE905504 at this location in this document.

The enclosure PE603892 has the following characteristics:

ITEM_BARCODE	= PE603892
CONTAINER_BARCODE	= PE905504
NAME	= Raw Shot Trace Data
BASIN	= GIPPSLAND
PERMIT	= PEP44
TYPE	= SEISMIC
SUBTYPE	= FEILD
DESCRIPTION	= Raw Shot Trace Data close to Wellington Park-1
REMARKS	=
DATE_CREATED	= 4/04/62
DATE_RECEIVED	=
W_NO	= W467
WELL_NAME	= WELLINGTON PARK-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LTD/WOODSIDE(LAKES ENTRANCE) OIL COMPANY N.L.

(Inserted by DNRE - Vic Govt Mines Dept)