WELL COMPLETION REPORT

SOUTH WEST BAIRNSDALE NO.1.

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SOUTHWEST BAIRNSDALE-1

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ARCO LIMITED / WOODSIDE (LAKES ENTRANCE)

OIL CO. N. L.

SOUTHWEST BAIRNSDALE NO. 1 WELL

FINAL WELL REPORT

by

Frank T. Ingram
Arco Limited

and

N. Meyers
Consulting Geologist

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SUMMARY

The Southwest Bairnsdale No. 1 well was drilled to a total depth of 3926 feet. The well was spudded on January 8, 1962, and was completed as a dry hole on February 14, 1962.

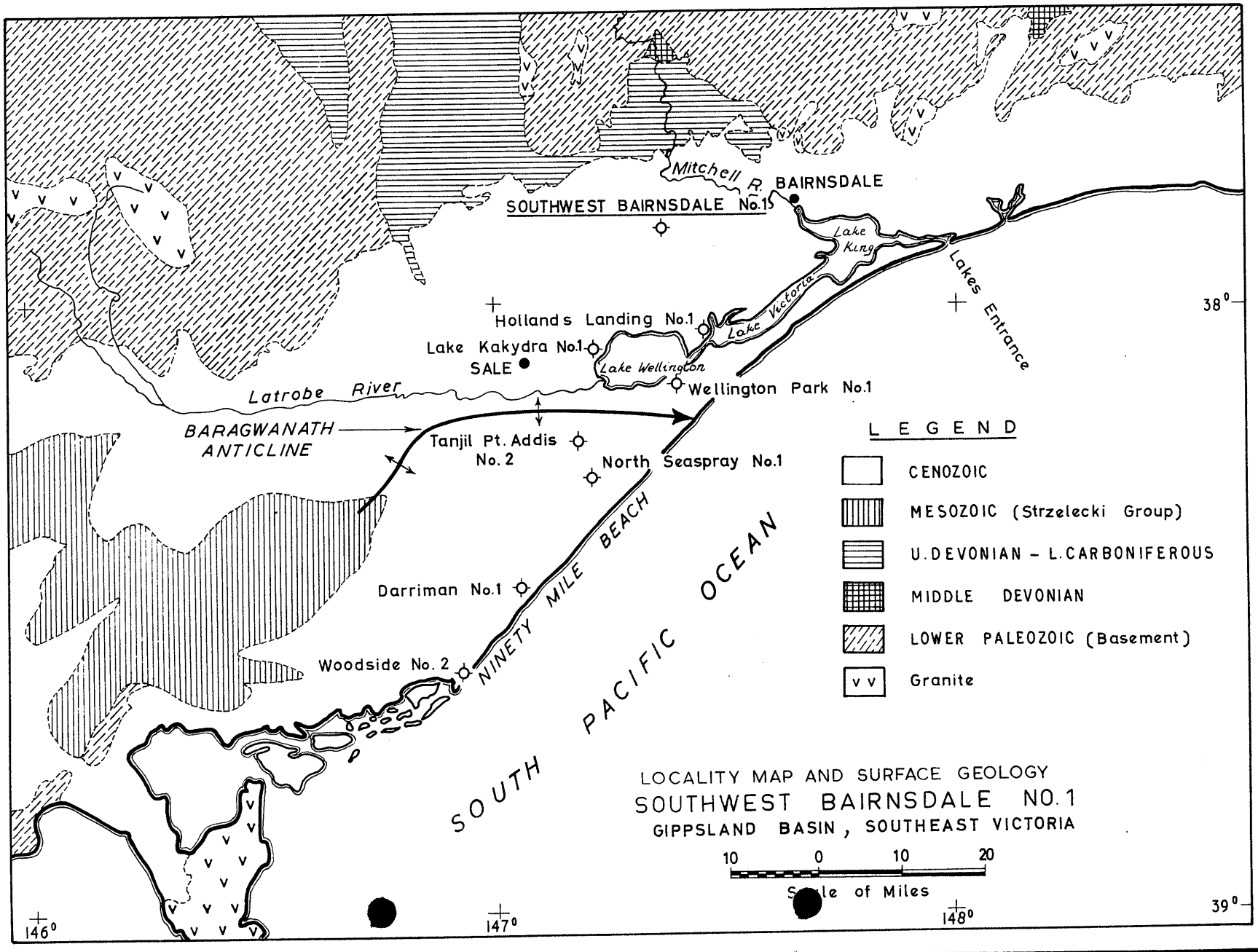
Tertiary sediments were encountered from the surface to 1408 feet, and Upper Devonian - Lower Carboniferous non-marine sediments were penetrated from 1408 feet to 3806 feet where granite basement was encountered.

The Middle-Devonian marine sediments, which are exposed in the highlands to the north of the well, were not encountered.

Basal Tertiary gravels, although having good porosity and permeability, contained only fresh water. Upper Devonian - Lower Carboniferous sandstones are well cemented and have very little porosity or permeability.

No shows of hydrocarbons were found.

S/40


Mitchell R.
BAIRNSDALE
SOUTHWEST BAIRNSDALE No.1
Lake King
Lakes Entrance
Lake Victoria
38°
Holland's Landing No.1
Lake Kakydra No.1
SALE
Lake Wellington
Latrobe River
Wellington Park No.1
BARAGWANATH ANTICLINE
Tanjil Pt. Addis No. 2
North Seaspray No.1
NINETY MILE BEACH
Darriman No.1
Woodside No. 2
SOUTH PACIFIC OCEAN
LEGEND
CENOZOIC
MESOZOIC (Strzelecki Group)
U.DEVONIAN - L.CARBONIFEROUS
MIDDLE DEVONIAN
LOWER PALEOZOIC (Basement)
Granite
LOCALITY MAP AND SURFACE GEOLOGY
SOUTHWEST BAIRNSDALE NO.1
GIPPSLAND BASIN, SOUTHEAST VICTORIA
10 0 10 20
Scale of Miles
146°
147°
148°
39°

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INTRODUCTION

North of the Gippsland Basin sedimentary rocks of Devonian and Carboniferous age have been mapped and described by various geologists, but before the drilling of the South-west Bairnsdale No. 1 well these rocks had never been investigated in the sub-surface of the Gippsland Basin.

The Tabberabbera Beds of Middle Devonian age crop out along the Mitchell River valley where they consist of marine interbedded limestone, sandstone and shale. Further east in the vicinity of Buchan, sediments of the same age consist mostly of limestones, with a well developed biostromal facies.

Unconformably overlying the Middle Devonian in the Mitchell River area is a non-marine sequence of shales, sand-stones and volcanics of Upper Devonian - Lower Carboniferous age. The Mitchell River approximately follows the north-south axis of a southward plunging syncline developed in these sediments. When seen in outcrops the sandstones are often porous and fairly "clean".

Because of the very thick Mesozoic section present in the southern part of the Gippsland Basin no wells have ever encountered Paleozoic sediments which are believed to underlie most of this area. In the northern part of the basin, west of the Lakes Entrance area, only one well had penetrated the Tertiary sequence prior to the drilling of the Southwest Bairnsdale No. 1. This well, drilled about 5 miles southwest of the town of Bairnsdale found Tertiary sediments in contact with phyllite of Ordovician age, at a depth of 1485 feet.

In order to obtain information on the stratigraphy structure, porosity and permeability of the Pre-Tertiary, mainly Paleozoic, sediments in the Gippsland Basin it was decided to drill a stratigraphic well 14 miles southwest of Bairnsdale. This well was located near the axis of the Mitchell River syncline as it was projected southward into the

basin. This site was picked as being the most likely to be underlain by both Middle Devonian and Upper Devonian - Lower Carboniferous sediments.

The well was located so that any pinchouts in the Upper Devonian - Lower Carboniferous sequence would be favorably situated to trap hydrocarbons that might have migrated northward from the deeper part of the basin. Hydrocarbons have been generated in the Gippsland Basin as evidenced by the oil produced, in small quantities, from wells in the Lakes Entrance area. The source of these hydrocarbons is unknown, but it probably originated from sediments under Bass Strait.

No seismic survey was conducted prior to drilling, but a gravity and magnetic survey by the Bureau of Mineral Resources, Geology and Geophysics confirmed the southward extension of the Mitchell River syncline beneath Tertiary sediments.

The well was drilled as a joint operation between Arco Limited and Woodside (Lakes Entrance) Oil Co. N.L., with Arco being the Operator.

WELL HISTORY

GENERAL DATA

Well Name and Number	SOUTHWEST BAIRNSDALE NO. 1
Location	Latitude 37°52'6"S.
	Longitude 147°21'58"E
Name and Address of Tenement Holder	Victorian Oil N.L. 792 Elizabeth Street, Melbourne.
Details of Petroleum Tenement	PPL. 185 Victoria
District	Gippsland
Total Depth	3926'
Date Drilling Commenced	January 8th, 1963
Date Drilling Completed	February 14, 1963
Date Well Abandoned	February 14, 1963
Date Rig Released	February 14, 1963
Drilling Time in Days to Total Depth	38

Elevation (above MSL)	:	Ground	225
	:	Kelly Bushing	236
Status	:	Plugged and abandoned	
Cost	:	Not available	

DRILLING DATA

Name and Address of Drilling Contractor	:	Reading and Bates (Australia) Pty.Ltd. 2 City Road Melbourne, S.C.4., Victoria	
Drilling Plant	:	Make	National
		Type	50
		Rated capacity	7500 feet with 4-1/2 inch drill pipe
		Rated capacity	10000 feet with 3-1/2 inch drill pipe
		Motors	(2) General Motors 6-71 twin model diesel, 504 BHP each
Mast	:	Make	Lee C. Moore
		Type	131 feet Cantilever
		Rated capacity	550,000 pounds
Pumps	:	Make	National
		Type	1 - C250 1 - C150-B
		Size	7-1/4" x 12"
		Pump Motors	
		Make	General Motors
		Type	6-71 twin diesel
		BHP	312
Blowout Preventer Equipment	:	Make	Cameron (2)
	:	Size	12"
		Series	900
		Make	Hydril
		Size	12"
		Series	900
Hole Sizes and Depths	:	16" Surface to	30'
		12-1/4"	30' - 477'
		8-3/4"	477' - 3926'
Casing and Liner Details	:	Size	13-3/8"
		Weight	48 lb/ft
		Grade	J-55
		Range	2
		Setting Depth	30'
		Size	9-5/8"
		Weight	36 lbs/ft
		Grade	J-55
		Range	2
		Setting Depth	477'

Caser and Liner Cementing Details	:	Size	13-3/8"
		Setting depth	30'
		Quantity cement used	20 sacks
		Method used	Mixed and poured by hand
		Size	9-5/8"
		Setting depth	477'
		Quantity cement used	210 sacks
		Method used	Plug
Drilling Fluid	:	Type	Water base, bentonite, low pH
		Average Weight	30' - 477' 8.8 lbs/gal
			477' - 1000' 9.0 " "
			2000'-3000' 10.0 " "
			3000'-3926' 10.3 " "

The spud mud used to drill the surface hole was a low weight, low viscosity fresh water bentonite mud. After drilling out below the surface casing at 477 feet the viscosity was gradually built up to about 50 sec/qt., and the water loss was decreased to about 5 cc/30 min. The viscosity and water loss were controlled by the use of bentonite, Lo-Vis and CMC (Tylose 377). The pH of the mud system was maintained by the use of caustic soda.

Cement contamination was controlled by soda ash and bicarbonate of soda. No lost circulation was encountered.

The NaCl content of the mud increased to about 3500 ppm after drilling into the red shales of the Avon River Group, but this did not seriously affect the mud properties.

The mud system performed satisfactorily, and no unusual conditions were encountered.

The average weekly analysis of the drilling mud is given below :

Week ending	Weight lbs/gal	Viscosity sec/qt.	Water Loss	Filter Cake	pH
14/1/63	9.4	50	5.1	2/32"	9.0
21/1/63	9.9	53	6.6	2/32"	9.0
28/1/63	10.2	47	9.3	2/32"	9.5
4/2/63	10.4	47	8.0	2/32"	9.2
11/2/63	10.3	51	6.6	2/32"	9.3
14/2/63	10.3	48	7.0	2/32"	9.0

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Water Supply :

A 6" water well was drilled to a depth of 310 feet on the edge of the well site. This bore went about 50 feet into the marl before encountering water of any quantity. Casing was driven to 257 feet, and the bore was completed open hole from 257 to 310 feet. The standing water level came to 186 feet.

A pump-jack powered by a Southern Cross diesel motor was installed in the bore. Pumping capacity averaged about 100 barrels per day, which would not meet the demand for the daily drilling operation. A water tank-truck with a capacity of 37 barrels was used intermittently to keep the storage tanks filled. The water was hauled from a small pond about 2 miles from the well site.

Perforations and Shooting Record :

No perforations or shooting were attempted.

Plugging Back :

The well was plugged by circulating through open-ended drill pipe using a Halliburton cementing truck. A plug was set at 1160 to 1260 feet with 50 sacks of cement, and at 410 to 510 feet with 50 sacks of cement. A third plug was set in the 9-5/8" casing from the surface to 10 feet using 5 sacks of cement. Construction cement obtained locally was used for all cementing jobs.

Fishing Operations :

The following fishing operations were performed :

1. Twisted off 6 drill collars while drilling at 2658 feet. Went in with overshot and recovered all of fish with no difficulty.
2. Twisted off 11 drill collars while drilling at 3133 feet. Went in with overshot and recovered all of fish with no difficulty.
3. Lost 1 cone and most of the bearings from 8-3/4" bit at 3156 feet. Made two trips with magnet and recovered cone and majority of bearings. Remainder of bearings were "drilled up" with bit while drilling.
4. Lost 1 cone with bearings from core head while coring at 3338 feet. Went in with magnet and recovered all of fish.
5. Twisted off 8 drill collars while drilling at 3454 feet. Went in with overshot and recovered all of fish.

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6. Dropped 1 die from slips while making trip at 3772 feet. Went in with magnet and recovered die.

Side-tracked Hole :

The hole was not side-tracked.

LOGGING AND TESTING

Ditch Cuttings :

Cuttings were collected after passing over the shale shaker, then washed and placed in sample bags. Cuttings were collected at intervals of 10 feet while drilling and 5 feet while coring.

Coring :

The original coring program called for a total of 9 cores, but only six were taken because basement was encountered before expected, and some of the anticipated section was not present. The first core was cut in the top of the Avon River Group, and cores were cut approximately each 500 feet below this until encountering granite. One core was taken in the granite.

It was attempted to cut at least 10 feet in each core, but this was often impossible due to the hard abrasive nature of the sediments.

The total footage cored was 49 feet, and a total of 41.5 feet, or 85%, was recovered.

A Hughes type "J" core barrel and Hughes hard formation core bits were used for all cores.

See appendix 5 for a complete description of all cores.

Side-Wall Sampling :

No side-wall samples were taken.

Electrical and Other Logs :

Two logging runs were made by Schlumberger, the first at 3338 feet and the second at 3853 feet. The type logs run were the standard electrical log, microlog-microcaliper, sonic and continuous dipmeter logs.

See appendix for details of logging.

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Drilling Time and Gas Log :

A mud logging caravan, leased from Oil Development N.L., was in operation while drilling from 30 feet to total depth. The logging unit was operated by two geologists - Frank Ingram and Nelson Meyers. Mr. D. Rutledge, geologist, was present the first 5 days of the operation until the arrival of Mr. Meyers.

The drilling time was recorded by a geolograph located on the rig floor, and also by an Esterline Angus drilling rate recorder located in the logging caravan. The gas content of the drilling mud was logged continuously from 30 feet to the total depth using a Johnson Williams hot wire gas detector in combination with a "Brown" recorder. The gas curve on the composite log is the result of the logging.

Formation Testing :

One formation test was made in the interval 2522 to 2559 feet after a small quantity of gas was recorded by the gas detector. This test recovered only 120 feet of drilling mud, and the flowing pressures recorded were very low.

A Johnston type "B" testing tool with a single 7-1/4" packer and a Halliburton pressure recorder were used for this test.

See appendix 2 for details of this formation test.

Deviation Surveys :

The hole deviation from vertical was measured with a "Totco" device run on wire line, or dropped in the drill pipe before starting a trip.

The deviation from 300 feet to the base of the Tertiary at 1408 feet increased from 1/4° to 3/4°. Upon entering the Avon River Group section the deviation started to increase more rapidly and reached 3-1/4° by 1865 feet. From 1865 feet to total depth the deviation stayed in the range from 2-3/4° to 4-3/4°. No crooked hole problems were encountered.

Temperature Surveys :

No temperature logs were run. The bottom hole temperatures measured by Schlumberger were 120° at 3342 feet, and 122° at 3860 feet.

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Other Well Surveys :

No other well surveys other than those described above were conducted.

G E O L O G Y

SUMMARY OF PREVIOUS WORK

Geological and Drilling :

The geology of the Paleozoic highlands north of the Gippsland Basin has been studied by various geologists for the Mines Department of Victoria and for several private companies. The majority of the reports by these geologists are unpublished, however.

The geology of the Mitchell River area has been described by A. E. Ringwood, 1955; J. H. O'Mara, 1956; and J. A. Talent, 1955. Dr. Emile Rod, Geologist for Arco Limited studied the Tabberabbera area a few months prior to the drilling of the Southwest Bairnsdale No. 1 well.

The Tertiary sequence of the Gippsland Basin is well known from the many bores that have gone into or through this sequence. In the Bairnsdale area several wells have been drilled, but prior to the drilling of the Southwest Bairnsdale No. 1 only one of these had penetrated the Tertiary. This bore, the Frome-Lakes Pty. Ltd. Gippsland No. 5, encountered Ordovician phyllite at 1425 feet.

Other wells in the area include the Coongoolmerang No. 1 (TD 945 feet), Coongulmerang No. 3 (TD 1214 feet) and the Nindoo No. 1 (TD 533 feet).

Geophysical :

In 1951-1952 a gravity and magnetic survey was made in East Gippsland by the Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. No seismic work was conducted by Arco/Woodside in the well site area because of the lack of stratigraphic information in the area, the uncertainty of reflections from steeply dipping beds and the difficulty of drilling shot holes in the surface gravels in this area.

SUMMARY OF THE REGIONAL GEOLOGY S. W. BARNSDALE 14/40

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

The Paleozoic subsurface is probably very much like the area of Paleozoic outcrops on the north side of the basin. Ordovician and Silurian sediments, altered by dynamic metamorphism and intruded by granite, probably underlie Mesozoic strata over most of the basin. Preserved, highly folded marine strata of Middle Devonian age occur as erosional remnants, or down-faulted blocks, north of the eastern half of the basin. Isolated occurrences of Middle Devonian rocks could be expected in the subsurface in the eastern half of the basin. Overlying these altered and highly folded older Paleozoic rocks on the northern side of the basin is a thick continental sequence of red shales, sandstones, conglomerates and volcanics of Upper Devonian - Lower Carboniferous age. These beds are slightly to moderately folded and probably extend south at least as far as the Lake Wellington area.

No Permian sediments are known in the subsurface of the basin. However, conglomerate, exposed along a major fault on the south side of the Carrajung uplift, is thought to be glacial tillite of Permian age.

The major structural trend in the Tasman geosyncline is north-south, and as the Paleozoic rocks in the sub-surface of the Gippsland Basin are an extension of this geosyncline, then the same trend is thought to persist.

No sediments of Triassic age are known in the Gippsland Basin.

The Upper Jurassic and Lower Cretaceous times are represented by the Strzelecki Group, a thick sequence of non-

marine sediments deposited in an east-west trending trough, or graben. The thickness of this sequence is not known, but the Wellington Park No. 1 well penetrated 8,226 feet with no indication of reaching the base. Estimates of the thickness in the outcrop area of the Strzelecki Ranges varies from 10,000 to 20,000 feet.

The Mesozoic sediments do not extend very far north of the north boundary of the depositional trough. This boundary is thought to extend approximately through Stratford and the south side of Lake King. North of the trough Tertiary sediments overlie, for the most part, Palaeozoic rocks.

During Eocene time, when the Latrobe Valley Coal Measures was deposited, the Gippsland Basin acquired, in general, its present size and shape. In the Latrobe Valley and coastal area, between Seaspray and Welshpool, swampy conditions resulted in very thick accumulations of brown coal. Towards the east coal becomes a minor constituent and clastic material predominates. East of Sale several bores have found thin fossiliferous lenses within the coal measures. In the North Seaspray No. 1 well area brown coal accounts for 32% of the total thickness of the coal measures.

The Latrobe Valley Coal Measures pass into gravels of marine origin in the Lakes Entrance area. These gravels appear to be equivalent to the marine gravels (Colquhoun Gravels) at the base of the Tertiary in the Southwest Bairnsdale No. 1.

In Oligocene time the first widespread marine ingression occurred in the Gippsland basin resulting in the deposition of the Lakes Entrance Formation.

In Miocene time, as the sea gradually encroached over the basin, limestone and marl was deposited over a large area. This sequence of sediments consists of several members, but usually is referred to as the Gippsland Limestone.

A marine environment continued into Pliocene time, but then gradual retreat of the sea ended marine deposition in the Gippsland area of the Gippsland basin. From Upper Pliocene to recent time non-marine conditions prevailed, and a cover of sand, gravel and clay was deposited over most of the basin.

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STRATIGRAPHIC TABLE

The following is the stratigraphic sequence penetrated in the Southwest Bairnsdale No. 1.

TABLE I

Age	Name	Depth Ref. K.B.	Thickness	Lithology
TERTIARY	Lake Wellington and/or Haunted Hills Gravels	200'	200'	Sand and Clay
	Tambo River Formation	275'	75'	Shelly Sand
	Gippsland Limestone	1035'	760'	Marl and Limestone
	Lakes Entrance Formation	1230'	195'	Siltstone, Clay, Sand and Marl
	Colquhoun Gravels	1408'	178'	Gravel and Clay
				Unconformity
UPPER DEVONIAN-LOWER CARBONIFEROUS	Avon River Group or Iguana Creek Beds	3806'	2398'	Shale, Siltstone Sandstone and Conglomerate
				Unconformity
PRE-UPPER DEVONIAN	Basement		?	Biotite Granite

STRATIGRAPHY

0 - 200 feet

Lake Wellington and/or Haunted Hills Gravels

Upper Pliocene

Sand, yellow to white, fine to coarse grained, mostly quartz with occasional chert and rock fragments; and Clay, white, yellow and red, partly limonitic. Impervious and non-water bearing.

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200 - 275 feet

Tambo River Formation

Upper Miocene

Sand, white, fine to medium grained, with very abundant pelecypods, gastropods, echinoids and Foraminifera.

The Jemmy's Point Formation of Lower Pliocene age is absent here. However, the Tambo River Formation in the Southwest Bairnsdale No. 1 well has a lithology identical with that of the Jemmy's Point Formation in the North Seaspray No. 1. The fossiliferous sand probably represents a near shore deposit during the regression of the sea from the basin. This regression started about the end of Miocene time and continued until about Middle Pliocene. Thus, the fossiliferous sand becomes progressively younger in age to the south. Apparently, the sea was south of the Bairnsdale area before sediments of Jemmy's Point time were deposited, accounting for the absence of this formation in the Southwest Bairnsdale No. 1.

275 - 1035 feet

Gippsland Limestone

Miocene

Marl, medium grey, often slightly silty, friable to soft and gummy, very fossiliferous, glauconitic, with interbedded Limestone, tan, gray and brown, fine grained, friable to slightly hard, fossiliferous, glauconitic.

The limestone occurs in the interval from 580 to 760 feet, and is much less abundant than in sections south of Lake Wellington. The Gippsland Limestone thickens to the south, reaching a maximum in the Hollands Landing well, where it is 1655 feet thick.

The Gippsland Limestone is composed of three substages which are from top to bottom, the Bairnsdale, Batesford and Longford. But since these substages cannot be recognized lithologically and their boundaries can only be determined by microfossils in cuttings which are

usually badly contaminated, the substage nomenclature has not been shown on the composite log.

1035 - 1230 feet

Lakes Entrance Formation

Oligocene

1035 - 1135 feet

Siltstone, gray-brown, tan and gray, calcareous, very glauconitic and pyritic, slightly hard, fossiliferous; with minor Limestone and Marl, as above.

1135 - 1230 feet

Clay, white, soft, sticky; Sand, white, medium to coarse grained with occasional pebbles; and Siltstone, Marl and Limestone, as above.

This formation represents the period of widespread marine transgression over the non-marine sediments of the Latrobe Valley Coal Measures. In the Southwest Bairnsdale No. 1 fine clastic material is the predominant type of sediment. Further south, in the Lake Wellington - Seaspray area, soft, calcareous shale is the characteristic lithology. Glauconite is present in moderate amounts in the Southwest Bairnsdale No. 1, but the highly glauconitic sandstone present at the base in the Lakes Entrance area is absent.

The Lakes Entrance Formation increases in thickness toward the south, reaching a maximum thickness of 786 feet in the Hollands Landing well.

1230 - 1408 feet

Colquhoun Gravel

Eocene

Sand and Gravel, mostly clean, unconsolidated; Sandstone, white to medium gray, hard; Clay, brown to white, partly ligneous, soft; and traces of brown coal and pyrite.

The clay is confined mostly to the upper 40 feet;

the gravel in the lower 140 feet is clean and very porous. The pebbles often exceed 1" in diameter and are composed mostly of quartz and variety of metamorphic rocks.

Foraminifera are present in the upper 60 feet, indicating that the sands and gravels were deposited in shallow marine water, probably near the mouth of a sizeable stream.

The name "Colquhoun Gravels" comes from the Lakes Entrance area where similar sediments have a thickness of about 60 feet. The gravels probably extend unbroken from the Southwest Bairnsdale No. 1 well to the Lakes Entrance area, but grade south and westward into the non-marine sediments of the Latrobe Valley Coal Measures.

1408 - 3806 feet

Avon River Group (Iguana Creek Beds)

Upper Devonian - Lower Carboniferous

Shale, brown-red to dark red, soft to slightly hard and brittle, slightly silty and micaceous, often mottled light green, light gray and white, irregular orange and white inorganic calcite masses; Siltstone, brown-red, green and gray green, slightly calcareous, argillaceous, micaceous, partly siliceous, friable to hard; Sandstone, light gray, light green and light red, firm to medium grained, often coarse grained, composed of angular grains of quartz and light green, gray and black volcanic rock fragments, occasional red shale inclusions, calcareous in upper part, becoming siliceous in lower part, hard and abrasive, "clean" to slightly argillaceous; and Conglomerate, hard, siliceous, argillaceous, composed mostly of quartz with chert, volcanic and other rock fragments, feldspar and red shale inclusions, very abrasive.

This sequence of "red beds" is well known from outcrops north of the Gippsland Basin. It has been called by various names such as "Avon River Group", "Iguana Creek Beds" and "Snowy Bluff Group". The name "Avon

River Group" appears to have precedence over the others, and that name has been used in this report.

The drilled sequence is very similar to that exposed north of the basin, except for the complete absence of volcanic flows in the well which are common in the lower part of the sequence. Sandstone is a minor constituent in the upper 1450 feet of the group, but below this, sandstones, replaced by conglomerate towards the base, are the predominant lithology.

No organic remains were found, and the sequence is believed to be completely non-marine in origin. The salinity of the drilling mud increased to approximately 3500 ppm, while drilling in these sediments. This suggests that the sediments were deposited in an arid climate, thereby favoring the enrichment of the connate waters with sodium chloride and other salts.

3806 - 3926 feet

Basement

Pre-Upper Devonian

Biotite Granite, light gray, medium to coarsely crystalline, consisting of quartz, potash feldspar, soda rich oligoclase and biotite.

In Core No. 6 at 3826 - 3830 feet the granite is slightly weathered and alteration products such as chlorite, kaolinite, sericite and calcite have been formed.

The granite is similar to granite in the Pilot Bore at Lakes Entrance, except for the presence of microcline in the latter.

S T R U C T U R E

The cores taken in the Avon River Group sediments all have dips of low magnitude, mostly 5° to 10°. No cores were taken in the Tertiary sequence, but the dip of these sediments is believed to be of very low magnitude, or even flat lying.

A continuous dipmeter survey was made from 2000 to 3853 feet, and the dip direction in the Avon River Group was

shown to be consistently toward the southeast. The average dip direction, or azimuth, was calculated at S12°E, with an average magnitude of 14°. This confirms the well being located slightly west of the southward plunging synclinal axis as projected southward from the Mitchell River syncline.

The absence of the volcanic flows in the basal part of the Avon River Group indicate that the underlying granite was a typographically high feature during the time of volcanic activity. The granite is believed to be a stock intruded into highly folded and slightly metamorphosed Ordovician sediments.

The absence of Middle Devonian sediments in the well means that the structural low, developed in Middle Devonian rocks at Tabberabbera, does not extend southward into the Gippsland Basin. More probably, the preservation of these beds at Tabberabbera is due mainly to faulting.

RELEVANCE TO THE OCCURRENCE OF OIL

No indication of hydrocarbons, except for three very small, insignificant shows of gas by the gas detector, were found in the Southwest Bairnsdale No. 1. The porous sands and gravels at the base of the Tertiary sequence contained only fresh water.

The almost complete lack of porosity in the Avon River Group sandstones eliminates these beds as potential reservoirs. The development of porosity further south in the subsurface is improbable.

POROSITY AND PERMEABILITY OF SEDIMENTS PENETRATED

The first occurrence of porosity was in sands in the lower part of the Tambo River Formation and marls at the top of the Gippsland Limestone. A water bore at the well site produced water from this zone at the approximate rate of 100 barrels per day.

The microlog showed that the Gippsland Limestone is impervious, except for occasional thin porous beds.

Very good to excellent porosity was found in about 75% of the Colquhoun Gravels. These gravels are "clean" for the most part, and should have very high permeability.

The sandstones of the Avon River Group are very tight because of the calcareous and siliceous cement. The siltstones, and the sandstones to a lesser extent, are argillaceous and also very tight. A formation test of the internal 2522-2559 feet produced no formation fluid.

Listed velow are porosities calculated from the microlog and sonic log, along with porosities and permeabilities determined from cores by the Bureau of Mineral Resources, Geology and Geophysics :

POROSITY AND PERMEABILITY DETERMINATION

TABLE 2

Depth	Porosity			Permeability	
	Microlog	Sonic log	Cores	Cores	
1320	32%	35%	Not cored	Not determined	Colquhoun Gravels
1380	27%	25%	"	"	"
1453	None indicated	13%	11%	Nil	
1810	"	7%	4.5%	Nil	
2340	"	8%	5.6%	Nil	
3574	16%	17%	Not cored	Not determined	
3655	Not reliable	6%	" "	"	"

CONTRIBUTION TO GEOLOGICAL CONCEPTS RESULTING FROM DRILLING

1. The Avon River Group of Upper Devonian - Lower Carboniferous age overlies granite basement at the well site.
2. The Middle Devonian sediments do not extend south from Tabberabbera beneath the axis of the Mitchell River syncline, into the Gippsland Basin.
3. The volcanic flows common in the lower part of the Avon River Group are absent in the well. The granite basement is thought to have been a topographical "high" during this period of volcanic activity.

4. The Colquhoun Gravels contain a marine microfauna of Eocene age. These gravels are thought to be a facies of the Latrobe Valley Coal Measures.

5. Porosity seen in sandstones of the Avon River Group in the outcrop area north of the basin have poor to fair porosity. However, these sandstones are very tight in the subsurface due to cementation.

24/40

S. W. BAIRNSDALE

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ROD, EMILE 1962 Investigation of selected localities in the Paleozoic framework of the Gippsland Basin, unpublished report for Arco Limited.

TALENT, J. A. 1955 Upper Devonian - Carboniferous rocks west of Freestone Creek, Gippsland, Victoria, unpublished report for Frome - Lakes Pty. Ltd.

APPENDIX I

S. W. BAIRNSDALE

LIST AND INTERPRETATION OF ELECTRICAL AND OTHER LOGS

The following Schlumberger logs were run :

Electrical log	Run 1	475' - 3342'
	Run 2	3200' - 3860'
Microlog	Run 1	475' - 3342'
	Run 2	3200' - 3860'
Sonic log	Run 1	475' - 3856'
Continuous Dipmeter	Run 1	2000' - 3853'

The logs for the most part are self-explanatory. Several important features should be noted, such as :

1. The lack of SP character. In the Tertiary sequence this is caused by the similar salinity of the formation waters and the drilling mud. In the Avon River Group the nearly straight SP curve is caused by the tightness of the sediments.

   The fresh water in the Colquhoun Gravels can best be seen on the lateral curve. The gravels have been moderately invaded by drilling mud as shown by the progressive decrease of resistivity from the long normal to the short normal curve.

2. Enlarged hole and lack of wall cake. This is probably due to the unconsolidated nature of the porous gravels and the inability of the mud cake to hold the individual pebbles in place.

   In the Avon River Group the lack of permeability has prevented the build-up of wall cake.

3. For determination of porosities the microlog is more reliable in the Tertiary sequence, and the sonic log is more reliable in the Avon River Group.

A mud logging caravan was leased from Oil Development N. L. for the duration of the drilling operation. This caravan housed the gas detection device and various other equipment used by the geologists while logging the well.

A Johnson-Williams hot wire gas detector was in continuous operation from 512 feet to total depth. During normal operations this detector operated on a voltage high enough to burn methane, plus all other combustible gases, but could be switched to a lower voltage whereby only hydrocarbons heavier than methane would ignite. By this arrangement the percentage methane in any gas "show" could be estimated. The values shown by the gas curve in the composite log are for total gas.

VELOCITY SURVEY

of the

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

SOUTHWEST BAIRNSDALE NO. 1

by

VICTOR BYCHOK

A velocity survey of the Arco - Woodside Southwest Bairnsdale No. 1 was conducted on 12 February, 1963, using the Schlumberger Sonic Tool. At the time of the survey the well had drilled into "basement rocks". The interval measured was from 475' to 3856'.

Assurface casing had been set to a depth of 477 ft., the velocity used in the computation for this interval was based on the measured average velocity for this interval in the Arco - Woodside Wellington Park No. 1.

Location of Well			
Latitude	37°52'6" South	Longitude	147°21'58" East
K.B.Elevation	236 feet	Total Depth Surveyed	3856 ft.
Casing Record	9-5/8" set at 477.5 ft.		

VELOCITY DATA

Dgd	Tgd	Δ Dgd	Δ Tgd	Vi	Vav
		246*	0.043*	5720*	
246*	0.043*				5720*
		518	0.0720	7194	
764	0.115				6644
		408	0.0553	7377	
1172	0.1703				6842
		592	0.0461	12842	
1764	0.2164				8152
		500	0.0342	14620	
2264	0.2506				9034

		500	0.0362	13312	
2764	0.2868				9637
		500	0.0336	14881	
3264	0.3204				10187
		328	0.0209	15698	
3592	0.3413				10524
		22	0.0012	18333	
3614	0.3425				10551

Explanation of Abberviations

Dgd - measured depth of sonde from datum elevation

Tgd - measured vertical time from datum elevation

Δ Dgd - difference in depth between interval depths

Δ Tgd - difference in vertical time between interval times

Vi - interval velocity = ft/sec = $\frac{\Delta \text{ Dgd}}{\Delta \text{ Tgd}}$

Vav - average velocity = ft/sec $\frac{\text{Dgd}}{\text{Tgd}}$

* - data from Arco - Woodside Wellington Park No. 1

DATUM PLANE - SEA LEVEL

Logging time - 2½ hours

Victor Bychkov

APPENDIX

FORMATION TESTING DETAILS

SOUTHWEST BAIRNSDALE No. 1

D.S.T. No. 1

2522'- 2559', Open hole, tool open 1 hour, no shut in, weak blow diminishing to no blow in 1 min., recovered 120 feet drilling mud, no water gas or oil. IHP 1270 psi, IFP 30 psi, FFP 90 psi, FHP 1300 psi.

S. W. BAIRNSDALE 30/40

APPENDIX 3

PALEONTOLOGICAL REPORT

REPORT ON TERTIARY STRATIGRAPHY FROM SOUTH-WEST BAIRNSDALE NO. 1 WELL

by

D. J. TAYLOR

Department of Mines, Victoria

Rotary cuttings samples have been examined from 30' to 1420' in Arco-Woodside's Southwest Bairnsdale No. 1 Well. No cores were cut in this interval, thus because of contamination the boundaries given cannot be considered exact and the maximum error is probably -30'.

The stratigraphy, based on foraminiferal content, is outlined below in drilled order. Unless otherwise stated, all rock units and stage names are those used by Carter (1963).

30 - 200 feet:

Unfossiliferous sands. These are probably Pliocene - Pleistocene in age and may represent the Lake Wellington Formation and/or the Haunted Hill Gravels.

200 - 280 feet:

Fossiliferous sands and clays, with an abundant fauna of large Foraminifera including Elphidium imperatrix, Massilina lapidigera, and Triloculina tricultrata. This fauna is typical of the upper Miocene Tambo River Formation. Milliolids predominate (90% to 99%) the foraminiferal fauna which suggests a shallow water (probably shoreline) environment.

280 - 550 feet:

The top of the Gippsland Limestone is at 280 feet. The fauna between 280 feet and 550 feet contains planktonic elements, including Orbulina universa, which are typical of the Bairnsdalian Stage and of the Bairnsdale Limestone Member. A high proportion of milliolids and laginids are noted. This proportion is unusually high for the Bairnsdale Limestone, thus a near shore environment is suggested.

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550 - 650 feet:

The first drilled appearances of Planorbulinella plana and Globoquadrina dehiscens were noted in this interval. The highest appearances of these species in the Gippsland Limestone is recorded in the Wuk Wuk Marls.

650 - 1040 feet:

The first drilled appearance of Astrononion centroplax is noted at 650 feet. This would approximate to the top of the Longfordian Stage, which is represented by the Longford Limestone, the basal member of the Gippsland Limestone.

1040 - 1240 feet:

There is a marked faunal change at 1040 feet. The planktonic fauna is still abundant, but is predominated by globigerinids of the Globigerina ouachitaensis - G. bulloides group. Globigerinoides spp. are absent. The benthonic fauna includes Astrononion centroplax, Calcarina mackayi, Lamarkina glencoensis, Crespinina kingscotensis and Sherbonina atkinsoni. The latter two species are confined to the Janjukian whilst the other species, including the globigerinids, are typical of the Janjukian. Therefore the faunal change at 1040 feet suggests the top of the Janjukian stage in this well. This interval is lithologically similar to the Lakes Entrance Formation.

1240 - 1415 feet:

At 1240 feet, Globigerina linaperta is present. This is a pre-Janjukian species and does not range above Faunal Unit 3 (Carter, 1959). Carter (1963) does not record it from the Gippsland nor does he record any other species which do not range above Faunal Unit 4. At 1260 feet G. linaperta is present with the Eocene Benthonic species, Anomalina westraliensis, Cibicides umbonifer and Guembelina rugosa. This fauna is definitely Upper Eocene in age and probably represents Faunal Unit 3 as the planktonic elements of Faunal Units 1 and 2 are not present.

1415 feet to T.D.:

Refer to reports by Talent and Bell.

Comments on Stratigraphy:

The major item of stratigraphic interest in this section is the positive identification of Upper Eocene sediments overlying the Lower Carboniferous sandstone at 1415 feet. These Upper Eocene sediments comprise sands and gravels and are marine in the top 60 feet (the top being at 1240). Because of cutting contamination it is not known if marine conditions extend below 1300 feet, although sedimentation appears to be continuous. The sediments are similar to the lowest Tertiary sediments in the Lakes Entrance sub-surface sections in which Crespin (1943) found Foraminifera. She regarded the gravels to be pre-Janjukian (i.e. Anglesean) and to be the equivalent of the Latrobe Valley Coal Measures. Boutakoff (1954) adheres to this view and refers to these sediments as the "Colquhoun Gravels". Carter (1963) agrees with Boutakoff but regards Crespin's Foraminifera as being drilling contamination. Carter's view is justified as most of the species listed by Crespin are Miocene (post Janjukian).

It is concluded that the interval from 1240 feet to 1415 feet in Southwest Bairnsdale No. 1 Well is a distinct rock unit and that it represents the "Colquhoun Gravels" in the Lakes Entrance area. This conclusion is supported by the distinct faunal content which represents Faunal Unit 3. The fauna at the base of the overlying unit (the Lakes Entrance Formation) represents Faunal Unit 5. The "Colquhoun Gravels" are of the order of 60 feet thick under Lakes Entrance. The proximity to the Lower Carboniferous sandstones may account for the thicker development (175 feet) in the Southwest Bairnsdale section.

Both the base and top of the Lakes Entrance Formation are clear lithologically and closely corresponds with the paleontological determinations. The top is marked by the change from an arenaceous/argillaceous sequence to a calcareous sequence. This agrees with the type section at Lakes Entrance. But in the central and western part of the basin the change is more transitional so that the top of the Lakes Entrance Formation is difficult to pick on lithology alone. The greensand member of this Formation is not developed.

The Gippsland Limestone is not well developed. The Glencoe Limestone Members appear to be absent on paleontological grounds.

It is suggested that Tertiary marine sedimentation in this section took place close to the northern margin of the Gippsland Basin. This is supported by the palaeoecology of the Gippsland Limestone; the distinct boundary between the Lakes Entrance Formation and the Gippsland Limestone which agrees with the boundary between the Janjukian and Longfordian (as at Lakes Entrance); and the presence of the "Colquhoun Gravels" which are absent from the central, deeper parts of the basin.

The marine Tertiary sequence in Southwest Bairnsdale No. 1 well is tabulated below. (Depths quoted are drilled depths).

Depth ft.	Faunal Units (Carter) 1959)	Australian Tertiary Stages Carter, 1969	Rock Units (Carter, 1962)	
			Formation	Member
30-200			Lake Wellington or Haunted Hills Gravels	
200-280		Mitchellian	Tambo River	
280-550	11	Bairnsdalian	Gippsland Limestone	Bairnsdale Limestone
550-650	10	Balcombian		Wuk Wuk Marls
** 650-1040	8-6	Longfordian		Longford Limestone
1040-1240	5	Janjukian	Lakes Entrance	
1240-1415	3	Johannian	"Colquhoun Gravels"	

** Note absence of Bateesfordian Stage and apparent absence of Glencoe Limestone.

S. W. BARNSDALE 34/40

References :

Boutakoff, N. 1954 A new approach to petroleum geology and oil possibilities in Gippsland. Vic. Mining and Geol. J., 5 (4-5).

Carter, A. N. 1959 Guide Foraminifera of the Tertiary Stages in Victoria. Vic. Mining and Geol. J. 6. (3), 48-54.

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Crespin, I. 1943 The stratigraphy of the Tertiary marine rocks in the Gippsland, Victoria. Min. Resourc. Surv., Aust., Palaeont. Bull. 4.

D. J. TAYLOR,
Geologist.
7.3.1963

APPENDIX 4 S.W. BAIRNSDALE 35/40

PETROLOGICAL REPORTS

REPORT ON AVON RIVER GROUP CUTTINGS AND CORES FROM ARCO S.W. BAIRNSDALE NO. 1 BORE

by JOHN A. TALENT
Department of Mines, Victoria

A detailed log of cores and cuttings is appended to this report; it will suffice to summarize the lithologic succession. It should be borne in mind that there will be a slight discrepancy between the depth struck and the return of cuttings.

1430 - 1830'	Drab claret siltstone with minor grey siltstone and some sandstone in the range 1670-1680; siena claystone in the range 1710-1730.
1830 - 1860'	Alternating siltstones and sandstones.
1860 - 2500'	Drab claret siltstone with some very fine grey sandstone in the range 2050-2080, 2180-2190, 2200-2210, 2460-2470 and with ragged masses of inorganic calcite in core 3 at 2330-2340.
2510-3300'	Fine sandstone with some drab claret siltstone.
3300 - 3320'	Drab claret siltstone.
3320 - 3340'	" " " and sandstone.
3340 - 3360'	Drab claret claystone.
3360 - 3430'	Drab claret siltstone and sandstone.
3430 - 3470'	Sandstone with siltstone in last 10'.
3470 - 3510'	Drab claret siltstone.
3510 - 3790'	Sandstone and siltstone alternating continuously.
3790 - 3800'	Sandstone and first granodiorite cuttings.
3800 - 3930'	Granodiorite.

The succession corresponds roughly with that described by Easton (1938, Mining and Geol. Journ., v.1) from the Mitchell River in that there is a basal sequence of sandstones

followed by a sequence of dominantly drab claret coloured siltstones. It differs from that sequence in the Mitchell River valley by the apparent absence of rhyolites and acid lavas low in the sequence; the total absence of basalts contrasts with sections to the west on Iguana and Freestone creeks. It would therefore seem that S.W. Bairnsdale No. 1 was located on a "high" of the pre-Upper Devonian land surface which was not covered by extrusive igneous rocks. A similar "high" is indicated by the tapering out of lavas in a north-easterly direction from the vicinity of Iguana and Cobbannah creeks towards Tabberabbera.

Irregular masses of inorganic carbonate transgressing the bedding of the drab claret siltstones, and clearly post the deposition of the siltstones, occurs in core 3 at 2330-2340'; tiny patches of similar calcite occur in the siltstone cuttings at 1750-1760'. Thin sections of both occurrences show no organic structure whatever. Such bodies of calcite are responsible for the irregular cavities found in the siltstones at some outcrops of Avon River Group sediments; they are also a source of calcite for the stalactites and stalagmites found in rock shelters in gorges along the Mitchell River and adjacent streams.

No organic remains, other than Tertiary contamination, was found in the cuttings; the cores were unfossiliferous. This and the condensed sequence on a pre-Upper Devonian "high" is not favourable to the hypothesis of a passage to marine sediments in the Devono-Carboniferous sub-surface in the Gippsland Basin.

JOHN A. TALENT

S. W. BAIRNSDALE 37/40

PETROGRAPHIC ANALYSIS

BIOTITE GRANITE

by
G. BELL
Department of Mines, Victoria

Core 6. 3326' - 3830'

Core Sample

Greenish white, quartz-rich plutonite showing signs of intense alteration. Broken surfaces show a development of green chlorite in a rock mass consisting of small, black biotite flakes in cloudy-white feldspar and clear quartz.

Thin Section

Coarse grained granite consisting of clear quartz, sericitised and kaolinised potash feldspar, soda-rich oligoclase and chloritised biotite. A small proportion of the oligoclase is fresh and well twinned according to both carlsbad and albite laws, but most is clouded by secondary sericite and kaolinite. Most of these altered grains show traces of twinning and zonal banding.

Potash feldspar appears to be somewhat in excess of plagioclase and occurs as large partly altered grains.

Biotite is almost completely altered to penninite and calcite, but shows a laminated form and exhibits pleochroism where alteration is not complete.

Accessory minerals include primary crystals of pale-green apatite and secondary grains of pyrite.

Comparisons

The only material for comparison was a number of sections of granitic material from various bores in the Lakes Entrance, Lake Bunga and Colquhoun areas.

S. W. BAIRNSDALE 38/40

If sections can be compared with any reliability, the only one which closely resembled the Arco-Woodside sample was one from 1330' (sl. 4962) in the Pilot Bore, Lakes Entrance Shaft. This section, however, shows that in this granite, biotite and feldspar are not so extensively altered while a small proportion of microcline is present. Unfortunately this slice has been badly broken during preparation.

Another similar rock occurs in Lake Bunga No. 2 Bore at 1272' (slices 2840 and 7993). This however shows more microcline.

No granite samples were found in the Department's collections from Sarsfield or Granite Rock and therefore no comparison with this material could be made.

G. BELL.
7/3/1963

S.W. BAIRNSDALE

39/40

APPENDIX NO. 5

CORE DESCRIPTIONS

CORE NO. 1, 1443' - 1454', recovered 10'

1443' - 1453' Predominantly Shale, dark brown - red with light green laminations and light green oxidized zones along short irregular fractures, partly silty and slightly hard, brittle, slight to moderate cross-bedding, some redeposited mud chips, small scale slumping common, occasional white calcareous patches, dips of 0 - 15°, most reliable 8 - 9°.

CORE NO. 2, 1810' - 1820', recovered 9'

1810' - 1815' Shale, dark red, hard, irregular fractures, occasional light green laminations, partly silty, slightly micaceous, small irregular white calcareous patches.

1815' - 1819' Shale, dark chocolate brown, moderate to hard, brittle, slightly micaceous, very slightly calcareous, occasional Sandstone bands up to 2" thick, gray-brown, hard, slightly micaceous, fine grained, slightly argillaceous, slightly calcareous, tight. Gentle crossbedding throughout core. Dip of 5° to 10°.

CORE NO. 3, 2330' - 2340', recovered 10'

2330' - 2337.5' Shale, dark brick red, slightly silty, dense, slightly hard, brittle.

2331' - 2333' Shale, as above, with abundant irregular banded masses of calcite.

2333' - 2338' Shale, dark red to red-brown, partly silty, slightly hard, finely micaceous; interlaminated with Siltstone, dark red brown, argillaceous, micaceous, often exhibits graded bedding, slightly to moderately cross-bedded, dips of 0 - 12°.

2337.5' - 2338' Sandstone, light grey - green, very fine grained, slightly calcareous, hard, tight, wavy contact at base with shale, grading into shale upwards, ground mass of quartz, green and black minerals with occasional specks of red clay.

2338' - 2340' Shale, dark red with occasional irregular masses of light green calcite, occasional slickensides.

CORE NO. 4, 2840' - 2848', recovered 4.5'

2840' - 2840.8' Sandstone, light gray-green, very fine to fine grained, angular quartz and basic minerals, micaceous, calcareous and siliceous cement, trace of pyrite, hard, tight, occasional inclusions of siltstone, irregular masses of white and tan calcite with a pseudo-organic appearance. Thin laminations of gray and gray-green shale. Steeply inclined fractures with slickensided surfaces common. Dip of low magnitude.

CORE NO. 5, 3332' - 3338', recovered 4'

(* Note : Core head completely worn out, lost one cone)

3332' - 3336' Sandstone, medium brown-red, fine to medium grained, poorly sorted, conglomeratic in internal 3333' - 3333.5', grains of clear and smoky quartz, light gray and light green aphanitic rock fragments common, abundant fragments of red shale, siliceous cement, slightly calcareous and argillaceous, very hard and tight, poorly bedded, poorly visible dips of 5 - 10°.

CORE NO. 6, 3826' - 3830', recovered 4'

3826' - 3830' Granite, gray, medium to coarsely crystalline, alteration products of chlorite and calcite along oblique fractures.

PALAEOZOIC GRANODIORITE FROM ARCO-WOODSIDE'S SOUTHWEST BAIRNSDALE 1 WELL (N. FLANK OF GIPPSLAND BASIN)

INTRODUCTION.

Arco-Woodside's Southwest Bairnsdale 1 well was drilled in 1963 about 15 miles W. S. W. of Bairnsdale on the north flank of the Gippsland Basin (Fig. 1). The well details and composite logs are contained in the B. M. R.'s Petroleum Search Subsidy Acts Publication No. 77 published in 1966.

Southwest Bairnsdale 1 penetrated Cainozoic and Upper Devonian-Lower Carboniferous sediments before encountering, at 3, 806 feet (3, 570 feet below sea level), an unexpected granitic mass which was drilled 120 feet to total depth (Fig. 2).

Although described in the published completion report (P. S. S. A. Publ. 77) as a granite, the following description indicates that it is actually a granodiorite. The sample examined was taken from Core 6 at 3, 826-30 feet and submitted in 1963 by G. Bell for thin-sectioning.

HAND SPECIMEN (Rock No. 15297)

The hand specimen of the core is a hard, medium-grained granitic rock with a very pale green coloration. It apparently consists of quartz, white to pale green feldspar and biotite. A fine trace of pyrite was noted.

PETROGRAPHY (Slide No. 8664)

In thin-section the rock is medium-grained, relatively equigranular, and holocrystalline. It has a normal granitic texture and consists predominantly of quartz and partly altered feldspar and biotite. There is a tendency for the quartz and feldspar to be segregated into distinct patches rather than the normal random distribution.

Quartz is anhedral and up to 3. 5 mm across. Inclusions are rare other than a few small altered biotites.

Plagioclase feldspar is perhaps the most abundant mineral and consists of calcic oligoclase. The crystals are anhedral and rarely subhedral and are up to 4. 3 mm across. The larger ones are relatively common and tend to be block-shaped. The plagioclase is rarely fresh, but is sericitised, and often severely, so that the original crystal is virtually

unidentifiable. Mild kaolinisation is also evident. Twinning is not widespread, and many of the feldspars are poorly zoned instead, whereas others are neither twinned nor zoned. The latter, which could be taken as orthoclase, are assumed by the writer to be plagioclase because they have the same size range and share the same alteration products as the identifiable plagioclase feldspar. In addition to sericite alteration there is also sufficient finely disseminated chlorite to give the crystals a pale green tinge in the hand specimen. Very fine calcite is yet another alteration product. Inclusions in the plagioclase include apatite needles and some small altered biotite crystals.

Potash feldspar is in minor amounts only. It is finer-grained than the plagioclase and is usually of the order of 1.25 mm in size. It shows kaolinite alteration to a limited extent, but is deficient in sericite alteration. The majority of the potash feldspar is orthoclase, though some perthite is present.

Biotite flakes are up to 2.5 mm long. They have ragged outlines and are altered to chlorite - penninite - and other accessories. The latter consist of calcite; iron ore, which is disseminated, anhedral leucoxene and rare, euhedral pyrite; uncommon epidote; and occasional apatite. In one example alteration of the biotite has proceeded beyond the chlorite stage to a colorless, fibrous mineral, believed to be vermiculite, which is interleaved with the remaining chlorite.

Tourmaline and zircon are present in the thin-section but are extremely rare.

Mention is made above of calcite as an alteration product of plagioclase feldspar, but it also present as occasional narrow veins traversing the thin-section.

COMMENTS

The rock is a biotite granodiorite. Alteration, particularly of biotite and plagioclase feldspar, is well established.

The nearest outcropping granitic rock is that north of Bairnsdale near Sarsfield, but this is a granite (Hocking, 1969), and is almost certainly a different intrusion.

3/4

REFERENCE

Hocking, J. B., 1969. Palaeozoic granite from the Sarsfield area, north of Bairnsdale (N. margin of Gippsland Basin).

Vict. Mines Dept. unpublished report 1969/26

Berry Hocking

J. B. HOCKING,
Geologist,
Sedimentary Basin Studies Section.

29th August, 1969.

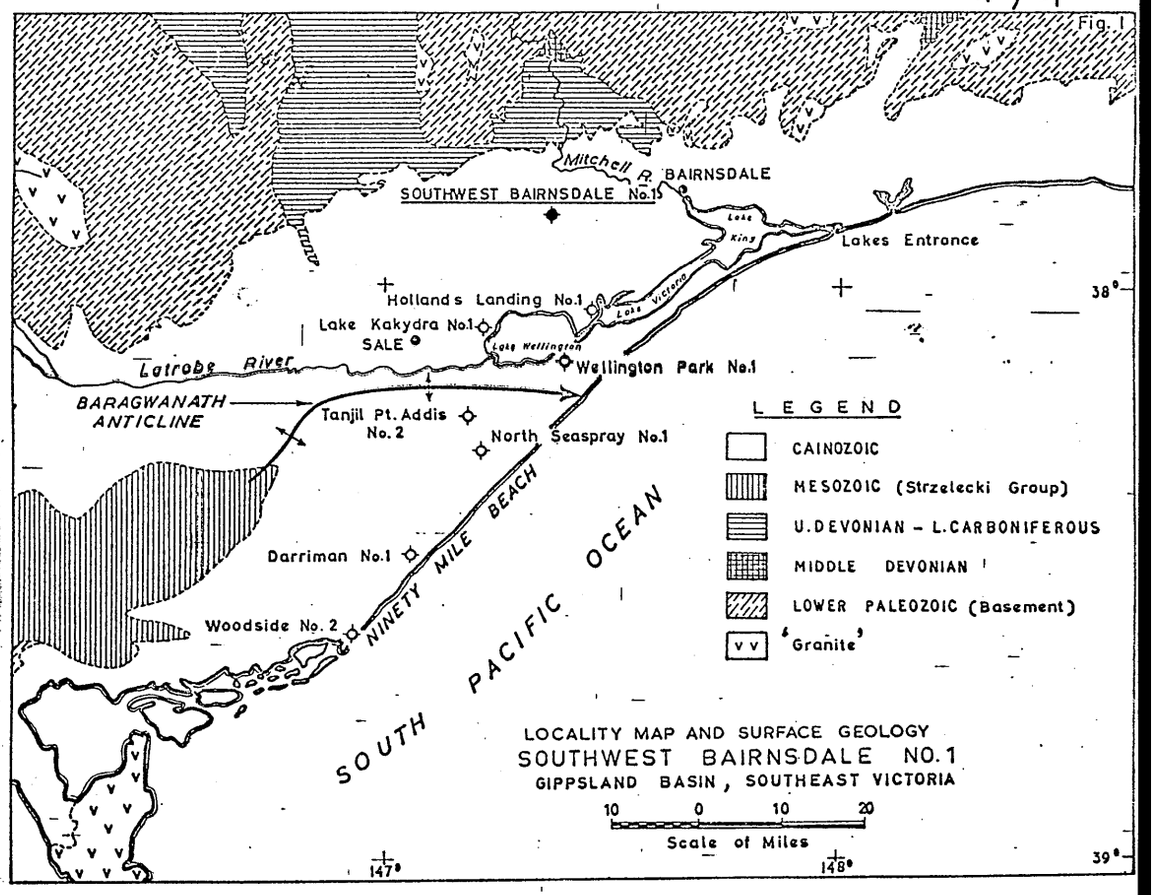

FIG.1 Location map (from P.S.S.A. Publication No.77)

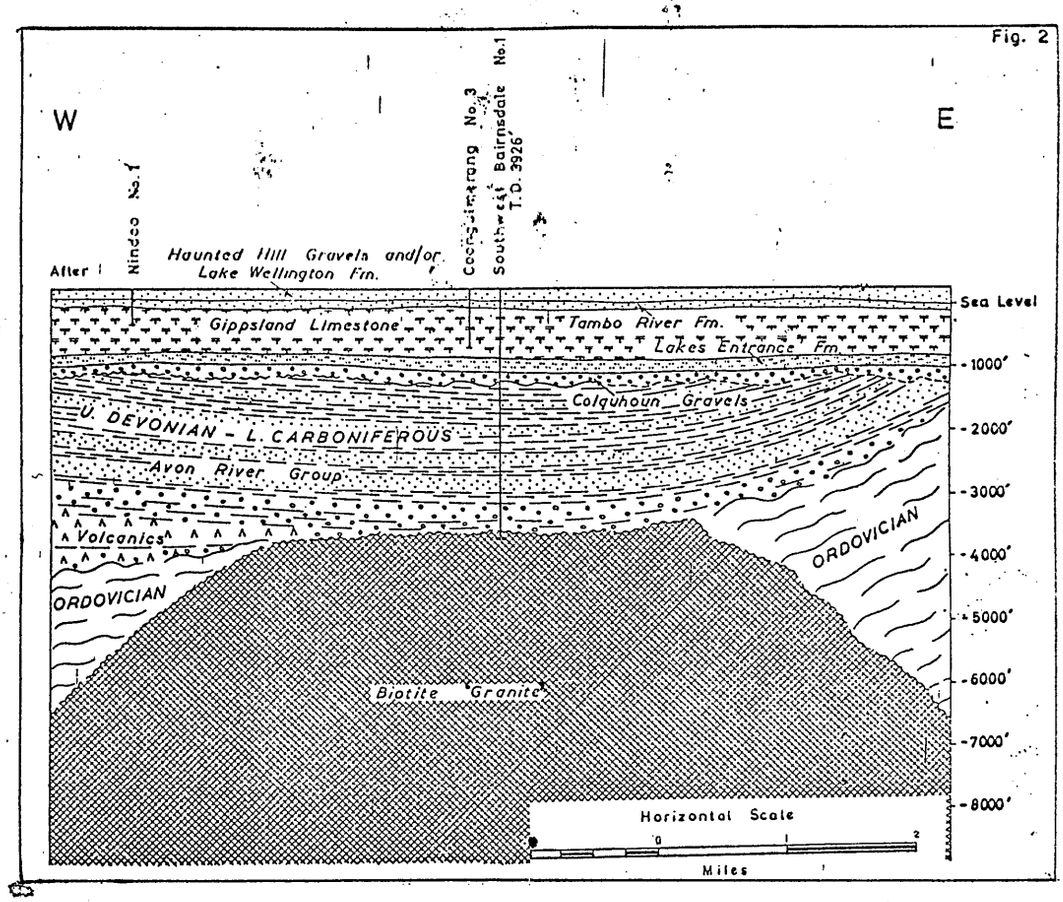

FIG.2 Cross-section (from P.S.S.A. Publ. No.77)

B.M.R. 27-2-63

M.D. F/L No. 3092 "B"

Petroleum Technology Laboratory, Bureau of Mineral Resources, Geology and Geophysics, Canberra

Date: 19th February, 1963.

CORE ANALYSIS RESULTS

Notes (i) Unless otherwise stated, the porosities and permeabilities were determined on two small plugs (V & H) cut at right angles from the core or sample. Ruska field porometer and permeameter were used with air and dry nitrogen, respectively, as the saturating and flowing media. (ii) Oil and water saturations were determined using Dean-Stark type extraction apparatus. (iii) Acid solubilities were determined using 15% commercial hydrochloric acid (iv) N.D. means Not Determined.

Well or Area	Core or sample number	Depth in ft. From: To:	Effective porosity % by Vol.		Absolute permeability in millidarcys		Avg. density in gm./c.c.		Fluid saturation			Acid solubility % by vol.	Oil Characteristics		
			V.	H.	V	H.	Dry Bulk	Grain	Water % pore space	Oil: % pore space	Oil: Metric tons/ acre ft		Fluorescence in solvent	Colour of extracted oil.	Fluorescence of extracted oil.
South West Bairnsdale No. 1	1	1453	11	11	Nil	Nil	2.41	2.69	59	Nil	Nil	Nil	Trace	Nil Oil	Nil Oil
"	2	1810	5	4	"	"	2.63	2.74	45	"	"	"	"	"	"
"	3	2340	6		"	"	2.58		52	"	"	"	"	"	"

Additional information: Acetone tests on these cores proved negative.

General file no. 62/399

Well file no. 62/1224

3414

PE602063

This is an enclosure indicator page.
The enclosure PE602063 is enclosed within the container PE904013 at this location in this document.

The enclosure PE602063 has the following characteristics:

ITEM_BARCODE	= PE602063
CONTAINER_BARCODE	= PE904013
NAME	= Composite Well Log
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Composite Well Log Southwest Bairnsdale No 1
REMARKS	=
DATE_CREATED	= 12/02/63
DATE_RECEIVED	=
W_NO	= W474
WELL_NAME	= Southwest Bairnsdale-1
CONTRACTOR	= Arco Ltd/Woodside Oil Co
CLIENT_OP_CO	= Arco Ltd/Woodside Oil Co

(Inserted by DNRE - Vic Govt Mines Dept)

PE906344

This is an enclosure indicator page.
The enclosure PE906344 is enclosed within the container PE904013 at this location in this document.

The enclosure PE906344 has the following characteristics:

ITEM_BARCODE	= PE906344
CONTAINER_BARCODE	= PE904013
NAME	= Stratigraphic Column
BASIN	= GIPPSLAND
PERMIT	= PPL185
TYPE	= WELL
SUBTYPE	= STRAT_COLUMN
DESCRIPTION	= Generalised Stratigraphic Column for Southwest Bairnsdale-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 2/01/86
W_NO	= W474
WELL_NAME	= SOUTHWEST BAIRNSDALE-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE904014

This is an enclosure indicator page.
The enclosure PE904014 is enclosed within the container PE904013 at this location in this document.

The enclosure PE904014 has the following characteristics:

ITEM_BARCODE	= PE904014
CONTAINER_BARCODE	= PE904013
NAME	= Geologic Cross Section
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= CROSS_SECTION
DESCRIPTION	= Geologic Cross Section Before & After drilling
REMARKS	=
DATE_CREATED	= 24/05/63
DATE_RECEIVED	=
W_NO	= W474
WELL_NAME	= Southwest Bairnsdale-1
CONTRACTOR	= Arco Ltd/Woodside Oil Co
CLIENT_OP_CO	= Arco Ltd/Woodside Oil Co

(Inserted by DNRE - Vic Govt Mines Dept)

PE906345

This is an enclosure indicator page.
The enclosure PE906345 is enclosed within the container PE904013 at this location in this document.

The enclosure PE906345 has the following characteristics:

ITEM_BARCODE	= PE906345
CONTAINER_BARCODE	= PE904013
NAME	= Time/depth curve
BASIN	= GIPPSLAND
PERMIT	= PPL185
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Time/depth curve for Southwest Bairnsdale-1
REMARKS	=
DATE_CREATED	= 13/02/63
DATE_RECEIVED	= 2/01/86
W_NO	= W474
WELL_NAME	= SOUTHWEST BAIRNSDALE-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE906346

This is an enclosure indicator page.
The enclosure PE906346 is enclosed within the container PE904013 at this location in this document.

The enclosure PE906346 has the following characteristics:

ITEM_BARCODE	= PE906346
CONTAINER_BARCODE	= PE904013
NAME	= Seismic section
BASIN	= GIPPSLAND
PERMIT	= PPL185
TYPE	= SEISMIC
SUBTYPE	= SECTION
DESCRIPTION	= Seismic section - line 67, Southwest Bairnsdale-1
REMARKS	=
DATE_CREATED	= 8/08/69
DATE_RECEIVED	=
W_NO	= W474
WELL_NAME	= SOUTHWEST BAIRNSDALE-1
CONTRACTOR	= UNITED GEOPHYSICAL CORP
CLIENT_OP_CO	= WOODSIDE OIL NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE907039

This is an enclosure indicator page.
The enclosure PE906347 is enclosed within the container PE904013 at this location in this document.

The enclosure PE906347 has the following characteristics:

ITEM_BARCODE	= PE906347
CONTAINER_BARCODE	= PE904013
NAME	= Regional Seismic section
BASIN	= GIPPSLAND
PERMIT	= PPL185
TYPE	= SEISMIC
SUBTYPE	= SECTION
DESCRIPTION	= Regional Cross-section of seismic lines 69/67 and 69/79
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W474
WELL_NAME	= SOUTHWEST BAIRNSDALE-1
CONTRACTOR	=
CLIENT_OP_CO	= ARCO LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)