WCR

Well Completion Report

Ballangeich - 1

(W965)

Phoenix Oil & Gas NL

A. Williams

PHOENIX OIL & GAS N.L.

November 1987

BALLANGEICH NO. 1

WELL COMPLETION REPORT

PHOENIX OIL & GAS N.L.

COMPILED BY: A. J. WILLIAMS

DATE: NOVEMBER, 1987

BALLANGEICH 1

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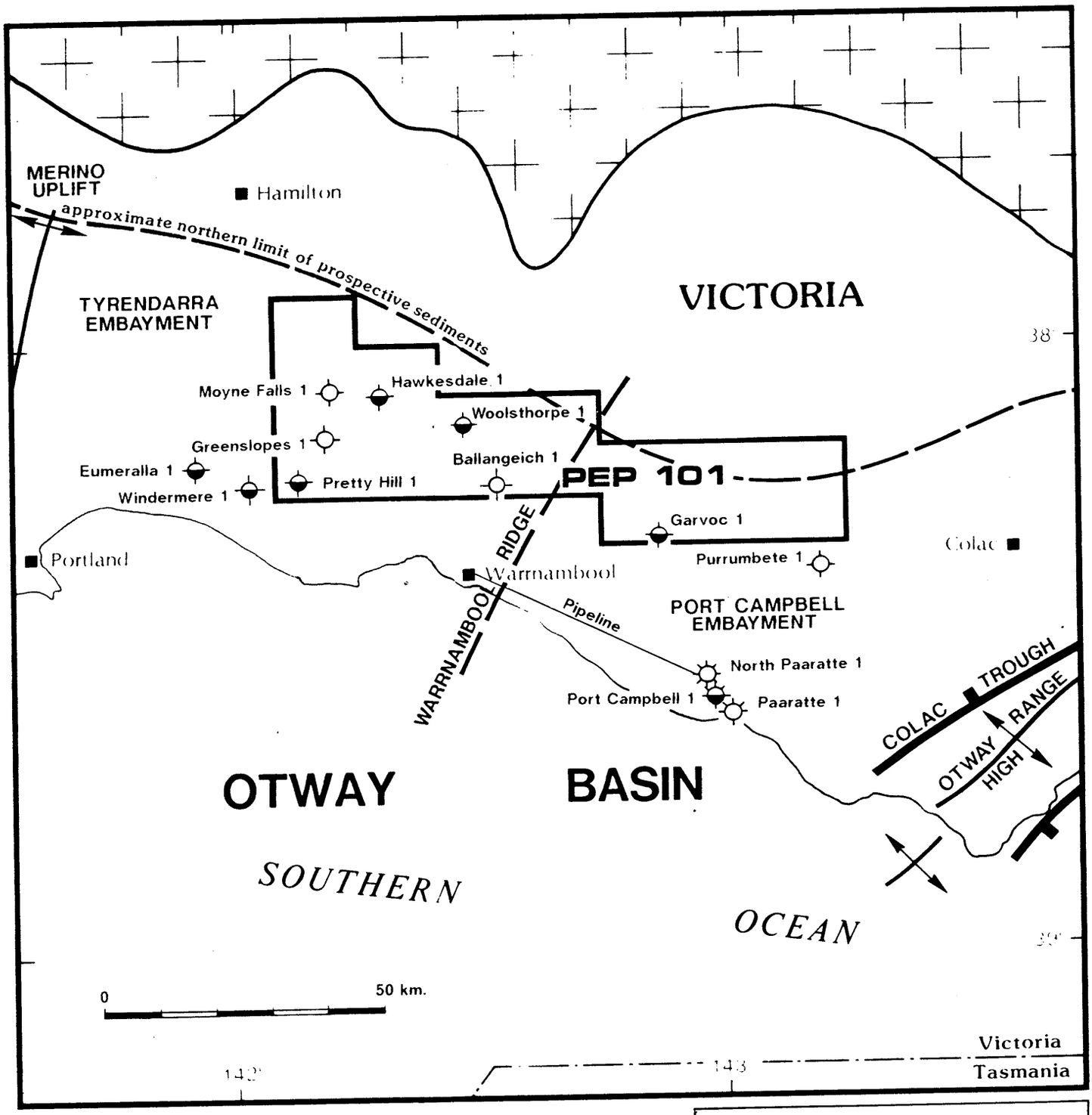
LOCATION MAP



gas well
show of gas
show of oil and gas
show of oil
dry well
basement

PHOENIX OIL & GAS N.L.

ONSHORE VICTORIA

OTWAY BASIN

PEP 101

Author : A.J.Williams	
Drawn By : WHS	Date : 29/10/87

WELL DATA CARD

BALLANGEICH 1

WELL SUMMARY SHEET

OPERATOR	Phoenix Oil & Gas N.L.	**LOCATION**	
DRILLING CONTRACTOR	G.D.S.A.	**Latitude**	38 14'15" S
RIG	Superior 700E SCR	**Longitude**	142 38'30" E
SPUDDED	19.7.87 0010 Hours	**Easting**	54643645.97m
COMPLETED	29.7.87. 2400 Hours	**Northing**	5766625.32m
		Seismic	Line OPX84A-17 SP 186 Line OPX84A-18 SP 140

TOTAL DEPTH		**ELEVATION**	
Driller	1249.9m	**G.L.**	98.25m
Logger	1245.7m	**K.B.**	103.53m

STRUCTURE TYPE

Tilted horst block play with westerly dip and rollover into the horst faults.

COMPLETION DETAILS			
PLUG 1	1125-1175m	**PLUG 2**	800-850m
SURFACE PLUG	10 Sacks	**PLUG 3**	150-180m

CASING DETAILS				
Casing Size	9⅝"	**Shoe Depth**	162m(D)	162m(L)

FORMATIONS PENETRATED

AGE	FORMATION	DEPTH	ELEVATION	THICKNESS
Tertiary	Unnamed Basalt	surface	98.25m	37.0m
	Pt.Campbell Limestone	37.0m	61.25m	80.0m
	Gellibrand Marl	117.0m	-18.75m	250.0m
	Clifton Formation	367.0m	-268.75m	110.0
Early Cretaceous	Eumeralla Formation	477.0m	-378.75m	341.0m
	Heathfield Sandstone	818.0m	-719.75m	26.0m
	Geltwood Beach Formation	844.0m	-745.75m	306.0m
	Pretty Hills Sandstone	1150.0m	-1051.75m	26.0m
Early Jurassic	Shale Unit	1176.0m	-1077.75m	25.0m
	Casterton Beds	1201.0m	-1102.75m	25.0m
Pre Jurassic ?	Unnamed Basement	1226.0m	-1127.75m	23.9m
	TOTAL DEPTH (Driller)	1249.9m	-1151.65m	
	TOTAL DEPTH (Logger)	1245.7m	-1147.45m	

LOGS

LOG TYPE	SUITE	INTERVAL (M)	BHT / TIME
DDL/MSFL/GR/CAL/SP	1	161-TD	126°F/6'42" (6.7)hrs
BHC/CAL/GR	1	161-TD	138°F/10'50" (10.8)hrs

CORES	TESTS
Nil	Nil

PE905660

This is an enclosure indicator page.
The enclosure PE905660 is enclosed within the container PE905659 at this location in this document.

The enclosure PE905660 has the following characteristics:

ITEM_BARCODE	= PE905660
CONTAINER_BARCODE	= PE905659
NAME	= Drilling Time Graph
BASIN	= OTWAY
PERMIT	= PEP101
TYPE	= WELL
SUBTYPE	= DIAGRAM
DESCRIPTION	= Ballangeich-1 Drilling Time Graph from Well Completion Report
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 25/11/87
W_NO	= W965
WELL_NAME	= BALLANGEICH-1
CONTRACTOR	=
CLIENT_OP_CO	= PHOENIX OIL & GAS N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

WELL HISTORY

1. GENERAL DATA

WELL NAME:	Ballangeich # 1	
Interest Holder:	Phoenix Oil and Gas N.L.	44.5%
	Santos Limited	22.5%
	Bridge Resources	11.125%
	Winton Oil N.L.	6.675%
	Lakes Oil Limited	5.0%
	Conex Australia	10.45%
	* Conex Australia earned its interest from all partners but Lakes Oil by contributing to the cost of this well.	
Participating Interest:	Phoenix Oil and Gas N.L.	44.5%
	Santos Limited	22.5%
	Bridge Resources	11.125%
	Winton Oil N.L.	6.675%
	Lakes Oil Limited	5.0%
	Conex Australia	10.45%
Operator:	Phoenix Oil and Gas N.L.	
Permit:	PEP-101	
Location:	Latitude 38° 14' 12.3942" S Longitude 142° 38' 28.8292" E	
	Eastings 54643645.97m Northings 5766625.32m	
Elevation:	GL: 98.25m AHD KB: 103.53m	
Seismic Reference:	Line OPX 84A-17 SP 186 Line OPX 84A-18 SP 140	
Total Depth:	1250m	
Well Status:	Plugged and Abandoned	

2. DRILLING DATA

Drilling Commenced:	0010 hrs. 19.7.87
Drilling Completed:	27.7.87

Rig Released: 2400 hrs. 29.7.87

Total Rig Time: 11 days

Contractor: Gearhart Drilling Services (Australia) Pty. Ltd.

Rig: Gearhart Rig No. 2

Type: Superior Model 700E SCR

Drawworks: One superior model 700E electric driven drawworks complete with auxiliary brake and sandreel. Maxium input H.P. 1000. Driven by EMD Motor.

One Foster Model 37 Break-out Cathead. Mounted on drillers side.

One Foster Model 24 Break-out Cathead. Mounted off drillers side.

Transmission - 2 speed transmission with high chain 1 1/4" triple 26T to 24T. Twin disc PO218 air clutch. Low chain 1 1/4" triple 20T to 39T twin disc PO218 air clutch.

Engines: Four Caterpiller Model 3412 PCTA diesel engines.

Mast: Floor mounted cantilever mast Dreco - Model No: M12713-510 designed in accordance with A.P.I. specification 4E "Drilling and Well Servicing Structures".

Clear Working Height	127'
Base Width	13' 6"
Hook Load	
Gross Nominal Capacity	510,000 LBS
Hook Load Capacity With:	
10 Lines Strung	410,000 LBS
8 Lines Strung	365,000 LBS
6 Lines Strung	340,000 LBS
4 Lines Strung	306,000 LBS
Maximum Wind Load 100 MPH	No Setback
Maximum Wind Load 84 MPH	Rated Setback

	Adjustable racking board with capacity for 108 stands of 4½" drill pipe, 10 stands of 6 ½" drill collars, 3 stands of 8" drill collars designed to withstand an A.P.I. windload of 84 MPH with pipe racked.
Crown Block	215 ton with five 36" sheaves, and one 36" fastline sheave grooved 1 1/8"
Substructure:	One piece substructure. 14' H X 13'6" W X 50'L W/12' BOP clearance. Set-back-200,000 LBS - Casing=210,000 LBS
Rig Lighting:	Explosion proof fluorescent.
Travelling Block:	One 667 Crosby McKissick 250 ton combination block hook Web Wilson 250 Ton Hydra - Hook Unit 5 - 36" sheaves.
Kelly Drive:	One Foster Kelly Spinner for an Ideco TL-200 swivel.
Kelly:	One square Kelly Drive 4¼" X 40' complete with scabbard.
Swivel:	One oilwell PC-300 ton Swivel.
Rotary Table:	One oilwell a 20 ½" Rotary Table Torque tube driven from drawworks
Air Compressors & Receivers:	Two Leroi Dresser Model 660A air compressor packages c/w 10 H.P. motors rated at 600 volt 60 HZ 3 phase. Receivers each 120 gallon capacity and fitted with relief valves.
Instrumentation:	One (1) 6 Pen Drill Sentry Recorder to record: Weight (D) 1-Martin Decker Sealtite 1-Cameron Deadline Type Penetration (Feet) Pump pressure (0-6000 P.S.I.) Electric Rotary Torque Rotary Speed R.P.M.) Pump S.P.M. (with selector switch)

	One (1) Drillers console including the following equipment: Martin Decker weight indicator type "D" Electric rotary torque Guage Pit scan S.P.M. gauge (2 per console) Rotary R.P.M. gauge One set of "Double Shot" Deviation instrument "Totco". One set of mud testing laboratory standard kit (Baroid)
Drilling Line:	5000' of 1 1/8" - Tiger brand
Mud Pumps:	Two Gardner Denver mud pumps model No. PZ-8 750 each driven by 800 HP EMD Motor
Generator:	Four Brown Boveri 600 Volt 3 Phase 60 HZ AC Generators, powered by four Cat 3412 PCTA Diesel Engines.
B.O.P.'s and Accumulator:	One Hydril 13 5/8" X 3000 P.S.I. spherical annular B.O.P., studded top and flanged bottom. Height 14" One Hydril 13 5/8" X 5000 P.S.I. flanged double gate B.O.P. One Galaxie 13 5/8" X 5000 P.S.I. 3000 double studded adaptor flanges complete with studs and nuts. One cup tester. Gray c/w test cups for 9-5/8" and 13 3/8" One Wagner model 130-160 3 BND 160 gallon accumulator consisting of: Sixteen 11 gallon bladder type bottles One 20 H.P. electric driven tripex pump 600 volt 60 HZ 3 phase motor and controls One Wagner model A-60 auxiliary air pump 4.5 gals/minute One Wagner Model UM2SCB5S mounted hydraulic control panel with five (5) 1" stainless steel fitted selector valves and two (2) stripping controls and pressure reducing valves. Three (3) 4" hydraulic readout gauges: -one for annular pressure -one for accumulator pressure -one for manifold pressure

One Wagner Model GMSB - 5A 5 station remote drillers control with three pressure readback gauges, increase and decrease control for annular pressure.

Spools: One set flanged adaptor spools to mate 13-5/8" LOT X 5000 P.S.I. A.P.I. B.O.P. flange to following wellhead flanges:

12" X 900 Series, Height 14"
10" X 900 Series, " "
8" X 900 Series, " "
B.O.P. Spacer. Flange 12" 3000 R57 studded X 6" 3000 R45 Flange, Height 16"
B.O.P. Spacer Spool (Drilling Spool) 12" 5000 X 12" 5000 BX160, Height 14"

Kelly Cocks: One Griffith Lower Kelly Cocks 6 ½" O.D. with 4½" X H Connections.
One Griffith Upper Kelly Cock 7 3/4" with 6-5/8" A.P.I. Connections.

Drill Pipe Safety Valve: One Griffith 6½" inside blowout preventors (4½" X H)
Two Griffith 6 ½" Stabbing Value (4½" X H)

Choke Manifold: One McEvoy choke and kill manifold 3"-5000 P.S.I.

Mud System: One Pill tank capacity 25 BBLS
Two Mix tanks capacity 108 BBLS. (each)
One Reserve tank capacity 120 BBLS
One Desilt tank capacity 120 BBLS
One Desand tank capacity 120 BBLS
One Shaker Tank capacity 130 BBLS
One sand trap capacity 15 BBLS

Fuel Tanks: One 140 BBLS
One 6000 GALS - 30,000 litres

Water Tanks: One 400 BBLS

Mixing Pumps: Five Mission Magnum 5" X 6" X 14" Centrifugal pumps complete with 50 HP 600 volt HZ 3 PH explosion proof electric motors

Trip Tank Pump: One Mission Magnum 2" X 3" Centrifugal pump complete with 20 HP 600 Volt 60 HZ 3 PH explosion proof motors.

Water Transfer Pumps:	Three Mission Magnum 2" X 3" Centrifugal Pumps c/w 20 H.P. 600 volt 60 HZ 3 PH explosion proof motors.
Mud Agitators:	Six Geolograph/Pioneer 40 TD - 15" 'Pitbull' mud agitators with 15 H.P. 600 Volt 60 HZ 3 PH electric motors.
Shale Shaker:	One Brandt - Dual Tandem shale shaker.
Desander:	One Pioneer T8-6 'Sandmaster' desander.
Desilter:	One Pioneer T12-4 'Siltmaster' desilter.
Drill Pipe:	10000 FT of 4½" Grade 'E' 16.60 lbs/ft hard banded drill pipe 326 joints.
Drill Collars:	1 - 6½" OD drill collar (short) 15' 29 - 6½" OD drill collars 8 actual 8" OD drill collars. 8 actual joints of 4½" Hevi-Wate drill pipe Two (2) bit subs - 6-5/8" Reg DBL box Two (2) bit subs - 4½" Reg x 4-½" XH DBL box One (1) XO sub - 7-5/8" Reg x 6-5/8" Reg DBL box One (1) XO sub - 4-½" XH box x 4-½" IF pin One (1) XO sub - 4-½" Reg x 4-½" XH DBL pin Two (2) XO sub - 6-5/8" Reg pin x 4-½" XH box One (1) Junk sub - 6-5/8" Reg pin x 6-5/8" Reg box One (1) Junk sub - 4-½" Reg box x 4-½" Reg pin One (1) Junk sub - 4-½" Reg box x 4-½" XH Box Two (2) Kelly saver sub s/w rubber 4-½" XH PXB Two (2) Circular subs- 4-½" XH x 1502 Hammer Union Two (2) 12-¼" Ezi Change S/STAB 6-5/8" Reg PXB Two (2) 8-½" Intergral Blade Stabilizers 4-½" XH PXB

Elevators:	One (1) 4-½" BJ 250 ton 18 degree taper d/p Elevators One (1) 2-7/8" IUS 100 ton Tubing Elevators One (1) 2-7/8" EUI 100 ton Tubing Elevators One (1) 13-3/8" Baash Ross 150 ton S/Door Elevators One (1) 13-3/8" S/Joint P.U. Elevators One (1) 9-5/8" Webb Wilson 150 ton S/Door Elevators One (1) 9-5/8" S/Joint P.U. Elevators One (1) 7" BJ 200 ton S/Door Elevators One (1) 7" S/Joint P.U. Elevators All P.U. Elevators c/w Slings & Swivel One (1) 8" Webb Wilson 150 ton S/Door Elevators D/C One (1) 5-3/4" Webb Wilson 150 ton S/Door Elevators D/C Above c/w Lift Nubbing and Bails
Rotary Slips D/P Tubing:	Two (2) 4-½" Varco SDML D/P Slips One (1) 3-½" Varco SDML tubing slips Two (2) 8" -6-½" DCS-R drill collar slips
Kelly Cocks I.B.O.P.:	One (1) 6-½" Hydril Kelly Guard 4-½" XH PXB One (1) 6-½" Griffith I.B.O.P. full opening valve 4-¼" XH PXB One (1) 8" Griffiths full opening Upper Kelly Cock 6-5/8" Reg L/H PXB
Rotary Tongs:	One (1) BJ type 'B' c/w Latch & Lug Jaws 13-3/8" - 3-½"
Casing Slips:	Three (3) 13-3/8" - 9-5/8" - 7" Varco CSML casing slips
Bit Breakers:	Four (4) 17-½" - 12-¼" - 8-½" - 6"
Fishing Tools:	One (1) 8-1/8" Bowen series 150 F.S. O/Shot One (1) 10-5/8" Bowen series 150 F.S. O/Shot c/w grapples & backoffs to fish contractors down hole equipment One (1) 8 O.D. Fishing Magnet 4-½" Reg Pin

One (1) Reverse Circ Junk basket 4-½" XH Box
One (1) Junk basket Mill type c/w Mill Shoe 4-½" Reg Pin
One (1) Jars 6-½" O.D. Griffiths Fishing 4-½" XH PXB
One (1) Jar Accelerator Griffiths Fishing 6-½" O.D. 4-½" XH PXB
One (1) Bumper Sub 6-½" O.D. Fishing 4-½" XH PXB
One (1) 12" Junk Mill - 6-5/8" Reg Pin
One (1) 8" Junk Mill 4-½" Reg Pin

Rotary Reamers: One (1) 6-½" O.D. Drilco N.B. Roller Reamer c/w type K Cutters 8-½" hole

Pup Joints: Three (3) 5' -10; 15; 4-½" O.D. Grade 'G' Pup Joints

Auger: One (1) 27-½" Auger 4-½" XH Nox

Rathole Digger: One (1) Fabricated Rotary Table chain driven

Power Tong: One (1) Farr 13-5/8" - 5-½" Hydraulic Power Tong c/w hydraulic power pack & hoses & torque guage assembly

3. **DRILLING SUMMARY** (Drillers Depths)

Ballangeich 1 was spudded at 0010 hrs. on the 19th July, 1987.

A 17½" surface hole was drilled to 22m, 2 joints of 13-3/8" - 48lb - H40 casing was run and cemented with 60 sacks of cement with an additon of ½% CaCl.

A 12¼" hole was drilled to 163m with surveys, 15 joints of 9.5/8" - 43.5lb - N80 casing was run to 162 metres and cemented with 300 sacks of cement with ½% CaCl slurry (wt 15.6 ppg)

The BOP's were installed and tested prior to drilling out of the casing shoe.

An 8½" hole was drilled with surveys to total depth of 1249.9m.

At TD a suite of Gearhart logs was run. These were DLL-MSFL-GR-SP, BHC-GR and a velocity survey (Velocity Data).

Ballangeich 1 was plugged and abandoned with plugs being set as follows:

PLUGS	INTERVAL	CEMENT	ADDITIVES
1	1175-1125m	50 sacks	15.4 ppg
2	850-800m	50 sacks	15.6 ppg
3	180-150m	50 sacks	
4	Suface Plug	10 sacks	

(a) Lost Time

No time was lost during drilling the Ballangeich 1.

(b) Water Supply

(c) Mudlogging

Mudlogging services were provided by Exploration Logging Australia Inc. Ditch cuttings were caught, washed and descibed at 10m intervals to 300m and at 5m intervals to total depth. All samples were checked for fluorescence.

A total gas detector and FID Chromatograph were in operation from suface casing shoe to TD. Rate of penetration, depth and pumpstrokes were monitored for the duration of the well from the logging unit.

(d) Testing and Coring

No tests were run and no cores were cut.

(e) Electric Logging

Suite 1	DLL-MSFL-GR-CAL-SP	162m-TD
	BHC-GR-CAL	162m-TD

(f) Sidewall Cores

No sidewall cores were taken.

(g) Geothermal Gradient and Bottom Hole Temperature

An extrapolated bottom hole temperature of 71.1°C (160°F) was calculated from temperatures recorded during the logging run. The geothermal gradient at Ballangeich 1 is calculated as 4.09°C/100m (2.24°F/100 feet). These results are shown graphically in Appendix IV.

(h) Deviation Survey

Refer Enclosure II.

(i) Velocity Survey

A velocity survey was run at total depth by Velocity Data Pty. Ltd. (Enclosure III).

(j) Completion Details

Ballangeich 1 was plugged and abandoned. Abandonment plugs were set as follows:-

Plug 1	1175-1125m
Plug 2	850-800m
Plug 3	180-150m
Plug 4	Surface

1. OBJECTIVES

The exploration well Ballangeich 1 is located 15km SE of Woolsthorpe 1 and 22km NNE of Warrnambool in PEP-101, south-west Victoria. The well was drilled to test the hydrocarbon potential of the Lower Cretaceous Pretty Hills Sandstone.

The Ballangeich feature is a tilted horst block situated immediately to the west of the Warrnambool High and trap potential was defined at the Near Top Pretty Hills seismic horizon with westerly dip and rollover into the horst faults.

Secondary objectives for the well were the Lower Cretaceous Heathfield Sandstone.

2. SUMMARY OF REGIONAL GEOLOGY

The Otway Basin is a major WNW trending trough which previously extended eastwards over what are now the Gippsland and Bass Basins and was formed by numerous syndepositional faults sub-parallel to the basin axis. The basin was initiated during the Upper Jurassic to Lower Cretaceous when the continental breakup of Australia with Antarctica commenced.

Rifting with associated right-lateral wrenching developed several intrabasinal highs. This separated the Otway Trough into the Otway, Gippsland and Bass Basins. Consequently compressional forces caused en-echelon folding as in the Otway Ranges High. Block faulting and tilting of the basement superimposed a number of NE trending highs on the Otway Basin which later divided the area into four sub-basins, the Gambier, the Tyrendarra, the Port Campbell and Torquay Embayments.

Following post-rift erosion, progressive downwarping occurred in the Upper Cretaceous. This caused a marine transgression to occur. Deposition of a "Rift Valley Type" sequence followed and the basin became peri-cratonic or open-marginal. At this time a number of marine incursions occurred along the northern edge of the basin margin. Deposition of a series of transgressive-regressive sedimentary cycles continued into the Tertiary. The Otway Basin remained a pericratonic feature throughout the Tertiary.

3. RESULTS OF DRILLING

(a) Stratigraphy

AGE	FORMATION	DEPTH KM(m)	ELEV. (m)	THICK (m)
Recent	Unnamed Basalt	0	98.25	37.0
Tertiary	Pt. Campbell Limestone	37.0	61.25	80.0
	Gellibrand Marl	117.0	-18.75	250.0
	Clifton Formation	367.0	-268.75	90.0
Early Cretaceous	Eumeralla Formation	477.0	-378.75	341.0
	Heathfield Sandstone	818.0	-719.75	26.0
	Geltwood Beach Formation	844.0	-745.75	306.0
	Pretty Hills Sandstone	1150.0	-1051.75	26.0
Upper Jurassic	'Shale Unit'	1176.0	-1077.75	25.0
	Casterton Beds	1201.0	-1102.75	25.0
Pre Jurassic?	Unnamed Basement	1226.0	-1127.75	23.9+
	TD	1249.9	-1151.65	

Table 1- Ballangeich 1 Stratigraphy.

A brief description of each formation follows (refer Table

UNNAMED BASALT (RECENT) comprises medium to very hard, fine grained basalt which is weathered in part.

The PORT CAMPBELL LIMESTONE (TERTIARY) consists of a sucrosic, bioclastic limestone, commonly glauconitic. A transgressive, shallow marine environment is proposed for this formation.

The GELLIBRAND MARL (UPPER TERTIARY) comprises dominantly marl with some pyrite. Fossil fragments are extremely common throughout the section. At the top of the unit there is an approximate 50m transition zone between the Gellibrand and the Port Campbell Limestone with the amount of clay increasing with depth. Below 320m, minor interbeds of siltstone appear increasing towards the base of the unit. The Gellibrand Marl is interpreted as being marine.

The CLIFTON FORMATION (UPPER TERTIARY) is dominantly a sandstone unit interbedded with and grading to limestone, very fossiliferous, in the upper 20m, of the unit. Below this level the sandstone is interbedded with occasional siltstone bands to the base. This unit is of a shallow marine, transgressive environment, unconformably overlying the Cretaceous.

The EUMERALLA FORMATION (LOWER CRETACEOUS) consists of interbedded sandstone and siltstone. Towards the base of the unit, occasional limestone interbeds occur and the formation becomes clayey, with claystone representing up to 30% of the interval. Minor coal seams are intersected near the base where the Eumeralla grades to siltstone. This zone represents a paralic type environment changing upward to a 'tidal flat' or lacustrine to marginal marine.

The HEATHFIELD SANDSTONE (LOWER CRETACEOUS) is sandstone with minor siltstone interbeds. The siltsone is commonly fossiliferous and coal is common throughout the unit. The depositional environment is fluviatile.

The GELTWOOD BEACH FORMATION (LOWER CRETACEOUS) consists of siltstone, predominantly, interbedded with sandstones and minor coals in the upper 35m grading to purely coaly siltstone. Below 920m claystone interbeds become common and coal more predominant. The unit represent a fluviatile, floodplain environment.

The PRETTY HILLS SANDSTONE (LOWER CRETACEOUS) comprises interbedded sandstone and siltstone and represents a fluviatile deposit.

The 'SHALE UNIT' (UPPER JURASSIC) is interbedded siltstone, sandstone and claystone grading to carbonaceous shale at the base. The environment is interpreted as non-marine (fluvial?) with minor marginal marine influences.

The CASTERTON BEDS (UPPER JURASSIC) consist dominantly of shale with minor sandstones, and siltstones (less than 10%). It is interpreted to be of a paludal origin.

Economic BASEMENT (PRE JURASSIC?) at Ballangeich 1 consists of dark green to green basalt with minor calcite veining.

(b) Stratigraphic Prognosis

Table 2 Stratigraphic Prognosis v's Actual

FORMATION	PROG DEPTH KB (m)	ACTUAL DEPTH KB (m)	DIFF	PROG THICK	ACTUAL THICK	DIFF
Tertiary	100	37	63H	200	440	+240
Eumeralla	300	477	177L	480	367	-113
Geltwood Beach	780	844	64L	454	306	-148
Pretty Hills	1234	1150	84H	66	76	+10
Basement	1300	1226	74H			

Geophysical control for Ballangeich was provided by the 1984 Terang Seismic Survey and stratigraphic control obtained from Greenslopes 1 and Woolsthorpe 1. Most selected tops were well outside prognosis indicating that only poor control existed at Ballangeich 1. The difference in prognosis was due to the lack of reliable velocity data concerning the prospect area.

Prior to drilling, it was unclear whether the Heathfield Sandstone existed at the locality but it was subsequently proven to occur with no structural closure.

(c) Hydrocarbon Summary

A total gas detector and FID chromatograph were in operation from surface casing shoe to TD. Ditch cuttings were washed, described, checked for fluorescence and bagged throughout the section.

Gas values remained low throughout the entire section penetrated and no fluorescence or shows were recorded.

4. SUMMARY

Ballangeich 1 was drilled as an exploration well on the western flank of the Warrnambool High. The well is located approximately 15kms SE of Woolsthorpe 1 and 22kms NNE of Warrnambool.

The primary objective was the Lower Cretaceous Pretty Hills Sandstone with a secondary objective being the Lower Cretaceous Heathfield Sandstone.

Total depth was reached at 1249.9m (driller) in Pre-Jurassic (?) 'Basement'. Geophysical control was poor with a large discrepency between prognosed and actual tops. The well confirmed the presence of the Heathfield Sandstone in the locality.

No gas, fluorescence or hydrocarbon shows were recorded in the penetrated section. Log interpretation indicates the Heathfield and Pretty Hills Sandstones to be water saturated.

Ballangeich 1 was plugged and abandoned.

5. CONTRIBUTIONS TO GEOLOGICAL KNOWLEDGE

(i) No hydrocarbons exist at the Ballangeich location

(ii) All potential reservoir objectives encountered in Ballangeich 1 are water wet

(iii) The well confirmed the presence of the Heathfield Sandstone in proximity to the Warrnambool High and of good potential reservoir quality.

(iv) The lack of any show in the penetrated section would indicate that there was no generation of hydrocarbon within or migration into the Ballangeich structure.

(v) No closure exists at the 'Base Eumeralla' or Heathfield level at Ballangeich 1.

(vi) Palynology indicates the shale unit below the Pretty Hills does, in fact, belong to the Jurassic Casterton Beds.

6. REFERENCES

Jackman, G. 1987	Ballangeich No. 1 Proposal to Drill, Phoenix Oil and Gas N.L. (Unpublished)
Mitchell, L. P. 1986	Greenslopes 1 Well Completion Report, Phoenix Oil and Gas N.L. (Unpublished)
Leslie, R. B. & Sell, B. H. 1968	Woolsthorpe 1 Well Completion Report, Open file (unpublished
Wopfner, H. &. Douglas, J. G. 1971	The Otway Basin SE Australia. Special Bulletin of the Geological Surveys of S.A. and Victoria

APPENDIX I.

LITHOLOGICAL DESCRIPTIONS

In accordanace with the Well Proposal, cuttings were collected, washed, bagged and described at 10m intervals from 30m to 300m and at 5m intervals to TD at 1250m (Exlog.).

BALLANGEICH NO. 1

SAMPLE DESCRIPTIONS

AT:

20-30m: BASALT (100%). dark brown to dark brown-black to slight reddy brown; medium-very hard; medium grained; common quartz grains; plagioclase and mica; idioblastic texture; weathered in part; occasional iron staining

30-40m: BASALT (60%) as above.

LIMESTONE (40%) white-off white-yellow; friable-very soft; sucrosic texture; common bioclasts; trace fine quartz; crypto crystalline in part; inferred good porosity

40-50m: BASALT (10%) as above.

LIMESTONE (90%) as above

50-60m: LIMESTONE (100%) light grey-off white, friable-very soft; sucrosic texture; common lithic fragments; trace glauconite; good inferred porosity; sandy in part; common fossils in part.

60-70m: LIMESTONE (100%) as above

70-80m: LIMESTONE (100%) as above

80-90m: LIMESTONE (100%) as above

90-100m: LIMESTONE (100%) as above; common glauconite nodules

100-110m: LIMESTONE (100%) off white-light grey; friable-crumbly; sucrosic texture; fine grained; calcite crystals; slight organic matrix; trace lithic fragments; good porosity; cryptocrystalline in part

110-120m: LIMESTONE (100%) off white-light grey; friable-soft-occasionally brittle; surcrosic texture; fine grained; occasional organic matrix; common glauconite, fossils, lithic fragments; slight to fair porosity.

120-130m LIMESTONE (100%) as above; sample has 30% dispersive clay

130-140m: LIMESTONE (100%) light grey-offwhite-orange in part; soft-silty-plastic; very fossiliferous; abundant glauconite; poor porosity.

140-150m: LIMESTONE (100%) as above

150-160m: LIMESTONE (100%) as above

160-170m: MARL (100%) medium grey-dark grey; very soft-plastic; amorphous; very fossilferous; trace glauconite; trace iron stained quartz grains.

170-180m: MARL (95%) as above

LOOSE QUARTZ GRAINS (5%) orange; coarse, iron stained.

180-190m: MARL (100%) as above

190-200m: MARL/CALCAREOUS CLAYSTONE (100%) Medium grey-light grey; plastic-dispersive; angular quartz common; very fossiliferous; trace mica; trace pyrite; trace lithic fragments

200-210m: MARL (100%) as above

210-220m: MARL (100%) as above

220-230m: MARL (100%) as above; slightly more calcareous

230-240m: MARL (100%) as above; abundant fossils

240-250m: MARL (100%) as above

250-260m: MARL (100%) as above

260-270m: MARL (100%) as above

270-280m: MARL (100%) as above

280-290m: MARL (100%) as above

290-300m: MARL (100%) as above

300-305m: MARL (100%) light grey-soft-mushy; abundant fossil fragments; clay dispersive

305-310m: MARL (100%) as above

310-315m: MARL (100%) as above

315-320m: MARL (100%) as above

320-325m: MARL (80%) as above

SILTSTONE (20%) medium brownish-grey; very argillaceous and lithic; soft

325-330m: MARL (80%) as above

SILTSTONE (20%) as above

330-335m: MARL (80%) as above

SILTSTONE (20%) as above

335-340m MARL (70%) as above

SILTSTONE (30%) as above, more carbonaceous in part

340-345m: MARL (70%) as above

SILTSTONE (30%) as above

345-350m: MARL (70%) as above

SILTSTONE (30%) as above

350-355m: MARL (70%) as above

SILTSTONE (30%) as above

355-360m: MARL (40%) as above; grading to silty claystone

SILTSTONE (60%) as above

360-365m: LIMESTONE (100%) calcarenite; cream; broken fossil fragments; no cement

365-370m: LIMESTONE (100%) as above but more yellow brown

370-375m: LIMESTONE (100%) as above

375-380m: LIMESTONE (100%) cream-brown; fossiliferous, calcarenite;brown iron staining may indicate surface wEathering

380-385m: LIMESTONE (40%) as above

SANDSTONE (60%) brown; medium to coarse grained; subangular to well rounded; iron stained; excellent porosity; some pyrite.

385-390m: SANDSTONE (80%) as above

SILTSTONE (20%) as above

390-395m: SANDSTONE (100%) as above

395-400m: SANDSTONE (100%) as above; grains are more rounded and better sorted

400-405m: SANDSTONE (100%) as above; pyritic

405-410m: SANDSTONE (100%) as above

410-415m: SANDSTONE (100%) as above

415-420m: SANDSTONE (100%) as above

420-425m: SANDSTONE (100%) as above

425-430m: SANDSTONE (80%) as above

SILTSTONE (20%) medium grey-brown to dark grey-black; firm-soft-crumbly; moderately argillaceous; trace carbonaceous fragments; common fine, well rounded quartz grains

430-435m: SANDSTONE (70%) as above

SILTSTONE (30%) as above

435-440m: SANDSTONE (80%) as above

SILTSTONE (20%) as above

440-445m: SANDSTONE (90%); clear-translucent; friable-loose; fine-medium, occasionally coarse; subangular to subrounded; occasionally angular; poor-moderate sorting; slighty calcareous; trace carbonaceous matter and carbonaceous smear; good-fair porosity; no fluorsecence

SILTSTONE (10%) as above

445-450m: SANDSTONE (100%) clear-translucent; loose; medium grained; subrounded-rounded; well sorted; carbonaceous stains; good inferred porosity; no fluorencence.

450-455m: SANDSTONE (100%) clear-translucent; loose; medium grained; well sorted; pyrite in part; good visible porosity; no fluorescence

455-460m: SANDSTONE (100%) as above; occasional coarse angular grains; non calcareous

460-465m: SANDSTONE (80%) as above

SILTSTONE (20%) medium grey brown-grey black; soft-firm; very argillaceous; blocky; carbonaceous fragments; trace lithic fragments; trace fossils; noncalcareous

465-470m: SANDSTONE (70%) clear-translucent-orange brown; friable-loose; medium coarse; subangular-subrounded; common chart fragments; non calcareous; carbonaceous stain; good porosity; no fluorescence; trace granitic fragments

SILTSTONE (30%) as above

470-475m: SANDSTONE (70%) as above

SILTSTONE (30%) as above

475-480m: SANDSTONE (80%) as above

SILTSTONE (20%) as above

480-485m: SANDSTONE (80%) clear-translucent-white-green in part; fine-medium, occasional coarse grained; subangular-subrounded occasional angular; poorly sorted; common green lithic fragments; trace fossil fragments; trace pyrite; slight-non calcareous; poor-nil porosity; nonfluorescence; trace koalinitic matrix

SILTSTONE (20%) brown-dark brown, occasional green-grey; hard-brittle, predominantly soft; very argillaceous; trace carbonaceous fragments and coaly stringers; non-calcareous

485-490m: SANDSTONE (95%) as above

SILTSTONE (5%) as above

490-495m: SANDSTONE (80%) as above

SILTSTONE (20%) as above

LIMESTONE -trace

495-500m: SANDSTONE (90%) clear-translucent; loose; medium-coarse-very coarse; angular-subrounded; poorly sorted; common green minerals; trace koalinitic matrix; common fossil fragments; slightly calcareous; trace carbonaceous smear; fair porosity; no fluorescence.

SILTSTONE (10%) as above; clay dispersing

500-505m: SANDSTONE (70%) as above

SILTSTONE (30%) as above

505-510m: SANDSTONE (60%) as above

SILTSTONE (40%) as above

510-515m: SANDSTONE (60%) clear-grey; loose-firm; fine-medium-occasionally coarse; subangular-angular; poorly sorted; common green minerals; common argillaceous matrix; trace mica; non-calcareous; no porosity; no fluorescence.

SILTSTONE (40%) as above

515-520m: SANDSTONE (50%) as above

SILTSTONE (50%) green grey-grey brown; soft; amorphous; very argillaceous; moderate to very common, fine, well rounded quartz; slightly calcareous; trace coal.

520-525m: SANDSTONE (100%) as above

SILTSTONE (100%) medium grey-grey green; soft-dispersive; blocky-amorphous; very argillaceous; common fossil fragments; common well rounded fine quartz; slightly calcareous; trace coaly fragments.

530-535m: SILTSTONE (100%) as above

535-540m: SILTSTONE (100%) as above

540-545m: SILTSTONE (100%) as above

545-550m: SILTSTONE (100%) as above; up to 5% loose quartz grains; pyrite; clear-translucent-orange brown; coarse-very coarse; angular.

550-555m: SILTSTONE (100%) medium grey-dark grey green-occasional brown; soft-hard; blocky; trace carbonaceous flecks; slight to non-calcareous.

555-560m: SILTSTONE (100%) medium grey to brownish; quartzose; lithic; argillaceous; soft; trace sand and fossils (cavings?).

560-565m: SILTSTONE (100%) as above

565-570m: SILTSTONE (100%) as above; numerous loose sand grains and fossils (cavings?)

570-575m: SILTSTONE (100%) as above; minor claystone, grey-brown; soft

575-580m: SILTSTONE (100%) as above; grading in part to very light grey, fine grained sandstone

580-585m: SANDSTONE (60%) light grey, fine-very fine grained; firm; quartzose; lithic; argillaceous; very calcareous; tight; grading in part to siltstone; trace coal

SILTSTONE (40%) as above

585-590m: SANDSTONE (40%) as above

SILTSTONE (60%) as above

590-595m: SILTSTONE (50%) as above

SANDSTONE (30%) as above

CLAYSTONE (20%) grey brown; soft; silty; carbonaceous in part

595-600m: SILTSTONE (70%) as above; grading to sandstone and claystone

SANDSTONE (10%) as above

CLAYSTONE (20%) as above

600-605m: SILTSTONE (60%) as above

SANDSTONE (20%) light grey; fine grained; firm; lithic; argillaceious; variably calcareous; carbonaceous; tight grading to siltstone

CLAYSTONE (20%) brownish; carbonaceous and green grey; soft; trace coal.

605-610m: SILTSTONE (50%) as above

SANDSTONE (30%) as above

CLAYSTONE (20%) as above

610-615m: SANDSTONE (40%) as above

SILTSTONE (30%) as above

CLAYSTONE (30%) mostly light grey; silty with carbonaceous specks

615-620m: SANDSTONE (40%) grading to siltstone; quartzose; very argillaceous; firm

SILTSTONE (40%) as above

CLAYSTONE (20%) as above

620-625m: SILTSTONE (70%) dark brown grey; slightly carbonaceous

SANDSTONE (10%) as above

CLAYSTONE (20%) as above, becoming more carbonaceous; trace coal

625-630m: SILTSTONE (70%) as above

CLAYSTONE (20%) as above

SANDSTONE (10%) as above

630-635m: SILTSTONE (60%) as above

SANDSTONE (20%) as above

CLAYSTONE (20%) as above

635-640m: SILTSTONE (50%) as above

CLAYSTONE (50%) as above

SANDSTONE - trace

640-645m: SILTSTONE (50%) as above

CLAYSTONE (30%) as above

SANDSTONE (20%) as above

645-650m: SILTSTONE (50%) as above

CLAYSTONE (30%) as above

SANDSTONE (20%) as above

650-655m: SILTSTONE (50%) as above

CLAYSTONE (30%) as above

SANDSTONE (20%) as above

655-660m: SILTSTONE (50%) as above

CLAYSTONE (30%) as above

SANDSTONE (20%) as above

660-665m: SILTSTONE (60%) as above

SANDSTONE (15%) as above

CLAYSTONE (15%) as above

COAL (10%) dark brown, earthy

665-670m: SILTSTONE (60%) as above; grading to claystone

CLAYSTONE (40%) as above

COAL - trace

670-675m: SILTSTONE (60%) as above

CLAYSTONE (40%) as above

COAL - trace

SANDSTONE - trace

675-680m: SILTSTONE (60%) light grey; soft to firm; quartzose; very argillaceous; micaceous and carbonaceous in part; sandy grading to sandstone

CLAYSTONE (30%) light grey to brownish; variably calcareous; silty in part

COAL (10%) dark brown; earthy

SANDSTONE - trace

680-685m: SILTSTONE (50%) as above

CLAYSTONE (40%) as above

SANDSTONE (10%) as above

685-690m: CLAYSTONE (60%) as above

SILTSTONE (40%) as above

COAL/SANDSTONE - trace

690-695m: SILTSTONE (60%) as above

CLAYSTONE (40%) as above

SANDSTONE - trace

695-700m: SILTSTONE (60%) as above

CLAYSTONE (40%) as above

SANDSTONE - trace

700-705m: SILTSTONE (100%) as above

SANDSTONE/CLAYSTONE - trace

705-710m: SILTSTONE (100%) as above; trace coal

710-715m: SILTSTONE (100%) light grey-white-medium grey green; soft-sticky; amorphous; common-very argillaceous; trace carbonaceous-coaly fragments; slight-non calcareous; micromicaceous; trace coal

715-720m: SILTSTONE (100%) as above

720-725m: SILTSTONE (100%) as above

725-730m: SILTSTONE (80%) as above

COAL (20%) brown-brown black; blocky; dull

730-735m: SILTSTONE (80%) as above

COAL (20%) as above

735-740m: SILTSTONE (100%) as above; common fossil fragments

740-745m: SILTSTONE (100%) as above; trace coal

745-750m: SILTSTONE (100%) as above; trace coal

750-755m: SILTSTONE (100%) light grey-medium grey; soft-plastic; amorphous; trace fine, well rounded sand; trace fossil fragments; slight to non-calcareous; very argillaceous grading to claystone in part.

755-760m: SILTSTONE (90%) as above

SANDSTONE (10%) white-off white; soft-friable; very fine-fine grained; subangular to subrounded; well sorted; abundant kaolinitic matrix; slightly calcareous; trace glauconite; tight.

760-765m: SILTSTONE (100%) as above

765-770m: SILTSTONE (100%) as above

770-775m: SILTSTONE (80%) as above

SANDSTONE (20%) as above

775-780m: SILTSTONE (80%) as above

SANDSTONE (20%) as above

780-785m: SILTSTONE (90%) as above

SANDSTONE (10%) as above

785-790m: SILTSTONE (100%) as above

790-795m: SILTSTONE (100%) light grey-medium grey-brown grey; firm-soft; amorphous; blocky; very argillaceous; trace lithic fragments; trace mica; very fossiliferous in part; slight to noncalcareous; grading to claystone in part

795-800m: SILTSTONE (100%) as above

800-805m: SILTSTONE (100%) as above

805-810m: SILTSTONE (100%) as above

810-815m: SANDSTONE (90%) clear-translucent; loose; coarse; subangular-subrounded; occasionally rounded; well sorted; trace mica; trace calcitic cement; trace pyrite; common coaly fragments ;assumed good porosity; no fluorescence.

SILTSTONE (10%) brown-grey brown-occasional green grey; soft-plastic; amorphous; occasionally blocky; trace lithic fragments; very fossiliferous; slight to moderately calcareous; common coal

815-820m: SANDSTONE (100%) as above

820-825m: SILTSTONE (100%) as above

825-830m: SILTSTONE (100%) as above

830-835m: SANDSTONE (100%) clear-translucent; loose; medium to coarse; subangular-subrounded; occasionally rounded; moderate sorting; trace calcareous cement; trace carbonaceous matter; assumed fair-good porosity; trace dull orange mineral fluorescence.

835-840m: SANDSTONE (100%) as above; trace smokey quartz; trace pyrite

840-845m: SANDSTONE (60%) as above

SILTSTONE (40%) light grey-off white-yellow grey; soft-plastic; amorphous; very argillaceous; coaly fragments; non-slightly calcareous

845-850m: SANDSTONE (60%) as above; non calcareous

SILTSTONE (40%) as above

850-855m: SILTSTONE (80%) as above; slight-moderately calcareous in part

SANDSTONE (20%) as above; coarse-very coarse; loose; milky

855-860m: SILTSTONE (80%) as above

SANDSTONE (20%) as above

860-865m: SILTSTONE (805) as above

SANDSTONE (20%) as above

865-870m: SILTSTONE (80%) as above

SANDSTONE (20%) as above

870-875m: SILTSTONE (100%) light brown-grey green; soft-plastic; amorphous; occasionally blocky; very argillaceous; common fossils; common coal fragments; slightly calcareous

875-880m: SILTSTONE (100%) as above

880-885m: SILTSTONE (100%) as above

885-890m: SILTSTONE (100%) as above

890-895m: SILTSTONE (100%) as above

895-900m: SILTSTONE (100%) as above

SANDSTONE - trace; trace pyrite

900-905m: SILTSTONE (100%) as above

905-910m: SILTSTONE (100%) as above

910-915m: SILTSTONE (100%) medium grey-grey green-light brown; soft-plastic-dispersive in part; very argillaceous; very fossiliferous; moderate to very calcareous; very coaly; moderately sandy in part

915-920m: SILTSTONE (100%) as above

920-925m: SILTSTONE (100%) as above

925-930m: SILTSTONE (60%) medium grey to brownish grey; quartzose; lithic; very argillaceous; variably carbonaceous and calcareous; micromicaceous

SANDSTONE (20%) fine-medium grained; clear; common coaly fragments

CLAYSTONE (20%) light medium grey; slightly carbonaceous; micromicaceous; silty in part; soft but not very sticky

930-935m: SILTSTONE (60%) as above

CLAYSTONE (30%) as above

SANDSTONE (10%) as above

935-940m: SILTSTONE (70%) as above

CLAYSTONE (20%) as above

SANDSTONE (10%) as above

940-945m: SITLSTONE (50%) as above

CLAYSTONE (40%) as above

SANDSTONE (10%) as above;subrounded to rounded; maybe cavings

945-950m: SILTSTONE (50%) as above

CLAYSTONE (40%) as above

SANDSTONE (10%) as above

950-955m: SILTSTONE (70%) as above

CLAYSTONE (30%) as above

SANDSTONE - trace

955-960m: SILTSTONE (70%) as above

CLAYSTONE (30%) as above

SANDSTONE - trace

960-965m: SILTSTONE (60%) as above; trace sand

CLAYSTONE (40%) as above

965-970m: SILTSTONE (60%) as above; trace sand

CLAYSTONE (40%) as above

970-975m: SILTSTONE (80%) as above; trace sand

CLAYSTONE (20%) as above

975-980m: SILTSTONE (70%) medium grey to grey brown; firm-soft; very argillaceous; lithic; variably carbonaceous; micromicaceous; calcareous in part grading to claystone

CLAYSTONE (20%) grey and brown; firm-soft.

SANDSTONE (10%) medium; clear; individual rounded quartz grains (possibly cavings)

980-985m: SANDSTONE (60%) light grey; fine grained; firm; lithic; argillaceous; calcareous; tight

SILTSTONE (20%) as above

CLAYSTONE (20%) as above

985-990m: SILTSTONE (50%) as above

CLAYSTONE (40%) as above

SANDSTONE (10%) as above

990-995m: SILTSTONE (50%) as above

SANDSTONE (40%) as above; trace pyrite

CLAYSTONE (10%) as above

995-1000m: SANDSTONE (60%) as above; pyrite common; trace dull, dark brown coal

SILTSTONE (20%) as above

CLAYSTONE (20%) as above

1000-1005m: CLAYSTONE (40%) as above; generally darker brown; more carbonaceous

SILTSTONE (30%) as above

SANDSTONE (30%) as above

1005-1010m: CLAYSTONE (50%) as above

SILTSTONE (30%) as above

SANDSTONE (20%) as above

1010-1015m: CLAYSTONE (50%) as above

SILTSTONE (30%) as above

SANDSTONE (20%) as above

1015-1020m: CLAYSTONE (50%) as above

SILTSTONE (40%) as above

SANDSTONE (10%) as above

1020-1025m: SANDSTONE (50%) as above

SILTSTONE (30%) as above

CLAYSTONE (20%) as above

1025-1030m: SANDSTONE (50%) as above

SILTSTONE (30%) as above

CLAYSTONE (20%) as above

1030-1035m: SANDSTONE (50%) as above; more clean individual grained;medium, coarse grains

SILTSTONE (30%) as above

CLAYSTONE (20%) as above

1035-1040m: SILTSTONE (40%) as above

SANDSTONE (30%) as above

CLAYSTONE (30%) as above

1040-1045m: SILTSTONE (50%) as above

CLAYSTONE (40%) as above

SANDSTONE (10%) as above

1045-1050m: SILTSTONE (60%) as above

SANDSTONE (20%) as above

CLAYSTONE (20%) as above

1050-1055m: SILTSTONE (60%) light grey to brown; quartzose; lithic; argillaceous in part; carbonaceous and calcareous; micro-micaceous

CLAYSTONE (30%) brownish to medium grey; soft to firm; chunky; silty in part

SANDSTONE (10%) light grey; fine grained; lithic; argillaceous; calcareous; tight; some medium individual rounded grains.

1055-1060m: SILTSTONE (40%) as above

CLAYSTONE (40%) as above

SANDSTONE (20%) as above

1060-1065m: SILTSTONE (60%) as above; trace sand

CLAYSTONE (40%) as above

1065-1070m: SILTSTONE (50%) as above; trace sand

CLAYSTONE (50%) as above

1070-1075m: SILTSTONE (80%) as above

CLAYSTONE (10%) as above

SANDSTONE (5%) as above

COAL (5%) dull; dark brown

1075-1080m: SILTSTONE (80%) as above

CLAYSTONE (10%) as above

SANDSTONE (5%) as above

COAL (5%) as above

1080-1085m: SILTSTONE (100%) light grey-grey green-occasionally brown; soft-firm-occsionally moderatley hard; very argillaceous; blocky; common angular sand; trace pyrite; common coaly stringers; slightly calcareous; moderately fossiliferous

1085-1090m: SILTSTONE (100%) as above

1090-1095m: SILTSTONE (95%) as above

COAL (5%) dark brown-brown black; hard-brittle; blocky; silty; dull

1095-1100m: SILTSTONE (90%) as above

SANDSTONE (10%) white-clear-translucent; friable-moderately hard; fine-occasionally medium; subangular-subrounded; moderately well sorted; trace koalinitic matrix; trace silica cement; trace carbonaceous flecks; tight; poor porosity; no fluorescence.

1100-1105m: SILTSTONE (70%) as above

SANDSTONE (30%) as above

1140-1145m: SILTSTONE (65%) as above

SANDSTONE (30%) as above; no fluorescence

COAL (5%) as above

1145-1150m: SILTSTONE (60%) as above; very argillaceous in part; grading to claystone

SANDSTONE (40%) clear to brownish iron-stained; friable; medium to coarse; rounded; well sorted; excellent apparent porosity; no fluorescence; trace coal

1150-1155m: SANDSTONE (95%) as above

SILTSTONE (5%) as above

1155-1160m: SILTSTONE (35%) as above

SANDSTONE (65%) as above

1160-1165m: SANDSTONE (100%) as above; increasing calcitic cement; trace silt

1165-1170m: SANDSTONE (100%) as above; clean; only moderately well sorted; trace silt

1170-1175m: SANDSTONE (80%) as above; pyritic

SILTSTONE (20%) as above; minor greenish; lithic fragments; argillaceous

1175-1180m: SANDSTONE (80%) as above; trace dark green minerals; (possibly weathered igneous rock)

SILTSTONE (20%) as above

1180-1185m: SANDSTONE (50%) as above

SILTSTONE (30%) as above; grading to claystone

CLAYSTONE (20%) as above

1105-1110m: SILTSTONE (80%) as above

SANDSTONE (20%) as above; common coarse quartz grains

1110-1115m: SILTSTONE (95%) as above

SANDSTONE (5%) as above

1115-1120m: SILTSTONE (65%) as above

SANDSTONE (30%) as above

COAL (5%) dirty brown-black; blocky; dull

1120-1125m: SILTSTONE (70%) as above

SANDSTONE (25%) as above

COAL (5%) as above

1125-1130m: SILTSTONE (95%) grey green-light grey-occasional grey brown; soft-moderately hard; blocky; very argillaceous in part; common fossil fragments; moderately calcareous; very coaly; grading to sandstone in part

SANDSTONE (5%) white-off white; soft-friable; fine-very fine; subangular-subrounded; well sorted; abundant kaolinitic matrix in part; noncalcareous; tight; no fluorescence.

1130-1135m: SILTSTONE (60%) as above

SANDSTONE (40%) clear-translucent; friable-loose; fine-medium-occasional coarse; subangular-subrounded; moderate sorting; trace silica cement; non calcareous; tight; no fluorescence.

1135-1140m: SILTSTONE (65%) as above

SANDSTONE (30%) as above; common quartz over-growths

COAL (5%) as above

1185-1190m: SANDSTONE (50%) as above

SILTSTONE (30%) as above

CLAYSTONE (20%) as above

1190-1195m: SANDSTONE (40%) as above

SILTSTONE (40%) as above

CLAYSTONE (20%) as above

1195-1200m: SHALE (60%) dark brown; carbonacous; poorly fissile

SANDSTONE (20%) as above

SILTSTONE (20%) as above

1200-1205m: SHALE (80%) dark brown; carbonaceous; firm; poorly fissile; silty; micromicaceous

SANDSTONE (10%) as above

SILTSTONE (10%) as above

1205-1210m: SHALE (100%) as above

1210-1215m: SHALE (80%) as above

COAL (20%) black; hard brittle; conchoidal fracture; vitreous lustre; bright

1215-1220m: SHALE (100%) as above

1220-1225m: BASALT (10%) green-dark green; hard; phenocrysts; common plagioclase; trace free quartz; olivine groundmass; olivine crystals; trace calcite veining

SHALE (90%) as above

1225-1230m: SHALE (50%) as above

BASALT (50%) as above

1230-1235m: BASALT (100%) grey-grey black; hard-very hard; very fine grained

1235-1240m: BASALT (100%) as above

1240-1245m: BASALT (100%) as above

1245-1250m: BASALT (100%) as above

APPENDIX II.

LOG ANALYSIS

BALLANGEICH NO. 1

Well Log Analysis

Available Logs:

BHC-GR-Cal	161-1249.9m
DLL-MSFL-GR-SP-Cal	161-1249.9m

Well logs recorded by Gearhart Australia Pty. Ltd.

Borehole Conditions:

9 5/8" Casing set at 162m.
8½" Bit drilled to TD.

Fluid in hole:	Freshwater Gel
Density:	9.2 lbs/gal
Viscosity:	41 secs
pH:	11
Fluid loss:	7cc
Rm:	2.0 @ 70°F
Rmf:	0.95 @ 76°F
Bottom Hole Temperature:	126°F

GENERAL:

Both the Heathfield Sandstone and Pretty Hills Sandstone have moderate log porosity sections with values ranging from 12.6 - 22.6% (Heathfield) and 0.9 - 21.7% (Pretty Hills). The logs values together with associated water saturations are listed in Table A1. All values have been shale corrected.

Only the Sonic log was available for direct porosity determination and a travel time (tma) of 182 μs/m and fluid travel time of 620 μs/m were selected.

TABLE: A1
WELL: BALLANGEICH NO. 1
DATE: October, 1987

DEPTH (m)	SONIC	Øs(corr)	SP	LLS	LLD	Rw (Ωm)	Sw %
818	220	17.7	-15	3.0	3.1	0.102	97.4
820	197.5	12.6	-26	2.8	2.8	0.055	100 *
820.5	226	18.1	-26	2.8	2.8	0.062	100 *
821.5	226	18.6	-24	2.7	3.0	0.062	74.8
822.5	216	19.7	-12	3.1	3.2	0.119	93.2
824	226	21.8	0	2.6	2.7	0.247	100 *
824.8	222	20.7	0	2.6	2.7	0.247	100 *
825.5	223	22.5	0	2.6	2.7	0.247	100 *
826.8	225	22.1	0	2.7	2.8	0.247	100 *
887.5	227	22.6	0	2.9	2.9	0.247	100 *
829	226	21.5	0	2.6	2.6	0.246	100 *
830	229	22.0	0	3.0	3.0	0.246	100 *
831	228	20.2	0	3.2	3.2	0.246	100 *
831.5	228.5	20.9	0	3.2	3.2	0.246	100 *
832.9	220.5	19.1	0	3.2	3.2	0.246	100 *
834	203	14.5	-10	3.2	3.2	0.131	100 *
835	220	17.9	-16	3.4	3.4	0.095	88.8
836	215	16.6	-15	3.9	3.9	0.098	90.5
837	215	16.8	-22	3.3	3.3	0.071	83.7
837.6	211	15.7	-22	3.3	3.3	0.071	83.0
839	220	18.6	0	2.9	2.9	0.245	100 *
840	219	17.9	0	3.2	3.2	0.245	100 *
840.5	219.5	17.8	0	3.2	3.2	0.245	100 *
842	220	20.0	-18	3.2	3.2	0.086	79.3
843	215	15.1	-19	4.0	4.0	0.080	90.6
844	212	19.8	-19	4.0	4.0	0.080	82.1

* Values of Sw calculated 100% or over are labeled 100*

TABLE: A1
WELL: BALLANGEICH NO. 1
DATE: October, 1987

DEPTH (m)	SONIC	Øs(corr)	SP	LLS	LLD	Rw (Ωm)	Sw %
1150.5	196	12.5	7	7.0	7.0	0.418	100 *
1151	193	15.0	9	7.0	7.0	0.451	100 *
1151.5	200	16.6	11	4.0	4.0	0.494	100 *
1152.5	203	16.4	11	4.4	4.4	0.500	100 *
1153.5	207	7.7	11	4.4	4.4	0.569	100 *
1154.5	203	12.6	2	6.1	6.1	0.254	100 *
1157	218	21.7	6	7.9	7.9	0.354	100 *
1158	198	16.2	1	10.0	10.0	0.237	74.1
1158.5	196	14.1	0	10.0	10.0	0.219	91.9
1159	196	15.5	8	6.2	6.2	0.407	100 *
1161	195	13.9	9	6.7	6.7	0.447	100 *
1162	201	16.0	3	7.0	7.0	0.275	95.4
1163	213	18.8	-6	9.0	9.0	0.139	57.2
1164	199	12.2	-8	10.0	11.3	0.120	72.6
1165	201	15.0	-8.5	8.0	9.0	0.118	67.5
1166	199	14.7	-12	9.0	9.5	0.093	59.1
1167	200	11.6	-21	10.0	11.0	0.054	56.8
1168	186	0.9	-25	7.0	8.0	0.047	100 *
1169	192	13.7	-22	8.0	8.5	0.053	53.3
1170	201	17.3	-21	6.5	6.5	0.058	50.5
1171	189	10.2	-20	13.0	13.0	0.053	58.4
1172	180	7.0	-1	11.0	11.0	0.201	100 *
1173	190	14.6	5	8.3	8.3	0.325	83.7
1174	193	16.2	9	9.5	9.5	0.468	85.5
1175	187	11.6	6	8.3	8.3	0.353	100 *
1176	193	15.9	10	7.0	7.0	0.488	91.0
1177	199	17.8	10	7.0	7.0	0.488	82.9

Values of Sw calculated 100% or over are labeled 100

APPENDIX III.

PALYNOLOGY

PALYNOLOGY AND KEROGEN ANALYSIS OF FIVE SAMPLES FROM BALLANGEICH NO. 1 WELL

M. AZIZ ISLAM

Report No. 4
October, 1987

Australasian Palynostratigraphic Services
60 Wilber Street
Rossmoyne
Western Australia 6155

SUMMARY

Sample Depth (m)	Zone	Age
810	*Crybelosporites striatus*	Aptian-Albian
860	*Cyclosporites hughesi*	Aptian
865	*Foraminisporis wonthaggiensis*	Valanginian-Aptian
1200	*Retitriletes watherooensis*	Tithonian
1240	-	Indeterminate

CONTENTS

INTRODUCTION

Five cuttings samples from Ballangeich No. 1 well were received from the Phoenix Oil and Gas N.L. for palynological analyses and visual kerogen assessment. The samples were from these depths : 800-810 m, 860 m, 860-865 m, 1190-1200 m and 1230-1240 m (hereinafter only last depths of the sample intervals are mentioned).

All samples except the lowest one at 1240 m were rich in sporomorph yields. Caving has been appreciable in all samples and mostly took place from immediately overlying sections. Obvious cavings from higher sections were minimal which were easily distinguished and ignored (such as much younger dinoflagellate cysts).

Due to caving from immediately overlying sections, only top occurrences of significant sporomorph species have been taken into account for zonal correlation. Generally, most species occur rarely and sporadically in the upper (and lower) parts of their respective stratigraphic ranges. Yet greater emphasis have been placed on such rare occurrences rather than on the whole assemblages which have been masked by caving. That explains why, except these significant species, the sporomorph assemblages in all samples look identical.

PALYNOSTRATIGRAPHY

The following zonal correlations are based on top occurrences of significant species and remain subject to confirmation by core sample analyses. The distribution of species is presented in Table 1.

810 m

Crybelosporites striatus Interval Zone

Aptian-Albian

Top occurrence of Biretisporites eneabbaensis together with abundant Microcachryidites antarcticus suggest that the sample is not younger than the Crybelosporites striatus Interval Zone as modified by Helby et al. (1987). Other species supportive to this correlation are the nominate species, Cyclosporites hughesi, common Pilosisporites notensis and abundant Foraminisporis asymmetricus. The age of the zone is latest Aptian to early Albian.

860 m

Cyclosporites hughesi Interval Zone

Aptian

Top occurrence of Callialasporites turbatus suggests that the sample is not younger than the Aptian Cyclosporites hughesi Interval Zone as modified by Helby et al. (op. cit.). Other species supporting this correlation are the nominate species, Foraminisporis asymmetricus, F. wonthaggiensis, Microcachryidites antarcticus and common Pilosisporites notensis.

865 m

Foraminisporis wonthaggiensis Interval Zone

Valanginian-Aptian

Top occurrence of Aratrisporites sp. indicate that the sample is not younger than the Foraminisporis wonthaggiensis Interval Zone as modified by Helby et al. (op. cit.). F. wonthaggiensis Interval is a broad zone ranging from Valanginian to basal Aptian. Other notable species are the nominate species, Contignisporites cooksoniae and Microcachryidites antarcticus.

1200 m

Retitriletes watherooensis Oppel Zone

Tithonian

The sample is considered to be not younger than the Tithonian Retitriletes watherooensis Oppel Zone as modified by Helby et al. (op. cit.) from the top occurrence of Araucariacites fissus. Abundant Microcachryidites antarcticus, and rare Callialasporites dampieri and C. turbatus are important accessory species.

1240 m

Indeterminate

Although some distinction in kerogen properties is observed, the sample yielded almost identical sporomorph assemblage which is considered to be almost entirely caving. The sample is, therefore, thought to be almost barren of palynomorphs. Possible sampling error is also not entirely ruled out. The only significant species, Duplexisporites problematicus, is very weathered and is probably not indigenous.

PALYNOFACIES

All samples examined contain abundant terrestrial sporomorphs and a few dinoflagellate cysts noticed are obvious caving from much younger strata. Rare fungal palynomorphs are present. The samples are, therefore, considered non-marine. There were no evidence to indicate otherwise. The lowest sample at 1240 m is considered nearly barren of palynomorphs and is probably non-marine.

MATURITY AND SOURCE-ROCK POTENTIAL

Visual assessment of kerogen components is presented in Table 2. Due to caving, the results remain tentative and subject to confirmation by core sample analyses.

With Thermal Alteration Indices (TAI) ranging from 2.75 to 3.0, the upper 4 samples are considered mature to generate liquid hydrocarbon. Moderate yield of organic residue (VOM = volume of organic matter) together with moderate sporinite component indicate good source-rock potential but this is downgraded in terms of oil potential by low cuticle yields, moderate woody substances and high sapropelic components. These samples are, therefore, more potent to generate gas and condensate than oil.

The lowest sample at 1240 m with high VOM is a very good source-rock but for low sporinite and cuticle, moderate woody material and high sapropel is potent to generate gas and condensate with little oil.

REFERENCE

HELBY, R., MORGAN, R. and PARTRIDGE, A.D., 1987.
A palynological zonation of the Australian Mesozoic.
Association of Australasian Palaeontologists, Memoir No. 4,
pp. 1-94.

TABLE 1. DISTRIBUTION OF SPECIES

	Sample depth (m)				
	810	860	865	1200	1240
Aequitriradites spinulosus	X	X	X	X	
Araucariacites australis	X	X	X	X	X
Biretisporites eneabbaensis	X			X	X
Camarozonosporites clivosus	X	X	X	X	X
Ceratosporites equalis	X	X	X	X	X
Cibotiumspora juriensis	X	X	X		X
Cicatricosisporites australiensis	X	X	X	X	X
Classopollis torosus	X	X	X	X	X
Clavatipollenites hughesi	X	X	X	X	X
Crybelosporites striatus	X	X	X	X	
Cyathidites asper	X		X	X	X
Cyathidites australis	X	X	X	X	X
Cyathidites minor	X	X	X	X	X
Cycadopites follicularis	X	X	X	X	X
Cycadopites nitidus	X	X	X	X	X
Cyclosporites hughesi	X	X	X	X	X
Dictyophyllidites equiexinus	X		X		X
Dictyophyllidites harrisii	X	X	X	X	X
Dictyophyllidites mortonii	X	X	X	X	X
Dictyotosporites complex	X	X	X	X	X
Dictyotosporites speciosus	X	X	X	X	
Foraminisporis asymmetricus	X	X		X	
Foraminisporis daylii	X		X	X	
Foraminisporis wonthaggiensis	X	X	X	X	X
Gleicheniidites senonicus	X		X		X
Klukisporites lacunus	X	X	X	X	X
Leptolepidites major	X	X	X		
Matonisporites cooksoniae	X	X	X	X	X
Microcachrydites antarcticus	X	X	X	X	X
Neoraistrickia truncata	X	X	X	X	X
Osmundacidites wellmanii	X	X	X	X	X
Pilosisporites grandis	X	X			

...cont'd

TABLE 1 (cont'd)

	Sample depth (m)				
	810	860	865	1200	1240
Pilosisporites notensis	X	X	X	X	X
Pilosisporites parvispinosus	X	X	X	X	X
Pinuspollenites globosaccatus	X		X		X
Pinuspollenites parvisaccatus	X	X	X	X	X
Podocarpidites ellipticus	X	X	X	X	X
Retitriletes austroclavatidites	X	X	X	X	X
Retitriletes circolumenus	X	X	X	X	X
Retitriletes facetus	X	X	X	X	X
Retitriletes reticulumsporites	X	X	X		X
Retitriletes rosewoodensis	X	X	X	X	X
Retitriletes semimuris	X	X	X	X	
Rogalskaisporites cicatricosus	X	X	X	X	X
Stereisporites antiquasporites	X	X	X	X	X
Trilobosporites trioreticulosus	X		X		
Triporoletes reticulatus	X	X	X	X	
Trisaccites variabilis	X		X	X	X
Vitreisporites pallidus	X	X		X	X
Alisporites grandis		X		X	X
Alisporites similis		X	X	X	X
Aequitriradites verrucosus		X			X
Callialasporites dampieri		X		X	X
Callialasporites turbatus		X		X	X
Camarozonosporites ramosus		X	X	X	X
Cicatricosisporites hughesi		X	X		
Crybelosporites stylosus		X			X
Foveosporites canalis		X	X	X	X
Leptolepidites verrucatus		X	X	X	
Aratrisporites sp.			X		X
Contignisporites cooksoniae			X		
Araucariacites fissus				X	X
Callialasporites segmentatus				X	X
Retitriletes watherooensis				X	X
Staplinisporifes caminus				X	X
Callialasporites trilobatus					X
Coronatispora perforata					X
Duplexisporites problematicus					X

TABLE 2. VISUAL ASSESSMENT OF KEROGEN

SAMPLE				PALYNOMORPHS				KEROGEN COMPONENTS						TAI	SOURCE POTENTIAL	
					Diversities											
DEPTH	TYPE	Wt (g)	VOM (ml.)	PRES.	Sp.	M.	M%	Spo.	Alg.	Cut.	Woo.	Ine	Sap.		Oil	Gas/ Cond.
810 m	Cuttg.	10	1.0	4	4		0	2	0	1	2	2	4	2.75	2	3
860 m	"	10	0.8	4	4		0	2	0	1	2	1	4	2.75	2	3
865 m	"	10	0.8	4	4		0	2	0	1	2	1	4	2.75	2	3
1200 m	"	10	1.3	4	4		0	2	0	1	1	1	4	3.00	2	3
1240 m	"	10	3.5	3	1		0	1	0	1	2	1	4	3.00	1	4
				1. Very poor 2. Poor 3. Fair 4. Good	1. 1-10 2. 11-20 3. 21-30 4. 30+			T. 0-2% 1. 2-10% 2. 11-25% 3. 26-50%			1+ 8-10% 2+ 20-25% 3+ 40-50% 4 50%+			1+ Immat. 2 Semimat. 2+ Mature 3+ Postmat.	1. Poor 2. Fair 3. Good 4. Very good	

Australasian Palynostratigraphic Services

PE907918

This is an enclosure indicator page.
The enclosure PE907918 is enclosed within the container PE905659 at this location in this document.

The enclosure PE907918 has the following characteristics:

ITEM_BARCODE	= PE907918
CONTAINER_BARCODE	= PE905659
NAME	= Palynological Table
BASIN	= OTWAY
PERMIT	= PEP101
TYPE	= WELL
SUBTYPE	= DIAGRAM
DESCRIPTION	= Ballangeich-1 Palynological Table, figure 1 from well Completion Report
REMARKS	= This item was previously barcoded as PE990792 from Andrews Palynology.
DATE_CREATED	=
DATE_RECEIVED	= 21/09/87
W_NO	= W965
WELL_NAME	= BALLANGEICH-1
CONTRACTOR	=
CLIENT_OP_CO	= PHOENIX OIL & GAS N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX IV

GEOTHERMAL GRADIENT

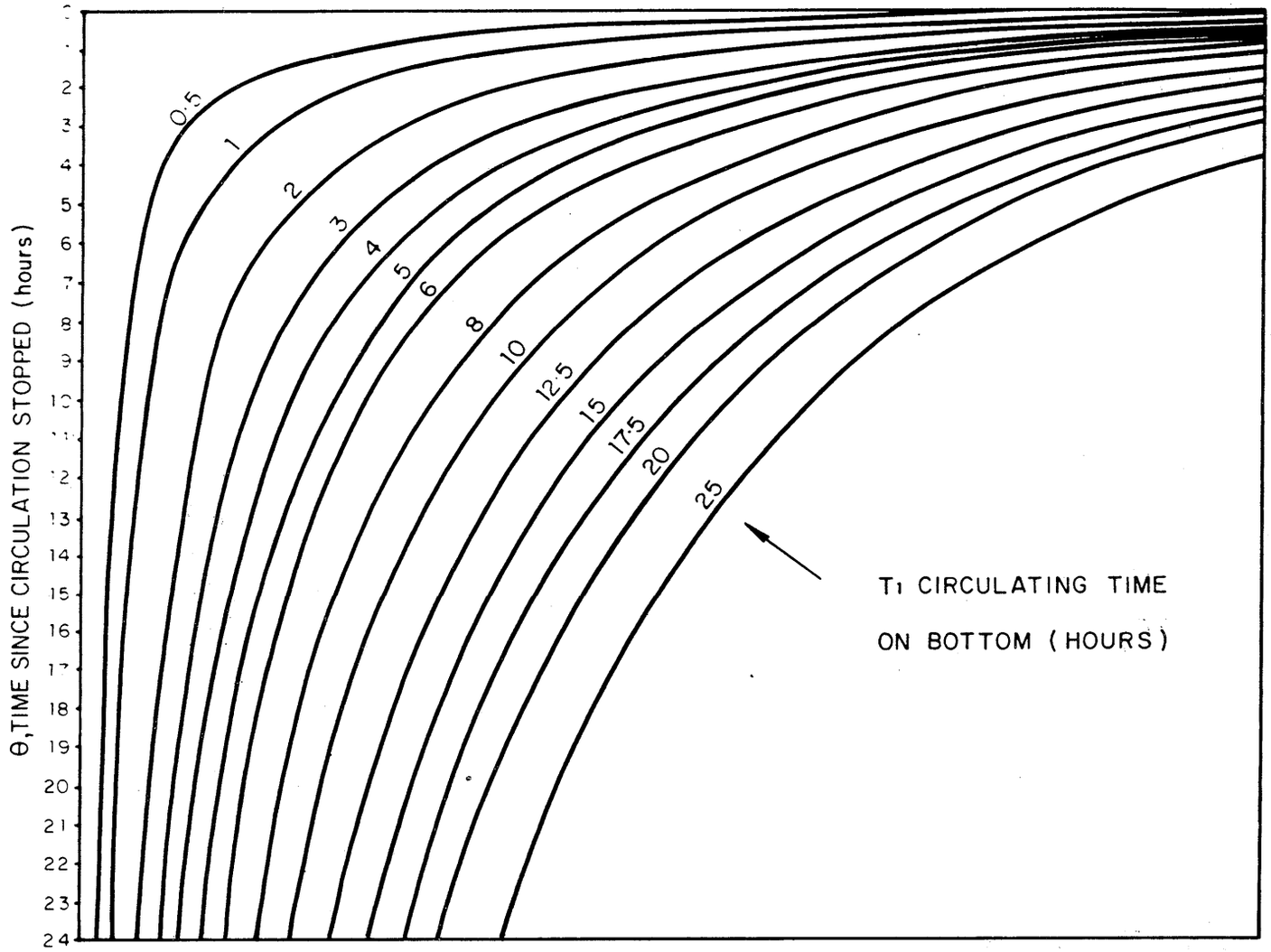
The following data is available

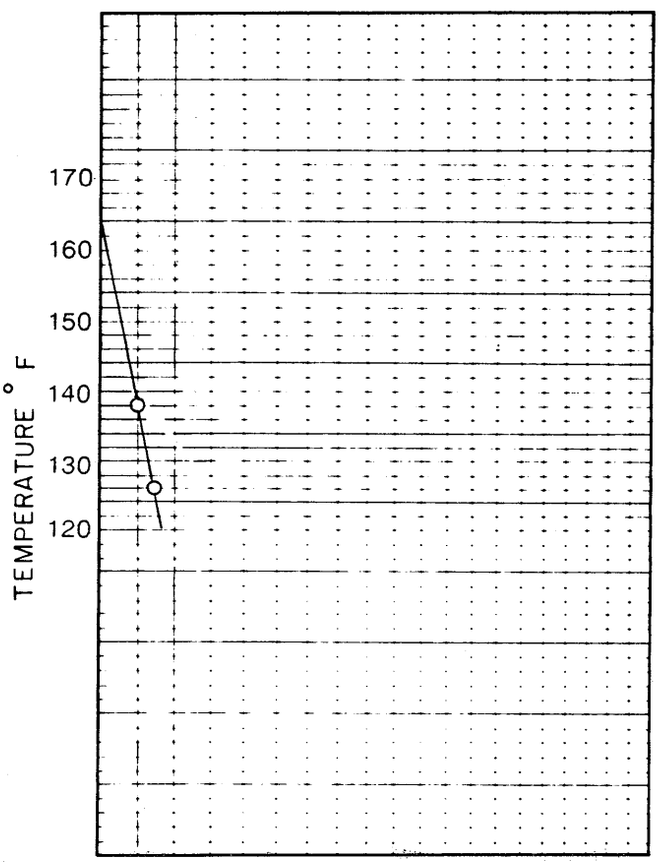
Logging Run		
DLL-MSFL-GR-CAL-SP	126°F @ TD	6.7 hours after circulation ceased
BHC-Cal-GR	138°F @ TD	10.8 hours after circulation ceased

Extrapolated BHT = 164°F @ TD

Assuming a mean annual surface temperature of 55.4°F and a linear temperature-depth relationship, the geothermal gradient at Ballangeich 1 is 2.63°F per 100 feet.

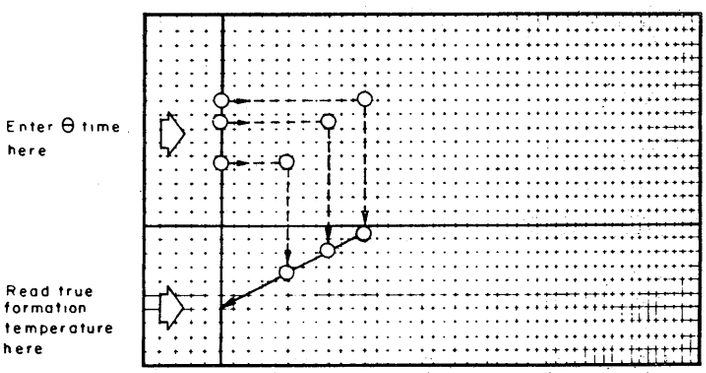
BOTTOM HOLE TEMPERATURE EXTRAPOLATION NOMOGRAPH





DIRECTIONS FOR USE OF NOMOGRAPH

1. Determine T circulating time on bottom.
2. For each temperature measurement, determine θ time since circulation
3. Set appropriate temperature scale
4. Proceed as shown below.



PHOENIX OIL & GAS N.L.

WELL **BALLANGEICH 1** LOG SUITE 1

MEAN ANNUAL SURFACE TEMPERATURE **13° C (55.4° F)**

EXTRAPOLATED BHT **164° F (73.3° C)**

AT DEPTH **1249.9m (driller)**

REMARKS **Thermal Gradient 4.8° C 100m**
(8.64° F 100m or 2.63° F 100ft)

GEOLOGIST **A.J.Williams** DATE **24 8 87**

PE604036

This is an enclosure indicator page.
The enclosure PE604036 is enclosed within the container PE905659 at this location in this document.

The enclosure PE604036 has the following characteristics:

ITEM_BARCODE	= PE604036
CONTAINER_BARCODE	= PE905659
NAME	= Composite Well Log
BASIN	= OTWAY
PERMIT	= PEP101
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Ballangeich-1 Composite Well Log, enclosure 1 from Well Completion Report
REMARKS	=
DATE_CREATED	= 31/10/87
DATE_RECEIVED	= 25/11/87
W_NO	= W965
WELL_NAME	= BALLANGEICH-1
CONTRACTOR	=
CLIENT_OP_CO	= PHOENIX OIL & GAS N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

PE604037

This is an enclosure indicator page.
The enclosure PE604037 is enclosed within the container PE905659 at this location in this document.

The enclosure PE604037 has the following characteristics:

ITEM_BARCODE	= PE604037
CONTAINER_BARCODE	= PE905659
NAME	= Mud Log
BASIN	= OTWAY
PERMIT	= PEP101
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Ballangeich-1 Mud Log, enclosure 2 from Well Completion Report
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 25/11/87
W_NO	= W965
WELL_NAME	= BALLANGEICH-1
CONTRACTOR	= EXLOG
CLIENT_OP_CO	= PHOENIX OIL & GAS N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

ENCLOSURE - 3

VELOCITY SURVEY

A copy of this report was forwarded to your Company on September 16th, 1987 and should be attached to this copy.

(See PE905662)