Fur Seal-1

VIC/P54

Well Completion Report

Interpretive Data

March 2008

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1. Palynological Interpretation Report

ENCLOSURES

1. Composite Log: Fur Seal-1 (1:500 TVD)

1. WELL SUMMARY

Fur Seal-1 is located approximately 30 kms from the nearest landfall in the Gippsland Basin, southeastern Victoria. It lies approximately 6.7 km west of Sunfish-1, 4.3 km north-west of Remora-1, 11.2 km east of Moonfish-1, 10.9 km southwest of Sweetlips-1 and 14 km from the Snapper Field in the production permit VIC/P54 (Figure 1). The well was designed as an exploration well to test a combined stratigraphic/structural trap in the southwest part of VIC/P54. The Fur Seal structure is an elongate, east-west orientated, four-way dip closure with the southern flank of the structure formed by the southerly dip of the Intra-Latrobe Group, and the northern flank formed by the base of the Marlin Channel truncating the southerly dipping Intra-Latrobe Group (Figures 2 and 3).

Fur Seal-1 was spudded at 03:00 hrs on October 24th, 2005 by the semi-submersible rig Ocean Patriot in 56.6 m of water. The vertical well reached a total depth of -2588.2 mTVDAHD (2610.0 mMDRT) at 01:30hrs on November 1st, 2005. Total depth was called in the Strzlecki Group. No Emperor Sub-group was intersected in this well.

In addition to the acquisition of logging-while-drilling data (Sperry-Sun LWD), the following suite of wireline logs was run:

Run 1: Dual CSAT Checkshot Survey

No conventional or sidewall cores were cut. No well testing was carried out.

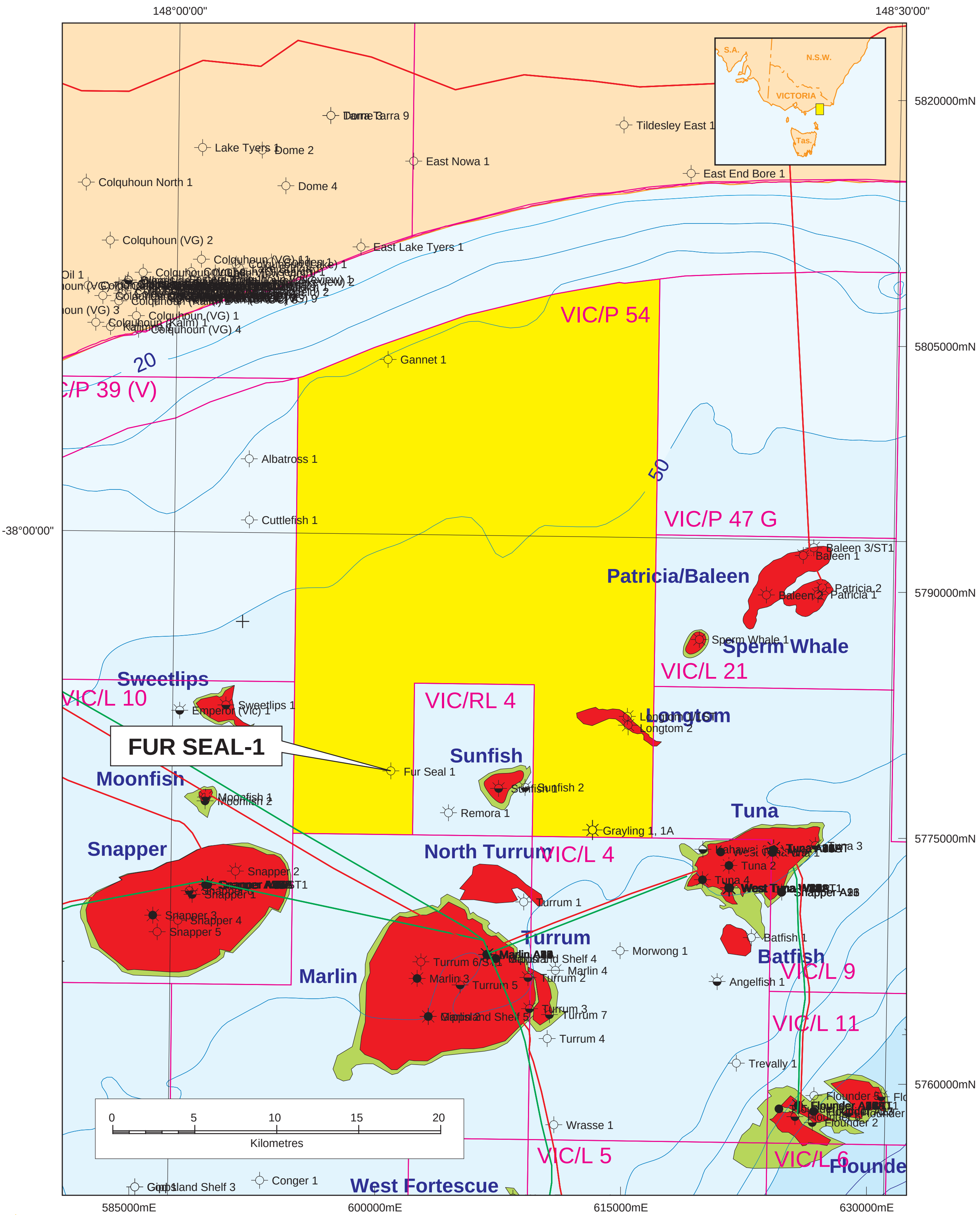
The top of the primary objective Kingfish Formation was intersected at -2176.7 mTVDAHD (2198.4 mMDRT), 43.3 m high to prognosis (Figure 4). The lithology comprises interbedded siltstone, carbonaceous sitlstone and calcareous claystone. Minor sandstone was seen at the top of the interval. The abundance of this sandstone became greater with increasing depth and comprised up to 95% kaolinitic matrix. Poor to fair inferred porosity was noted and no hydrocarbon shows were observed.

The secondary objective Volador Formation was intersected at -2362.2 mTVDAHD (2383.9 mMDRT), 1.5 m high to prognosis (Figure 4). The lithology comprises interbedded argillaceous sandstone and siltstone. The sandstone is fine to coarse-grained and poorly sorted. Poor to fair porosity was also noted within this interval and no hydrocarbon shows were observed.

Fur Seal-1, a dry hole, was plugged and abandoned and the rig was released at 18:00 hrs on November 5th, 2005 when 1 km from location.

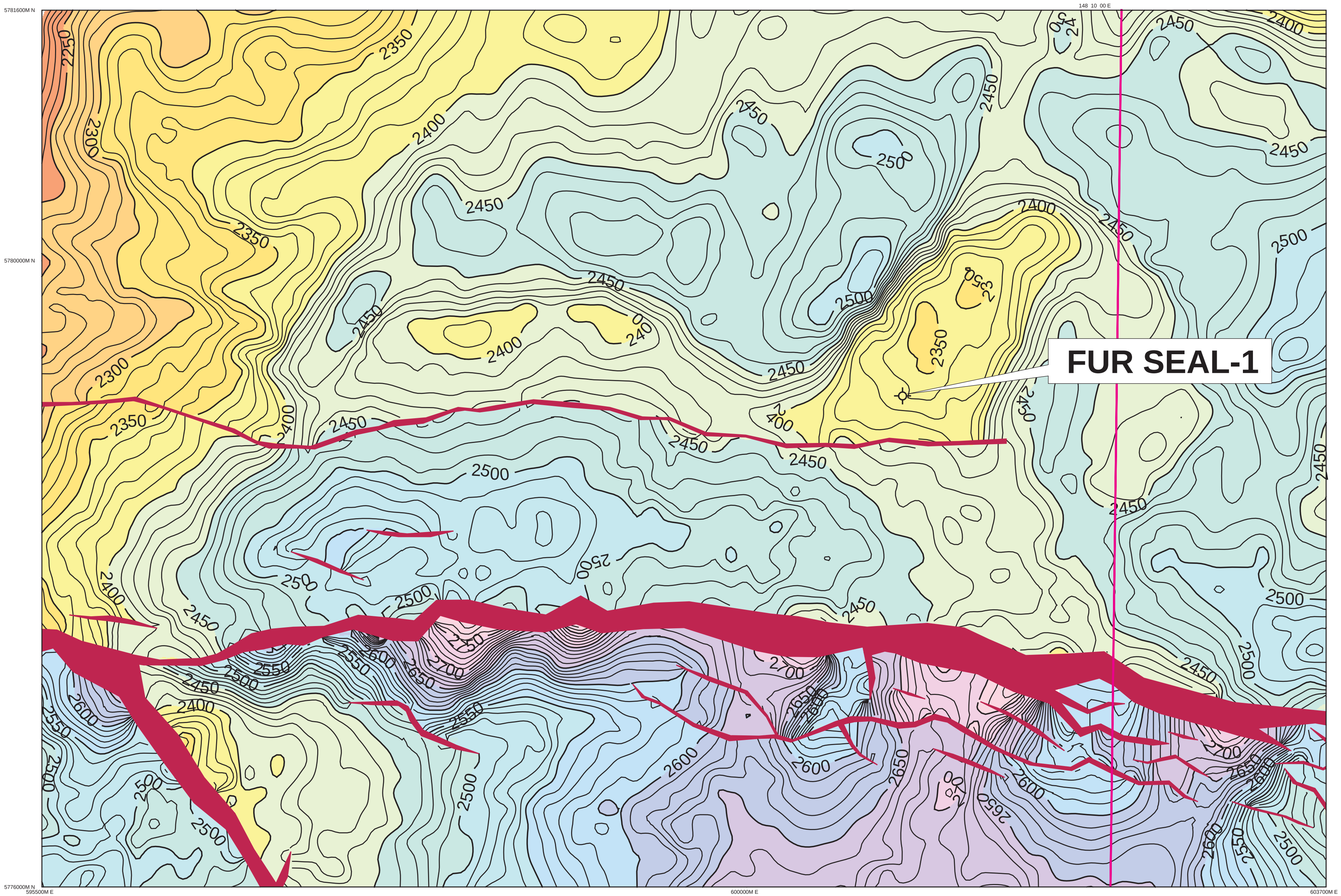
VIC/P 54

FUR SEAL-1 LOCATION MAP



September 2007 WLMu8912

Figure 1



0 1 2
KILOMETRES

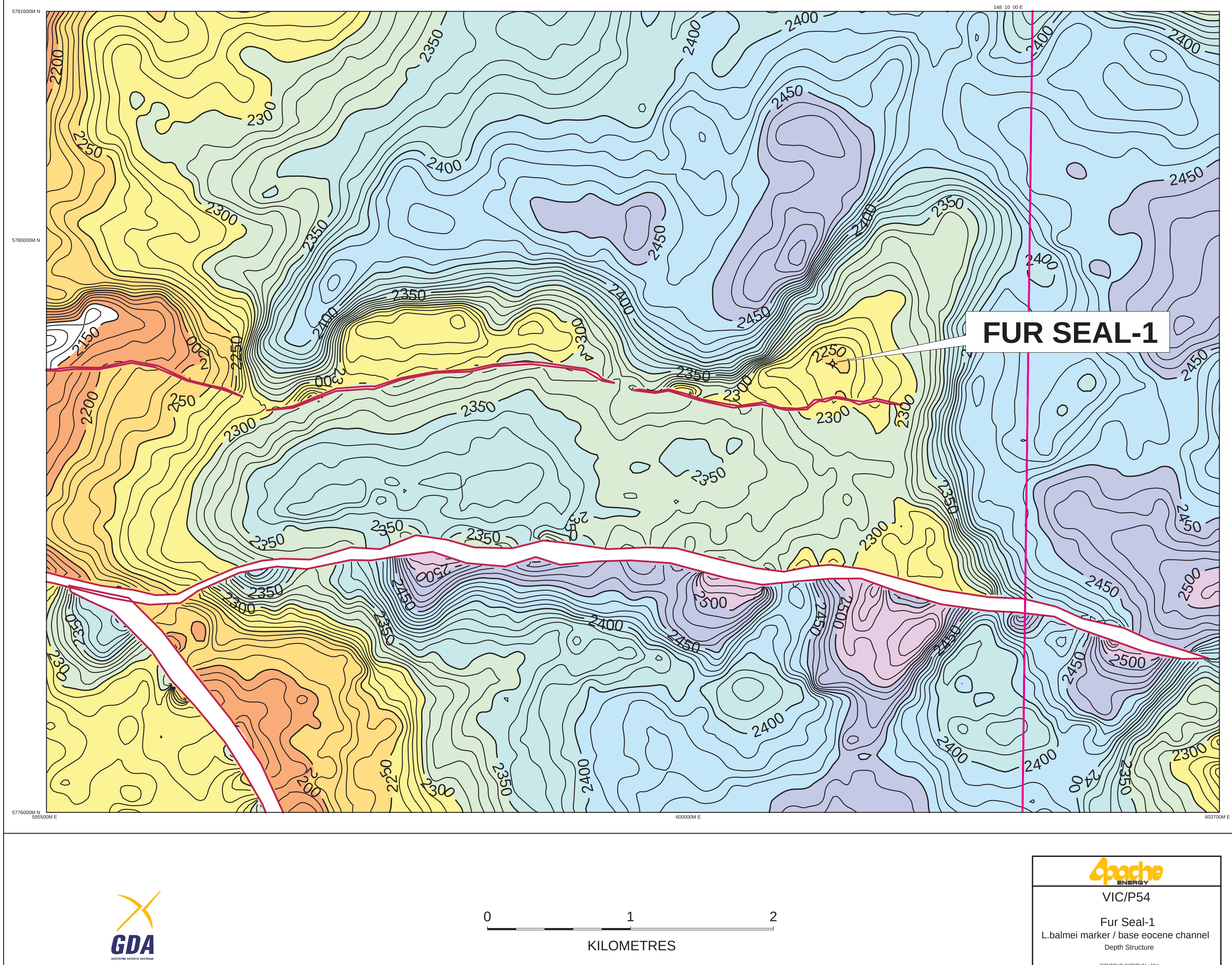
VIC/P54

Fur Seal-1
F longus / base eocene channel
Depth Structure

CONTOUR INTERVAL: 10m

Author : RLK	Date : September 7, 2006
Mapsheet : FURSEAL	Scale :
Map File : vicp54_furseal_FLON_postdrill.map	Plan No. : RLKu9562

Figure 2



VIC/P54

Fur Seal-1

L.balmei marker / base eocene channel

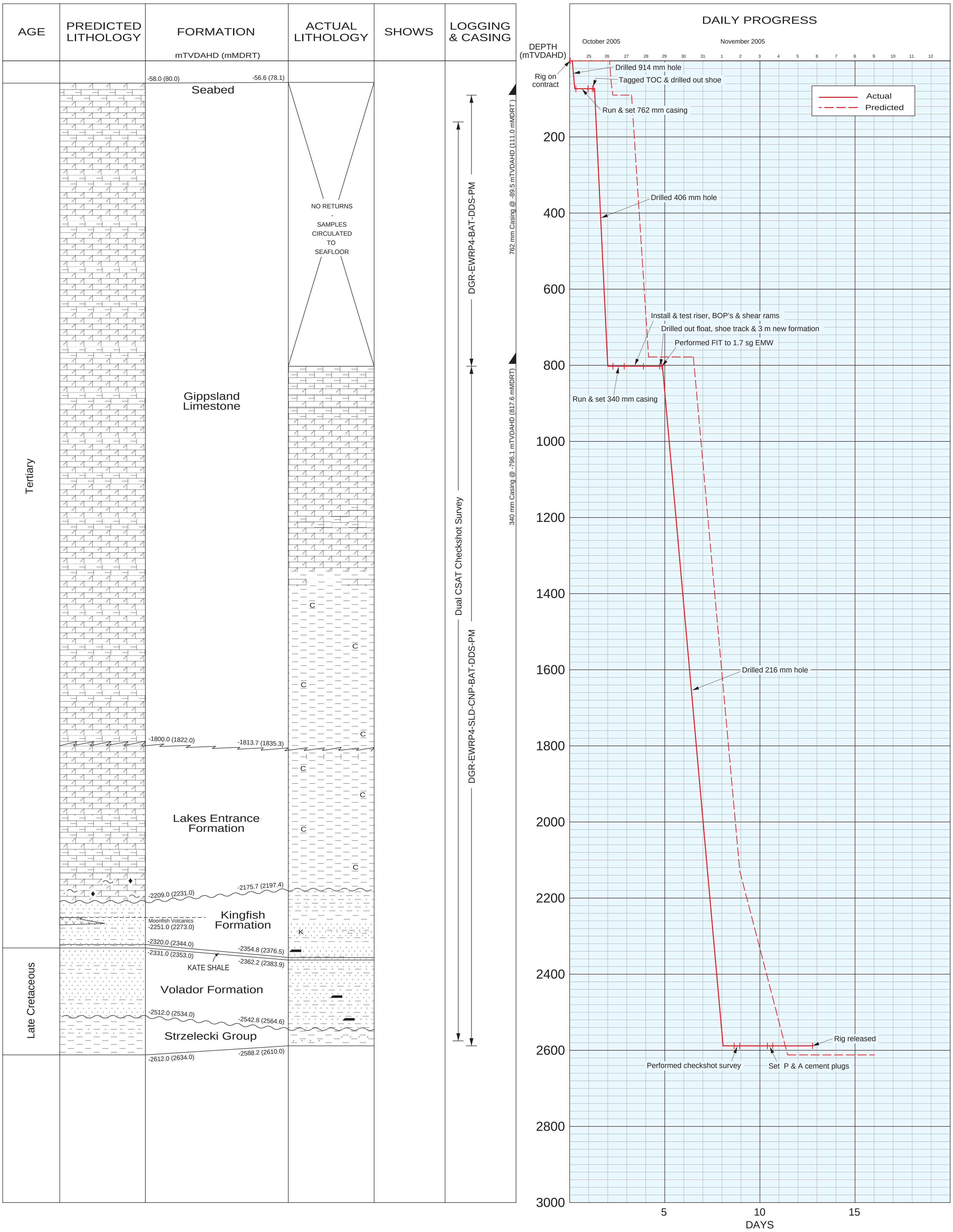
Depth Structure

CONTOUR INTERVAL: 10m

Author : RLK	Date : September 7, 2006
Mapsheet : FURSEAL	Scale :
Map File : vicp54_furseal_BMFvolc_postdrill.map	Plan No. : RLKu9563

Figure 3

FUR SEAL-1



LATITUDE :	38° 07' 47.91" S	UTM:	5,779,136.7 mN
LONGITUDE :	148° 09' 08.44" E		600,995.5 mE

SEISMIC LINE : IL 3195, XL 7787
SPUD DATE : 24 October 2005, 03:00 hrs
REACHED T.D.: 1 November 2005, 01:30 hrs
ELEVATION R.T.: 21.5 m above AHD
WATER DEPTH : 56.6 m below AHD
SEA BED : 78.1 m below R.T.
STATUS : Plugged & Abandoned, Dry Hole
RIG : Ocean Patriot
RIG RELEASED : 5 November 2005, 18:00 hrs

GDA

Apache ENERGY

VIC/P-54
GIPPSLAND BASIN

FUR SEAL-1

PREDICTED vs ACTUAL SECTION & WELL HISTORY

Author :	WCR	Date :	June 2007
Drawn :	Perth Exploration Dept.	Plan No.	A5u9460

Figure 4

2. WELL INDEX SHEET

Well:	Fur Seal-1	**Partners:**	Apache Energy Ltd (Operator) Apache Northwest Pty Ltd Nexus Energy Vic P54 Pty Ltd
Well Type:	Exploration		
Basin:	Gippsland		
Tenement:	VIC/P54		
Objective:	Kingfish Formation (Primary) Volador Formation (Secondary)		
Status:	P & A Dry Hole		
Spudded:	03:00 hrs 24 October 2005	**Latitude:**	38º 07' 47.91" S
TD Reached:	01:30 hrs 1 November 2005	**Longitude:**	148º 09' 08.44" E
Rig Released:	18:00 hrs 5 November 2005	**Northing:**	5,779,136.7 mN
Total Depth:	-2588.2 mTVDAHD (2610.0 mMDRT)	**Easting:**	600,995.5 mE
RT Elevation:	21.5 m above AHD	**Datum:**	GDA94
Water Depth:	56.6 m below AHD	**Projection:**	MGA Zone 55, CM 147º East
Drill. Contr.:	Diamond Offshore Pty Ltd	**Seis Loc:**	Northern Fields 3D Seismic Survey Inline 3195, Crossline 7787
Rig (Type):	Ocean Patriot (Semi-submersible)		

Formations

Subgroup	**Formation/Marker**	**Tops**		
		mMDRT	**mTVDAHD**	**mTVT**
Seaspray	Gippsland Limestone (Seabed)	78.1	-56.6	1757.1
	Lakes Entrance Formation	1835.3	-1813.7	363.0
Halibut	Kingfish Formation	2197.4	-2175.7	179.1
	Kate Shale (Lower *L. balmei* marker)	2376.5	-2354.8	7.4
	Volador Formation	2383.9	-2362.2	182.2
Emperor	Strzelecki Group	2566.1	-2544.4	43.8
	Total Depth	2610.0	-2588.2	

Hole and Casing Details

Hole Size (mm)	**Interval (mMDRT)**	**Interval (mTVDAHD)**	**Casing Size (mm)**	**Depth (mMDRT)**	**Depth (mTVDAHD)**
914	78.1 to 111.7	-56.6 to -90.2	762	111.0	-89.5
406	111.7 to 824.0	-90.2 to -802.5	340	817.6	-796.1
216	824.0 to 2610.0	-802.5 to -2588.2			

MWD/LWD Logs

Bit No.	**Log Suite**	**Interval mTVDAHD(mMDRT)**	**Max °C**	**Hole Size (mm)**	**Remarks**
1	DGR-EWRP4-BAT-DDS-PM	-90.2 to -802.5 (111.7 to 824.0)	25	311	All recorded data recovered at surface.
2	DGR-EWRP4-SLD-CNP-BAT-DDS-PM	-802.5 to -2588.2 (824.0 to 2610.0)	75.5	216	All recorded data recovered at surface.

Well Index Sheet (cont.)

Wireline Logs

Suite	Run	Log Suite	Interval mTVDAHD (mMDRT)	BHT (°C)	Remarks
1	1	Dual CSAT Checkshot Survey	-2575.2 to -160.5 (2597.0 to 182.0)	109	Checkshots recorded at 15 m intervals from TD to loss of signal.

Cement Plugs

Plug No.	Interval mTVDAHD (mMDRT)	Tagged
1a	-2588.2 to -2358.3 (2610.0 to 2380.0)	Y
1b	-2388.3 to -2358.3 (2410.0 to 2380.0)	N
1c	-2078.3 to -1018.4 (2100.0 to 1040.0)	N
2	-838.4 to -734.5 (860.0 to 756.0)	Y
3	-138.5 to -78.5 (160.0 to 100.0)	N

Testing: No testing was carried out.

Coring: No conventional or sidewall cores were cut.

Comments: The surface location is 3.5 m on a bearing of 223.4º from the prosposed Fur Seal-1 location.

3. GEOLOGY

3.1 Summary of Regional Geology

The Fur Seal structure is located upon a fault terrace within the Rosedale Fault System on the northern margin of the Gippsland Basin (Figure 1). The Gippsland Basin is located at the eastern end of the major Late Jurassic to Late Cretaceous rift system that formed the southern edge of the Australian continent. It developed as a series of asymmetrical grabens in response to the break-up of Australia and Antarctica during the Early Cretaceous, and separation of Australia from the Lord Howe Rise/Campbell Plateau during the Late Cretaceous.

Clastic deposition commenced during the Early Cretaceous and continued in the basin at least until the Miocene in onshore regions. The onshore western part of the basin is dominated by terrestrial pre-rift succession of the Early Cretaceous Strzelecki Group which is Albian and older in age. The eastern offshore part has a much more complete and complex sedimentary record and all of the economic hydrocarbon accumulations. The offshore portion of the basin also has a thick interval of carbonates, the Gippsland Limestone that was deposited during the Miocene.

The structural evolution of the Gippsland Basin involved extensional and compressional events. Two phases of superimposed extension associated with southeastern Australian rifting events affected the region. Extension resulted in a series of NW-SE to WNW-ESE orientated en-echelon basement-involved normal faults on both the northern and southern margins of the basin. The en-echelon, soft-linked dog-leg pattern of normal faults on both the southern and northern margins of the basin is a characteristic of basement involvement in faulting, suggesting pre-existing structural grain influencing the orientation of subsequent faults. Locally, on the basin margins, these faults accommodate large syn-depositional thickness variations.

During the Cenomanian and Turonian, sediments of the syn-rift phase were deposited in lacustrine and lake margin settings (Emperor Sub-Group). The separation of the Lord Howe Rise and the onset of the Tasman Sea opening to the east of the Gippsland Basin during the Santonian were responsible for generating a basin-wide unconformity surface referred to as the Longtom Unconformity. This unconformity separates the underlying lacustrine Emperor Sub-Group from the overlying braided fluvial, deltaic to paralic and shallow marine rocks of the Golden Beach Sub-Group. Shallow marine depositional environments within the Golden Beach Sub-Group are only recorded from the eastern part of the basin. As the Tasman Sea rifting progressed to seafloor spreading in the mid-Campanian (*T. lilliei* biozone), basaltic volcanism within the basin and on the basin flanks reached a peak, covering much of the Golden Beach coastal plain environment with basic extrusives. The unconformity at the top of the Golden Beach Sub-Group is known as the Seahorse Unconformity.

Following this volcanic episode the sediments of the Halibut Sub-Group were deposited during the late syn-rift to post-rift thermal subsidence phase of basin evolution. These were deposited in fluvial, alluvial, deltaic and paralic environments in a basin that opened out to the east onto a developing ocean. The majority of the Halibut Sub-Group was deposited in a non-marine coastal plain setting behind a generally NE-SW orientated beach-barrier complex. During the deposition of the Halibut Sub-Group syn-depositional growth was achieved via extensional reactivation of pre-existing NW-SE to WNW-ESE faults. This faulting progressively ceased during the Paleocene to Eocene. Towards the end of the Lower Eocene the coastal plain was well established with fluvial systems feeding a strand line beach/barrier system.

Compressional tectonics began to affect the Gippsland Basin from the Early Eocene. Uplift and inversion of the central region and northern margins initiated at this stage caused erosion and generation of initially fluvially incised canyon systems. Within the eastern part of the basin several erosional monadnocks are formed within these canyon systems. In eastern parts of the basin significant amounts of erosion have resulted in a prominent unconformity surface that cuts down into the Halibut Sub-Group to the level of the Maastrichtian Volador Formation. The section underlying the Top Latrobe Unconformity in the western part of the basin is much younger than in eastern parts of the basin. Backstepping (or transgressing) of a series of barrier beach/strandline complexes from east to west occurred during the Eocene. Subsequent to this period of incision and downcutting several pulses of relative sea-level rise took place as subsidence and sedimentation rates slowed, allowing flooding/transgressive pulses to gradually push the shoreline system towards the NW. The depositional lows (eroded canyons) are flooded first preferentially as Eocene offshore marine facies, e.g. the Flounder Formation, are deposited. By the Middle Eocene the palaeo-shoreline had transgressed westwards. By the end of the Eocene the palaeo-shoreline is believed to have moved inland from Lakes Entrance. In most of the offshore areas deposition of condensed glauconitic siltstones and shales replaced deposition of coarse siliciclastics.

Northwest directed compression and transpression began in the Early Eocene and continued episodically with varying intensity through to the Pliocene. Major pulses of compression subsequent to the Early Eocene affected the basin during the Lower Oligocene, Middle Miocene and Pliocene. A series of NE to ENE trending anticlines are the result of this compression. Whilst many of the resultant compressional features are eroded and partially truncated, suggesting periods of sub-aerial exposure, several structures in the west of the basin are not eroded, suggesting they were not emergent sub-aerially.

The marine marls of the Lakes Entrance formation record the final marine transgression in the Early Oligocene. Locally, this succession onlaps onto the flanks of the earlier formed compressional features. From the Mid-Miocene onwards a thick limestone unit, the Gippsland Limestone, was deposited. Major incisions during the mid to Late Miocene are interpreted as offshore erosion/mass wasting events that may have been initiated during compressional reactivation. These incisions are infilled by prograding limestone depositional wedges, which are ultimately responsible for creating the present day shelf-slope break.

The presence of mature source rock intervals within the basin is evidenced by significant oil and gas reserves in the basin. Within the Central Deep portion of the basin coals, coaly or carbonaceous shales of the Strzelecki Group, Golden Beach and Halibut Sub-Groups have all contributed to the oil and gas pools reservoired in the basin. The most prolific source rock intervals however, are suggested to be within the lower coastal plain facies of the Golden Beach and Halibut Sub-Groups. Contributions from source rock intervals in more marine-influenced shales in the eastern parts of the basin have been noted. The regional top seal for the reservoirs in the Gippsland Basin is the Lakes Entrance Formation, however, the presence of volcanics, shales, coaly shales, coals and glauconitic shales related to marine flooding within the Golden Beach and Halibut Sub-Groups have been proven at several intersections to provide valid top seals and cross-fault seals. Within the Latrobe Group there are several proven reservoir levels distributed throughout the entire stratigraphy. The various extensional phases of faulting and subsequent compressional events and incision, in combination with the presence of intra-formational seal units, have developed a myriad of proven trapping configurations in the basin.

3.2 Surrounding Wells

Well Name	Permit	Operator	Date Completed	TD (mRT)	Status
Tuna-2	VIC/L4	Esso Aust. Ltd.	09/12/1968	2761	P & A*, Successful gas & oil confirmation test
Turrum-1	VIC/L3	Esso Aust. Ltd.	27/06/1969	3057	P & A*, Gas Well
Sunfish-1	VIC/P1	Esso Aust. Ltd.	03/03/1974	2492	P & A*, Oil & Gas Well
Sunfish-2	VIC/P1	Esso Aust. Ltd.	14/10/1983	2647	P & A*, Oil Well
Tuna-4	VIC/L4	Esso Aust. Ltd.	31/08/1984	3321	P & A*, Oil & Gas Well
Remora-1	VIC/P1	Esso Aust. Ltd.	29/05/1987	2961	P & A*, Gas & Oil Discovery
Longtom-1	VIC/P1	BHP Petroleum	14/06/1995	2242	Abandoned Gas Well
Longtom-2/ST1	VIC/P54	Apache Aus Dev	22/12/2004	2148	P & A*, Gas Well
Grayling-1/1A	VIC/P54	Apache Aus Dev	20/01/2005	2914	P & A*, Gas Well

P & A*- Plugged & Abandoned

3.3 Structure

The Fur Seal feature is an elongate, east-west orientated, four-way dip closure with the southern flank of the structure formed by the southerly dip of the Intra-Latrobe Group, and the northern flank formed by the base of the Marlin Channel truncating the southerly dipping Intra-Latrobe Group (Figures 2, 3 and 5). The Marlin Channel in this part of the Gippsland Basin has an east-west orientation to its southern margin.

3.4 Stratigraphy

The stratigraphic section penetrated in Fur Seal-1 is described below and summarised in Figure 6; delineation of age units is based on log correlation with nearby wells together with palynological data (Appendix 1). Detailed lithological descriptions are included in the cuttings descriptions, daily geological reports, core chip descriptions and mudlog section of the Fur Seal-1 Basic Data Well Completion Report. Age, lithology and drilling data have been collated on the composite well log accompanying this report (Enclosure 1). No cuttings were recovered from spud to -802.5 mTVDAHD (824.0 mMDRT.

<u>Gippsland Limestone</u>

Depth: -56.6 (Seabed) to -1813.7 mTVDAHD (78.1 to 1835.3 mMDRT)
Thickness: 1757.1 mTVT
Age: Late Oligocene to Recent

FUR SEAL-1 : Nth Fields 3D line 3195 showing objective section

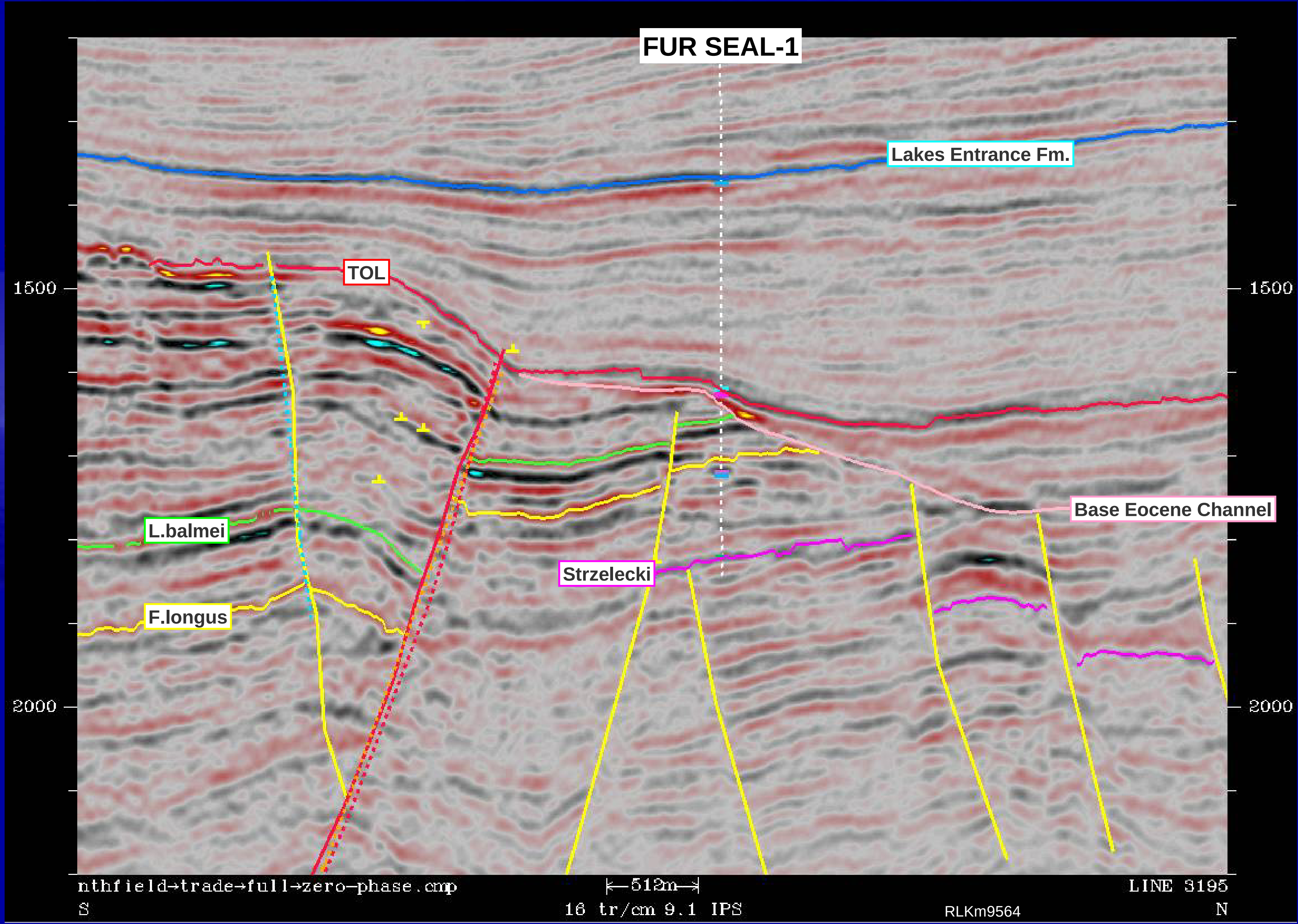


Figure 5

FUR SEAL-1

STRATIGRAPHY

SYSTEM	STAGE	GROUP	FORMATION	MEASURED DEPTH (mMDRT)	SUBSEA TVD DEPTH (mTVDAHD)	THICKNESS (mTVT)	DEPOSITIONAL ENVIRONMENT	APPROXIMATE PALYNOLOGICAL ZONATIONS
TERTIARY	LATE OLIGOCENE TO RECENT	SEASPRAY GROUP	GIPPSLAND LIMESTONE	78.1	-56.6	1,757.1	OFFSHORE MARINE	*T. bellus* - Upper *P. tuberculatus*
	PALEOCENE TO OLIGOCENE		LAKES ENTRANCE FORMATION	1835.3	-1813.7	363.0		Middle - Lower *P. tuberculatus*
		HALIBUT SUBGROUP	KINGFISH FORMATION	2197.4	-2175.7	179.1	VERY NEARSHORE TO NON - MARINE	Upper *L. balmei*; Lower *L. balmei*
	PALEOCENE		KATE SHALE	2376.5	-2354.8	7.4		
LATE CRETACEOUS	MAASTRICHTIAN		VOLADOR FORMATION	2383.9	-2362.2	182.2		Upper *F. longus*
	ALBIAN		STRZELECKI GROUP	2564.6	-2542.8	43.8		Late Cretaceous; *P. pannosus*; Upper *C. paradoxa*
				2610.0	-2588.2			

AUTHOR: WCR	DATED: March 2007
DRAWN: Perth Drafting Dept.	PLAN No.: STRu9235

Figure 6

The Gippsland Limestone sediments were not sampled above -802.5 mTVDAHD (824.0 mMDRT) as returns were circulated to the seafloor. Below this level the lithology consists of predominantly calcilutite at the top of the interval, becoming interbedded with marl with increasing depth and then changes to massive marl below -958.4 mTVDAHD (980.0 mMDRT). At -1338.4 mTVDAHD (1360.0 mMDRT) the marl becomes interbedded with calcareous claystone that increases in abundance to 100% with increasing depth.

Palynological analysis (Appendix 1) on cuttings from the base of the Gippsland Limestone suggests this interval is Late Oligocene to Miocene in age, deposited within the upper *P. tuberculatus* to *T. bellus* biozones, in an offshore to shelfal marine environment. Regionally, the Gippsland Limestone is interpreted as being deposited in an offshore marine environment.

Lakes Entrance Formation

Depth: -1813.7 to -2175.7 mTVDAHD (1835.3 to 2197.4 mMDRT)
Thickness: 363.0 mTVT
Age: Oligocene

The Lakes Entrance Formation lies disconformably below the Gippsland Limestone and has been interpreted from LWD logs by a baseline shift in resistivity logs and correlation with offset wells. The lithology comprises massive calcareous claystone. Regionally, the Lakes Entrance Formation is interpreted as being deposited in an offshore marine environment.

Palynological analysis suggests the Lakes Entrance Formation is Oligocene in age, deposited within the middle to lower *P. tuberculatus* biozone in an offshore to shelfal marine environment.

Kingfish Formation

Depth: -2175.7 to -2354.8 mTVDAHD (2197.4 to 2376.5 mMDRT)
Thickness: 179.1 mTVT
Age: Paleocene

The Kingfish Formation lies unconformably below the Lakes Entrance Formation. It is interpreted from LWD logs by a slight increase in gamma ray values that correspond to a bulk shift in resistivity, density and neutron porosity logs. The top of the formation is comprised of interbedded siltstone and calcareous claystone with trace sandstone. Below -2248.3 mTVDAHD (2270.0 mMDRT) the lithology comprises interbedded kaolinitic sandstone and sandstone with minor interbedded siltstone. The sandstones are fine to coarse-grained and poorly sorted. White kaolinitic matrix (up to 95%) is noted in some samples. Inferred porosity is poor to fair and no hydrocarbon shows were observed.

Palynological analysis suggests these sediments are Paleocene in age, deposited within the *L. balmei* biozone in a non-marine, fluvial, swamp or lake environment.

Kate Shale

Depth: -2354.8 to -2362.2 mTVDAHD (2376.5 to 2383.9 mMDRT)
Thickness: 7.4 mTVT
Age: Maastrichtian

The Kate Shale lies conformably below the Kingfish Formation and is interpreted from LWD logs by a marked increase in gamma ray values. The lithology comprises predominantly siltstone (50 to 90%) with minor kaolinitic sandstone (possibly cavings from the section above).

No palynological analysis was done on cuttings from this interval in Fur Seal-1. Regionally, the Kate Shale is interpreted to be at the Tertiary-Cretaceous boundary, deposited within the lowermost *L. balmei* to uppermost *F. longus* biozones in a non-marine environment.

Volador Formation

Depth: -2362.2 to -2544.4mTVDAHD (2383.9 to 2566.1 mMDRT)
Thickness: 182.2 mTVT
Age: Maastrichtian

The Volador Formation lies conformably below the Kate Shale and is interpreted from LWD logs by a decrease in gamma ray and resistivity values. The lithology comprises interbedded sandstone and carbonaceous siltstone claystone. Trace coal was also seen. The sandstone is fine to coarse-grained and poorly sorted. Poor to fair inferred porosity is noted. No hydrocarbon shows were observed.

Palynological analysis could not determine the biozones within this section. It does, however, suggest these sediments are Late Cretaceous in age and were deposited in a non-marine environment.

Strzelecki Group

Depth: -2544.4 to -2588.2 mTVDAHD (2566.1 to 2610.0 mMDRT)
Thickness: +43.8 mTVT (base not penetrated)
Age: Albian

The Strzelecki Group lies unconformably below the Volador Formation. The Golden Beach and Emperor Subgroups, seen in offset wells below the Volador Formation, are absent from Fur Seal-1. The top of the Strzelecki Group has been interpreted from LWD logs by an increase in gamma ray and resistivity. The lithology comprises massive claystone. Minor interbedded argillaceous sandstone (thought possibly to be cavings) and silty claystone were also seen. Moderate inferred porosity was noted within the sandstone but no hydrocarbon shows were observed.

Palynological analysis suggests this section is Albian in age, deposited within the *P. pannosus* to Upper *C. paradoxa* biozones, in a non-marine, floodplain environment.

–

3.5 Hydrocarbon Occurrences

Total gas and chromatographic gas analysis were recorded during the drilling of Fur Seal-1 and results are presented in the daily geological reports and the mudlog section of the Fur Seal-1 Basic Data Well Completion Report. Riserless drilling resulted in no returns to surface from spud to -802.5 mTVDAHD (824.0 mMDRT) and therefore no gas or cuttings data were available.

Total average gas values recorded throughout the drilling of Fur Seal-1 ranged from 0.22 to 1.26%. Three minor gas peaks (up to 1.79% over a background of 1.08%) were recorded within the primary objective Kingfish Formation. Gas composition was predominantly C_1 but included up to C_5 components. No hydrocarbon fluorescence was observed. No gas peaks were recorded and no hydrocarbon fluorescence was observed within the secondary objective Volador Formation.

3.6 Contributions to Geological Knowledge and Conclusions

Fur Seal-1 was designed as an exploration well to test a combined stratigraphic/structural trap, mapped at both Kingfish and Volador Formation levels.

At least two porous sandstones of > 8 m thickness were encountered. Lateral seal against the southern flank of the Marlin Channel is the most likely reason for failure although the complete lack of any shows or any residual pay may point to Fur Seal-1 being in a migration shadow north of the Moonfish-Remora fault.

The *L. balmei* volcanics were not present at Fur Seal-1 and must have pinched out somewhere between this location and the Emperor/Sweetlips and Moonfish wells. As predicted, the *M. diversus* section had been removed by erosion at the Fur Seal location.

Fur Seal-1, a dry hole, was plugged and abandoned and the rig was released at 18:00 hrs on November 5th, 2005 when 1 km from location.

APPENDIX 1

Palynology Report

PALYNOLOGY OF

FUR SEAL-1

GIPPSLAND BASIN, AUSTRALIA

by

ROGER MORGAN

Prepared for
APACHE ENERGY

December 2005

REF: GIP.FUR SEAL-1 REPORT

PALYNOLOGY OF

FUR SEAL-1

GIPPSLAND BASIN, AUSTRALIA

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Table 1 Summary of Palynological Data, Fur Seal-1
Table 2 Environmental Raw Data (percent content of groups), Fur Seal-1

Figure 1 Zonation Summary (Helby, Morgan and Partridge 1987)
Figure 2 Tertiary Zonation Scheme (Partridge 1976 and pers. comm. using time scale of Haq et al)
Figure 3 Maturity profile : Fur Seal-1

Enclosure 1 Species distribution chart

1 SUMMARY

Poor microfossil yields have reduce confidence, but the following breakdown is indicated.

1600/20 m (cutts) – 1820/40 m (cutts) : *T. bellus-P. tuberculatus* upper subzone : Miocene : offshore to shelfal marine : immature

1840/60 m (cutts) – 2190/200 m (cutts) : *P. tuberculatus* Zone, middle-lower subzones : Oligocene : offshore to shelfal marine : immature for hydrocarbons

2200/10 m (cutts) – 2210/20 m (cutts) : *L. balmei* Zone, upper subzone : Paleocene : non-marine, swamp margin and floodplain : marginal mature for oil, immature for gas/condensate

2220/30 m (cutts) – 2360/70 m (cutts) : *L. balmei* Zone, lower subzone : Paleocene : non-marine, fluvial, swamp and lake : marginal mature for oil, immature for gas/condensate

2400/10 m (cutts) – 2540/50 m (cutts) : *F. longus* Zone, upper subzone : Maastrichtian : non-marine, swamp to swamp margin : marginal mature for oil, immature for gas/condensate

2560/70 m (cutts) : Late Cretaceous : non-marine : marginal mature for oil, immature for gas/condensate

2580/90 m (cutts) : *P. pannosus* Zone : Albian : non-marine, floodplain : marginal mature for oil, immature for gas/condensate

2590/600 m (cutts) – 2600/10 m (cutts) : *C. paradoxa* Zone, upper subzone : Albian : non-marine, floodplain : marginal mature for oil, immature for gas/condensate

2 INTRODUCTION

Palynology of the **Fur Seal-1** section is entirely cuttings based using 23 samples submitted by Steve Moss of Apache. Microfossil yields were initially very low, and many samples have been reprocessed to achieve better yields. The problem may be the nature of the rocks, mud additives, or drilling bits. The problem will be monitored in the future for see if it re-occurs.

The Cretaceous zonation is basically that of Helby, Morgan and Partridge (1987) shown in Figure 1 with subdivisions as discussed in the test. The Tertiary zones are those of Partridge (1976 and pers. comm.) as shown on Figure 2.

All depths are given in metres and are recorded drillers depths.

Palaeoenvironmental assessments are based on specimen counts of 100 specimens, also providing a percentage content of all species. Criterea for the palaeo-environmental subdivisions are given on Table 1. In running text, rare = <1-3%, frequent = 4-10%, common = 11-30%, abundant = 31-50% and superabundant = 51-100%.

Confidence ratings include the factor of sample type, and distinctiveness of the fossil event, according to the scheme shown on Table 1. This is the STRATDAT scheme used by Esso.

Maturity data were generated in the form of Spore Colour Index, and are plotted on Figure 3 Maturity Profile : Fur Seal-1. The oil and gas windows follow the general concensus of geochemical literature. The oil window corresponds to spore colours of light-mid brown (Staplin Spore Colour Index of 2.7) to dark brown (3.6) equal to vitrinite reflectance values of 0.6% to 1.3%. Geochemists argue variations on kerogen type, basin type and basin history. The maturity data is thus open to reinterpretation using the basic colour observations as reworked. However, the range of interpretation philosophies is not great, and probably would not move the oil window by more than 200 m.

TABLE 1

SUMMARY OF PALYNOLOGICAL DATA : FUR SEAL-1

DEPTH (m)	SAMPLE TYPE	MICROFOSSIL YIELD	PERCENTAGE				DIVERSITY *1		SPORE-POLLEN ZONE	CR *2	MICROPLANKTON ZONE	CR *2	ENVIRONMENT *3
			MICROPLANKTON			SPORE-POLLEN-	SALINE MICROPLANKTON	SPORE-POLLEN					
			DINOFLAG	SPINY AC.	FRESH ALGAE								
1600/20	CUTTS	MODERATE	52	5	3	40	LOW	MODERATE	T. BELLUS-P. TUBERCULATUS, LOWER	C2	T. VANCAMPOAE	C2	SHELFAL MARINE
1820/40	CUTTS	MODERATE	86	11	0	3	LOW	EX LOW	T. BELLUS-P. TUBERCULATUS, LOWER	C5	T. VANCAMPOAE	C2	OFFSHORE MARINE
1840/60	CUTTS	MODERATE	81	1	4	14	MODERATE	MODERATE	P. TUBERCULATUS, MIDDLE-LOWER	C2	OPERCULODINIUM SPP.	C2	OFFSHORE MARINE
1900/20	CUTTS	LOW	70	20	1	9	LOW	LOW	P. TUBERCULATUS, MIDDLE-LOWER	C2	OPERCULODINIUM SPP.	C2	OFFSHORE MARINE
2110/20	CUTTS	LOW	44	3	5	48	LOW	HIGH	P. TUBERCULATUS, MIDDLE-LOWER	C2	OPERCULODINIUM SPP	C2	SHELFAL MARINE
2150/60	CUTTS	LOW	74	10	3	13	MODERATE	LOW	P. TUBERCULATUS, MIDDLE-LOWER	C2	OPERCULODINIUM SPP.	C2	OFFSHORE MARINE
2180/90	CUTTS	LOW	32	2	2	64	LOW	HIGH	P. TUBERCULATUS, MIDDLE-LOWER	C2	OPERCULODINIUM SPP.	C2	SHELFAL MARINE
2190/200	CUTTS	LOW	91	5	1	3	MODERATE	EX LOW	P. TUBERCULATUS, MIDDLE-LOWER	C2	OPERCULODINIUM SPP.	C2	OFFSHORE MARINE
2200/10	CUTTS	LOW	(1)	0	3	96	(LOW)	HIGH	L. BALMEI, UPPER	C2			NON-MARINE, SWAMP MARGIN
2210/20	CUTTS	LOW	92)	(1)	0	97	(EX LOW)	MODERATE	L. BALMEI, UPPER	C2			NON-MARINE, FLOODPLAIN
2220/30	CUTTS	LOW	(1)	0	3	97	(EX LOW)	MODERATE	L. BALMEI, LOWER	C2			NON-MARINE, FLOODPLAIN
2260/70	CUTTS	LOW	(5)	0	0	95	(EX LOW)	MODERATE	L. BALMEI, LOWER	C2			NON-MARINE, FLUVIAL
2290/300	CUTTS	NEAR BARREN	-	-	-	-	-	EX LOW	INDETERMINATE	-			?NON-MARINE, ?FLUVIAL
2320/30	CUTTS	EX LEAN	0	0	5	95	NIL	LOW	L. BALMEI	C2			?NON-MARINE, ?FLUVIAL
2340/50	CUTTS	LOW	0	0	0	100	NIL	MODERATE	L. BALMEI, LOWER	C2			?NON-MARINE, SWAMP
2360/70	CUTTS	LOW	0	0	13	87	NIL	MODERATE	L. BALMEI	C2			NON-MARINE, LAKE
2400/10	CUTTS	EX LOW	0	0	2	98	NIL	HIGH	F. LONGUS, UPPER	C2			NON-MARINE, SWAMP MARGIN
2490/500	CUTTS	NEAR BARREN	(5)	0	0	95	(EX LOW)	MODERATE	INDETERMINATE	C5			NON-MARINE, SWAMP
2540/50	CUTTS	LOW	0	0	0	100	NIL	HIGH	F. LONGUS, UPPER	C2			NON-MARINE, SWAMP MARGIN
2560/70	CUTTS	NEAR BARREN	-	-	-	100	NIL	MODERATE	LATE CRETACEOUS	C5			NON-MARINE
2580/90	CUTTS	LOW	0	0	2	98	NIL	MODERATE	P. PANNOSUS	C2			NON-MARINE, FLOODPLAIN
2590/600	CUTTS	LOW	0	0	0	100	NIL	MODERATE	C. PARADOXA, UPPER	C2			NON-MARINE, FLOODPLAIN
2600/10	CUTTS	LOW	0	0	0	100	NIL	MODERATE	C. PARADOXA, UPPER	C2			NON-MARINE, FLOODPLAIN

*1 DIVERSITY	
V HIGH	30+ SPECIES
HIGH	20-29 SPECIES
MOD	10-19 SPECIES
LOW	5-9 SPECIES
EX LOW	1-4 SPECIES

*2 CONFIDENCE RATINGS	
A = Core Bp = Sidewall core (percussion)	1 = Excellent Confidence High diversity with key species
Br = Sidewall core (rotary/mechanical) C = Coal cuttings	2 = Good Confidence Moderate diversity with key species
D = Ditch cuttings E = Junk basket	3 = Fair Confidence Low diversity with key species
F = Miscellaneous/unknown G = Outcrop	4 = Poor Confidence Moderate to high diversity without key species
	5 = Very Low Confidence Low diversity without key species

*3 ENVIRONMENTS	DINOFLAGELLATE CONTENT%	DINOFLAGELLATE DIVERSITY	FRESHWATER ALGAE CONTENT%
OFFSHORE MARINE	67 to 100	VERY HIGH	LOW
SHELFAL MARINE	34 to 66	HIGH	"
NEARSHORE MARINE	11 to 33	MODERATE	"
VERY NEARSHORE MARINE	5 to 10	MODERATE-LOW	"
MARGINAL MARINE	<1 to 4	LOW-VERY LOW	"
BRACKISH	0, SPINY ACRITARCHS ONLY	EXTREMELY LOW	"
NON-MARINE (UNDIFF)	0, NO SPINY ACRITARCHS	NIL	LOW
NON-MARINE (LACUSTRINE)	0, NO SPINY ACRITARCHS	NIL	MODERATE 10%+

( ) BRACKETS INDICATE COUNT CONSIDERED UNRELIABLE DUE TO CAVING.

TABLE 2 **ENVIRONMENTAL RAW DATA : FUR SEAL-1**

Depths (m)	Type	Total Marine MP	Total Fresh MP	Total Angiosperm Pollen	Total Gymnosperm Pollen	Total Spores	Total Other (mostly fungal)	Environments
1600/20	CUTTS	57	3	11	12	17	0	SHELFAL MARINE
1820/40	CUTTS	97	0	1	1	1	0	OFFSHORE MARINE
1840/60	CUTTS	82	4	4	5	5	0	OFFSHORE MARINE
1900/20	CUTTS	90	1	<1	3	6	0	OFFSHORE MARINE
2110/20	CUTTS	47	5	26	9	12	1	SHELFAL MARINE
2150/60	CUTTS	84	3	2	5	5	1	OFFSHORE MARINE
2180/90	CUTTS	34	2	33	11	17	3	SHELFAL MARINE
2190/200	CUTTS	96	1	0	0	3	0	OFFSHORE MARINE
2200/10	CUTTS	(1)	3	12	54	30	0	NON-MARINE, SWAMP MARGIN
2210/20	CUTTS	(3)	0	<1	73	24	0	NON-MARINE, FLOODPLAIN
2220/30	CUTTS	(1)	3	9	65	22	0	NON-MARINE, FLOODPLAIN
2260/70	CUTTS	(5)	0	5	75	15	0	NON-MARINE, FLUVIAL
2290/399	CUTTS	-	-	-	-	-	-	?NON-MARINE, ?FLUVIAL
2320/30	CUTTS	0	5	0	21	74	0	?NON-MARINE, ?FLUVIAL
2340/50	CUTTS	0	0	5	31	64	0	?NON-MARINE, SWAMP
2360/70	CUTTS	0	13	4	40	43	0	NON-MARINE, LAKE
2400/10	CUTTS	0	2	29	33	36	0	NON-MARINE, SWAMP MARGIN
2490/500	CUTTS	(5)	0	0	28	67	0	NON-MARINE, SWAMP
2540/50	CUTTS	0	0	26	32	42	1	NON-MARINE, SWAMP MARGIN
2560/70	CUTTS	-	-	-	-	-	-	NON-MARINE, ?FLUVIAL
2580/90	CUTTS	0	0	3	75	22	0	NON-MARINE, FLOODPLAIN
2590/600	CUTTS	0	0	0	58	41	1	NON-MARINE, FLOODPLAIN
2600/10	CUTTS	0	0	0	68	32	0	NON-MARINE, FLOODPLAIN

THE NON-MARINE ENVIRONMENTS ARE RECOGNISED ON BINT & MARSHALL & HELBY (1988) CRITERA, NAMELY	
FLUVIAL:	LEAN, SANDY, POLLEN DOMINANT
FLOODPLAIN:	RICH, POLLEN DOMINANT, SPORES SUBORDINATE AND DIVERSE, NO OR VERY FEW FRESHWATER ALGAE
SWAMP MARGIN:	RICH, POLLEN AND SPORES CO-DOMINANT, SPORES VERY DIVERSE, MINOR FRESHWATER ALGAE <10%
SWAMP:	RICH, SPORES DOMINANT AND LOW DIVESITY, MINOR FRESHWATER ALGAE <10%
LACUSTRINE:	RICH, FRESHWATER ALGAE 10%+, POLLEN USUALLY DOMINANT, SPORES SUBORDINATE WITH USUALLY MODERATE TO LOW DIVERSITY

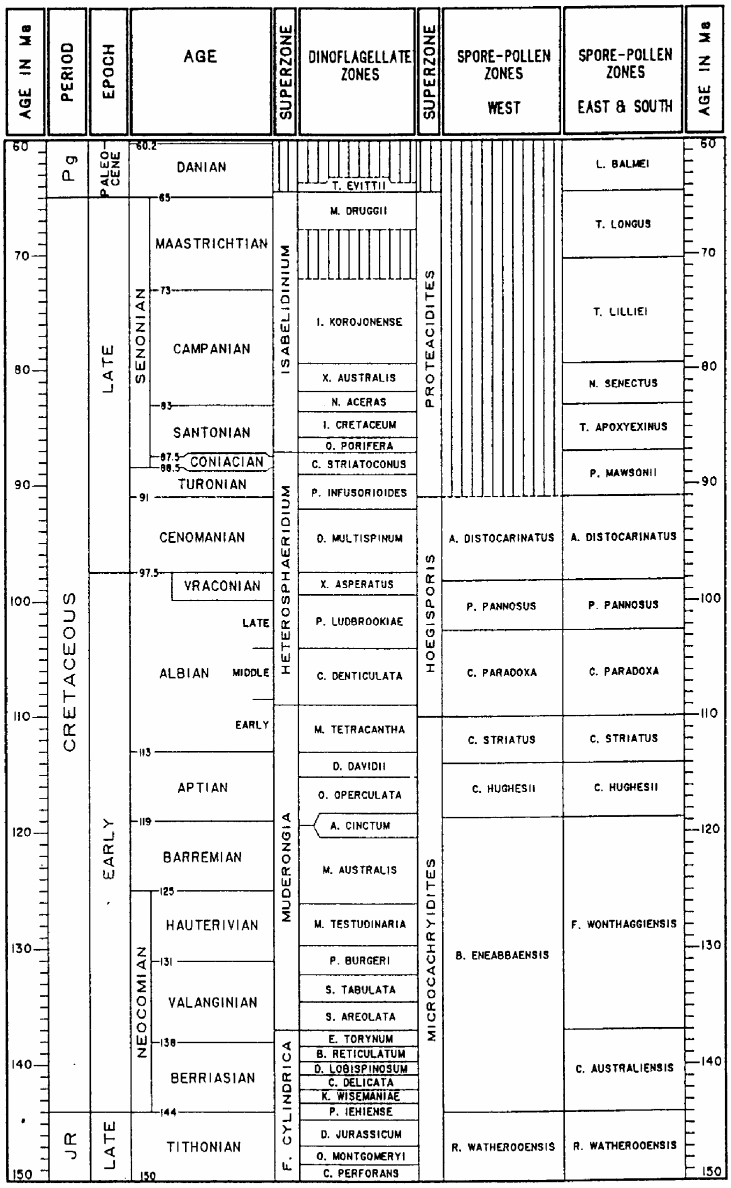


Figure 1a ZONATION FRAMEWORK - LATEST JURASSIC TO PALEOCENE

(from Helby et al, 1987)

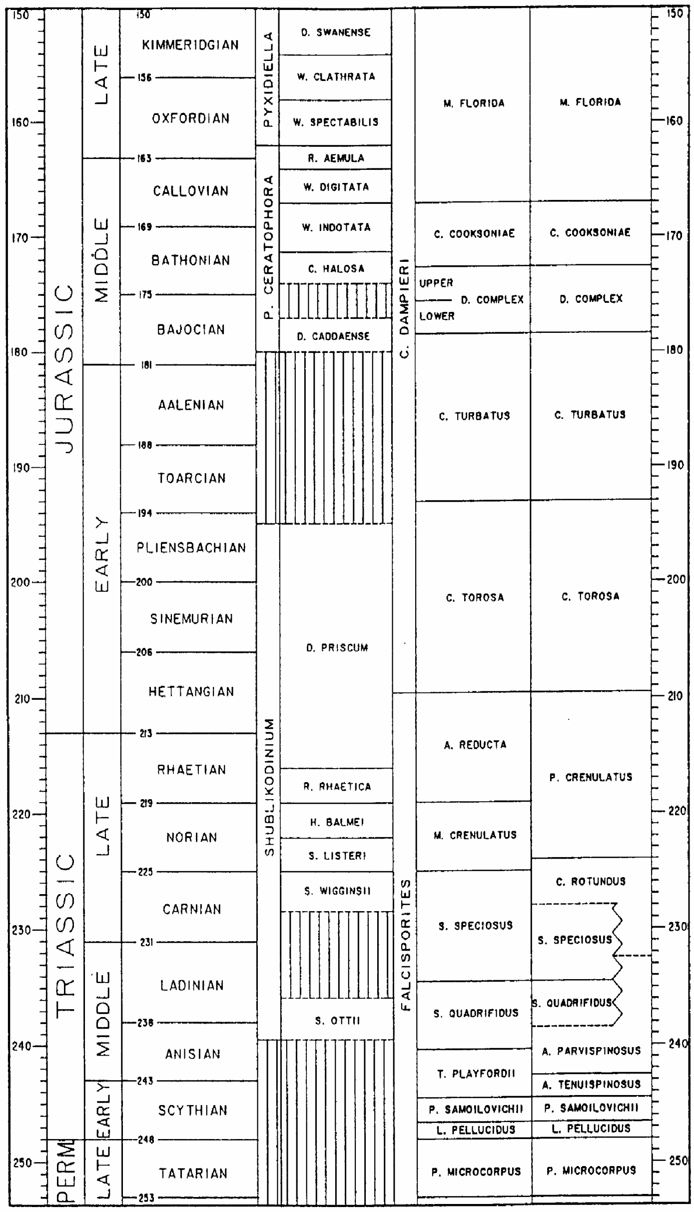


Figure 1b ZONATION FRAMEWORK - LATE PERMIAN TO LATE JURASSIC (from Helby et al, 1987)

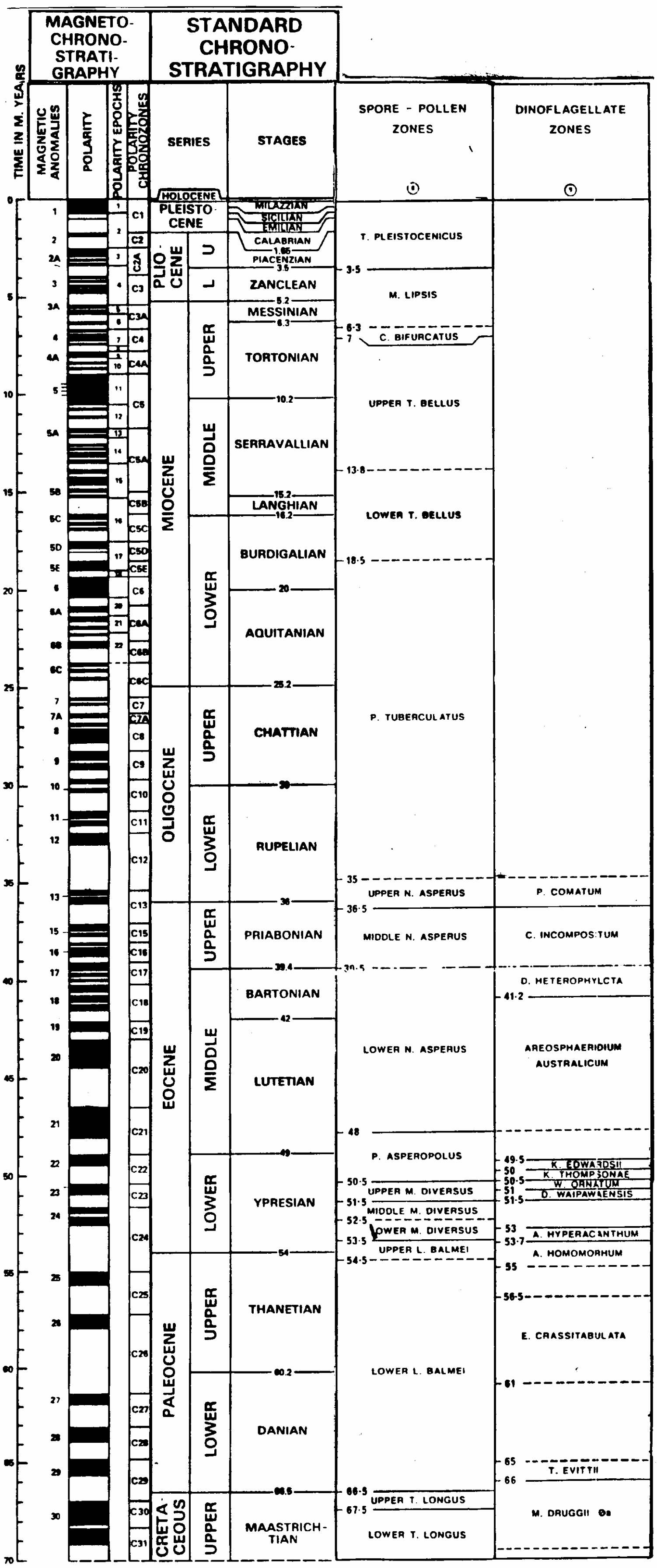
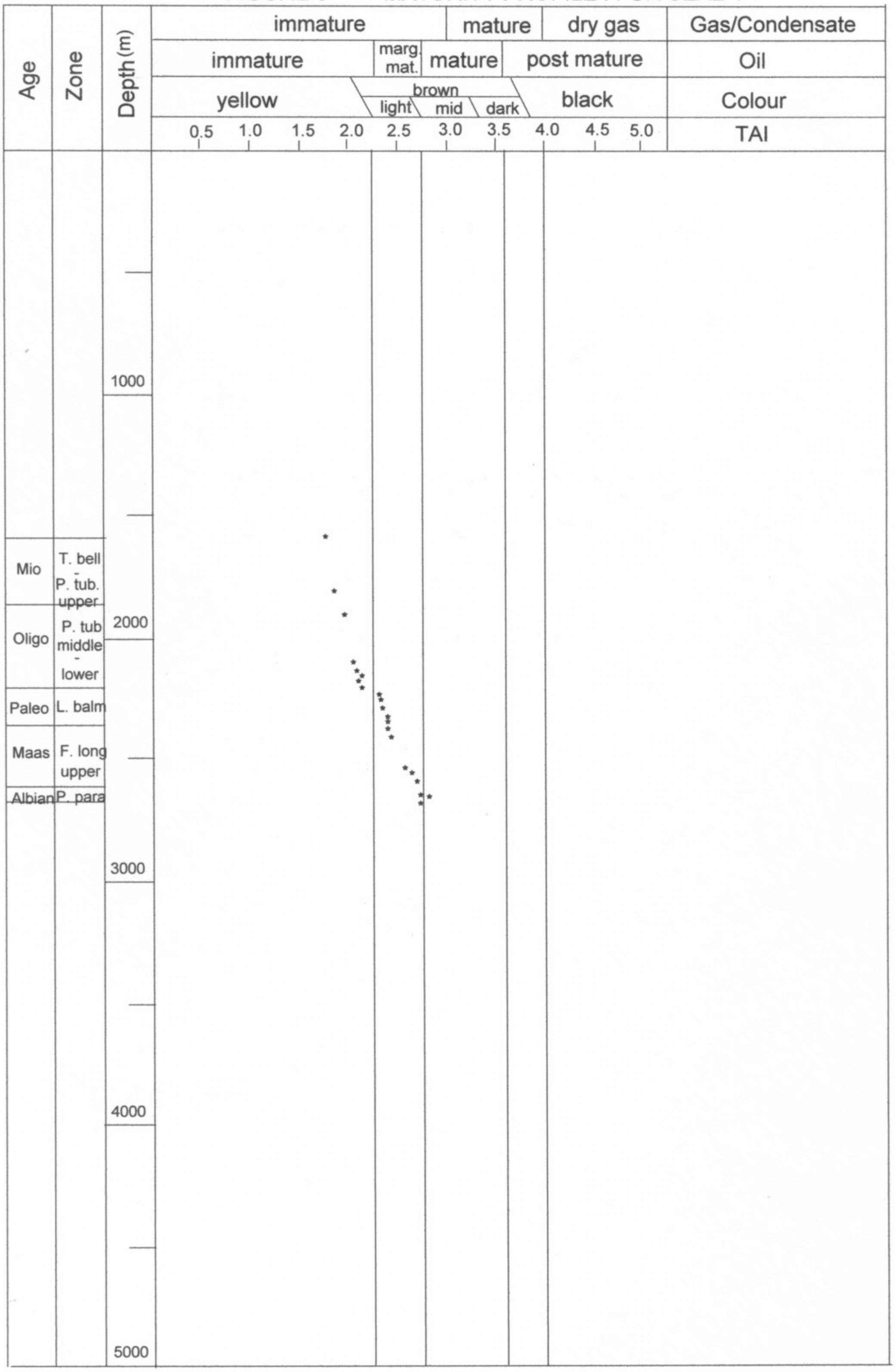


FIGURE 1 **TERTIARY ZONATION SCHEME (Partridge 1976 and pers. comm. using time scale of Haq et al)**

FIGURE 3 MATURITY PROFILE : FUR SEAL-1



3 PALYNOSTRATIGRAPHY

3.1 1600/20 m (cutts) – 1820/40 m (cutts) : *T. bellus-P. tuberculatus* upper subzone

Assignment is indicated at the top by youngest *Cyatheacidites annulatus* and *Proteacidites rectomarginus*, and at the base by oldest *Tuberculodinium vancampoae Graminiae* and *Acaciapollenites myriosporites*. Spores and pollen are subordinate with *Cyathidites minor, Dilwynites granulatus, Falcisporites similis* and *Lygistepollenites florinii* frequent. Rare elements include *C. annulatus, Nothofagidites emarcidus, Polypodiisporites usmensus* and *P. rectomarginus*.

Dinoflagellates dominate the assemblage, with *Spiniferites ramosus* abundant and microforaminifera and *Operculodinium* spp. Frequent. Rare taxa include *Cordosphaeridium multispinosum, Impletosphaeridium* sp.1 Davey, *Lingulodinium machaerophorum* and *T. vancampoae*.

Offshore to shelfal marine environments are indicated by the dominant and diverse dinoflagellates and subordinate spores and pollen.

Yellow spore colours indicate immaturity for hydrocarbons.

3.2 1840/60 m (cutts) – 2190/200 m (cutts) : *P. tuberculatus* Zone, middle-lower subzones

Yields are poor with spores and pollen subordinate. Assignment is indicated at the top by youngest *Nothofagidites flemingii* and at the base by oldest *Cyatheacidites annulatu*s. Common is *Nothofagidites emarcidus* with frequent *C. minor, D. granulatus, F. similis* and *Vitreisporites pallidus*. Rare elements include *C. annulatus, N. flemingii, Nothofagidites falcatus, Myrtaceidites parvus* and *P. usmensis.*

Dinoflagellates dominate the assemblage with abundant *Spiniferites ramosus* and common *Operculodinium* spp. and microforams. Rare elements include *Cordosphaeridium multispinosum, Impletosphaeridium* sp. 1, *Lingulodinium machaerophorum, Eisenackia ornata* and *Systematophora placacantha*.

Dominance of diverse dinoflagellates indicate offshore to shelfal marine environments.

Yellow spore colours indicate immaturity for hydrocarbon generation.

3.3 2200/10 m (cutts) – 2210/20 m (cutts) : *L. balmei* Zone, upper subzone

Assignment is indicated by at the top by youngest *Lygistepollenites balmei*, here frequent to common. The base of the subzone is defined at lower confidence by the absence of older markers (top *Tetracolporites verrucosus* seen below at 2220/30 m). The absence of *Proteacidites grandis* and the dinoflagellate *A. homomorphum* suggests truncation of the top of the subzone, as does top frequent *L. balmei* in the top sample. This latter event usually occurs below the top of the zone (1870 m in Grayling-1A well below the zone top at 1820 m). Common are *C. minor, L. balmei* and *F. similis* with frequent *C. australis, Gleicheniidites* spp., *L. balmei, P. mawsonii* and *V. pallidus*. Rare elements include *Cyathidites gigantis, G. rudata, Haloragacidtes harrisii* and *Nothofagidites endurus.* Caved elements include *C. annulatus* and *N. falcatus.*

Dinoflagellates are rare and considered all caved (especially *Operculodinium* spp. and *T. vancampoae*).

Environments appear to be non-marine with all dinoflagellates considered caved, amongst dominant and diverse pollen and spores. However, some of these dinoflagellates may be in place (*S. ramosus* and microforams) and might suggest very nearshore or marginal marine conditions. Sub-environments are swamp margin and floodplain.

Light brown spore colours indicate marginal maturity for oil, but immaturity for gas/condensate.

3.4 2220/30 m (cutts) – 2360/70 m (cutts) : *L. balmei* Zone, lower subzone

Assignment is indicated at the top by youngest *T. verrucosus* and at the base by the absence of older markers (top *Tricolpites confessus* at 2400/10 m). However, yields are poor and diversity low and it is possible that the zone base has been picked too low due to caving and masking of older assemblages in the cuttings suite. *L. balmei* is frequent down to 2340/50 m however, suggesting the *L. balmei* Zone at least to that point. Common are *C. splendens, D. granulatus, F. similis, L. balmei, P. mawsonii* and *V. pallidus.* Rare elements include *G. rudata* and *T. verrucosus*.

Dinoflagellates are extremely scarce and considered all caved. Some dark *S. ramosus* specimens might be in place suggesting marginal marine environments.

Environments are therefore considered non-marine, with all dinoflagellates caved amongst the dominant and diverse spores and pollen. Sub-environments are floodplain, swamp and lake, as detailed in Table 2.

Light brown spore colours indicate marginal maturity for oil, but immaturity for gas/condensate.

3.5 2400/10 m (cutts) – 2540/50 m (cutts) : *F. longus* Zone, upper subzone

Assignment is indicated at the top by youngest *Tricolpites confessus* and frequent *Gambierina rudata* and at the base by oldest frequent *G. rudata.* The zone top could be picked too low due to masking by younger caving. In other wells, top *F. longus* Zone is often slightly above top frequent *G. rudata*. In Sweetlips-1, top *F. longus* Zone is at 1713.9 m with top frequent *G. rudata* at 1720.0 m. Common are *C. splendens, Proteacidites* spp. and *F. similis* with frequent *C. australis, G. rudata,* and *Stereisporites antiquasporites*. Rare elements include *L. balmei*, *N. endurus*, *T. verrucosus* and *T. confessus*.

Dinoflagellates are virtually absent with isolated specimens at 2490/500 m considered caved. Freshwater algae (*Botryococcus*) are minor.

Environments are considered non-marine, with the isolated dinoflagellates considered caved. High spore content suggests swamp or swamp margin environments.

Light brown spore colours suggest marginal maturity for oil and immaturity for gas/condensate.

3.6 2560/70 m (cutts) : Late Cretaceous

Yields are extremely poor (probably due to sandy lithologies) and the sample cannot be zonally assigned. However, frequent *Proteacidites* spp. and rare *P. mawsonii* indicate a Late Cretaceous age. A single *G. rudata* suggests the *N. senectus* Zone or younger, but might be caved.

Common are *C. minor*, *F. similis* and *Proteacidites* spp. with frequent *Dictyophyllidites* spp., *P. mawsonii* and *S. antiquasporites*.

Dinoflagellates are absent.

Environments are considered non-marine with no dinoflagellates amongst the dominant and diverse spores and pollen.

Light brown spore colours suggest marginal maturity for oil and immaturity for gas/condensate.

3.7 2580/90 m (cutts) : *P. pannosus* Zone

Assignment is indicated at the top by the abrupt loss of Late Cretaceous types (especially *Proteacidites* spp. and *P. mawsonii*), and the downhole influx of Early Cretaceous spores (*Aequitriradites verrucosus, Cicatricosisporites australiensis, Crybelosporites striatus, Dictyotosporites speciosus, Foraminisporis asymmetricum, Triporoletes reticulatus* and *Triporoletes radiatus*. At the base, oldest *Phimopollenites pannosus* without older markers is definitive. Abundant is *F. similis* with frequent *C. minor, M. antarcticus* and *V. pallidus*. Rare elements include those Early Cretaceous taxa listed above.

Dinoflagellates are absent.

Non-marine environments are indicated by the dominant and diverse pollen and spores and absence of dinoflagellates. Dominance of saccate pollen suggests dry floodplain environments.
Light brown spore colours suggest marginal maturity for oil and immaturity for gas/condensate.

3.8 2590/600 m (cutts) – 2600/10 m (cutts) : *C. paradoxa* Zone, upper subzone

Assignment is indicated at the top and base by the subzone restricted *Pilosisporites grandis* at 2590/600 m only. Abundant is *F. similis* with frequent *C. minor, Dictyophyllidites* spp., *M. antarcticus* and *O. wellmanii*. Rare elements include *A. spinulosus, C. australiensis, P. grandis* and *T. reticulatus*.

Dinoflagellates are absent.

Non-marine environments are indicated by the dominant and diverse pollen and spores and absent dinoflagellates. Dominance of saccate pollen indicates floodplain environments.

Light brown spore colours suggest marginal maturity for oil and immaturity for gas/condensate.

4 DISCUSSION

Organic yields in these samples are generally adequate to good, but recognisable fossil contents are low. These samples have been processed more than once in an attempt to achieve better yields. It may be that mud additives or drill bit type has caused complications. The problem will be monitored in future Gippsland Basin drilling.

Comparisions to nearby wells Emperor-1 and Sweetlips-1 are instructive. At the base, Strzelecki Group was intersected in Fur Seal-1 as in Emperor-1 but not drilled in Sweetlips-1.

The Turonian-Coniacian Emperor-1 Group (*P. mawsonii* Zone Kipper Shale equivalent) seen in Emperor-1 and Sweetlips-1 is absent from Fur Seal-1.

The Maastrichtian (upper *F. longus* Zone) Latrobe Group is present in Fur Seal-1, as in the other two wells. The apparent age clash in Emperor-1 (partly *T. lilliei* Zone) is probably only apparent and not real.

The Paleocene (*L. balmei* Zone) Latrobe Group is also present in all three wells, although its top appears to be truncated in Fur Sea-1. The Early Eocene *M. diversus* to *P. asperopolous* Latrobe Group is absent at Fur Seal-1 in contrast to the other two wells.

The Oligocene-Miocene Seaspray Group (*P. tuberculatus-T. bellus* Zones) is present in all wells.

5 REFERENCES

Helby, R.J, Morgan, R.P and Partridge, A D (1987) A Palynological Zonation of the Australian Mesozoic *In* Studies in Australian Mesozoic Palynology *Assoc. Australas. Palaeontols. Mem. 4, 1-94*

Partridge, A.D. (1976) The Geological Expression of Eustacy in the early Tertiary of the Gippsland Basin APEA J.

Well Name : FUR SEAL-1

Operator : APACHE

Interval : 1590m - 2630m

Scale : 1:5000

Chart date: 23 December 2005

Palynological Data Chart : BASIC DATA

% Abundance histogram : Highest occurrence

Roger Morgan

FUR SEAL-1

Morgan Palaeo Associates
Maitland, South Australia

Enclosure 1

Sampling
Cutting
Core
Sidewall core

Text Keys
*1 % within discipline (40mm=100%)
*2 In-Situ occurrences

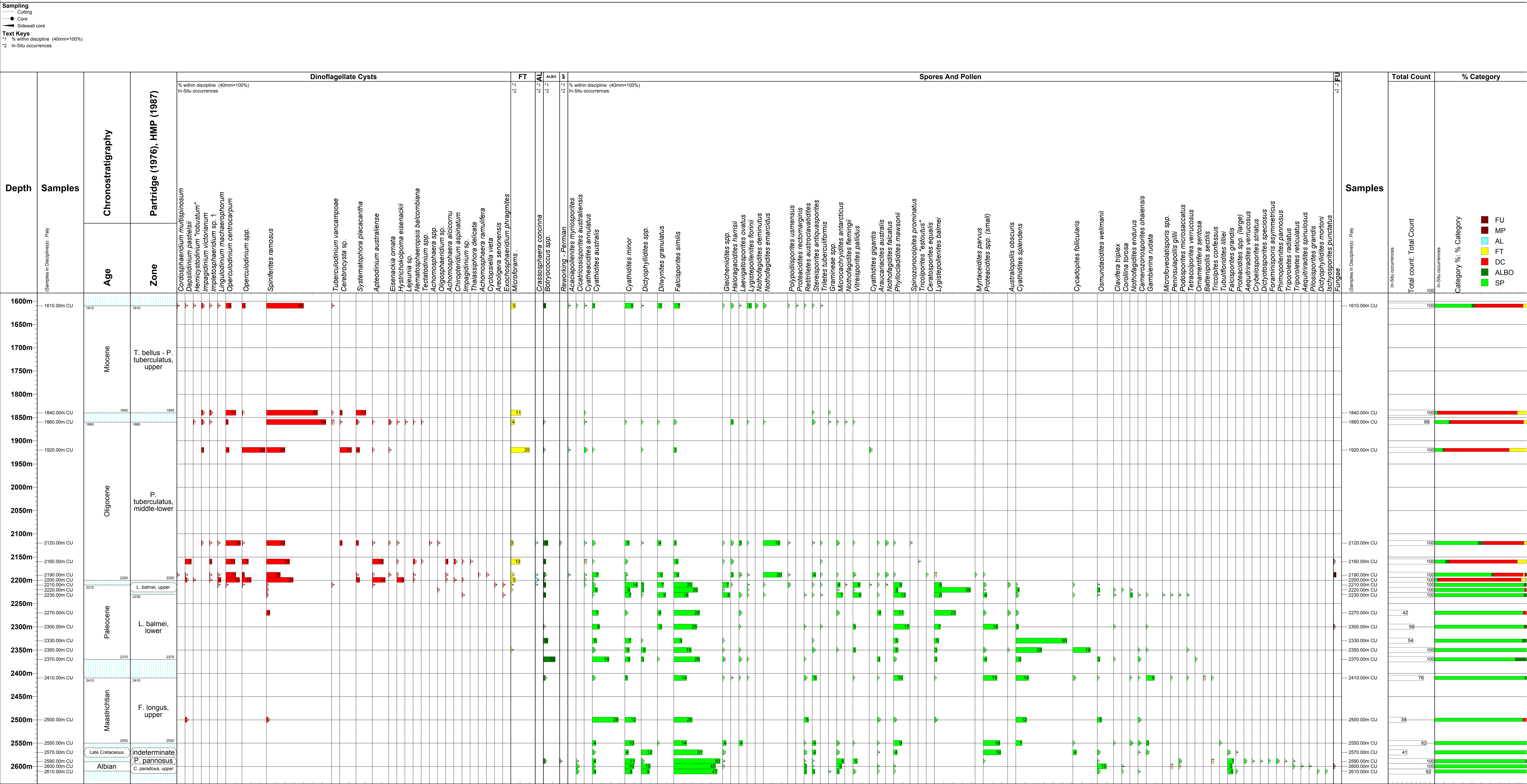
Well Name : FUR SEAL-1
Operator : APACHE
Interval : 1590m - 2630m
Scale : 1:5000
Chart date: 23 December 2005

Palynological Data Chart : INTERPRETIVE DATA
% Abundance histogram : Highest occurrence
Roger Morgan

FUR SEAL-1

Morgan Palaeo Associates
Maitland, South Australia

Enclosure 1



ENCLOSURE 1

Fur Seal-1

Composite Log 1: 500 TVD

COMPOSITE WELL LOG

FUR SEAL-1

GIPPSLAND BASIN
OFFSHORE VICTORIA

Latitude:	38 deg 07' 47.91" S	Well Status:	Plugged & Abandoned, Dry Hole
Longitude:	148 deg 09' 08.44" E	Date Spudded:	24 October 2005 @ 03:00 hrs
Datum:	GDA 94	Date at TD:	1 November 2005 @ 01:30 hrs
Permit:	VIC/P54	Date Rig Released:	5 November 2005 @ 18:00 hrs
Sheet:	Melbourne NE SJ55	Geologist(s):	R. Blackmore / M. Woodmansee
Block Number:	1850	Casing:	762 mm (30") Casing @ -89.5 mTVDAHD (111.0 mMDRT)
Water Depth:	56.6 m below AHD		340 mm (13 3/8") Casing @ -796.1 mTVDAHD (817.6 mMDRT)
RT-AHD:	21.5 m		
Total Depth:	-2588.2 mTVDAHD (2610.0 mMDRT)		

Remarks: The surface location is 3.5 m on a bearing of 223.4° from the proposed Fur Seal-1 location.

Drafted: 8 March 2007 CLu9464

DEVIATION

Angle ° @ Azimuth °

ENGINEERING SYMBOLS

13 3/8" Drill Casing Shoe

Drill Stem Test (Details at end of log)

Wireline Formation Tester Data: Tight; Lost seal; Pressure reading; Fluid Sample taken (details at end of log)

Perforations

Cement Plug

Bridge Plug

GEOLOGICAL SYMBOLS

1 Sidewall Core No Recovery
2 Sidewall Core Recovered
3,5 Sidewall Core Recovered (Multiple Samples)
6,9 Sidewall Core No Recovery (Multiple Samples)
10,15 Sidewall Core Recovery/No Recovery (Multiple Samples)

Recovered Core
Core No. (Log adjusted recovered core in depth track)
No Recovery

HYDROCARBON SHOWS

Oil: Weak, Good
Gas: Weak, Good

MWD LOGS

Bit #	Hole Size (mm)	Logging Suite	Interval mTVDAHD (mMDRT)	Max (deg C)	Remarks
1	311	DGR-EWRP4-BAT-DDS-PM	-90.2 to -802.5 (111.7 to 824.0)	25	All recorded data recovered at surface.
2	216	DGR-EWRP4-SLD-CNP-BAT-DDS-PM	-802.5 to -2588.2 (824.0 to 2610.0)	75.5	All recorded data recovered at surface.

WIRELINE LOGS

Suite	Run	Logging Suite	Interval mTVDAHD (mMDRT)	BHT (deg C)	Remarks
1	1	Dual CSAT Checkshot Survey	-2575.2 to -160.5 (2597.0 to 182.0)	109	Checkshots recorded at 15 m intervals from TD to loss of siginal.

LOG DESCRIPTION

GR	Gamma-Ray (BHI GRAFM)
CAL	Acoustic Caliper (Sperry-Sun ACAL)
RESD	Deep Resistivity (BHI RACELM)
RESM	Medium Resistivity (BHI RPCELM)
RESX	Extra Shallow Resistivity (BHI RPCEHM)
RESS	Shallow Resistivity (BHI RACEHM)
RHOB	Bulk Density (Sperry-Sun SBD2)
NPHI	Neutron Porosity (Sperry-Sun NUCL)
DTC	Compressional Slowness (Sperry-Sun BATC)
ROP	Rate of Penetration

COMPOSITE WELL LOG

FUR SEAL-1

CLu9464