APPENDIX-2

PALYNOLOGICAL ANALYSIS OF BLACKBACK-1 AND ITS SIDETRACKS 1 AND 2 IN PERMIT VIC/P24, GIPPSLAND BASIN.

by

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INTERPRETED DATA

INTRODUCTION

A total of sixty-eight samples, comprising forty-eight sidewall cores, eight conventional core samples and twelve cuttings samples were processed from Blackback-1 and its two sidetracks and examined for spores, pollen and microplankton.

In Blackback-1 four conventional core samples and four cutting samples were examined from the Middle to Late Eocene channel fill section. Oxidised organic residue yields were mostly low resulting in mostly low to moderate palynomorph concentration and diversity.

In Blackback-1 Sidetrack-1 sixteen sidewall cores and four conventional cores were examined. Two of the sidewall cores examined were the basal Lakes Entrance Formation while the remaining samples were from the Middle to Late Eocene channel fill section. As in the original hole oxidised organic residue yields and palynomorph yields were mostly low, however recorded species diversity for both spores-pollen and microplankton were significantly higher resulting in zone assignments of higher confidence.

In Blackback-1 Sidetrack-2 thirty-two sidewall cores and eight cutting samples were examined. All samples are from the undifferentiated part of the Latrobe Group (often referred to as Latrobe coarse clastics). Oxidised residue yields were mostly moderate to high, but palynomorph and diversity was variable from very low to high.

Lithological units and palynological zones from base of Lakes Entrance Formation to T.D. are given in the following summary. Interpretative data with indentification of zones and their confidence ratings are recorded in Tables-1 to 3, while basic data on residue yields, preservation and diversity are recorded in Tables-4 to 6. All species which can be identified with binomial names are tabulated on the accompanying separate range charts for the original Blackback-1 and the Sidetrack-1 and Sidetrack-2 holes.

All depths given in this report are measured depths in the respective boreholes except on the Palynological Data Sheet where the data from the three boreholes has been merged and reported as TVDSS (True Vertical Depth Subsea).

PALYNOLOGICAL SUMMARY OF BLACKBACK-1 AND SIDETRACKS 1 AND 2.

ALL DEPTHS ON SUMMARY ARE MEASURED DEPTHS IN RESPECTIVE BOREHOLES.

AGE	UNIT/FACIES	BLACKBACK-1		SIDETRACK-1		SIDETRACK-2	
		SPORE-POLLEN ZONES (DINOFLAGELLATE ZONES)	DEPTHS (mKB)	SPORE-POLLEN ZONES (DINOFLAGELLATE ZONES)	DEPTHS (mKB)	SPORE-POLLEN ZONES (DINOFLAGELLATE ZONES)	DEPTHS (mKB)
Oligocene	Lakes Entrance Formation	NOT SAMPLED		*P. tuberculatus*	2877.0	NOT SAMPLED	
Oligocene?				Upper *N. asperus*	2884.0		
			2897m		2887m		
Late Eocene	LATROBE GROUP "*N. asperus* Channel-fill"			Upper *N. asperus*	2887.4		
Late Eocene		Middle *N. asperus*	2903.0-2911.4	Middle *N. asperus* (*T. spinosus*)*	2897.0-2912.8 (2908.6)	NOT SAMPLED	
Middle Eocene		Lower *N. asperus*	2915.0	Lower *N. asperus* (*T. inaequalis*)*	2917.6-2991.0 (2940.0-2980.0)		
-UNCONFORMITY-			3003m		2996m		2996m
Maastrichtian	Undifferentiated or "coarse clastics" facies	NOT SAMPLED		NOT SAMPLED		Upper *T. longus* (*M. druggii*)	3008.0-3142.0 (3008.0-3045.0)
Maastrichtian						Lower *T. longus*	3260.0-4221.5
			T.D. 3400m		T.D. 3047m		T.D. 4401m

* Informal Microplankton Zones.

GEOLOGICAL COMMENTS

1) The Maastrichtian Upper and Lower *T. longus* Zones are recorded over a measured interval of over 2,000 metres in the deviated Sidetrack-2. Assuming the zone extends to T.D. a minimum true vertical thickness of 1,100 metres was drilled. The minimum average depositional rate is 157 metres/million years. Similar thicknesses for the zones were drilled in other nearby deep wells, *viz*: Flounder-1 (1070+ metres), Flounder-A1 (1140+ metres) Hermes-1 (1430 metres) and Volador-1 (1,200 metres).

2) Review and re-examination of palynomorph assemblages recorded from the adjacent Hapuku-1 well indicate that it was also still within the Lower *T. longus* Zone at T.D. A significant section in Hapuku-1 was originally assigned to the underlying *T. lilliei* Zone on the negative evidence of the absence of key *T. longus* Zone index species such as *Forcipites longus*, *Quadraplanus brossus* and *Tetracolporites verrucosus*. It is now considered that insufficient samples were analysed from this well and insufficient time spent searching for the rarer zone species. The combined thickness of the Upper and Lower *T. longus* Zones intersected in Hapuku-1 is about 750 metres.

3) The spore-pollen assemblages recorded in sidewall core samples from the *T. longus* Zones in both Blackback-1 and Hapuku-1 are typically of low to moderate diversity and this is considered to be an affect of the higher than average depositional rates during these zones. In the thicker sections of most of the Late Cretaceous to Paleocene zones in the Gippsland Basin, it is empirically observed that key spore-pollen index species are often rare. This rarity is interpreted to reflect dilution or masking of the more regional index species by more abundant long ranging species. Most of the latter species are known to originate from parent plants which would have been most abundant on the coastal plain and therefore produce spore-pollen of more local origin.

4) At least two marine incursions are recognised in the Late Cretaceous in Blackback-1 Sidetrack-2. The younger incursion is part of the widespread *M. druggii* Zone identified at the top of the section between 3008-3045m. It is suggested the whole of the Upper *T. longus* Zone may be marine on the presence of glauconite in the sidewall cores and absence of coals through the section.

   The older incursion is represented by rare but diagnostic early Maastrichtian dinoflagellates between 4095-4112m. It is suggested that the shales between 4074-4152m, which represent the thickest shale

package in the lower part of the well, may correlate to one of the Maastrichtian condensed sections (see Haq *et al.* 1987, 1988; Loutit *et al.* 1988).

The rarity of dinoflagellate specimens in both incursions is considered to be due to dilution by "local" terrestrial spore-pollen.

5) A major erosive unconformity separates the Maastrichtian *T. longus* Zones from the overlying Middle to Late Eocene *N. asperus* Zones. At this unconformity the condensed sequence of dinoflagellate rich Paleocene to Early Eocene sediments in the adjacent Hapuku-1 between 9227-9400 feet (2812.4-2865.1m) have all been eroded. The presence of marine sediments above and below the unconformity and the location of Blackback-1 with respect to the known palaeogeography of the basin suggests the unconformity was most likely formed by a submarine channel or canyon.

6) The "*N. asperus* Channel Fill" in Blackback-1 is predominantly a poorly sorted, glauconitic sandstone. The unit varies from siltstone through fine to medium grained sandstone. Overall the unit is much coarser grained than either of the age equivalent Turrum or Gurnard Formations, and the reservoired hydrocarbons indicate it has better porosities than either of the latter formations. The presence of the acritarch *Tritonites inequalis* in microplankton assemblages from the "*N. asperus* Channel Fill" and absence of the older species *T. tricornus* and *T. pandus* indicate an age younger than the oldest Turrum Formation (see Marshall & Partridge, 1988). It is therefore difficult to source the coarser sands in Blackback from down the Marlin Channel.

7) The common occurrence in the "*N. asperus* Channel Fill" of microplankton species interpreted as reworked suggest instead a provenance for the unit to the south-west. Although the palynological data on the wells Athene-1, Selene-1 and Helios-1 in that direction is somewhat patchy the following observations are made:

   a) In Athene-1 the sidewall core assemblage at 2838.5m contains a Lower *N. asperus* Zone assemblage with frequent *Areosphaeridium* sp. cf *A. arcuatum* associated with *Homotyblium tasmaniense* a species association characteristic of this zone in Blackback-1. The immediately underlying sidewall core at 2879.5m contains an Upper *T. longus* Zone assemblage.

b) In Helios-1 the sidewall core at 2630m contains a *P. asperopolus* Zone assemblage in which *Homotyblium tasmaniense* comprises 14% of the assemblage and also has the only previous record the acritarch *Tritonites bilobus* in the Gippsland Basin (R. Morgan, pers comm.). This latter species is significant as it is recorded as reworked in Blackback. At the time of description of the *Tritonites* species *T. bilobus* had not been found in the Gippsland Basin even though plenty of suitable aged samples had been examined to the north of the Blackback location (Marshall & Partridge, 1988). Overlying the *P. asperopolus* Zone in Helios-1 is a poorly documented *N. asperus* Zone section between 2596-2680m. Unfortunately the recorded assemblages are too limited to make a clear comparison to assemblages of the same age in Blackback.

c) Rare reworked Paleocene dinoflagellates in the "*N. asperus* Channel Fill" suggest local reworking from a condensed marine Paleocene section similar to that documented in Hapuku-1 (Partridge, 1975).

8) Comparing the microplankton assemblages in Blackback with those recorded from Hapuku-1 including the distribution of reworking it is suggested that the base of the "*N. asperus* Channel Fill" in Hapuku-1 lies between the sidewall cores at 9221 ft and 9227 ft (2810.6-2812.4m).

BIOSTRATIGRAPHY

Zone and age determinations have been made using criteria proposed by Stover & Partridge (1973), Helby *et al.* (1987) and unpublished observations made on Gippsland Basin wells drilled by Esso Australia Ltd.

Author citations for most spore-pollen species can be sourced from Stover & Partridge (1973, 1982), Helby *et al.* (1987) and Dettmann & Jarzen (1988) or other references cited herein. Species names followed by "ms" are unpublished manuscript names. Zone names have not been altered to conform with recent nomenclatural changes to nominate species such as *Forcipites* (al.*Tricolpites*) *longus* (Stover & Evans) Dettmann & Jarzen 1988. Author citations for dinoflagellates can be found in Lentin & Williams (1985, 1989).

Lower *Tricolpites longus* Zone — Maastrichtian.

The Lower *T. longus* Zone is recorded from Sidetrack-2 between 3260-4221.5m but probably extends the extra 180 metres to T.D. Although moderate to high organic residue yields were obtained from most samples, palynomorph concentrations were often low, and the mostly moderate species diversity of the individual samples reflect this. Overall the total species diversity in the zone is high with 68 spore-pollen species recorded on the range chart. It is notable however that key zone species were recorded in less than half of samples examined (i.e. 9 out of 23 sidewall cores). The species used to identify the base of the zone are *Forcipites longus* (identified in 5 sidewall cores), *Tetracolporites verrucosus* (identified in 3 sidewall cores at 3802.5m, 3949m and 4095m), and *Quadraplanus brossus* (from sidewall cores at 3448m and 3478.5m). These species were also recorded from cuttings samples. About a third of the sidewall cores, although clearly containing Late Cretaceous assemblages could only be confidently assigned to the broader time interval of *T. lilliei* to *T. longus* Zones.

In the lower half of the zone very rare microplankton are recorded in the samples. Usually only a single specimen or fragment was recorded in any one palynological slide. Most of the fragmented specimens are peridinacean dinoflagellates and have been recorded on the range chart as *Isabelidinium* spp. The four significant species recorded are all only represented by single specimens. These are *Isabelidinium pellucidum*, from cuttings at 4110m; *Odontochitina spinosa* from SWC 70 at 4112m; *Nelsoniella tuberculata* from SWC 11 at 4112m, *Isabelidinium cretaceum* at 4095m. The first two species are consistent with an early Maastrichtian age (Helby *et*

al. 1987, fig. 40; Wilson, 1984) while *N. tuberculata* and *I. cretaceum* are not normally recorded in sediments younger than Campanian.

Upper *Tricolpites longus* Zone — Maastrichtian.

This zone is recorded from five sidewall cores from Sidetrack-2 between 3008-3142m. The base of the zone is recognised by the increase in abundance of *Gambierina* spp. principally *G. rudata*. The deepest three samples containing this characteristic abundance are only give a confidence rating of 2. The higher confidence rating of 1 is reserved for the shallower samples containing either *Stereisporites (Tripunctisporis)* spp. (at 3008.0m) or the indicator species for the *M. druggii* Zone. These are several specimens of *Manumiella conoratum* at 3008m and 3045m , while *Manumiella druggii* was only recorded from the shallower sample.

Lower *Nothofagidites asperus* Zone — Middle Eocene.

The Lower *N. asperus* Zone was recorded in the original Blackback-1 from a single conventional core sample at 2915m and from both conventional core and sidewall core samples in the Sidetrack-1 between 2917-2991m.

The zone is identified on the common to abundant presence of *Nothofagidites* spp. including the First Appearance Datum (FAD) for *Nothofagidites falcatus* at 2991m in Sidetrack-1.

The microplankton assemblages in the samples also indicate a Middle Eocene age and suggest a correlation with the upper part of the Lower *N. asperus* Zone. Key microplankton identified in the Sidetrack-1 samples are dinoflagellates *Wilsonidium lineidentatum* (at 2965.1m and 2991m); *Rhombodinium glabrum* (at 2940m and 2967.5m); *Achilleodinium* sp. cf. *A. biformoides* (at 2951.9m) and the acritarch *Tritonites inaequalis*. The ranges of these species according to Marshall & Partridge (1988, fig. 4) would suggest a correlation with the *D. heterophlycta* Zone of Partridge (1976). Unfortunately *Deflandrea heterophlycta* was not positively identified, although possible endocysts with the characteristic verrucate ornament of the species were recorded in the sidewall core at 2991m.

Two pollen species recorded do suggest a younger Middle *N. asperus* Zone age for the sequence in Sidetrack-1. These are single specimens of *Triorites magnificus* recorded at 2980m and *Proteacidites tuberculatus*

recorded at 2946.2m. It is considered preferable to regard these records as anomalously low first appearances for these species, and favour the age dating indicated by the more abundant microplankton.

The gross composition of the microplankton assemblages can be characterised by the unusual association of *Areosphaeridium* sp. cf *A. arcuatum* and *Homotryblium tasmaniense*.

Areosphaeridium australicum ms (= *Areosphaeidium* sp. cf. *A. diktyoplokus* in Marshall & Partridge 1988) is typical the dominent species in many samples from the Lower *N. asperus* Zone in the Gippsland Basin. In this well it is only positively recorded from the deepest core sample in Blackback-1. The remainder of the samples from the zone contain rare to common specimens of the closely related species *Areosphaeridium* sp. cf. *A. arcuatum*. Although previously recorded from the Gippsland Basin the total range, geographic distribution and likely acme of this species is poorly understood.

The frequent to common *Homotryblium tasmaniense* specimens found in most samples are all interpreted to be reworked. *Homotryblium tasmaniense* is not found in other well sampled Middle to Late Eocene marine sequences referred to the *N. asperus* Zone elsewhere in the Gippsland Basin. For example, *H. tasmaniense* is not found in the Turrum Formation in the Marlin Channel in wells such as Turrum-1 and Remora-1 (Partridge, 1987). Nor is *H. tasmaniense* found in the Gurnard Formation. For example see well sampled Gurnard Formation in Swordfish-1 (Partridge, 1977). The only exception is the record of *H. tasmaniense* in the Upper *N. asperus* Zone from the adjacent Hapuku-1 well. The range of *H. tasmaniense* in other wells in the Gippsland Basin suggests that the reworking is from Early Eocene Upper *M. diversus* to *P. asperopolus* Zones. Another reworked fossil suggesting a similar age is a specimen of *Tritonites bilobus* recorded at 2951.5m in Sidetrack-1 (see Marshall & Partridge, 1988, fig.4).

In addition to the dominant Early Eocene reworking there are a few rare specimens of key Paleocene dinoflagellates which are also interpreted as reworked. The most notable are *Palaeoperidinium pyrophorum* at 2991m and *Eisenackia crassitabulata* at 2923.97m both from Sidetrack-1.

Middle *Nothofagidites asperus* Zone **Late Eocene.**

The Middle *N. asperus* Zone is recorded from the conventional core-1 in Blackback-1 between 2903-2911.41m and in the Sidetrack-1 between 2987-2912.8m from conventional core-1 and a shallower sidewall core.

Nearly all the samples gave low to very low yields, and although the assemblages are clearly assigned to the broader *N. asperus* Zone interval, key indicator species for the Middle subdivision are rare.

In the original Blackback-1 hole key spore-pollen species were not recorded and the zone assignment is based on the associated microplankton. Key species of which, in order of importance, are: *Schematophora speciosus* (2911.41m); *Alisocysta ornata* (2905.56m); A. sp. cf. *A. ornata* (2903m); and *Areosphaeridium capricornum* (2911.41m).

In the Sidetrack-1 hole the key spore-pollen recorded are *Triorites magnificus* (2912.8m) and *Proteacidites rectomarginis* (2908.6m). The microplankton support the zone assignment and the key species recorded are: *Tritonites spinosus* (2912.8m); *Areosphaeridium capricornum* (2987m); *Deflandrea leptodermata* (2987m) and *Corrudinium corrugatum* ms (2908.6m and 2912.8m).

Upper *Nothofagidites asperus* Zone — Late Eocene-Oligocene.

Two sidewall cores at 2884m and 2887.4m from Sidetrack-1 are assigned to the Upper *N. asperus* Zone.

The deeper sample at 2887.4m gave only a very low yield and the palynomorph assemblage was dominated by spore-pollen. The sample is assigned to the Upper subdivision on presence of *Proteacidites stipplatus*.

The shallower sample at 2884m gave a high yield and a high concentration of palynomorphs, again dominated by spore-pollen, and is assigned to the Upper subdivision based on the frequent occurrence of both *P. stipplatus* and *P. rectomarginis*.

The few microplankton recorded in both samples were not diagnostic.

Proteacidites tuberculatus Zone — Oligocene.

The sidewall at 2877m in Sidetrack-1 was assigned to the *P. tuberculatus* Zone on the presence of the key spore *Cyatheacidites annulatus*. The diverse spore-pollen assemblage also contained frequent *Proteacidites rectomarginis* and rare *P. stipplatus*, while the microplankton were dominated by *Operculodinium centrocarpum*.

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TABLE-1: INTERPRETATIVE PALYNOLOGICAL DATA BLACKBACK-1, GIPPSLAND BASIN.

SAMPLE TYPE	DEPTH (METRES)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
Core-1	2903.0	Middle *N. asperus*		2	
Core-1	2905.56	Middle *N. asperus*	(*A. ornata*)	1	
Core-1	2911.41	Middle *N. asperus*	(*S. speciosus*)	0	*Rhombodinium glabrum* present.
Core-1	2915.0	Lower *N. asperus*		2	*Areosphaeridium australicum* ms present.
Cuttings	2935	Indeterminate			Abundant *P. tuberculatus* Zone cavings.
Cuttings	2950	Indeterminate			
Cuttings	2970	Indeterminate			
Cuttings	2995	Indeterminate			*Areosphaeridium* sp. cf. *A. arcuatum* present.

TABLE-2: INTERPRETATIVE PALYNOLOGICAL DATA BLACKBACK-1, SIDETRACK-1, GIPPSLAND BASIN.

SAMPLE TYPE	DEPTH (METRES)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 23	2877.0	*P. tuberculatus*		1	*Cyatheacidites annulatus* present.
SWC 22	2884.0	Upper *N. asperus*		1	Frequent *Proteacidites stipplatus*.
SWC 21	2887.4	Upper *N. asperus*		2	
SWC 18	2897.0	Middle *N. asperus*		2	Age based on dinoflagellates.
Core-1	2908.6	Middle *N. asperus*	(*T. spinosus*)	2	
Core-1	2912.8	Middle *N. asperus*		0	*Triorites magnificus* present.
Core-1	2917.6	Lower *N. asperus*		2	*Areosphaeridium* sp. cf. *A. arcuatum* common.
Core-1	2923.97	Lower *N. asperus*		1	*A.* sp. cf. *A. arcuatum* frequent.
SWC 15	2936.0	Lower *N. asperus*		2	
SWC 14	2940.0	Lower *N. asperus*	(*T. inaequalis*)	1	
SWC 13	2946.2	Lower *N. asperus*	(*T. inaequalis*)	1	*Proteacidites pachypolus* frequent!
SWC 12	2951.9	Lower *N. asperus*		2	Reworked *Tritonites bilobus*!
SWC 11	2959.5	Lower *N. asperus*	(*T. inaequalis*)	1	
SWC 10	2965.1	Lower *N. asperus*	(*T. inaequalis*)	1	*Wilsonidinium lineidentatum* present.
SWC 9	2967.5	Lower *N. asperus*		2	*Rhombodinium glabrum* present.
SWC 6	2980.0	Lower *N. asperus*	(*T. inaequalis*)	1	Anomalously low record of *Triorites magnificus*.
SWC 5	2984.5	Indeterminate		-	
SWC 4	2987.2	Indeterminate		-	Most dinoflagellates caved.
SWC 3	2991.0	Lower *N. asperus*		1	*W. lineidentatum*, *N. falcatus* present.
SWC 1	2995.0	Indeterminate		-	

TABLE-3: INTERPRETATIVE PALYNOLOGICAL DATA BLACKBACK-1 SIDETRACK-2, GIPPSLAND BASIN

Sheet 1 of 2

SAMPLE TYPE	DEPTH (METRES)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 90	3008.0	Upper *T. longus*	*M. druggii*	1	
SWC 89	3045.0	Upper *T. longus*	*M. druggii*	1	
SWC 57	3082.0	Upper *T. longus*		2	
SWC 56	3095.0	Upper *T. longus*		2	
SWC 54	3142.0	Upper *T. longus*		2	*Gambierina* common.
SWC 53	3180.0	Indeterminate			
SWC 52	3236.0	Indeterminate			
SWC 88	3260.0	Lower *T. longus*		1	*Proteacidites reticuloconcavus* ms present.
SWC 87	3280.5	*T. lilliei/T. longus*			
SWC 49	3332.5	*T. lilliei/T. longus*			
SWC 48	3357.5	Indeterminate			Limited assemblage from coal.
SWC 86	3377.5	*T. lilliei/T. longus*			
SWC 46	3400.5	*T. lilliei/T. longus*			
SWC 45	3427.0	*T. lilliei/T. longus*			
SWC 44	3448.0	Lower *T. longus*		1	*Quadraplanus brossus* present.
SWC 42	3478.5	Lower *T. longus*		1	*Quadraplanus brossus* present
SWC 84	3479.5	Lower *T. longus*		1	*Forcipites longus* present.
SWC 36	3535.0	Lower *T. longus*		2	*Proteacidites reticuloconcavus* ms present.
SWC 80	3603.5	*T. lilliei/T. longus*			
SWC 26	3643.0	*T. lilliei/T. longus*			
SWC 25	3660.5	Lower *T. longus*		1	*F. longus* present.
SWC 79	3728.0	Lower *T. longus*		1	*F. longus, Micrhystridium* sp. present.
SWC 78	3776.5	Indeterminate			Poorly processed.
SWC 20	3802.5	Lower *T. longus*		1	*Tetracolporites verrucosus* present.
Cuttings	3930	*T. lilliei/T. longus*			
SWC 73	3949.0	Lower *T. longus*		1	Rare species *Reticulosporis albertonensis*.
Cuttings	3995	*T. lilliei/T. longus*			
SWC 12	4095.0	Lower *T. longus*		1	*F. longus, T. verrucosus* both present.
Cuttings	4110	Lower *T. longus*	*(I. pellucidum)*	3	
SWC 70	4112.0	*T. lilliei/T. longus*			*Odontochitina spinosa* present.

TABLE-3: INTERPRETATIVE PALYNOLOGICAL DATA BLACKBACK-1 SIDETRACK-2, GIPPSLAND BASIN

Sheet 2 of 2

SAMPLE TYPE	DEPTH (METRES)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 11*	4112.0	*T. lilliei/T. longus*			*Nelsoniella tuberculata* present.
Cuttings	4115	Lower *T. longus*		3	*F. longus* present
Cuttings	4120	Lower *T. longus*		3	*F. longus* present
SWC 69	4143.0	*T. lilliei/T. longus*			
Cuttings	4155	Lower *T. longus*		3	*T. verrucosus* present
SWC 66	4221.5	Lower *T. longus*		1	Sample over oxidised. FAD *F. longus*
SWC 65	4223.0	*T. lilliei/T. longus*			
Cuttings	4225	Indeterminate			
Cuttings	4230	Indeterminate			
SWC 63	4271.0	*T. lilliei/T. longus*			

* Given as 4112.1m on range chart.

LAD = Last appearance datum.
FAD = First appearance datum.

PALYNOLOGY DATA SHEET

BASIN: *GIPPSLAND* ELEVATION: KB: *+21m* GL: *-418.0m*

WELL NAME: *BLACKBACK-1* TOTAL DEPTH: *4022m TVD Subsea*

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA					LOWEST DATA				
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	*T. pleistocenicus*										
	M. lipsis										
	C. bifurcatus										
	T. bellus										
	P. tuberculatus						*2794*	*1*			
PALEOGENE	Upper *N. asperus*	*2800*	*1*				*2803*	*2*			
	Mid *N. asperus*	*2809*	*2*				*2821*	*0*			
	Lower *N. asperus*	*2825*	*2*	*2830*	*1*		*2879*	*1*			
	P. asperopolus										
	Upper *M. diversus*										
	Mid *M. diversus*										
	Lower *M. diversus*										
	Upper *L. balmei*										
	Lower *L. balmei*										
LATE CRETACEOUS	Upper *T. longus*	*2891*	*1*				*2993*	*2*	*2919*	*1*	
	Lower *T. longus*	*3086*	*1*				*3866*	*1*			
	T. lilliei										
	N. senectus										
	T. apoxyexinus										
	P. mawsonii										
	A. distocarinatus										
EARLY CRET.	*P. pannosus*										
	C. paradoxa										
	C. striatus										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: *Data sheet is a composite of original hole and later 2 sidetracks. All depths converted to True Vertical Depth (TVD) measured from mean sea level. Microplankton zones or associations are: T. spinosus 2818m; T. inaequalis 2841-2871m; M. druggii 2891-2919m.*

CONFIDENCE RATING:
- 0: SWC or Core, Excellent Confidence, assemblage with zone species of spores, pollen and microplankton.
- 1: SWC or Core, Good Confidence, assemblage with zone species of spores and pollen or microplankton.
- 2: SWC or Core, Poor Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.
- 3: Cuttings, Fair Confidence, assemblage with zone species of either spores and pollen or microplankton, or both.
- 4: Cuttings, No Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: *A.D. Partridge* DATE: *February, 20, 1990.*

DATA REVISED BY: _____ DATE: _____

BASIC DATA

TABLE-4: BASIC PALYNOLOGICAL DATA BLACKBACK-1, GIPPSLAND BASIN.

SAMPLE TYPE	DEPTH (METRES)	LAB. NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER OF S-P SPECIES*	MICROPLANKTON ABUNDANCE	MICROPLANKTON NO. SPECIES*
Core-1	2903.0	78232A	Glauconitic sandstone	Low	Moderate	Poor-Fair	14+	Low	4+
Core-1	2905.56	78232C	Glauconitic sandstone	Low	Moderate	Good	14+	Low	7+
Core-1	2911.41	78232F	Glauconitic sandstone	Moderate	Moderate	Good	20+	Low	9+
Core-1	2915.0	78232H	Glauconitic sandstone	Low	Moderate	Fair-Good	30+	Moderate	7+
Cuttings	2935	78232J		Low	Low	Fair-Good	6+	Moderate	7+
Cuttings	2950	78232K		Moderate	Low	Fair-Good	9+	Moderate	6+
Cuttings	2970	78232L		Low	Very Low	Fair-Good	3+	Moderate	6+
Cuttings	2995	78232M		Very Low	Low	Fair	5+	Low	5+

* Diversity: Very Low = 1-5 species
Low = 6-10 species
Moderate = 11-25 species
High = 26-74 species
Very High = 75+ species

TABLE-5: BASIC PALYNOLOGICAL DATA BLACKBACK-1, SIDETRACK-1, GIPPSLAND BASIN.

SAMPLE TYPE	DEPTH (METRES)	LAB. NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER OF S-P SPECIES*	MICROPLANKTON ABUNDANCE	MICROPLANKTON NO. SPECIES*
SWC 23	2877.0	78249R	Brown claystone	Moderate	High	Poor-Fair	25+	Low	4+
SWC 22	2884.0	78249Q	Brown claystone	High	High	Fair	35+	Low	2
SWC 21	2887.4	78249P	Glauconitic sandstone	Very Low	Moderate	Fair-Good	26+	Low	2
SWC 18	2897.0	78249O	Glauconitic siltstone	Very Low	Moderate	Fair	17+	Low	7+
Core-1	2908.6	78248A	Glauconitic sltst/sst	Low	Moderate	Fair	20+	Low	5+
Core-1	2912.8	78248B	Glauconitic sltst/sst	Low	Moderate	Poor-Good	18+	Low	5+
Core-1	2917.6	78248C	Glauconitic sltst/sst	Low	Low	Poor	13+	Low	7+
Core-1	2923.97	78248D	Glauconitic sltst/sst	Low	Low	Fair-Good	24+	Moderate	16+
SWC 15	2936.0	78249M	Glauconitic sandstone	Low	Moderate	Fair	15+	Low	5+
SWC 14	2940.0	78249L	Glauconitic sandstone	Low	Moderate	Fair	29+	Moderate	10+
SWC 13	2946.2	78249K	Glauconitic sandstone	High	Moderate	Poor-Good	20+	High	11+
SWC 12	2951.9	78249J	Glauconitic sandstone	Low	Moderate	Fair	19+	Moderate	9+
SWC 11	2959.5	78249I	Glauconitic sandstone	Moderate	Low	Fair	7+	Moderate	7+
SWC 10	2965.1	78249H	Glauconitic sandstone	Moderate	Low	Fair	22+	Moderate	11+
SWC 9	2967.5	78249G	Glauconitic sandstone	Low	Low	Poor-Fair	14+	Moderate	10+
SWC 6	2980.0	78249F	Glauconitic sandstone	Low	Low	Fair-Good	20+	Low	10+
SWC 5	2984.5	78249E	Glauconitic sandstone	Very Low	Very Low	Poor	2+	Very Low	2
SWC 4	2987.2	78249D	Glauconitic sandstone	Very Low	Very Low	Poor	1+	Very Low	1
SWC 3	2991.0	78249C	Glauconitic sandstone	Very Low	Very Low	Poor	14+	Moderate	12+
SWC 1	2995.0	78249A	Glauconitic sandstone	Very Low	Very Low	Poor	1+	Very Low	3

* Diversity (See Table-4)

TABLE-6: BASIC PALYNOLOGIC DATA BLACKBACK-1, SIDETRACK-2, GIPPSLAND BASIN.

SAMPLE TYPE	DEPTH (METRES)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER OF S-P SPECIES*	MICROPLANKTON ABUNDANCE	MICROPLANKTON NO. SPECIES*
SWC 90	3008.0	78256M	Sandstone	Moderate	Low	Fair-good	16+	Low	2
SWC 89	3045.0	78256L	Glauconitic sandstone	Moderate	Very low	Fair	5+	Very low	1+
SWC 57	3082.0	78255I	Glauconitic siltstone	Moderate	High	Good	15+		
SWC 56	3095.0	78255H	Argillaceous siltstone	Moderate	Moderate	Fair	14+		
SWC 54	3142.0	78255F	Sst. (trace glauconite)	High	High	Good	22+		
SWC 53	3180.0	78255E	Argillaceous siltstone	Low	Low	Fair-good	3+		
SWC 52	3236.0	78255D	Sandstone	Moderate	Low	Fair-good	8+		
SWC 88	3260.0	78256K	Siltstone	Moderate	High	Fair-good	17+		
SWC 87	3280.5	78256J	Sandstone	Moderate	Low	Fair-good	15+		
SWC 49	3332.5	78255C	Laminated sandstone	High	Moderate	Poor-fair	15+		
SWC 48	3357.5	78255B	Coal	High	High	Poor	7+		
SWC 86	3377.5	78256I	Sandstone	Moderate	Moderate	Fair-poor	17+		
SWC 46	3400.5	78255A	Coally sandstone	High	Moderate	Good	17+		
SWC 45	3427.0	78254Z	Carbonaceous siltstone	Moderate	High	Fair-good	18+		
SWC 44	3448.0	78254Y	Sandstone	Moderate	Low	Fair	18+		
SWC 42	3478.5	78254X	Carbonaceous siltstone	High	Moderate	Fair	18+		
SWC 84	3479.5	78256G	Siltstone	High	High	Fair-good	22+		
SWC 36	3535.0	78254T	Carbonaceous siltstone	High	Low	Poor-fair	20+		
SWC 80	3603.5	78256C	Siltstone/sandstone	High	Low	Poor	20+		
SWC 26	3643.0	78254M	Sandstone	Moderate	Low	Poor	13+		
SWC 25	3660.5	78254L	Carbonaceous siltstone	Moderate	Moderate	Poor	21+		
SWC 79	3728.0	78256B	Siltstone	Moderate	Low	Fair-good	22+	Very low	1
SWC 78	3776.5	78256A	Siltstone	Low	Very low	Poor-fair	4+		
SWC 20	3802.5	78254J	Arenaceous siltstone	High	Low	Poor	17+	Very low	1
Cuttings	3930	78248P		Moderate	Moderate	Fair	8+		
SWC 73	3949.0	78255V	Siltstone/sandstone	Moderate	Low	Poor-fair	22+		
Cuttings	3995	78248Q		Moderate	Moderate	Fair	12+		
SWC 12	4095.0	78254F	Argillaceous siltstone	High	High	Fair-good	25+	Very low	1+
Cuttings	4110	78249O		High	High	Fair	31+	Very low	2+

TABLE-6: BASIC PALYNOLOGIC DATA BLACKBACK-1, SIDETRACK-2, GIPPSLAND BASIN.

Sheet 2 of 2

SAMPLE TYPE	DEPTH (METRES)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER OF S-P SPECIES*	MICROPLANKTON ABUNDANCE	MICROPLANKTON NO.
SWC 70	4112.0	78255T	Carbonaceous siltstone	Moderate	Low	Poor-fair	15+	Very low	2
SWC 11**	4112.0	78254E	Carbonaceous siltstone	High	Low	Poor	15+	Very low	2+
Cuttings	4115	78248R		High	Low	Poor	12+		
Cuttings	4120	78248N		High	Moderate	Fair	20+		
SWC 69	4143.0	78255S	Carbonaceous siltstone	Moderate	Low	Poor-fair	15+		
Cuttings	4155	78248M		High	Moderate	Poor-good	14+		
SWC 66	4221.5	78255P	Carbonaceous siltstone	High	High	Poor	20+		
SWC 65	4223.0	78255O	Carbonaceous siltstone	High	Low	Fair	26+		
Cuttings	4225	78248S		Moderate	Barren				
Cuttings	4230	78248L		Moderate	Low	Fair	3+		
SWC 63	4271.0	78255M	Siltstone	Moderate	Low	Fair	8+	Very low	1

** Given as 4112.1m on range chart.

* Diversity (See Table-4)