APPENDIX 3

PALYNOLOGICAL ANALYSIS OF SWEEP-1

GIPPSLAND BASIN

by

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and

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INTRODUCTION

Twenty-three sidewall core samples from Sweep-1 were examined for palynology. In general, fossil recovery was poor to fair, although good, diverse assemblages were obtained in few cases.

Formation and zone subdivision from the basal part of the Lakes Entrance Formation to the bottom of the well is summarised below. Table 1 lists all samples examined and summarises the findings, while individual fossil occurrence is recorded on the accompanying distribution charts.

SUMMARY

UNIT/FACIES	ZONE	DEPTH (in metres)
Lakes Entrance Formation "Micaceous Marl Member"	*P. tuberculatus*	744.5m
745m		
Lakes Entrance Formation "Greensand Member"	*P. tuberculatus*	747 - 755
756.5m	Unconformity	
Gurnard Formation (Glauconitic Sandstone)	Middle *N. asperus*	759
	Lower *N. asperus* and *D. heterophylcta*	761 - 771
772m		
Latrobe Group Coarse Clastics	Lower *N. asperus*	774 - 785
789m	Unconformity	
Latrobe Group Coarse Clastics	Lower *L. balmei*	790 - 812
	T. longus	819 - 838
842m	Unconformity	
Strzelecki Group	(barren)	855 - 901
TD-900m		

..../2

GEOLOGICAL COMMENTS

1. GREENSAND UNIT AND UNCONFORMITY:

In Sweep-1 a greensand or glauconitic sandstone unit was intersected between 745m and 772m. As is typical for the Gippsland Basin this unit lies between the coarse clastics of the Latrobe Group and the marine marls typical of the Lakes Entrance Formation.

The palynology and the micropalaeontology indicates that this greensand unit can be separated into two distinct units. The lower unit from 756.5m to 772m consists of fine grained moderately well sorted glauconitic sandstone of Middle to Late Eocene in age (Lower and Middle N. asperus Zones). As such it is lithological and age equivalent to the Gurnard Formation recognised in the offshore part of the Gippsland Basin. The upper unit from 745m to 756.5m is a poorly sorted glauconitic sandstone of Late Oligocene age (Planktonic foraminiferal Zone H2). In the eastern onshore part of the Gippsland Basin a slightly older Oligocene greensand is given member status at the base of the Lakes Entrance Formation. It was called the Greensand Member by Carter (1964) and renamed the Cunningham Greensand Member by Hocking (1976), (See Abele et al. 1976, pp. 257-259 for discussion).

A hitus of approximately 11 million years representing all of the Early Oligocene and most of the Late Oligocene separates the two greensand units and is placed at 756m.

The adjacent wells Flathead-1, Wahoo-1 and Sole-1 also contain equivalent greensand units which probably have similar time duration. Unfortunately sidewall core sampling is in these wells too widely spaced to adequately delineate the ages of these greensands.

The results from Sweep-1, where a significant unconformity lies within what has previously been regarded as a single lithological unit, once again indicates that the "greensand" development in the Gippsland Basin is best treated as a facies rather than a classical rock unit.

2. LATROBE GROUP COARSE CLASTICS

As in the greensand unit a significant unconformity occurs within the rock unit which is informally referred to as the Coarse Clastics. The unconformity is placed at 789m where there is a distinct break on the electric logs. The hiatus at the unconformity has a duration of approximately 10 million years, and is represented by the Lower N. asperus Zone overlying the L. balmei Zone within a sample gap of only 5 metres.

The situation of the Lower N. asperus Zone unconformably overlying the L. balmei Zone is characteristic of other wells along the margins of the Gippsland Basin and also the margins of the Bass and Otway Basins. This is interpreted as due to eustatic high stands of sea level during these zone intervals (See Steele, 1976, and Partridge, 1976). The absence of the Early Eocene spore-pollen zones at the Sweep-1 location is therefore interpreted as non-deposition rather than deposition followed by removal through erosion.

3. STRZELECKI GROUP

The samples examined from this unit were barren of spore-pollen and gave very low yields of mineral charcoal and woody types of particulate organic matter. The sediments are assigned to the Strzelecki Group solely on lithology and top of the unit is placed at the electric log break at 842 metres.

DISCUSSION OF ZONES

Tricolpites longus Zone 819 - 838m.

The top of the T. longus Zone is readily recognised by the highest occurrence of the zone species, Tricolpites longus, together with T. confessus and Proteacidites reticuloconcavus. Key species from other samples include Proteacidites prepolus, P. gemmatus, P. intracatus, P. palisadus and Ornamentifera sentosa, none of which range above the T. longus Zone. That the section is no older than the T. longus Zone is confirmed by the presence of Stereisporites (Tripunctisporis) at 826m. Unfortunately the sample at 833m was barren while that at 838m gave only a very limited assemblage. This last sample is assigned to this zone base on similarity to the higher assemblages, and consideration of the sequence recognised in Wahoo-1.

Lower Lygistepollenites balmei Zone 790m - 812m.

There were only two productive samples from the L. balmei Zone, and both can confidently be assigned to the zone based on the common occurrence of the nominated zone species. In the deeper sample this zone assignment is supported by the presence of Australopollis obscurus, Proteacidites angulatus and Polycolpites langstonii. In the higher sample, which unfortunately gave only a very low yield, the common occurrence of Haloragacidites harrisii suggests a position for the sample high in the L. balmei Zone, however

absence of any of the diagnostic zone species precludes assignment of the sample to the Upper L. balmei Zone.

Lower Nothofagidites asperus Zone 761m - 785m

The dominance of Nothofagidites pollen in the spore-pollen assemblages, which first occurs at 785m assigns this and the overlying samples to the Lower N. asperus Zone. This is supported by the first appearances of Tricolpites simatus at 780.5m, Proteacidites recavus at 774m and Nothofagidites falcatus which is first recorded from the base of the greensand unit at 771m.

The absence of Myrtaceidites tenuis and Intratriporopollenites notabilis indicates that a section equivalent to the P. asperopolus Zone in Flathead-1 is not present in Sweep-1.

Deflandrea heterophylcta Dinoflagellate Zone 761m - 771m

The base of the greensand unit lies within the upper part of the Lower N. asperus based on the occurrence of Deflandrea heteroplylcta, a key species for its nominated zone, in samples between 771m and 765m. Supporting species present include Wetzeliella glabra, Areosphaeridium dictyoplokus and Deflandrea oebisfeldensis. The occurrence of this species at 761m justifies extending this zone to that level even though D. heterophylcta was not recorded from the highest two samples.

Middle Nothofagidites asperus Zone 759m.

Only a very limited assemblage was recorded from the one sample assigned to this zone owing to very low palynomorph recovery. The sample is assigned to the Middle N. asperus Zone based on the presence of the dinoflagellates Schematophora speciosus and Corrodinium corrugatum.

Proteacidites tuberculatus Zone 744.5m - 755m

The occurrence of a number of morphologically relatively simple dinoflagellates which have been given the manuscript names Dinosphaera simplex, D. pontus and D. scabroellipticus, demonstrate a post-Eocene age for these sediments even though the P. tuberculatus zone marker fossils such as Cyatheacidites annulatus and the nominate species were not present.

REFERENCES:

ABELE, C., et al., 1976: Tertiary, in Geology of Victoria: J.G. Douglas & J.A. Ferguson, Eds., Spec. Publ. Geol. Soc. Aust., No. 5 pp. 1-528.

PARTRIDGE, A.D., 1976, The Geological Expression of Eustacy in the Early Tertiary of the Gippsland Basin, The APEA jour., Vol. 16, pt. 1, pp. 73-79.

STEELE, R.J., 1976: Some concepts of seismic stratigraphy with application to the Gippsland Basin, The APEA Jour., Vol. 16, pt.1, pp. 67-71.

BASIN GIPPSLAND DATE October 16, 1978

WELL NAME SWEEP-1 ELEVATION

AGE	PALYNOLOGIC ZONES	HIGHEST DATA					LOWEST DATA				
		Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
OLIG-MIO.	P. tuberculatus	744.5m	1				755m	1			
EOCENE	U. N. asperus										
	M. N. asperus	759m	2								
	L. N. asperus	761m	0				785m	2			
	P. asperopolus										
	U. M. diversus										
	M. M. diversus										
	L. M. diversus										
PALEOCENE	U. L. balmei										
	L. L. balmei	790m	2				812m	1			
	T. longus	819m	1				838m	2			
LATE CRETACEOUS	T. lilliei										
	N. senectus										
	C. trip./T.pach.										
	C. distocarin.										
	T. pannosus										
EARLY CRETACEOUS											
PRE-CRETACEOUS											

COMMENTS: D. heterophylata dinoflagellate zone : 765m to 771m

RATINGS:
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 spore and pollen or microplankton, or both.
4; CUTTINGS, NO CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If a sample cannot be assigned to one particular zone, then no entry should be made. Also, if an entry is given a 3 or 4 confidence rating, an alternate depth with a better confidence rating should be entered, if possible.

DATA RECORDED BY: _____ DATE _____

DATA REVISED BY: _____ DATE _____

TABLE 1 : SUMMARY OF PALYNOLOGICAL ANALYSES, SWEEP-1, GIPPSLAND BASIN

Sample	Depth (m)	Depth (ft.)	Zone	Age	Confidence Rating	Yield	Diversity	Comments
SWC-79	744.5	2441	P. tuberculatus	Oligocene	1	Poor	Low	D. pontus, D. simplex
SWC-49	747	2451	"	"	1	Poor	Moderate	Mostly Post-Latrobe dinoflagellates
SWC-78	749	2457	"	"	1	Poor	V.Low	One D. cf scabroellipticus
SWC-47	755	2477	"	"	1	Poor	Low	D. simplex
SWC-46	759	2490	Middle N. asperus	Middle to Upper Eocene	2	Poor	Moderate	Few dinoflagellates
SWC-75	761	2497	Lower N. asperus	Middle Eocene	0	Poor	High	Highest A. dictyoplokus
SWC-45	763	2503	--	--	-	V.Poor	V.Low	Almost barren
SWC-74	765	2510	"	"	1	Fair	High	D. heterophylcta present
SWC-44	767	2516	"	"	0	Good	High	"
SWC-73	769	2523	"	"	0	Fair	High	"
SWC-43	771	2529	"	"	0	Good	High	"
SWC-42	774	2539	"	"	2	Poor		Essentially Non-marine
SWC-71	780.5	2561	"	"	1	Low	High	"
SWC-41	785	2575	"	"	2	Low	High	"
SWC-70	790	2592	Lower L. balmei	Paleocene	2	Fair	Moderate	Common L. balmei, no other markers
SWC-38	812	2664	Lower L. balmei	"	1	Good	High	
SWC-37	819	2687	T. longus	Lower Paleocene	1	Good	Moderate	
SWC-66	826	2710	"	"	1	V.Good	High	
SWC-65	833	2733	--	--	-	Barren	--	Almost no organic material
SWC-35	838	2749	T. longus	Lower Paleocene	2	Poor	Fair	
SWC-34	855	2805	--	--	-	Barren	--	Practically no organic material
SWC-62	876	2874	--	--	-	Barren	--	Small amount charcoal/woody frags.
SWC-32	883	2897	--	--	-	Barren	--	Fine, black mineral charcoal

SWEEP-1 SPECIES LIST.

Well Name SWEEP-1 Basin GIPPSLAND Sheet No. 1 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S					
DEPTHS / PALYNOMORPHS	744.5	747	749	755	759	761	763	765	767	769	771	774	780.5	785	790	812	819	826	833	838	855	876	883							
A. qualumis																														
A. acutullus																														
A. luteoides																														
A. oculatus																														
A. sectus																														
A. triplaxis																														
A. obscurus																/														
B. disconformis																														
B. arcuatus											/		/																	
B. elongatus																														
B. mutabilis																														
B. otwayensis																														
B. elegansiformis								/																						
B. trigonalis		/						/																						
B. verrucosus																														
B. bombaxoides																														
B. emaciatus																														
C. bullatus																														
C. heskermensis										cf																				
C. horrendus																														
C. meleosus																														
C. apiculatus																														
C. leptos																														
C. striatus																														
C. vanraadshoovenii																														
C. orthoteichus/major								/			/																			
C. annulatus																														
C. gigantis																														
C. splendens						/		/		/				/	/		/	/												
D. australiensis				/																										
D. granulatus	/		/							/			/	/		/														
D. tuberculatus	/				/				/	/			/	/		/														
D. delicatus																														
D. semilunatus																														
E. notensis																														
E. crassiexinus																														
F. balteus																														
F. crater																														
F. lucunosus																														
F. palaequetrus																														
G. edwardsii																	/													
G. rudata																	/	/												
G. divaricatus																														
G. gestus																														
G. catathus									/			/																		
G. cranwellae																		/												
G. wahooensis																														
G. bassensis																														
G. nebulosus																														
H. harrisii	/	/	/	/	/	/		/	/	/	/	/	/	/	/															
H. astrus																		/												
H. elliottii																														
I. anguloclavatus																														
I. antipodus																														
I. notabilis																														
I. gremius												/																		
I. irregularis								/	/				/	/																
J. peiratus																														
K. waterbolkii																														
L. amplus																		/												
L. crassus																														
L. ohaiensis																														
L. bainii																		/												
L. lanceolatus																														
L. balmei	RW													RW	/	/		/												
L. florinii		/				/		/	/	/	/	/		/	/	/														
M. diversus								/		/																				
M. duratus																														
M. grandis																														
M. perimagnus																														

*C= core; S= sidewall core; T= cuttings.

SWEEP-1 SPECIES LIST

Well Name SWEEP-1 Basin GIPPSLAND Sheet No. 2 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S					
DEPTHS / PALYNOMORPHS	744.5	747	749	755	759	761	763	765	767	769	771	774	780.5	785	790	812	819	826	833	838	855	876	883							
M. subtilis						/		/		/	/			/																
M. ornamentalis																														
M. hypolaenoides																														
M. homeopunctatus																														
M. parvus/mesonesus		/		.									/																	
M. tenuis																														
M. verrucosus																														
M. australis																														
N. asperus						/				/	/			/																
N. asperoides																														
N. brachyspinulosus								/					/	/																
N. deminutus																														
N. emarcidus/heterus	/		/	/		/		/			/																			
N. endurus																/		/												
N. falcatus								/			/																			
N. flemingii					/	/		/	/	/	/	/	/	/		/		/												
N. goniatus										/				/																
N. senectus																														
N. vansteenisii		/							/	/	/			/																
O. sentosa																		/												
P. ochesis																														
P. catastus																														
P. demarcatus																														
P. magnus																														
P. polyoratus														/	/	/		/												
P. vesicus																														
P. densus															/															
P. velosus													/	/																
P. morganii/jubatus																														
P. mawsonii		/	/	/	/	/		/			/		/	/	/	/		/		/										
P. reticulosaccatus																														
P. verrucosus																														
P. crescentis																														
P. esobalteus																														
P. langstonii																/														
P. reticulatus																														
P. simplex																														
P. varus																														
P. adenanthoides (Prot.)		RW								/			/	/																
P. alveolatus																														
P. amolosexinus																cf														
P. angulatus																/		cf												
P. annularis												/	/	/	/	/														
P. asperopolus																														
P. biornatus																														
P. clarus																														
P. cleinei																														
P. confragosus																														
P. crassis								/	/									/												
P. delicatus																														
P. formosus													/																	
P. grandis														/																
P. grevillaensis																														
P. incurvatus																														
P. intricatus																		/												
P. kopiensis										cf																				
P. lapis																														
P. latrobensis														cf																
P. leightonii		RW				/																								
P. obesolabrus																														
P. obscurus						/		cf		cf																				
P. ornatus																														
P. otwayensis																														
P. pachypolus						/		/	/	/																				
P. palisadus																		/												
P. parvus																														
P. plemmelus									/				/																	
P. prodigus																														
P. pseudomoides																														
P. recavus					/			/	/	/																				

*C = core; S = sidewall core; T = cuttings.

SWEEP-1 SPECIES LIST

Well Name SWEEP-1 Basin GIPPSLAND Sheet No. 3 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S					
DEPTHS / PALYNOMORPHS	744.5	747	749	755	759	761	763	765	767	769	771	774	780.5	785	790	812	819	826	833	838	855	876	883						
P. rectomarginis																													
P. reflexus																													
P. reticulatus																													
P. reticuloconcavus																													
P. reticuloscabratus																													
P. rugulatus																													
P. scitus																													
P. stipplatus																													
P. tenuiexinus																													
P. truncatus																													
P. tuberculatus																													
P. tuberculiformis																													
P. tuberculotumulatus																													
P. xestoformis (Prot.)																													
O. brossus																													
R. boxatus																													
R. stellatus																													
R. mallatus																													
R. trophus																													
S. cainozoicus																													
S. rotundus																													
S. digitatoides																													
S. marlinensis																													
S. rarus																													
S. meridianus																													
S. prominatus																													
S. uvatus																													
S. punctatus																													
S. regium																													
T. multistrixus (CP4)																													
T. textus																													
T. verrucosus																													
T. securus																													
T. confessus (C3)																													
T. gillii																													
T. incisus																													
T. longus																													
T. phillipsii																													
T. renmarkensis																													
T. sabulosus																													
T. simatus																													
T. thomasii																													
T. waiparaensis																													
T. adelaidensis (CP3)																													
T. angurium																													
T. delicatus																													
T. geraniodes																													
T. leuros																													
T. lilliei																													
T. marginatus																													
T. moultonii																													
T. paenestriatus																													
T. retequetrus																													
T. scabratus																													
T. sphaerica																													
T. magnificus (P3)																													
T. spinosus																													
T. ambiguus																													
T. chnosus																													
T. helosus																													
T. scabratus																													
T. sectilis																													
V. attinatus																													
V. cristatus																													
V. kopukuensis																													

*C = core; S = sidewall core; T = cuttings.

SWEEP-1 SPECIES LIST

Well Name SWEEP-1 Basin GIPPSLAND Sheet No. 4 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S					
DEPTHS / PALYNOMORPHS	744.5	747	749	755	759	761	763	765	767	769	771	774	780.5	785	790	812	819	826	833	838	855	876	883						
Dino. pontus	/																												
Dino. simplex	/	/		/																									
Oper. centrocarpum	/	/	/	/	/	/			/																				
Leptodinium sp.	/	/		/	/	/																							
Achom. alcicornu	/								/																				
Spiniferites spp.	/	/		/				/	/																				
Caligod amiculum	/																												
Oper. brevum		/																											
Poly. varispinosum		/																											
Nema. cf. divergens		/																											
Ling. solarum		/		/																									
Pent. lactinctum		/																											
Cyclop. vieta		/																											
Poly. fibrosum		/		/																									
Dino. scabroellipticus			/																										
Lepto. leos				/																									
Emsl. australiense				/																									
Hemicystidinium sp.				/																									
Spinidinium sp.					/	/		/	/		/																		
Schem. speciosus					/																								
Tect. marlum					/																								
Corrod. corrugatum					/	/																							
Wetz. glabra						/			/	/																			
Areo. dictyoplokus						/			/	/	/																		
Defl. oebisfieldensis						/			/	/				cf.															
Areo. arcuatum						/																							
H'kolp. riguade						/				/																			
Defl. flounderensis						/																							
Defl. heterophylcta								/	/	/	/																		
Homot. tasmanensis								/																					
Thalasiphora sp.									/																				
Defl. leptodermata									/																				
Para. indentata									/	/	/																		
System. placantha										/																			
Phtham. coreoides										/																			
Hystr. tubiferum											/																		

*C=core; S=sidewall core; T=cuttings.