APPENDIX 2

PALYNOLOGICAL ANALYSIS
WIRRAH-3, GIPPSLAND BASIN

by

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Esso Australia Ltd
Palaeontology Report 1984/19

July 1984

0927L

INTERPRETATIVE DATA

INTRODUCTION

One hundred and sixteen (116) sidewall core, six (6) conventional core and six (6) cuttings samples were processed and examined for spore-pollen and dinoflagellates. Despite good sampling densities, recovery was only fair to poor with samples providing confident age determinations often separated by thick intervals of little or no yield. Palynological zones and lithological facies divisions from the base of the Lakes Entrance Formation to the total depth of the well are given below. The occurrence of spore-pollen and dinoflagellate species are tabulated in the accompanying range chart. Anomalous and unusual occurences of species are listed in Table 2.

AGE	UNIT/FACIES	ZONE	DEPTH(m)
Early Miocene	Lakes Entrance Fm	P. tuberculatus	1475.4
	log break at 1488.5m		
Late Eocene	Unnamed marl	Middle N. asperus	1491.5
	log break at 1495.0m		
Late Eocene	Gurnard Formation	Middle N. asperus	1495.3-1507.0
	log break at 1510.0		
Middle Eocene		Early N. asperus	1520.1-1648.1
Early/Middle Eocene		P. asperopolus	1688.2-1804.0
Early Eocene		Upper M. diversus	1873.0
Early Eocene		Middle M. diversus	1881.0-1889.0
Early Eocene	Latrobe Group	Lower M. diversus	1925.1-1950.5
Palaeocene	Coarse Clastics	Upper M. balmei	2035.0-2366.0
Palaeocene		Lowe L. balmei	2397.6-2593.0
Maastrichtian		Upper T. longus	2600.0-2775.0
Late Cretaceous		Lower T. longus	2800.0-2875.0
Late Cretaceous		T. lilliei	2994.4-3159.2
Late Cretaceous		N. senectus	3219.3-3225.0

GEOLOGICAL COMMENTS

1. The Wirrah-3 well contains a continuous sequence of sediments from the Late Cretaceous N. senectus Zone to the Late Eocene Middle N. asperus Zone.

2. The P. tuberculatus Zone sample at 1475.4m contains Early Miocene foraminifera (Rexilius 1984), demonstrating erosion or a hiatus in deposition during the Oligocene. The surface represented by the log break at 1488.5m is likely to represent the 30 million year unconformity.

3. The unnamed marl, picked on lithological and log characteristics as occuring between 1488.5 and 1495m Rexilius (ibid) is likely to be Late Eocene, Middle N. asperus Zone in age. Because the unit is represented by one sidewall core sample only, this date must be considered provisional but maximum and minimum ages are Middle N. asperus and Upper N. asperus Zone respectively. It is noted that the equivalent facies in the Sea-Horse Field wells to the west are Eocene-Early Oligocene in age whilst the unit is absent in wells to the east of Wirrah-3, e.g. Whiting-1 (Rexilius unpubl. data). It is unclear whether the equivalent unit occurs in the Wirrah-1 and 2 wells.

4. The Gurnard Formation, picked on lithological and log characteristics as extending from 1495 to 1510m (Rexilius ibid) is wholly Middle N. asperus Zone in age. Sidewall core samples from the lower section of this unit (1503.0 to 1507.0m) contain largely terrestrially-derived palynofloras of high concentration and good diversity. All contain large-diameter palynomorphs from plant groups which are unlikely to have dispersed spore-pollen over long distances, e.g. Triorites magnificus. Palynofloras in sidewall core samples from the upper part of the unit (1495.3 to 1501.0m) are dominated by marine species of dinoflagellates. In these samples the terrestrially derived spore-pollen component mostly comprises types capable of being long-distance transported. A likely explanation is that the Gurnard Formation was deposited during a period of effectively rising sea level, resulting the wellsite becoming progressively more distant from the palaeoshoreline. The sandstone unit at the top of the Latrobe Group coarse clastics (1510.9-1520.1m) lacks dinoflagellates and may represent either shore-face or fluvio-deltaic facies. The former is considered more likely given that the highest coal occurs at 1523m. The timing and direction of change in the palaeo-environment suggests the surface at 1510.0m (the top of the Latrobe Group coarse clastics) represents the 40.5Ma type 1 unconformity recognised by Partridge et al. (unpubl. results).

5. Other samples within the Latrobe Group coarse clastics that contain dinoflagellates are: 1571.5m and 1648.1m (Lower N. asperus Zone), 1804.0m (P. asperopolus Zone), and 2152.1m (Upper L. balmei Zone). Concentrations are low to very low in all cases and the environments represented likely to be marginal marine rather than marine. This is consistent with data showing that the Wirrah-1 and Wirrah-2 wells were unaffected by Palaeocene or Early Eocene marine transgressions.

5. The Middle M. diversus seismic marker occurs immediately below the lowest sample datable as Middle M. diversus Zone in age but almost certainly lies within a section of this age.

7. The well bottomed in sediments of N. senectus Zone age. Whilst this is consistent with its location on the downthrown side of the fault between Wirrah-1 and Wirrah-1, it is noted that sediments of T. lilliei, T. longus and L. balmei Zone ages in Wirrah-3 occur at greater depth than would be anticipated from the predicted structural relationship between this well and Wirrah-2. A possible explanation is the presence of a negative listric fault in the Late Cretaceous/Palaeocene sediments between the wells.

BIOSTRATIGRAPHY

The zone boundaries have been established using criteria proposed by Stover and Evans (1973), Stover and Partridge (1973), and Partridge (1976) and subsequent proprietry revisions including Macphail (1983).

Nothofagidites senectus Zone, 3219.3 to 3225m:
Samples within this zone are dominated by Proteacidites and gymnosperms. An N. senectus Zone age is suggested on the basis of (i) an absence of Gambierina and (ii) relatively frequent occurrences of Nothofagidites and Tricolpites spp. Most of these are undescribed but species able to be recognized include N. endurus (3222.0m), N. senectus (3219m), T. gillii and T. sabulosus sensu lato (3225.3m, 3222m). The last species includes two distinct forms informally named var "gillii"/var A and var "rudata"/var B depending on the absence or presence respectively of well developed thickenings (margines) partially surrounding the colpi. Tricolpites sabulosus (var. A.) most closely resembles T. sabulosus Dettman & Playford sensu stricto.

Tricolporites lilliei Zone, 2994.4 to 3159.2m:
The base of this zone is provisionally picked at 3159.2m, the first occurrence of a single poorly preserved pollen referrable to Gambierina rudata. The sample at 3132.8m contains numerous, well preserved specimens of this species in addition to other species which range no lower than the T. lilliei Zone, e.g. Tricolporites lilliei and Nothofagidites flemingii. Gambierina rudata, Tricolporites lilliei, Proteacidites amolosexinus, Tricolpites sabulosus (vars. A and B) and frequent Nothofagidites occur in samples assigned to this zone as do a number of typically early Cretaceous species, e.g. Foraminisporis asymmetricus, Cicatricosisporites spp., Kraeuselisporites spp. and, at 3107.9m, Pilosisporites notensis. The highest sample assigned to the T. lilliei Zone contains a diverse palynoflora including the first occurrences of species which become common in the T. longus Zone: Australopollis obscurus, Proteacidites otwayensis and Tricolpites wahooensis. The samples at 2934.0 and 2971.8m are no older than T. lilliei Zone in age.

Lower Tricolpites longus Zone, 2800.0 to 2875.0m:
Three samples are assigned to this zone. The lowermost contains the nominate species and is therefore by definition (Macphail, 1983) no older than Lower T. longus in age. The two higher samples at 2823.6 and 2800.0m contain frequent to common Gambierina with Tricolporites lilliei but lack species first appearing in the Upper T. longus Zone. Only in one sample (2823.6m) is Nothofagidites common (58% of count excluding Proteacidites and Podocarpidites). Percentages of Gambierina rudata and Triporopollenites sectilis in this sample are 27% and 5% respectively.

Upper Tricolpites longus Zone, 2600.0 to 2775.0m:
The base of this zone is defined by the first occurrence of Stereisporites punctatus at 2775.0m. Gambierina is abundant and Nothofagidites very rare in this sample. Otherwise palynofloras are diverse only towards the top, but the section contains the first occurrence of a number of important Late Cretaceous species: Proteacidites palisadus (2775.0m), P. clinei and P. wahooensis (2764.0m), P. reticuloconcavus, Ornamentifera sentosa and Tetracolporites verrucosus (2742.5m); Proteacidites protograndis and Stereisporites regium (2713.0m); Protcacidites gemmatus (2650.0m); Quadraplanus brossus (2625.0m); and Tetradopollis securus (2624.38m). The upper boundary of the zone is defined by the last appearance of Tricolpites longus, Tricolporites lilliei, Proteacidites otwayensis, P. palisadus and frequent Gambierina rudata at 2600.0m.

Lower Lygistepollenites balmei Zone, 2397.6 to 2593.0:
The section assigned to this zone comprises palynofloras dominated by Proteacidites and gymnosperms separated by intervals of poor or no recovery. The nominate species is relatively rare. The lower boundary is picked at 2593.0m, based on the first occurrence of Tetracolporites verrucosus and Stereisporites punctatus in an assemblage which lacks species ranging no higher than the Upper T. longus Zone. The sample at 2582.1m contains frequent specimens of Tetracolporites verrucosus and is therefore no younger than Lower L. balmei Zone in age. The presence of multiple specimens of Schizocolpus marlinensis in this sample represents an important extension in the known range of this species. Tetracolporites verrucosus occurs throughout the Lower L. balmei Zone section and its last occurrence in a palynoflora lacking Verrucosisporites kopukuensis at 2397.6m, defines the upper boundary of the zone.

Upper Lygistepollenites balmei Zone, 2035.0 to 2366.0m:
The lower boundary of the zone is defined by the first occurrence of Verrucosisporites kopukuensis at 2366.0m. Occurrences of this species, Australopollis obscurus, Gambierina rudata, common to abundant Lygistepollenites balmei and frequent Gleicheniidites circinidites are continuous throughout the Upper L. balmei Zone section. As is frequently the case in Gippsland wells, a number of species which are known to appear first in the Lower L. balmei Zone are first recorded in this zone, e.g. Haloragacidites harrisii at 2188.3m and Polycolpites langstonii at 2194.18m. Phyllocladidites verrucosus occurs at 2333.1, 2270.0 and 2188.30m, Proteacidites amolosexinus at 2288.0m, and Tetracolporites verrucosus and Malvacipollis diversus at 2096.4m. The upper boundary is provisionally placed at 2035.0m, the highest sample containing Verrucosisporites kopukuensis and relatively frequent Lygistepollenites balmei. The sample immediately above, at 2002.4m, lacks L. balmei, but contains a single specimen of Australopollis obscurus,. a species not known to range above the Upper L. balmei Zone.

Lower Malvacipollis diversus Zone, 1925.1 to 1950.5m
Two samples are assigned to this zone, both with low confidence. The lowermost, at 1950.5m contains frequent to common Proteacidites grandis in a poor diversity, Proteacidites-dominated assemblage. The uppermost, at 1925.1m, is more typically Lower M. diversus Zone in character, being dominated by thick walled spores including Cyathidites splendens and Verrucosisporites kopukuensis.

Middle Malvacipollis diversus Zone, 1881.0 to 1889.0m.
The occurrence of Proteacidites tuberculiformis at 1889.0m demonstrates this sample is no older than Middle M. diversus Zone in age. This sample contains a number of other species which are rarely, or not previously, recorded below the Upper M. diversus Zone, e.g. Proteacidites latrobensis, P. tuberculotumulatus, P. recavus and Gemmatricolporites cf gestus. Nevertheless, in the absence of Myrtaceidites tenuis and Proteacidites pachypolus, an Upper M. diversus Zone age cannot be demonstrated. The spore-pollen assemblage in the second of the two samples assigned a Middle M. diversus Zone age is more typical of the Middle M. diversus Zone, being dominated by Haloragacidites harrisii with several to frequent occurrences of Proteacidites tuberculiformis, P. xestoformis, Malvacipollis diversus, Tricolporites adelaidensis and T. moultonii.

Upper Malvacipollis diversus Zone, 1873.0m:
One sample only is assigned to this zone, based on the occurrence of Myrtaceidites tenuis in an assemblage with frequent Malvacipollis diversus and abundant Haloragacidites harrisii.

Proteacidites asperopolus Zone, 1688.2 to 1804.0m:
As with previous zones, the P. asperopolus Zone comprises samples with good recovery separated by barren intervals. The lower boundary, at 1804.0m, is picked at the first occurrence of Proteacidites asperopolus. The simultaneous occurrence of this species with Myrtaceidites tenuis at 1715.2 demonstrates that this sample is P. asperopolus Zone in age. The upper boundary is provisionally picked at 1688.2m, a coal palynoflora dominated by both Nothofagidites and Proteacidites and containing species which typically first appear within the P. asperopolus Zone, e.g. Proteacidites rugulatus and Beaupreadites trigonalis. Proteacidites asperopolus occurs in a sample containing negligible amounts of spore-pollen at 1662.2m indicating it is either P. asperopolus or Lower N. asperus Zone in age.

Lower Nothofagidites asperus Zone, 1520.1 to 1648.1m:
The lower boundary of this zone is provisionally placed at 1648.1m on the basis of (i) frequent Nothofagidites relative to Proteacidites and (ii) Proteacidites reflexus, a very rare species believed to first appear in the Lower N. asperus Zone. A more confident 'pick' is at 1596.4m, a sample containing species which first appear in this zone, Tricolporites delicatus, T. leuros, Proteacidites recavus and Nothofagidites falcatus, in a Nothofagidites-dominated assemblage. The Lower N. asperus Zone dinoflagellate indicator species Areosphaeridium diktyoplokus occurs at 1571.5m. The upper boundary is porovisionally picked at 1520.5. The occurrence of Verrucatosporites attinatus in this sample shows it is no older than upper Lower N. asperus Zone in age. Middle N. asperus Zone indicators are absent ex except for a caved specimen of Vozzhenikovia extensa.

Middle Nothofagidites asperus Zone 1491.5 to 1507.0m:
The lower boundary is placed at 1507.0m, the first occurrence of the Middle N. asperus Zone pollen indicator species Triorites magnificus (associated with frequent Vozzhenikovia extensa) is at 1507.0m.

The same association occurs at 1505.0m and 1503.0m. Vozzhenikovia extensa occurs upsection to 1495.3m. The upper boundary is provisionally picked at 1491.5m, a sample containing Proteacidites rectomarginis, a species which first appears in the Middle N. asperus Zone, and Proteacidites recavus which typically is last recorded in this zone.

The occurrence of Triorites magnifus and Rugulatisporites trophus at 1485.3m demonstrates this sample is also Middle N. asperus Zone in age, a conclusion supported by the occurrence of Zone K (Eocene) foraminifera. Since this sample is a greensand separated from the Gurnard Formation by a glauconite-free carbonate, it is likely to be incorrectly labelled as to depth. (See also Rexilius, 1984).

Proteacidites tuberculatus Zone, 1475.4m:
The presence of Cyatheacidites annulatus at 1475.4m confirms a P. tuberculatus Zone age for this sample.

REFERENCES

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PALYNOLOGY DATA SHEET

BASIN: GIPPSLAND ELEVATION: KB: +21.0m GL: -49.0m

WELL NAME: WIRRAH-3 TOTAL DEPTH:

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	1475.4	0				1475.0	0			
PALEOGENE	Upper *N. asperus*										
	Mid *N. asperus*	1491.5	2	1495.3	1		1507.0	0			
	Lower *N. asperus*	1520.1	2	1553.6	1		1648.1	2	1596.4	1	
	P. asperopolus	1688.2	2	1715.2	0		1804.0	1			
	Upper *M. diversus*	1873.0	1				1873.0	1			
	Mid *M. diversus*	1881.0	2				1889.0	2			
	Lower *M. diversus*	1925.1	2				1950.5	2			
	Upper *L. balmei*	2035.0	1				2366.0	1			
	Lower *L. balmei*	2397.6	1				2593.0	2	2558.5	1	
LATE CRETACEOUS	*T. longus*	2600.0	0				2875.0	1			
	T. lilliei	2994.4	2				3159.2	2	3132.8	1	
	N. senectus	3219.3	2				3225.0	3	3222.0	2	
	U. *T. pachyexinus*										
	L. *T. pachyexinus*										
	C. triplex										
	A. distocarinatus										
EARLY CRET.	*C. paradoxus*										
	C. striatus										
	F. asymmetricus										
	F. wonthaggiensis										
	C. australiensis										
PRE-CRETACEOUS											

COMMENTS: Upper T. longus Zone 2600.0 - 2775.0m; Lower T. longus Zone 2800 - 2875.0m. Please note that the T. longus Zone as recognized in pre-1983 wells corresponds approximately to the Upper T. longus Zone.

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: M.K. Macphail DATE: 8 June 1984

DATA REVISED BY: DATE:

TABLE 1 : SUMMARY OF PALYNOLOGICAL ANALYSIS WIRRAH-3

INTERPRETATIVE DATA

SAMPLE NO.	DEPTH (m)	YIELD	DIVERSITY SPORE POLLEN	LITHOLOGY	ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 125	1475.4	Good	V. low	Calcilut.	P.tuberculatus		0	C. annulata
SWC 123	1485.3	V. good	Low	Sh.,calc.	Indeterminate	-	-	Misplaced sample containing R.trophus & T.magnificus (Middle N.asperus Zone indicator species).
SWC 122	1491.5	V. good	Low	Slst.,calc., glau.	Indeterminate	-	-	Early Oligocene foram assemblage with reworked glauconite and Upper-Middle N. asperus palynoflora.
SWC 120	1495.3	V. good	Fair	S.st., glau.	Middle N.asperus	Late Eocene	1	V. extensa.
SWC 119	1497.4	Good	Fair	Sh., glau.	Middle N.asperus	Late Eocene	2	S.punctatus, P.reticulatus.
SWC 118	1499.3	Good	Fair	Slst., glau.	Middle N.asperus	Late Eocene	1	V.extensa frequent, M.verrucosus.
SWC 117	1501.0	Good	V. low	Slst., glau.	Middle N.asperus	Late Eocene	1	V.extensa.
SWC 116	1503.0	Good	High	Slst., glau.	Middle N.asperus	Late Eocene	0	T.magnificus, R.trophus, P.recavus, V.extensa.
SWC 115	1505.0	Good	Fair	Slst., glau.	Middle N.asperus	Late Eocene	0	T.magnificus, frequent V.extensa.
SWC 114	1507.0	Good	Fair	Slst., glau.	Middle N.asperus	Late Eocene	0	T.magnificus, P.pachypolus, P.rectomarginis, V.extensa
SWC 113	1509.9	Negligible		Slst., glau.	Indeterminate	-	-	
SWC 112	1510.9	Barren		Ss.	Indeterminate	-	-	
SWC 111	1512.9	Barren		Ss.	Indeterminate	-	-	
SWC 110	1515.0	V. low	V. low	Ss.	No younger than Middle N. asperus			B. elegansiformis.
SWC 109	1516.7	V. low	V. low	Ss.	Indeterminate	-	-	
SWC 108	1520.1	Fair	Fair	Ss.	Lower N.asperus	Middle Eocene	2	N.falcatus, V.attinatus.
SWC 107	1525.5	Good	Low	Slst., carb.	Lower N.asperus	Middle Eocene	2	N.falcatus.

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INTERPRETATIVE DATA

SAMPLE NO.	DEPTH (m)	YIELD	DIVERSITY SPORE POLLEN	LITHOLOGY	ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 106	1531.5	V. low	V. low	Sh.	Lower N.asperus	Middle Eocene	2	N.falcatus.
SWC 105	1539.9	Barren		Ss.	Indeterminate	-	-	
SWC 104	1553.6	Low	Fair	Ss.	Lower N.asperus	Middle Eocene	1	T.leuros, P.vesicus, N.falcatus
SWC 103	1571.5	V. low	Low	Ss.	Lower N.asperus	Middle Eocene	1	T.leuros, N.falcatus, A.diktyoplokus
SWC 102	1596.4			Slst., carb.	Lower N.asperus	Middle Eocene	1	T.leuros, T.delicatus, N.falcatus, P.pachypolus, P.recavus
SWC 101	1614.6	Negligible		Ss.	Indeterminate	-	-	
SWC 100	1648.1	Low	Low	Slst.	Lower N.asperus	Middle Eocene	2	P.reflexus, frequent Nothofagidites
SWC 99	1662.2	Negligible		Ss.	No younger than Lower N.asperus			P.asperopolus
SWC 98	1688.2	Fair	Fair	Coal	P.asperopolus	Early Eocene	2	P.rugulatus, abundant Proteacidites
SWC 97	1715.2	Good	High	Sh.,carb.	P.asperopolus	Early Eocene	0	P.asperopolus, M.tenuis
SWC 96	1742.6	Barren		Slst.	Indeterminate	-	-	
SWC 95	1770.1	Negligible		Sh.	Indeterminate	-	-	
SWC 94	1787.0	Barren	-	Slst.	Indeterminate	-	-	
SWC 93	1804.0	Good	High	Sh.	P.asperopolus	Early Eocene	1	P.asperopolus, P.pachypolus
SWC 92								
SWC 91	1858.2	Barren		Slst.	Indeterminate	-	-	
SWC 90	1873.0	Fair	Low	Coal	Upper M.diversus	Early Eocene	1	M.diversus frequent, M.tenuis
SWC 89	1881.0	V. good	High	Sh., carb.	Middle M.diversus	Early Eocene	1	P.tuberculiformis, P.xestoformis, T.moultonii, T.adelaidensis
SWC 88	1889.0	Good	V. high	Sh.	Middle M.diverus	Early Eocene	1	P.tuberculiformis
SWC 87	1909.1	Negligible		Ss.	Indeterminate	-	-	
SWC	192[illegible]	Goo	w		l M.d sus	Ea Eocei	2	ore- nate ynof
SWC 85	1950.5	Good	Low	Sh.	Lower M.diversus	Early Eocene	2	P.grandis common, T.adelaidensis

TABLE I : SUMMARY OF PALYNOLOGICAL ANALYSIS WIRRAH-3

INTERPRETATIVE DATA

SAMPLE NO.	DEPTH (m)	YIELD	DIVERSITY SPORE POLLEN	LITHOLOGY	ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 66	2405.0	Barren		Volcanic	-		-	
SWC 64	2424.0	Low	Fair	Slst.	Lower L. balmei	Paleocene	1	L.balmei, T.verrucosus
SWC 62	2435.6	Barren		Slst.	Indeterminate	-	-	
Ctg	2460-65	Low	V. Low	-	Lower L. balmei	Paleocene	3	L.balmei, T.verrucosus
SWC 61	2449.9	Good	Low	Dol.	Indeterminate	-	-	M.diversus Zone palynoflora
SWC 58	2467.5	Low	Low	Sh.	Indeterminate	-	-	
SWC 57	2474.5	Barren		Ss.	Indeterminate	-	-	
Ctgs	2470-75	V. Low	V. Low		L. balmei	Paleocene	-	H.harrisii, A.obscurus
SWC 55	2484.7	Low	Low	Sh.	Lower L. balmei	Paleocene	2	L.balmei, abundant Proteacidites
SWC 54	2491.5	Barren	-	Ss.	Indeterminate	-	-	
SWC 53	2495.7	Barren	-	Ss.	Indeterminate	-	-	
SWC 52	2498.5	Good	Low	Sh.	Lower L. balmei	Paleocene	1	L.balmei, T.verrucosus
SWC 51	2502.1	Fair	Low	Slst.	Lower L. balmei	Paleocene	2	L.balmei, reworked Early Cretaceous spp.
Ctgs	2510-15	V. Low	V. Low		Lower L. balmei	Paleocene	3	H.harrisii, T.verrucosus
SWC 48	2512.6	Barren	-	Ss.	Indeterminate		-	
SWC 47	2517.0	Barren	-	Slst.	Indeterminate		-	
SWC 42	2539.2	V. Low	V. Low	Slst.	Lower L. balmei	Paleocene	1	L.balmei, T.verrucosus
SWC 39	2552.5	Fair	Fair	Slst.	Lower L. balmei	Paleocene	1	L.balmei, frequent T.verrucosus
SWC 38	2555.9	V. Low	Fair	Ss.	Lower L. balmei	Paleocene	2	Frequent T. verrucosus
SWC 37	2557.0	Barren	-	Ss.	Indeterminate	-	-	
SWC 36	2558.5	Fair	High	Sh.	Lower L. balmei	Paleocene	1	H.harrisii, L.balmei, T.verrucosus, N.endurus, T.gillii, G.rudata, T.confessus, A.obscurus
SWC 35	2560.2	Barren	-	Ss.	Indeterminate	-	-	

TABLE I : SUMMARY OF PALYNOLOGICAL ANALYSIS WIRRAH-3

INTERPRETATIVE DATA

SAMPLE NO.	DEPTH (m)	YIELD	DIVERSITY SPORE POLLEN	LITHOLOGY	ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 29	2582.1	Low	Fair	Sh.	Lower L. balmei	Paleocene	2	T.verrucosus, P.adenantholdes
SWC 27	2593.0	Good	Fair	Sh.	Lower L. balmei	Paleocene	2	L.balmei, T.verucosus
SWC 26	2600.0	Fair	High	Sh.	Upper T. longus	Maastrichtian	0	S.punctatus, T.longus, T.lilliei, frequent G.rudata, P.otwayensis, P.pallsadus
Core	2600.15	Fair	Low	Sh.	Upper T. longus	Maastrichtian	1	P.reticuloconcavus, T.lilliei, T. apoxyexinus
Core	2601.3	Fair	Low	Sh.	Upper T. longus	Maastrichtian	0	T.longus, S.punctatus
SWC 25	2604	Low	High	Sh.	Upper T. longus	Maastrichtian	0	as above plus G.rudata (common), T. waiparensis, P.reticuloconcavus, P.wahooensis
Core 7	2624.38	Good	High	Sh.	Upper T. longus	Maastrichtian	0	S.punctatus, T.verrucosus, T.longus, T.securus
SWC 24	2625.0	Fair	Fair	Sh.	Upper T. longus	Maastrichtian	0	T.longus, Q.brossus, S.punctatus, P.otwayensis
Core 7	2633.87	V. good	Low	Sh.	Upper T. longus	Maastrichtian	0	T.longus, S.punctatus, palynoflora dominated by G.rudata.
Core 5	2648.62	V. good	Fair	Sh.	Upper T. longus	Maastrichtian	0	T.longus; S.punctatus and G.rudata frequent
SWC 23	2650.0	Good		Slst.	Upper T. longus	Maastrichtian	1	T.longus, S.Punctatus
Core 7	2678.38	Barren		Sh.	Indeterminate	-	-	
Core 7	2681.09	Negligible		Sh.	Indeterminate	-	-	
SWC 19	2713	Low	Fair	Sh.	T. longus	Maastrichtian	-	T.longus, G.rudata, S.regium. T.sectilis
SWC 18	2719.9	V. Low	Low	Sh.	T. longus	Maastrichtian	-	T.longus, G.rudata, P.otwayensis

TABLE I : SUMMARY OF PALYNOLOGICAL ANALYSIS WIRRAH-3

INTERPRETATIVE DATA

SAMPLE NO.	DEPTH (m)	YIELD	DIVERSITY SPORE POLLEN	LITHOLOGY	ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 17	2722.1	Negligible		Sh.	Indeterminate	-	-	
SWC 16	2737.0	Negligible		Ss.	Indeterminate	-	-	G.rudata
SWC 15	2742.5	Good	Fair	Coal	Upper T. longus	Maastrichtian	1	abundant G.rudata; T.verrucoous; S.punctatus, P.reticuloconcavus, O.sentosa
SWC 14	2744.6	Low	V. low	Slst.	T. longus	Maastrichtian	-	G.rudata frequent
SWC 10	2764.0	V. good	High	Sh.	Upper T. longus	Maastrichtian	0	G.rudata common, S.punctatus, P.cleinei, P.wahooensis, T.walparensis
SWC 9	2775.0	Fair	Low	Sh.	Upper T. longus	Maastrichtian	0	G.rudata abundant, S.punctatus
SWC 8	2789.0	V. Low	V. Low	Slst.	No older than T. lilliei Zone		-	G. rudata
SWC 7	2800.0	Fair	Low	Slst.	Lower T. longus	Late Cretaceous	2	G.rudata common, T.lilliei
SWC 6	2823,6	Low	Fair	Sh.	No older than T.lilliei Zone			T.lilliei; abundant Nothofagidites
SWC 3	2875.0	Low	Low	Ss./Sh.	Lower T.longus	Late Cretaceous	1	T.longus, G.rudata
SWC 1	2934.0	V. Low	V. Low		No older than T.lilliei Zone		-	G.rudata
SWC 162	2961.0	Barren		Conglom.	Indeterminate		-	
SWC 161	2971.8	Negligible		Slst.	No older than T.lilliei Zone			N.flemingii, P.angulatus
SWC 160	2978.2	Negligible		Conglom.	Indeterminate			
SWC 159	2994.4	V. good	High	Slst.	T. lilliei	Late Cretaceous	2	N.flemingii, T.lilliei, T.walparensis, T.sectilis
SWC 158	3002.0	Barren		Conglom.	Indeterminate		-	
SWC 156	3026.4	V. Low	V. Low	Slst.	No older than T.lilliei Zone		-	G.rudata, T.sabulosus
SWC 155	3039.0	V. Low	Low	Conglom.	Indeterminate		-	N.senectus, N.brachyspinulosus
SWC 154	3051.8	Negligible		Slst.	No older than T.lilliei Zone		-	G.rudata
SWC 151	3081.5	Barren		Conglom.	Indeterminate		-	

TABLE 1 : SUMMARY OF PALYNOLOGICAL ANALYSIS WIRRAH-3

INTERPRETATIVE DATA

SAMPLE NO.	DEPTH (m)	YIELD	DIVERSITY SPORE POLLEN	LITHOLOGY	ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 150	3088.0	Low	Low	Slst.	T. lilliei	Late Cretaceous	1	G.rudata frequent, T.lilliei, T.sectilis
SWC 149	3088.6	Negligible		Slst.	Indeterminate			
SWC 147	3097.0	V. Low	V. Low	Slst.	T. lilliei	Late Cretaceous	2	G.rudata
SWC 145	3107.9	Fair	High	Slst.	T. lilliei	Late Cretaceous	1	G.rudata, T.lilliei, N.flemingii
SWC 143	3127.4	Barren		Slst.	Indeterminate		-	
SWC 142	3132.8	Fair	High	Slst.	T. lilliei	Late Cretaceous	1	T.lilliei, N.flemingii, freq. G.rudata
SWC 141	3141.0	Negligible		Conglom.	No older than N.senectus Zone		-	
SWC 140	3159.2	V. Low	Low	Slst.	No older than N.senectus Zone		-	
SWC 137	3219.3	Fair	Low	Slst.	N. senectus	Late Cretaceous	2	N.senectus
SWC 136	3222.0	Low	Fair	Ss.	N. senectus	Late Cretaceous	2	N.senectus, N.endurus. T.sabulosus
Ctgs	3225.30	Low	Low		N. senectus	Late Cretaceous	3	Nothofagidites spp., T.sabulosus
Ctgs	3230.35	Good	Low		Indeterminate	-	-	Caved Eocene taxa
SWC 134	3241.9	V. Low	Low	Slst.	Indeterminate	-	-	Long-ranging Cretaceous spores only
SWC 133	3242.5	Low	V. Low	?	N. senectus	Late Cretaceous	2	N.cf.endurus, T.cf.sabulosus

TABLE 2

ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN TAXA IN WIRRAH-3

SAMPLE NO.	DEPTH(m)	ZONE	TAXON	COMMENTS
SWC 127	1485.3	Middle *N. asperus*	*Rugulatisporites trophus*	Rare sp. (Gurnard Fm), with *Triorites magnificus*
SWC 119	1497.4	Upper-Middle *N. asperus* (2)	*Stereisporites punctatus*	Rare late appearance
SWC 118	1499.3	Middle *N. asperus* (1)	*Myrtaceidites verrucosus*	Rare sp.
SWC 116	1503.1	Middle *N. asperus*	*M. eucalyptoides*	Rare sp. in Eocene
SWC 116	"	"	*Phyllocladidites paleogenicus*	Rare sp.
SWC 114	1507.0	Middle *N. asperus* (0)	*Proteacidites pachypolus*	Last appearance. *T. magnificus* present
SWC 114	"	"	*Dyphes colligerum*	Rare dinoflagellate
SWC 114	"	"	*Wetzeliella cf tabulatum*	First record
SWC 108	1520.1	Lower *N. asperus* (2)	*Phyllocladidites paleogenicus*	Rare sp.
SWC 108	"	"	*Podosporites erugatus*	Rare sp. in Eocene
SWC 108	"	"	*Haloragacidites verrucatoharrisii*	Rare ms sp. (Machphail)
SWC 108	"	"	*Verrucatosporites attinatus*	Rare sp.
SWC 102	1596.4	Lower *N. asperus* (1)	*Proteacidites callosus*	Rare sp.
SWC 101	1614.6	Lower *N. asperus* (2)	*Clavatipollenites glarius*	Very rare sp.
SWC 100	1648.1	Lower *N. asperus* (2)	*Proteacidites lapis*	Not recorded above *P. asperopolus* Zone
SWC 100	"	"	*P. reflexus*	Rare sp.
SWC 97	1715.2	*P. asperopolus* (0)	*Nothofagidites*	Common in assemblage
SWC 97	"	"	*Tricolpites phillipsii f. durus*	Rare var.
SWC 97	"	"	*"Tricolpites reticulatus"*	Rare sp. (Stover & Evans)
SWC 90	1873.0	Upper *M. diversus* (1)	*Proteacidites recavus*	Very rarely recorded below *P. asperopolus* Zone
SWC 89	1881.0	Middle *M. diversus* (1)	*Foveotriletes balteus*	Rare occurrence below Upper *M. diversus* Zone
SWC 88	1889.0	Middle *M. diversus* (2)	*Proteacidites tuberculotumulatus*	Very rare species, not usually found below Upper *M. diversus* Zone
SWC 88	"	"	*Gemmatricolporites cf gestus*	*G. gestus* ranges no lower than Lower *N. asperus* Zone

TABLE 2

ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN TAXA IN WIRRAH-3

SAMPLE NO.	DEPTH(m)	ZONE	TAXON	COMMENTS
SWC 88	1889.0	Middle M. diversus (2)	Proteacidites latrobensis	Not recorded below Upper M. diversus
SWC 88	"	"	P. rugulatus	Not recorded below P. asperopolus Zone
SWC 88	"	"	Tricolporites circumlumenus	Rare ms sp. (Macphail)
SWC 88	"	"	Tricolpites phillipsii f. durus	Rare var.
SWC 88	"	"	Proteacidites sp. nov.	Echinate, resembles P. parvus but much larger
SWC 83	2002.4	(Lower M. diversus)	Australopollis obscurus	Reworked (?) in sample dated as Lower M. diversus Zone on geological data
SWC 82	2035.0	Upper L. balmei (1)	Cupanieidites orthoteichus	Not previously recorded below M. diversus Zone
SWC 82	"	"	Tricolporites adelaidensis	Not previously recorded below Middle M. diversus Zone
SWC 80	2096.4	Upper L. balmei (1)	Tricolporites adelaidensis	As for SWC 82
SWC 80	"	"	Tetracolporites verrucosus	Rare occurrence with V. kopukuensis
SWC 79	2128.0	Upper L. balmei (1)	Tricolporites marginatus	Uncommon sp.
Core 2	2188.30	Upper L. balmei (1)	Phyllocladidites verrucosus	Rare above Lower L. balmei Zone
Core 2	"	"	Polycolpites langstonii	Var. with minute apiculae
Core 2	2194.18	Upper L. balmei (1)	Foveotriletes balteus	As for SWC 89
SWC 74	2288.0	Upper L. balmei (2)	Proteacidites amolosexinus	Late Cretaceous sp.
SWC 68	2392.6	Upper L. balmei (2)	Phyllocladidites reticulosaccatus	Rare sp.
SWC 64	2424.0	Lower L. balmei (1)	Proteacidites pallsadus	Late Cretaceous sp.
SWC 64	"	"	Verrucosisporites cf kopukuensis	Ancestral form of V. kopukuensis?
SWC 59	2467.5	Lower L. balmei (2)	Tricolpites marginatus	As for SWC 79
SWC 59	"	"	Proteacidites grandis	Caved specimen?
SWC 39	2552.5	Lower L. balmei (1)	P. grandis	Caved specimen?
SWC 36	2558.5	Lower L. balmei (1)	Gleichenildites spp.	Not usually abundant in this zone
SWC 36	"	"	Schizaea digitatoides	Uncommon sp.
SWC 36	"	"	Verrucosisporites cf kopukuensis	As for SWC 64
SWC 29	2582.1	Lower L. balmei (1)	Schizocolpus marlinensis	Not previously recorded below Lower M. diversus. Important record.

TABLE 2

ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN TAXA IN WIRRAH-3

SAMPLE NO.	DEPTH(m)	ZONE	TAXON	COMMENTS
Core	2600.15	Upper *T. longus* (1)	*Tricolporites apoxyexinus*	?Rare sp.
Core 7	2624.38	Upper *T. longus* (0)	*Proteacidites protograndis*	Ms sp. (Macphail)
SWC 19	2713.0	Upper *T. longus* (2)	*Proteacidites protograndis*	Ms sp. (Macphail)
SWC 15	2742.5	Upper *T. longus* (0)	*Ornamentifera sentosa*	V. rare sp.
SWC 6	2823.6	Lower *T. longus* (2)	Abundant *Nothofagidites*	58%, (*Gambierina* 27%)
SWC 3	2875.0	Lower *T. longus* (1)	*Tricolpites vergillus*	Rare ms sp. (Partridge)
SWC 159	2994.4	*T. lilliei* (1)	*Aglaoreidia* sp. nov.	Genus not previously recorded below Middle *N. asperus* Zone
SWC 159	"	"	*Nothofagidites flemingii*	Rare occurrence close to first appearance of sp.
SWC 159	"	"	*Gephryapollenites wahooensis*	Rare sp.
SWC 159	"	"	*Tricolpites confragosus*	New ms sp. with *Proteacidites conflagrous*-style ornamentation
SWC 150	3088.0	*T. lilliei* (1)	*Foveotriletes balteus*	V. rare in Late Cretaceous
SWC 142	3132.8	*T. lilliei* (1)	*Nothofagidites flemingii*	As for SWC 159
SWC 140	3159.2	*N. senectus* (?)	*Basopollis otwayensis*	
SWC 136	3222.0	*N. senectus* (1)	*Basopollis mutabilis*	