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APPENDIX

PALYNOLOGICAL ANALYSIS OF TURRUM-3

GIPPSLAND BASIN, SOUTHEASTERN AUSTRALIA

by

Neil G. Marshall

Esso Australia Ltd.

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CONTENTS

INTRODUCTION

Sixty-four sidewall core and eight cutting samples were examined for palynomorphs from Turrum-3. Occurrences of spore-pollen and dinoflagellate species in each sample are recorded on the enclosed range chart. Tables 1 and 3 summarize interpretative and basic palynological data, and anomalous occurrences of spores-pollen and dinoflagellates are listed in Table 2.

SUMMARY TABLE

AGE	FORMATION	PALYNOLOGY ZONE	DEPTH (in metres K.B)
Early-Middle Miocene	Lakes Entrance Formation	T. bellus	1460
Miocene - Early Oligocene (?)	Lakes Entrance Formation	P. tuberculatus	1479.9 - 1567.4
		log break at 1571 m	
Early Eocene	Latrobe Group	P. asperopolus	1573.5
Early Eocene	Latrobe Group	Upper M. diversus	1576.5
		Middle M. diversus	1596-1642
		Lower M. diversus	1660.7 - 1736.9
Late Paleocene	Latrobe Group	Upper L. balmei	1750.5 - 2034
Early-Late Paleocene	Latrobe Group	Lower L. balmei	2061 - 2647
Maastrichtian	Latrobe Group	Upper T. longus	2705 - 2850
		T. longus (undifferentiated)	2875 - 2995
			T.D. 2995m

GEOLOGICAL COMMENTS

1. Palynological analyses confirm the zonal assignments given to the seismic markers used in the geophysical mapping of the Turrum structure. The recognition of the Tricolpites longus Zone in samples from the basal portion of Turrum-3 confirms that the well terminated in a shale-sandstone interval of Late Cretaceous age. Because of technical problems encountered while testing the basal portion of the well, only cutting samples were available from the Late Cretaceous sequence. All other samples analysed from Turrum-3 consisted of sidewall core samples.

2. Reasonably good correlation exists between the spore-pollen zones recognized in Turrum-3 and those identified in the better sampled wells within the Turrum-Marlin area: these being Turrum-1 and -2, and Marlin-4. There is generally insufficient sample control in other wells within the Turrum-Marlin area to make meaningful correlations of the spore-pollen zones with Turrum-3. More refined correlations using an integration of spore-pollen and dinoflagellate zones are presently being attempted.

   The base of the Apteodinium homomorphum dinoflagellate Zone defines a readily identifiable marker within the Lygistepollenites balmei Zone in the Marlin-Turrum area, and is recognized in Turrum-2 and -3, and Marlin -1, -2 and -4. The lateral distribution of dinoflagellate zones older than the A. homomorphum Zone in these wells is assessed below.

   a) Eisenackia crassitabulata Zone : recognized in Turrum-1 (6900-7116') and Turrum-2 (7520'), and Marlin-4 (6954-7310'), but not in Turrum-3. Based on correlation with other wells, this zone would be expected to occur in Turrum-3 between 2350-2500m. Its apparent absence may be due to either low yields of dinoflagellates in the material studied or non-sampling of the appropriate horizon.

b) Isabelidinium druggii Zone : recognized in Marlin-1 (8468') and Turrum-1 (8142'), but not in Turrum-2 and -3 and Marlin-4. The zonal species is often rare and has a sporadic distribution, and its absence may be due to non-sampling of the critical horizon.

3. Hannah (1985) has examined five samples from the basal portion of the Lakes Entrance Formation for foraminifera. The dates indicated by these fossils confirm those inferred from the spore-pollen and dinoflagellates.

4. Turrum-3 contains the first record in the offshore Gippsland Basin of Triporopollenites bellus, the marker species of T. bellus Zone. It occurs with the foraminiferal Zone C (Hannah, pers. comm.), which is stratigraphically younger than its first known occurrence onshore. This offshore occurrence is consistent with known range of species.

BIOSTRATIGRAPHY

The spore-pollen zones have been identified using the criteria proposed by Stover & Partridge (1973). The dinoflagellate zones are modifications on the scheme of Partridge (1976). Discussions of the dinoflagellate assemblages and their zonal assignments are given with the descriptions of their associated spore-pollen assemblages.

Tricolpites longus Zone (undifferentiated) 2875-2995 m.

The four cutting samples placed in the interval are characterized by the occurrence of Gambierina rudata, G. edwardsii, Tetracolporites verrucosus, and the zonal species Tricolpites longus. The samples lack the taxa used by Macphail (1983) to subdivide the zone into Upper and Lower T. longus zonules.

Upper Tricolpites longus Zone 2705-2850 m.

The four cutting samples assigned to the interval are characterized by the presence of Gambierina rudata, G. edwardsii, Tetracolporites verrucosus, Tricolpites longus, and Stereisporites punctatus. Following Macphail (1983), the association of T. longus with S. punctatus has been used to assign these samples to the upper zonule of the T. longus Zone.

Lower Lygistepollenites balmei Zone 2061-2647 m.

Palynomorph assemblages are usually fairly to poorly preserved and are frequently pyritized, and can be characterized by the consistent, and often frequent occurrence of Lygistepollenites balmei. The presence of Nothofagidites kaitangata, Tetracolporites verrucosus, Gambierina edwardsii, G. rudata, and Australopollis obscurus, without taxa indicative of the Upper L. balmei Zone, is diagnostic of the Lower L. balmei Zone. Tricolpites waiparaensis occurs in a sample (2647 m) from the Lower L. balmei Zone and is not known to range above this interval in other wells from Gippsland.

Dinoflagellates also occur within this section and some distinctive taxa identified are: Glaphyrocysta retiintexta, Senegalinium dilwynense, Deflandrea medcalfii/dartmooria, Hystrichosphaeridium sp., Palaeocystodinium sp., and species of the Palaeoperidinium bassensis ms. complex. Apectodinium homomorphum first appears in the upper part of the Lower L. balmei Zone (2301 m) and this event defines the base of the A. homomorphum Zone. One specimen of Eisenackia circumtabulata was seen in the lowermost sample of the zone (2647 m). The only other records of this taxon in the Gippsland Basin are in Marlin-4 at 8250 ft and Pilotfish 1A at 2921 m, where it also occurs within the Lower L. balmei Zone. None of the dinoflagellates identified enabled the recognition of the Eisenackia crassitabalata or Trithyrodinium evittii Zones, which are often associated with the Lower L. balmei Zone in other wells from the Gippsland Basin.

Upper Lygistepollenites balmei Zone 1750.5-2034 m.

The base of the Upper L. balmei Zone was placed at the first occurrence of Proteacidites annularis at 1750.5 m. Some other first occurrences indicative of this subdivision are Proteacidites latrobensis at 1926 m, Cyathidites gigantis at 1888.9 m, and Banksieacidites lunatus ms. (previously referred to B. elongatus) at 1768.4 m. Consistent with this subdivision is the prominence of L. balmei and the occurrence of general L. balmei Zone indicators such as Polycolpites langstonii, Latrobosporites crassus, Australopollis obscurus, Integricorpus antipodus, Nothofagidites kaitangata, Haloragacidites harrisii, and Verrucosisporites kopukuensis.

Samples between 1768.4-2034 m usually contain low diversity dinoflagellate assemblages with the dominant elements being Apectodinium homomorphum and species of the Palaeoperidinium bassensis ms. complex. These are placed in the A. homomorphum Zone. The uppermost sample of the Upper L. balmei Zone at 1750.5 m is placed in the Apectodinium hyperacanthum dinoflagellate Zone, which is based on the occurrence of the zonal species and Kenleyia lophophora.

Lower Malvacipollis diversus Zone 1600.7-1736.9 m.

The base of the zone is defined by the first occurrences of Crassiretitriletes vanraadshoovenii and Spinizonocolpites prominatus. Other important taxa recorded in the interval are Malvacipollis diversus, M. subtilis, Proteacidites grandis, P. incurvatus, Peromonolites vellosus, Intratriporopollenites notabilis, and Cupanieidites orthoteichus.

The basal sample (1736.9 m) of the zone is assigned to the Apectodinium hyperacanthum dinoflagellate Zone due to the occurrences of Kenleyia lophophora and the zonal species.

Middle *Malvacipollis diversus* Zone 1642-1596 mm.

Only one sample at 1642 m, could be confidently assigned to the Middle *M. diversus* Zone, based on the first occurrences of *Proteacidites tuberculiformis*, *P. alveolatus*, and *P. leightonii*. The occurrences of *Myrtaceoipollenites australis*, *Proteacidites grandis*, and *Schizaea digitatoides* are also indicative of this zone.

Dinoflagellates recorded at this level include *Deflandrea longispinosa* (the most common taxon), *D. medcalfii/dartmooria*, *Spinidinium* sp., *Cordosphaeridium inodes*, *Spiniferites ramosus*, and *Paralecaniella indentata*.

The four samples above this level at 1596, 1604.5, 1611.5, and 1623.4 m contain spore-pollen assemblages indicative of a general *M. diversus* Zone age, but lack the index species needed for a more precise zonal determination. These are assigned to the Middle *M. diversus* Zone on negative evidence. The lower three of these samples (1596, 1604.5, 1611.5 m) contain dinoflagellate assemblages that are similar to the one from the Middle *M. diversus* Zone at 1642 m.

Upper Malvacipollis diversus Zone   1576.5 m.

Characteristic species recorded from this level are Anacolosidites acutulus, Intratriporopollenites notabilis, Myrtaceoipollenites australis, Proteacidites annularis, P. grandis, P. latrobensis, P. leightonii, P. tuberculiformis, Triporopollenites helosus and T. scabratus. This assemblage is considered to span the Middle and Upper M. diversus Zone, and it lacks the index species Myrtaceidites tenuis and Proteacidites pachypolus which would enable the distinction of the upper subdivision. Identification of the Upper M. diversus Zone is based on the first occurrence of the dinoflagellate species Homotryblium tasmaniense. Since recognition of this spore-pollen zonule is based largely on dinoflagellate evidence, it is given a low confidence rating.

Homotryblium tasmaniense and Deflandrea longispinosa are the most common dinoflagellates in the assemblage.

Proteacidites asperopolus Zone   1573.5 m.

The zone is identified primarily by the first occurrence of the zonal species. Other important taxa in the assemblage are Cupanieidites orthoteichus, Intratriporopollenites notabilis, Myrtaceidites tenuis, Proteacidites pachypolus and Santalumidites cainozoicus.

Dinoflagellates recorded from this level are Deflandrea longispinosa, Spinidinium sp., Spiniferites ramosus, and Homotryblium tasmaniense.

Proteacidites tuberculatus Zone 1479.9-1567.4 m.

The zone is characterized by the occurrence of *Cyatheacidites annulatus*, *Foveotriletes crater*, and *F. lacunosus*.

The interval is dominated by dinoflagellates and some important species are *Nematosphaeropsis balcombiana*, *N. rhizoma* ms., *Protoellipsoidinium simplex* ms., *Dinosphaera mammilatus* ms., *Batiacasphaera amplectus* ms., *Tuberculodinium vancompoae*, and *Cyclopsiella vieta*.

Triporopollenites bellus Zone 1460 m.

Identification of the zone is based on the occurrence of *T. bellus* at this level. This is the first record of this species in the offshore Gippsland Basin. The sample contains a similar dinoflagellate assemblage to those recorded from the upper part of the *Proteacidites tuberculatus* Zone.

TAXONOMIC CHANGES AND NEW TAXA IDENTIFIED

1. *Palaeoperidinium bassensis* ms. complex: This complex consists of a morphologically similar group of species with a combination, Type A+I3P archeopyle. They have a thin periphragm with an indistinct sculpture, occasionally a thin endophragm occupying most of the cyst, and weak apical and antapical horns. They often occur in assemblages of low diversity within the *L. balmei* Zone.

2. On the Data Sheets and Tables 1 and 3, *Deflandrea medcalfii/dartmooria* is recorded as *D. medcalfii*.

REFERENCES

HANNAH, M.J. 1985. Foraminiferal analysis of Turrum-3, Gippsland Basin. Esso Australia Ltd Palaeontological Report 1985/23.

PARTRIDGE, A.D., 1976. The Geological Expression of Eustacy in the Early Tertiary of the Gippsland Basin. APEA. J. 16, 73-79.

STOVER, L.E. & PARTRIDGE, A.D., 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. Proc. R. Soc. Victoria, 85, 237-286.

PALYNOLOGY DATA SHEET

BASIN: Gippsland ELEVATION: KB: +21m GL: -60m

WELL NAME: Turrum-3 TOTAL DEPTH: 2996m

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
	T. pleistocenicus										
NEOGENE	*M. lipsis*										
NEOGENE	*C. bifurcatus*										
NEOGENE	*T. bellus*	1460	1				1460	1			
PALEOGENE	*P. tuberculatus*	1479.9	2				1567.4	1			
PALEOGENE	Upper *N. asperus*										
PALEOGENE	Mid *N. asperus*										
PALEOGENE	Lower *N. asperus*										
PALEOGENE	*P. asperopolus*	1573.5	0				1573.5	0			
PALEOGENE	Upper *M. diversus*	1576.5	2				1576.5	2			
PALEOGENE	Mid *M. diversus*	1596	2				1642	0			
PALEOGENE	Lower *M. diversus*	1660.7	2				1736.9	0			
PALEOGENE	Upper *L. balmei*	1750.5	0				2034	2			
PALEOGENE	Lower *L. balmei*	2061	2				2647	0			
LATE CRETACEOUS	Upper *T. longus*	2705	3				2850	3			
LATE CRETACEOUS	*T. longus*	2875	3				2995	3			
LATE CRETACEOUS	*T. lilliei*										
LATE CRETACEOUS	*N. senectus*										
LATE CRETACEOUS	*T. apoxyexinus*										
LATE CRETACEOUS	*P. mawsonii*										
LATE CRETACEOUS	*A. distocarinatus*										
EARLY CRET.	*P. pannosus*										
EARLY CRET.	*C. paradoxa*										
EARLY CRET.	*C. striatus*										
EARLY CRET.	*C. hughesi*										
EARLY CRET.	*F. wonthaggiensis*										
EARLY CRET.	*C. australiensis*										

COMMENTS: Apectodinium homomorphum Zone (2301-1768.4m); A. hypercanthum Zone (1750.5-1736.9m).
Material studied from the T. longus Zone consisted of 8 cutting samples.

CONFIDENCE RATING:
- O: 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: Neil G. Marshall DATE: 2/7/1985

DATA REVISED BY: DATE:

TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 81	1460	T. bellus	Indet	Early-Middle Miocene	1	T. bellus, C. annulatus, T. vancompoae
SWC 79	1479.9	P. tuberculatus	Indet	Early Miocene-Oligocene	2	F. lacunosus, N. rhizoma
SWC 78	1489.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, D. mammilatus N. rhizoma, P. simplex
SWC 76	1510	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, N. rhizoma P. simplex
SWC 75	1520	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 74	1530	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, P. simplex
SWC 73	1537.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, P. simplex N. rhizoma
SWC 72	1545	P. tuberculatus	Indet	Early Miocene-Oligocene	0	N. rhizoma, D. mammilatus, P. simplex
SWC 69	1552.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 67	1557	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 66	1558.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, P. simplex
SWC 65	1561	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex, D. mammilatus
SWC 63	1565	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 62	1567.4	P. tuberculatus	Indet	Early Miocene-Oligocene	0	N. rhizoma, P. simplex
SWC 58	1573.5	P. asperopolus	Indet	Early Middle Eocene	0	P. asperopolus, P. pachypolus, S. cainozoicus

TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 57	1576.5	Upper M. diversus	Indet	Early Eocene	2	P. tuberculiformis, A. acutullus, H. tasmaniense
SWC 55	1596	Middle M. diversus	-	Early Eocene	2	
SWC 54	1604.5	Middle M. diversus	Indet	Early Eocene	2	P. grandis, M. diversus, D. dartmooria, D. longispinosa
SWC 53	1611.5	Middle M. diversus	Indet	Early Eocene	2	P. grandis, M. diversus, A. hyperacanthum D. dartmooria
SWC 52	1623.5	Middle M. diversus	Indet	Early Eocene	2	P. grandis, M. diversus, D. longispinosa
SWC 51	1642	Middle M. diversus	Indet	Early Eocene	0	P. tuberculiformis, M. australis, P. alveolatus, D. longispinosa, D. dartmooria
SWC 50	1660.7	Lower M. diversus	Indet	Early Eocene	2	C. orthoteichus, M. diversus, P. grandis T. ambiguus
SWC 49	1675.5	Lower M. diversus	-	Early Eocene	2	P. grandis, P. vellosus
SWC 48	1686	M. diversus	-	Early Eocene		P. grandis, P. annularis, P. latrobensis
SWC 47	1703.4	Indet	-	-		P. grandis
SWC 46	1718.5	Lower M. diversus	-	Early Eocene	2	M. diversus
SWC 45	1736.9	Lower M. diversus	A. hyperacanthum	Early Eocene	0	M. diversus, C. vanraadshoovenii, C. orthoteichus, S. prominatus, A. hyperacanthum
SWC 44	1750.5	Upper L. balmei	A. hyperacanthum	Late Paleocene	0	L. balmei, M. diversus, P. annularis, A. homomorphum, A. hyperacanthum
SWC 43	1768.4	Upper L. balmei	A. homomorphum	Late Paleocene	0	L. balmei, C. gigantis, M. diversus, P. annularis, A. homomorphum

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 42	1777	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	1	*L. balmei*, *C. gigantis*, *A. homomorphum*
SWC 41	1785	Upper *L. balmei*	-	Late Paleocene	2	*L. balmei*, *G. edwardsii*
SWC 40	1796.5	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	2	*L. balmei*, *M. subtilus*, *P. latrobensis*, *A. homomorphum*
SWC 39	1813	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	0	*L. balmei*, *C. gigantis*, *P. langstonii*, *A. homomorphum*
SWC 38	1837	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	0	*L. balmei*, *C. gigantis*, *A. homomorphum*
SWC 37	1868	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	2	*L. balmei*, *V. kopukuensis*, *A. homomorphum*
SWC 36	1888.9	Upper *L. balmei*	Indet	Late Paleocene	0	*L. balmei*, *C. gigantis*, *V. kopukuensis*
SWC 35	1926	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	2	*L. balmei*, *P. langstonii*, *P. latrobensis*, *A. homomorphum*
SWC 34	1963.5	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	2	*L. balmei*, *A. homomorphum*
SWC 33	1995	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	2	*L. balmei*, *P. langstonii*, *A. homomorphum*
SWC 32	2034	Upper *L. balmei*	*A. homomorphum*	Late Paleocene	2	*L. balmei*, *P. langstonii*, *P. annularis*, *A. homomorphum*
SWC 31	2061	Lower *L. balmei*	Indet	Paleocene	2	*L. balmei*, *N. kaitangata*
SWC 30	2090	Lower *L. balmei*	*A. homomorphum*	Paleocene	2	*L. balmei*, *N. kaitangata*, *G. rudata*, *G. edwardsii*, *A. homomorphum*
SWC 29	2127	Lower *L. balmei*	*A. homomorphum*	Paleocene	1	*L. balmei*, *N. kaitangata*, *A. homomorphum*
SWC 28	2157	Lower *L. balmei*	*A. homomorphum*	Paleocene	2	*L. balmei*, *N. kaitangata*, *A. homomorphum*

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TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 27	2158.4	Lower L. balmei	Indet	Paleocene	1	L. balmei, N. kaitangata, G. rudata
SWC 26	2160.5	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum
SWC 25	2162	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum, E. kaitangata
SWC 24	2166	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum
SWC 23	2194.9	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, N. kaitangata, G. rudata,
SWC 22	2225.5	Lower L. balmei	Indet	Paleocene	1	L. balmei, N. kaitangata, G. edwardsii
SWC 21	2261.9	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, N. kaitangata, A. homomorphum, D. dartmooria
SWC 20	2301	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum
SWC 19	2323	Lower L. balmei	Indet	Paleocene	1	L. balmei, G. rudata
SWC 18	2327..3	Lower L. balmei	Indet	Paleocene	1	L. balmei.
SWC 16	2397	Lower L. balmei	Indet	Paleocene	1	L. balmei, N. kaitangata
SWC 15	2399	Lower L. balmei	-	Paleocene	1	L. balmei, G. rudata, T. marginatus
SWC 14	2444	Lower L. balmei	-	Paleocene	1	L. balmei, A. obscurus
SWC 13	2485.9	Lower L. balmei	-	Paleocene	1	L. balmei, G. rudata
SWC 11	2562.9	Lower L. balmei	Indet	Paleocene	1	L. balmei
SWC 10	2571.9	Lower L. balmei	-	Paleocene	1	G. edwardsii, H. harrisii
SWC 9	2576.9	Lower L. balmei	-	Paleocene	0	L. balmei, G. rudata
SWC 6	2604	Indet	-	Paleocene		G. rudata, A. obscurus
SWC 5	2614	Lower L. balmei	Indet	Paleocene	1	L. balmei, S. dilwynense

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 4	2647	Lower L. balmei	Indet	Paleocene	0	L. balmei, G. edwardsii, G. rudata, T. verucosus, T. waiparaensis, E. circumtabulata
CTS	2700-05	Upper T. longus	Indet	Maastrichtian	3	G. rudata, T. longus
CTS	2755-60	Upper T. longus	Indet	Maastrichtian	3	G. rudata, S. punctatus
CTS	2805-10	Upper T. longus	-	Maastrichtian	3	G. edwardsii, G. rudata, S. punctatus, T. longus
CTS	2845-50	Upper T. longus	-	Maastrichtian	3	G. rudata, S. punctatus
CTS	2870-75	T. longus	Indet	Maastrichtian		G. rudata, T. verrucosus, T. longus
CTS	2975-80	Indet	Indet			G. rudata, G. edwardsii, T. verrucosus
CTS	2985-90	T. longus	Indet			G. rudata, G. edwardsii, T. verrucosus
CTS	2990-95	T. longus	-	Maastrichtian		G. rudata, G. edwardsii, T. verrucosus, T. longus

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TABLE 2

ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN AND DINOFLAGELLATE TAXA

SAMPLE NO.	DEPTH(m)	ZONE	TAXON	COMMENTS
SWC 50	1660.7	Lower *M. diversus*	*T. ambiguus*	1 specimen; not known consistently below Middle *M. diversus* Zone
SWC 49	1675.5	Lower *M. diversus*	*T. scabratus*	Occurs frequently; not known below Upper *M. diversus* Zone
SWC 49	1675.5	Lower *M. diversus*	*H. tasmaniense*	1 specimen; not known below Middle *M. diversus* Zone
SWC 48	1686	*M. diversus*	*L. balmei*	Rare occurrence; not known consistently above Upper *L. balmei* Zone
SWC 44	1750.5	Upper *L. balmei*	*M. diversus*	Rare occurrence; not known consistently below *M. diversus* Zone
SWC 43	1768.4	Upper *L. balmei*	*M. subtilis*	Rare occurrence; not known consistently below *M. diversus* Zone
SWC 40	1796.5	Upper *L. balmei*	*M. subtilis*	Rare occurrence; not known consistently below *M. diversus* Zone
SWC 39	1813	Upper *L. balmei*	*M. subtilis*	Rare occurrence; not known consistently below *M. diversus* Zone
SWC 4	2647	Lower *L. balmei*	*M. diversus*	1 specimen; not known consistently below *M. diversus* Zone

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TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
S & P	less than 10	10-30	greater than 30
D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD		DIVERSITY		PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
		SPORE-POLLEN	DINOS	SPORE-POLLEN	DINOS				
SWC 81	1460	Low	Medium	Low	Medium	Good	calc. slt.		
SWC 79	1479.9	Low	High	Low	Medium	Good	calc. slt.		
SWC 78	1489.9	Low	Medium	Low	Medium	Good	calc. sh.		
SWC 76	1510	Low	High	Low	Medium	Good	calc. sh.		
SWC 75	1520	Low	Medium	Low	Medium	Good	calc. slt.		
SWC 74	1530	Low	High	Low	Medium	Good	calc. sh.		
SWC 73	1537.9	Low	High	Low	Medium	Good	calc. sh.		
SWC 72	1545	Low	Medium	Low	Medium	Good	calc. slt.		
SWC 69	1552.9	Low	High	Low	Medium	Good	calc. slt.		
SWC 67	1557	Low	High	Low	Medium	Good	calc. sh.		
SWC 66	1558.9	Low	High	Low	Medium	Good	calc. cl.st.		
SWC 65	1561	Low	High	Low	Medium	Good	calc. sh.		
SWC 63	1565	Low	High	Low	Medium	Good	calc. slt.		
SWC 62	1567.4	Low	High	Low	Medium	Good	calc. slt		
SWC 58	1573.5	Medium	Low	Medium	Medium	Good	carb. slt		
SWC 57	1576.5	Medium	Medium	Medium	Medium	Good	dol. sh.		
SWC 55	1596	Medium	-	Medium	-	Good	coal		
SWC 54	1604.5	Medium	Low	Medium	Medium	Good	carb. slt.		

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TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
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D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD SPORE-POLLEN	YIELD DINOS	DIVERSITY SPORE-POLLEN	DIVERSITY DINOS	PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
SWC 53	1611.5	Medium	Medium	Medium	Medium	Good	carb. sh		
SWC 51	1642	High	Low	High	Medium	Good	carb. sh.	Low	
SWC 50	1660.7	Medium	Low	Medium	Low	Good	carb. sh.	Low	
SWC 49	1675.5	Medium	Low	Medium	Low	Good	carb. sh.		
SWC 48	1686	Low	-	Medium	-	Good	sst.		
SWC 47	1703.4	Low	-	Low	-	Good	sst.		
SWC 46	1718.5	Low	-	Low	-	Good	sh.		
SWC 45	1736.9	Medium	Low	Medium	Medium	Good	carb. slt.	Medium	
SWC 44	1750.5	Medium	Medium	Medium	Medium	Good	carb. sh.	Medium	
SWC 43	1768.4	Low	Low	Medium	Low	Good	carb. sh.		
SWC 42	1777	Medium	Low	Medium	Low	Good	carb. sh.	Medium	
SWC 41	1785	High	-	Medium	-	Good	coal		
SWC 40	1796.5	High	Low	Medium	Low	Good	slt.		
SWC 39	1813	Medium	Medium	Medium	Low	Good	carb. sh.		
SWC 38	1837	Medium	High	Medium	Medium	Good	carb. sh.	Medium	
SWC 37	1868	Low	Low	Medium	Low	Good	carb. sh		
SWC 36	1888.9	Low	Medium	Medium	Low	Fair	carb. sh	Medium	
SWC 35	1926	Medium	Low	Medium	Low	Poor	carb. sh.	Medium	Contaminated sample

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TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
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D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD		DIVERSITY		PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
		SPORE-POLLEN	DINOS	SPORE-POLLEN	DINOS				
SWC 34	1963.5	High	Medium	Medium	Low	Fair	carb. sh	Medium	
SWC 33	1995	High	Low	Medium	Low	Poor	carb. sh	Medium	
SWC 32	2034	High	Low	Medium	Low	Fair	carb. sh	Medium	
SWC 31	2061	Medium	Low	Medium	Low	Fair	carb. sh	Medium	
SWC 30	2090	High	Low	Medium	Low	Fair	carb. sh.	Medium	
SWC 29	2127	Medium	High	Medium	Low	Fair	carb. sh.	Medium	
SWC 28	2157	Low	Low	Medium	Medium	Fair	sst.		
SWC 27	2158.4	Medium	Low	Medium	Low	Fair	slt.	Medium	
SWC 26	2158.4	Low	Low	Low	Low	Good	dol. sst.		
SWC 25	2162	Low	Low	Medium	Medium	Good	dol. sst.		
SWC 24	2166	Low	Low	Medium	Medium	Fair	dol. sst.		
SWC 23	2194.9	Medium	Medium	Medium	Low	Fair	carb. sh.	Medium	
SWC 22	2225.5	Medium	Low	Medium	Low	Fair	carb. slt.	Medium	
SWC 21	2261.9	Medium	Medium	Medium	Medium	Fair	carb. sh.	Medium	
SWC 20	2301	Low	Low	Low	Low	Fair	dol. sst.		
SWC 19	2323	Low	Low	Medium	Low	Poor	carb. slt.	Medium	
SWC 18	2327.3	Low	Low	Low	Low	Poor	carb. sst.		
SWC 16	2397	Low	Low	Medium	Low	Fair	dol.slt.	Low	

TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
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SAMPLE NO.	DEPTH (m)	YIELD SPORE-POLLEN	YIELD DINOS	DIVERSITY SPORE-POLLEN	DIVERSITY DINOS	PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
SWC 15	2399	High	-	Medium	-	Fair	coal		
SWC 14	2444	Low	-	Low	-	Poor	dol. slt.		
SWC 13	2485.9	Medium	-	Low	-	Poor	dol. slt.	High	
SWC 11	2562.9	Medium	Low	Low	Low	Fair	carb. slt.	Medium	
SWC 10	2571.9	Low	-	Low	-	Fair	coal		
SWC 9	2576.9	Low	-	Medium	-	Poor	carb. slt.	Medium	
SWC 6	2604	Low	-	Low	-	Poor	dol. sst.		
SWC 5	2614	Medium	Low	Medium	Medium	Poor	carb. slt.	High	
SWC 4	2647	Medium	Low	Medium	Medium	Poor	dol. slt.	High	
CTS	2700-05	Medium	Low	Medium	Low	Fair	carb. slt.		
CTS	2755-60	Low	?	Low	? Low	Poor	carb. slt.		
CTS	2805-10	Medium	-	Medium	-	Fair	carb. slt.		
CTS	2845-50	Low	-	Low	-	Poor	carb. slt.		
CTS	2870-75	Low	?	Low	? Low	Fair	carb. slt.		
CTS	2975-80	Medium	?	Low	? Low	Fair	carb. slt.		
CTS	2985-90	Low	?	Low	? Low	Poor	carb. slt.		
CTS	2990-95	Medium	-	Low	-	Fair	carb. slt.		

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