Palynological analysis of cuttings samples from Great White-1, offshore Gippsland Basin.

by

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Introduction

Twenty-six cuttings samples between 3030m and 3470m from across the top of Latrobe in Great White-1 have been analysed to determine the age of the sequence. The following table summarises the results.

Palynological Summary of Great White-1

AGE	UNIT/FACIES	SPORE-POLLEN ZONES (MICROPLANKTON ZONES)	DEPTHS mKB
MIOCENE TO OLIGOCENE	SEASPRAY GROUP	*P. tuberculatus* (*Operculodinium* Superzone) (*F. leos* Zone)	3030 – 3190 (3030 – 3190) (3190)
MIDDLE EOCENE	LATROBE GROUP Turrum Formation equivalent	Lower *N. asperus* (*D. heterophlycta*)	3220 – 3240 (3220–3240)
MAASTRICHTIAN	LATROBE GROUP Undifferentiated	Undifferentiated *T. longus* Upper *T. longus* Lower *T. longus*	3300–3470 3310–3340 3430–3470

T.D. 3472m

An average of 12.5 grams of cuttings were collected and forwarded to Laola Pty Ltd in Perth on 28 January 1997 for processing to prepare the palynological slides for analysis. The material was returned on 6 February and initial provisional results provided on 10 February. The interpretative data with zone identification and Confidence Ratings are recorded in Table 1 and basic data on residue yields, preservation and diversity are recorded on Tables 2.

The residue yields recovered from the cuttings were mostly very low to low from both the Seaspray and Latrobe Groups. Less than one third of the samples gave moderate or high yields. Principally because of the low yields palynomorph concentrations on the slides was low to very low in the Latrobe Group increasing to moderate and high in the shallower samples examined from the Seaspray Group. Preservation of palynomorphs was generally poor to fair. Average spore-pollen diversity was 14+ species per sample and average microplankton diversity was 8+ species per sample. All species which have been identified with binomial names are tabulated on Table 3. The relinquishment list for palynological slides

is provided at the end of the report. No palynological residues remained after preparation of the slides.

Geological Comments

1. The cuttings analysed from Great White-1 between 3030-3470m have provided confident age dating of the basal Seaspray Group and underlying ~250 metres of the Latrobe Group notwithstanding the low assemblage yields and masking of the Latrobe Group assemblages by cavings from the overlying Seaspray Group.

2. The assemblages clearly indicate two major breaks or unconformities. The older separates a Maastrichtian age section of undifferentiated Latrobe coarse clastics from a Middle Eocene glauconitic facies equivalent in age to the Turrum and Gurnard Formations. The younger unconformity separates the Middle Eocene from the deep distal marine facies of the basal Seaspray Group which at its base is Early Oligocene in age.

3. Two additional breaks or unconformities are probably present in the section. However, the presence of these breaks are suggested with more caution and much less confidence as the changes the palynological assemblages are more subtle and obscured by cavings in the cuttings. The older of these breaks is between the Upper and Lower *T. longus* Zones. In the cuttings it lithologically separates sandy and possibly glauconitic sediments from the shallowest occurrences of carbonaceous shales and coaly fragments below 3430m. The younger of the two breaks is in the Seaspray Group and separates probable Early Miocene sediments from basal Oligocene sediments of the "Early Oligocene wedge" which has been previously found in nearby wells Blackback-3 and Gudgeon-1 (Partridge; 1994, 1995a).

4. Absent from the cuttings assemblages are any spores, pollen or microplankton considered diagnostic of Paleocene and Early Eocene ages represented by the *L. balmei, M. diversus* and *P. asperopolus* Zones or any microplankton considered restricted to the Late Eocene. Stratigraphic sections of these ages have been removed at the postulated unconformities.

5. A feature of the palynological assemblages from the cuttings is a biased towards larger palynomorphs compared to palynological preparations on equivalent sidewall cores. This is most clearly expressed by the consistent and common occurrence of the large and robust spore *Cyatheacidites annulatus* in nearly all samples. Although this spore is a conspicuous component of most sidewall core samples from the Seaspray Group it is

seldom common. The difference in character is interpreted as due to the removal of the finer and softer clay lithologies in the sediments when the drilling mud has been washed from the cuttings. As well as increasing the abundance of the larger and heavier palynomorphs it tends to remove the smaller index species. This is evident in Great White-1 by the rarity of the microplankton *Fromea leos* ms and the fact that none of the key *Tritonites* acritarch species were recorded.

Biostratigraphy

Zone and age determinations are based on the spore-pollen zonation scheme proposed by Stover & Partridge (1973), subsequently modified by Stover & Partridge (1982) and Helby, Morgan & Partridge (1987), and a dinoflagellate zonation scheme which has only been published in outline by Partridge (1975, 1976).

Author citations for most spore-pollen species can be sourced from Stover & Partridge (1973, 1982), Helby, Morgan & Partridge (1987) and Mildenhall & Pocknall (1989) or other references cited herein. Author citations for dinoflagellates can be found in the index of Lentin & Williams (1993) or other references cited herein. Species names followed by "ms" are unpublished manuscript names.

***Proteacidites tuberculatus* Spore-Pollen Zone:** **3030–3190 metres**
Miocene to Early Oligocene.

The seven samples assigned to this zone all contain numerous specimens of the key index species *Cyatheacidites annulatus*. Other index species are rare consisting of *Acaciapollenites myriosporites* and *Foveotriletes lacunosus* at 3090m. Provided these species are not caved they suggest a latest Oligocene to Early Miocene age for the shallowest three samples. Overall the assemblages are of moderate diversity dominated by the long ranging spores *Cyathidites palaeospora*, *Ischyosporites irregularis* ms, *Matonisporites ornamentalis*, *Laevigatosporites* spp. and *Stereisporites antiquisporites* and the widely distributed gymnosperm pollen *Araucariacites australis* and *Podocarpidites* spp. The angiosperm pollen are likewise relatively non-diagnostic being dominated by *Nothofagidites* spp. and *Haloragacidites harrisii*.

***Operculodinium* Microplankton Superzone:** **3030–3190 metres**
Oligocene-Miocene.

All samples analysed from the Seaspray Group are dominated by dinoflagellates characteristic of the *Operculodinium* Superzone which has a broad Oligocene to Miocene age range. The assemblages are mostly dominated by *Spiniferites* spp. and *Operculodinium centrocarpum*. Unfortunately, many of the key species in the

microflora are still undocumented and are identified by manuscript names. These include *Nematosphaeropsis rhizoma* ms, *Pyxidinopsis pontus* ms, *Protoellipsodinium simplex* ms and *Tectatodinium scabroellipticus* ms, which are widespread in the basin and long-ranging. Other manuscript species are recorded less often and may have only local significance. Of potential stratigraphic importance are *Hexagonifera* n.sp. found here at 3030m but previously recorded from Smiler-1 between 2487-2501m (Partridge, 1995b) and *Protoellipsodinium mamilatus* ms recorded herein between 3030-3090m (with a probable caved occurrence at 3210m), and previously recorded from Blackback-3 between 2772.4-2798m (Partridge, 1994).

Within the superzone the cutting between 3030-3090m all gave moderate yields and are considered to have a Miocene (or possibly late Oligocene) age based on presence the presence of *Tuberculodinium vancampoae* at 3030m. In contrast the cutting between 3120–3190m all gave surprisingly low yields. This latter interval can be characterised by the more consistent and often common occurrence of *Crassosphaera concinnia, Dapsilidinium pseudocolligerum* and *Hystrichokolpoma rigaudae*. These species are often typical of but not necessarily restricted to the basal portion of the superzone. The identification of the *F. leos* Zone at the base of this lower interval suggests that part if not all of the lower part of the Superzone belongs to the "Early Oligocene wedge" and is Early Oligocene in age.

Fromea leos Microplankton Zone: **3190 metres**
basal Oligocene.

The *F. leos* Zone is the only formal zone currently established within the *Operculodinium* Superzone. It was first defined in Blackback-3 by Partridge (1994) as the interval above the acme of *Phthanoperidinium comatum* to the Last Appearance Datum (LAD) of *Fromea leos* ms. It is only identified in one sample in Great White-1 based on the rare occurrence of the eponymous species. This record confirms the presence of the "Early Oligocene wedge" which is also found in adjacent wells Blackback-3 and Gudgeon-1 (Partridge; 1994, 1995a).

Lower _Nothofagidites asperus_ Spore-Pollen Zone: **3220-3240 metres**
Middle Eocene.

Cuttings between 3210–3240m have spore-pollen composition most similar to the broad *N. asperus* Zone. The three deeper samples are assigned to the Lower *N. asperus* Zone with very low confidence based largely on the associated microplankton assemblage. The only pollen species which could be considered diagnostic are *Proteacidites pachypolus* at 3220m and 3240m and *P. recavus* at 3230m. These species are more typical of the Lower rather than Middle or Upper *N. asperus* Zones. In contrast *Proteacidites rectomarginis* identified at 3210m and

3220m would normally be considered more typical of the Middle or Upper *N. asperus* Zones. This species however could just as easily be caved as it is often recorded from sidewall core samples at the base of the Seaspray Group.

No species that occur commonly in the Early Eocene, and therefore likely to be picked up in cuttings, such as *Proteacidites grandis, Myrtaceidites tenuis* or *Malvacipollis diversus* were recorded from Great White-1. It is therefore unlikely the older *P. asperopolus* or *M. diversus* Zones are present in the well.

***Deflandrea heterophlycta* Microplankton Zone:** **3220-3240 metres late Middle Eocene.**

A limited suit of Middle to Late Eocene microplankton are recorded in the cuttings between 3210–3240m. The samples between 3220-3240m are assigned to the *D. heterophlycta* Zone based on the common occurrence of the eponymous species and absence of microplankton index species of younger or older Eocene zones. The zone may extend to the deepest occurrence of *D. heterophlycta* at 3270m but this is considered unlikely as a change in the character of the cuttings occurs between 3240m and 3260m. Overall the microplankton assemblages is most reminiscent of this zone found in the Turrum Formation in Turrum-1 between 1955-2036m rather than assemblages from the sandy Eocene section in the Blackback wells.

The sample at 3210m could still be Eocene in age as it contains *Deflandrea phosphoritica, Impagidinium victorianum* and the youngest occurrence of frequent *Thalassiphora pelagica*. However, all these species occur in the underlying samples and there where no microplankton recorded which could be considered diagnostic of younger zones. Considering that the provisional log pick for the top of the Latrobe Group is about 3220m it is possible that the Eocene species could be reworked.

***Tricolpites longus* Spore-Pollen Zone:** **3300–3470 metres Maastrichtian.**

In the twelve cuttings examined between 3300–3470m the sporadic but consistent presence of pollen species which become extinct in the Maastrichtian provide a confident identification of the top of the *T. longus* Zone even though the overall assemblage diversity is low. The key species are *Tricolporites lilliei* recorded in five samples, *Battenipollis sectilis* recorded in four samples, *Nothofagidites senectus* recorded in two samples and *Forcipites* (al. *Tricolpites*) *longus*, *Proteacidites reticuloconcavus* ms and *Quadraplanus brossus* all recorded from the deepest sample.

The samples at 3310m and 3340m are considered to belong to the Upper *T. longus* Zone based on the common occurrence of *Gambierina rudata*. The two best of the deeper samples at 3430m and 3470m are considered to belong to the Lower *T. longus* Zone based on the lack of any *G. rudata* abundance. These samples contain the highest occurrence of carbonaceous to coaly lithologies in Great White-1. All the other samples are best left as undifferentiated *T. longus* Zone as their recorded assemblages are simply too limited.

The index dinoflagellate *Manumiella druggii* was recorded at 3430m but as it was only represented by two specimens no great significance can be attached to its stratigraphic position. Several poor specimens assigned to *Isabelidinium greenense* Marshall 1990 were also recorded from the deepest sample at 3470m. This species has been recorded as ranging to the top of the microplankton succession and top of the *T. lilliei* Zone in Pisces-1 (Marshall, 1990) so it is likely it can range into the *T. longus* Zone

References

HELBY, R., MORGAN, R. & PARTRIDGE, A.D., 1987. A palynological zonation of the Australian Mesozoic. *Memoir Association Australasian Palaeontologists 4*, 1-94.

LENTIN, J.K. & WILLIAMS, G.L., 1993. Fossil Dinoflagellates: Index to genera and species, 1993 Edition. *AASP Contribution Series No. 28*, 1-856.

MARSHALL, N.G., 1990. Campanian dinoflagellates from southeastern Australia. *Alcheringa 14*, 1-38.

MILDENHALL, D.C. & POCKNALL, D.T., Miocene-Pleistocene spores and pollen from Central Otago, South Island, New Zealand. *New Zealand Geological Survey Palaeontological Bulletin 59*, 12-128.

PARTRIDGE, A.D., 1975. Palynological zonal scheme for the Tertiary of the Bass Strait Basin (Introducing Paleogene Dinoflagellate Zones and Late Neogene Spore-Pollen Zones). *Geol. Soc. Aust. Symposium on the Geology of Bass Strait and Environs, Melbourne*, November, 1975. *Esso Aust. Ltd. Palaeo. Rept. 1975/17* (unpubl.).

PARTRIDGE, A.D., 1976. The geological expression of eustacy in the early Tertiary of the Gippsland Basin. *APEA Journal 16* (1), 73-79.

PARTRIDGE, A.D., 1994. Palynological analysis of sidewall cores from Blackback-3, Gippsland Basin. *Biostrata Report 1994/6*, 1-23.

PARTRIDGE, A.D., 1995a. Palynological analysis of sidewall cores between 3012.1m to 3057.1m in Gudgeon-1, Gippsland Basin. *Biostrata Report 1995/10*, 1-11.

PARTRIDGE, A.D., 1995b. Palynological analysis of Smiler-1, Gippsland Basin. *Biostrata Report 1995/17*, 1-15.

STOVER, L.E. & PARTRIDGE, A.D., 1973. Tertiary and late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. *Proceedings Royal Society of Victoria 85*, 237-286.

STOVER, L.E. & PARTRIDGE, A.D., 1982. Eocene spore-pollen from the Werillup Formation, Western Australia. *Palynology 6*, 69-95.

Table–1: Interpretative Palynological Data Great White-1

Sample type	Depth (m)	Spore-Pollen Zone	*CR	Microplankton Zone	*CR	Key Species and Comments
Cuttings	3030	*P. tuberculatus*	D2	*Operculodinium* spp.	D2	*Hexigonifera* n.sp. and *Tuberculodinium vancompoae* suggest Miocene age.
Cuttings	3060	*P. tuberculatus*	D2	*Operculodinium* spp.	D2	Common *Cyatheacidites annulatus* and rare *Foveotriletes crater.*
Cuttings	3090	*P. tuberculatus*	D2	*Operculodinium* spp.	D2	Frequent *Protoellipsodinium mamilatus* ms with specimens of *Acaciapollenites myriosporites* and *Foveotriletes lacunosus* .
Cuttings	3120	*P. tuberculatus*	D5	*Operculodinium* spp.	D5	Low yield—assemblage substantially caved.
Cuttings	3150	*P. tuberculatus*	D2	*Operculodinium* spp.	D2	Assemblage largely caved. Presence of *Alisocysta ornata* hints at Eocene reworking?
Cuttings	3170	*P. tuberculatus*	D2	*Operculodinium* spp.	D2	Assemblage largely caved.
Cuttings	3190	*P. tuberculatus*	D2	*F. leos*	D2	Rare *Fromea leos* ms confirms basal Oligocene section present.
Cuttings	3210	*P. tuberculatus* or *N. asperus*		Indeterminate		Highest occurrences of *Impagidinium victorianum* and *Deflandrea phosphoritica* indicates top of Eocene.
Cuttings	3220	Lower *N. asperus*	D4	*D. heterophlycta*	D3	Highest occurrence of *Deflandrea heterophlycta* confirms top of Eocene.
Cuttings	3230	Lower *N. asperus*	D4	*D. heterophlycta*	D3	Common *Deflandrea heterophlycta* with pollen *Proteacidites pachypolus* and *P. recavus.*
Cuttings	3240	Lower *N. asperus*	D4	*D. heterophlycta*	D3	Common *D. heterophlycta.*
Cuttings	3260	Indeterminate				Virtually barren.
Cuttings	3270	*P. tuberculatus and N. asperus*		*Operculodinium* spp. and *D. heterophlycta*		Mixed assemblage interpreted as largely caved.
Cuttings	3290	Indeterminate				Virtually barren.
Cuttings	3300	*T. longus*	D5			Highest occurrence of consistent *Gambierina rudata.*
Cuttings	3310	Upper *T. longus*	D3			Frequent *G. rudata* with highest occurrence of *Tricolporites lilliei.*
Cuttings	3320	Indeterminate				Low yield assemblage with mostly caved fossils.
Cuttings	3340	Upper *T. longus*	D2			Frequent *G. rudata* with *T. lilliei* and *Battenipollis sectilis.*
Cuttings	3350	*T. longus*	D4			*B. sectilis* present.
Cuttings	3360	*T. longus*	D4			*Tetradopollis securus* ms present.
Cuttings	3370	*T. longus*	D4			*Proteacidites wahooensis ms* and *Tricolpites confessus* present.
Cuttings	3390	Indeterminate				Virtually barren.
Cuttings	3410	Indeterminate				Virtually barren.
Cuttings	3430	Lower *T. longus*	D2			Placed in lower subzone on absence of *G. rudata* abundance.
Cuttings	3440	*T. longus*	D4			Low yield sample.
Cuttings	3470	Lower *T. longus*	D1			*Forcipites (al. Tricolpites) longus* and *Proteacidites reticuloconcavus* ms present.
			*CR =	Confidence Rating		

Confidence Ratings

The concept of Confidence Ratings applied to palaeontological zone picks was originally proposed by Dr. L.E. Stover in 1971 to aid the compilation of micropalaeontological and palynological data and to expedite the revision of the then rapidly evolving zonation concepts in the Gippsland Basin. The original scheme which mixed confidence in fossil species assemblage with confidence due to sample type gradually proved to be rather limiting as additional refinements to existing zonations were made. With the development of the STRATDAT computer database as a replacement for the increasingly unwieldy paper based Palaeontological Data Sheet files a new format for the Confidence Ratings was proposed. These are given for individual zone assignments on Table 1, and their meanings are summarised below:

Alpha codes: Linked to sample type

- **A** Core
- **B** Sidewall core
- **C** Coal cuttings
- **D** Ditch cuttings
- **E** Junk basket
- **F** Miscellaneous/unknown
- **G** Outcrop

Numeric codes: Linked to fossil assemblage

- **1** **Excellent confidence:** High diversity assemblage recorded with key zone species.
- **2** **Good confidence:** Moderately diverse assemblage recorded with key zone species.
- **3** **Fair confidence:** Low diversity assemblage recorded with key zone species.
- **4** **Poor confidence:** Moderate to high diversity assemblage recorded without key zone species.
- **5** **Very low confidence:** Low diversity assemblage recorded without key zone species.

Table–2: Basic Sample and Palynomorph Data for Great White-1									
Sample type	**Depth (m)**	**Wt**	**Vom (cc)**	**O/Yield**	**Visual Yield**	**Palynomorph Concentration**	**Preservation**	**Number SP Species**	**Number MP Species**
Cuttings	3030	16.4	1.9	0.115	Moderate	High	Fair	21	15
Cuttings	3060	18.8	2.40	0.127	Moderate	Moderate	Poor-good	23	18
Cuttings	3090	16.0	0.80	0.050	Moderate	High	Poor-good	24	17
Cuttings	3120	12.4	0.1	0.008	Very low	Low	Poor-fair	5	7
Cuttings	3150	12.6	0.1	0.007	Very low	Low	Poor-fair	16	12
Cuttings	3170	12.5	0.2	0.016	Low	Moderate	Poor-fair	16	14
Cuttings	3190	9.6	0.4	0.041	Low	Low	Poor-fair	26	14
Cuttings	3210	12.4	0.4	0.032	Low	Moderate	Poor-fair	26	20
Cuttings	3220	10.9	0.3	0.027	Low	Moderate	Poor-good	20	14
Cuttings	3230	10.5	0.2	0.019	Low	Moderate	Poor-fair	26	22
Cuttings	3240	12.5	0.3	0.024	Moderate	Moderate	Poor-good	25	17
Cuttings	3260	12.9	0.05	0.003	Low	Very low	Poor	NR	1
Cuttings	3270	10.8	0.1	0.009	Very low	Low	Poor	12	14
Cuttings	3290	13.9	0.1	0.003	Very low	Very low	Poor-fair	2	2
Cuttings	3300	10.8	0.05	0.004	Very low	Very low	Poor-fair	6	1
Cuttings	3310	10.2	0.1	0.009	Low	Low	Poor-good	11	1
Cuttings	3320	12.4	0.1	0.008	Low	Low	Poor-fair	12	3
Cuttings	3340	10.1	0.3	0.029	Low	Low	Poor-fair	19	3
Cuttings	3350	11.5	0.2	0.017	Moderate	Low	Poor-fair	13	3
Cuttings	3360	11.0	0.3	0.027	Moderate	Low	Fair-poor	17	NR
Cuttings	3370	13.8	0.1	0.007	Low	Very low	Poor-fair	10	1
Cuttings	3390	13.4	0.05	0.003	Very low	Very low	Poor	NR	1
Cuttings	3410	12.3	0.01		Low	Very low	Poor-fair	2	1
Cuttings	3430	11.5	0.01		Very low	Low	Poor-fair	16	8
Cuttings	3440	11.4	0.1	0.008	Low	Low	Poor-fair	8	4
Cuttings	3470	13.2	0.4	0.030	High	Low	Poor-good	29	5
Averages:		**12.5**						**14.8**	**8.4**
	Abbreviations								
	Wt. =	Weight of samples in grams							
	Vom (cc) =	Volume of aqueous suspension of kerogen residue recovered by Laola Pty Ltd							
	O/Yield =	Volume (cc) divided by Weight (grams)							

Table-3: Species List for Great White-1, Gippsland Basin.

Sample Depths	3030m	3060m	3090m	3120m	3150m	3170m	3190m	3210m	3220m	3230m	3240m	3260m	3270m	3290m	3300m	3310m	3320m	3340m	3350m	3360m	3370m	3390m	3410m	3430m	3440m	3470m
SPORE-POLLEN SPECIES																										
Acaciapollenites myriosporites			X																							
Araucariacites australis	X	X			X	X	X	X	X	X	X							X						X		C
Baculatisporites spp.		X	X				X											X						X		X
Battenipollis sectilis																		X	X	F						X
Bluffopollis scabratus							X																			
Camarozonosporites heskermensis	X					X							X							X						
Cicatricosisporites australiensis **RW**							RW																			
Cyatheacidites annulatus	C	C	C	C	C	C	X	C	X	X	X		F	X			X		X		F			X		
Cyathidites australis																									X	
Cyathidites minor																										C
Cyathidites paleospora	X	C	X	X	X	C	X	C	C	X	X							X		X				X		
Cyathidites splendens	RW			X	X						C		X		X	X	X	X		X						X
Dacrycarpites australiensis							X	X	X																	
Densoisporites velatus											RW								X							
Dictyophyllidites arcuatus		X				X							X													
Dilwynites granulatus		X	X				X	X	X		X															X
Dilwynites tuberculatus							X			X																
Ericipites scabratus							X	X			X															X
Forcipites longus																										X
Foveotriletes balteus	X																									
Foveotriletes crater		X																								
Foveotriletes lacunosus			X																							
Foveotriletes palaequetrus			X					X																		
Gambierina edwardsii																								X		X
Gambierina rudata											RW				X	C	X	C	X	X	X			F	X	X
Gleicheniidites circinidites					X		X	X										X								X
Granulatisporites trisinus **RW**			RW																							
Haloragacidites harrisii	C	X	C		X	X	F	F	X	X	X													X		
Herkosporites elliottii			X						X	X								X								X
Ischyosporites gremius								X	X	X			X													
Ischyosporites irregularis ms	X	X	X		X	X	X	X	X	X	X															
Kuylisporites waterbolki		X				X																		X		
Laevigatosporites major		X	X					X		X	X				X		X				X					X

Table-3: Species List for Great White-1, Gippsland Basin.

Sample Depths	3030m	3060m	3090m	3120m	3150m	3170m	3190m	3210m	3220m	3230m	3240m	3260m	3270m	3290m	3300m	3310m	3320m	3340m	3350m	3360m	3370m	3390m	3410m	3430m	3440m	3470m
Laevigatosporites ovatus	X	X	C						X		X		X				F	X		X	F			X		C
Latrobosporites amplus											RW					X										F
Latrobosporites marginis					X								X													
Latrobosporites ohiensis																X	X									
Leptolepidites verrucatus **RW**			RW																							
Lycopodiumsporites/Retitriletes spp.	X	X	X				X	X		X	X						X	F								X
Lygistepollenites balmei																										X
Lygistepollenites florinii	X	X			X	X	X	X	X	X	X		X			X				X						X
Malvacipollis subtilis		X									X															
Matonisporites ornamentalis	X	X	F		X		X	X	X	X	X						X									
Microcachryidites antacticus								F											X							
Nothofagidites asperus	X																									
Nothofagidites brachyspinulosus																										X
Nothofagidites deminutus	X		X					X	X	X	X															
Nothofagidites emarcidus/heturus	X	C	C		X	X	C	C	C	X	X		X		X											
Nothofagidites endurus																		X	F	X						F
Nothofagidites falcatus	X		X				X						X													
Nothofagidites flemingii							X		X	X	X															
Nothofagidites senectus																		X		X						
Nothofagidites vansteenisii							X	X	X																	
Peninsulapollis gillii																	X			F				X		X
Phyllocladidites mawsonii	X		F		X			X	C	X	F					X	F	X	X	F	X		X	X	X	F
Pilosisporites notensis **RW**										RW									RW							
Plicatipollenites spp. **RW**			RW		RW			RW		RW																
Podocarpidites spp.	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	F	X			F		X
Podosporites microsaccatus		X					X												X		X					
Polypodiidites perverrucatus	X									X	X													CV		
Proteacidites otwayensis ms											RW					X				X				X		X
Proteacidites pachypolus										X	X															
Proteacidites pseudomoides										X																
Proteacidites recavus										X																
Proteacidites recticuloconcavus ms																										X
Proteacidites rectomaginis								X	X																	
Proteacidites spp.	X		F		X	X		X		X	F		X		X		X	C	F	C	X		X	X	F	C

Table-3: Species List for Great White-1, Gippsland Basin.

Sample Depths	3030m	3060m	3090m	3120m	3150m	3170m	3190m	3210m	3220m	3230m	3240m	3260m	3270m	3290m	3300m	3310m	3320m	3340m	3350m	3360m	3370m	3390m	3410m	3430m	3440m	3470m
Proteacidites wahooensis ms																					X					
Protohaploxypinus spp. **RW**	RW	RW				RW				RW																
Quadraplanus brossus																										X
Stereisporites antiquisporites	F	F	X		X	X	F	X	X	X	X		X	F	X			X	X	F						X
Stereisporites (Tripunctisporis) sp.										X																
Tetradopllis securus ms																				X						
Tricolpites confessus																X				X	X					
Tricolpites waiparaensis																		X	X							
Tricolporites lilliei																X		F	F						X	F
Tricolporites paenestriatus			RW																							
Tubulifloridites antipodica														T			T							T		
Verrucatosporites attinatus ms								X																		
Verrucosisporites cristatus			X				X																			
Verrucosisporites kopukuensis	X				X			X	X	X	X							CV								
MICROPLANKTON SPECIES																										
Achomosphaera alcicornu	X	X	X	X																						
Achomosphaera ramulifera		X			X			X																		
Alisocysta ornatum					F		cf																			
Apectodinium sp.			X				X																			
Apteodinium australiense						X																				
Apteodinium sp.																										
Cooksonidium capricornum								X	X																	
Crassosphaera concinnia				C	C	F	X	X	X	X					X						CV					
Cyclopsiella vieta	X	X							X	X																
Cymatisphaera spp.								X			X													X		
Dapsilidinium pseudocolligerum			F			X		X	X	X																
Deflandrea flounderensis												cf														
Deflandrea heterophlycta									X	C	C		F					CV								
Deflandrea phosphoritica								X		X																
Deflandrea truncata													X													
Deflandrea sp. indent.											C		X													
Diphyes ariensis ms										X																
Enneadocysta spp.													X													

Table-3: Species List for Great White-1, Gippsland Basin.

Sample Depths	3030m	3060m	3090m	3120m	3150m	3170m	3190m	3210m	3220m	3230m	3240m	3260m	3270m	3290m	3300m	3310m	3320m	3340m	3350m	3360m	3370m	3390m	3410m	3430m	3440m	3470m
Fromea leos ms							X																			
Hexagonifera n.sp.	X																						CV			
Homotryblium tasmaniense											RW															
Hystrichokolpoma bullatus							X																			
Hystrichokolpoma rigaudae			F		X	C	C	X	F																	
Impagidinium dispertitum										X																
Impagidinium leos ms		X	X																							
Impagidinium spp.		X	X	X	X	X							X			CV								CV	CV	
Impagidinium victorianum								X	X	X																
Isabelidinium greenense																										X
Lejeunecysta sp.							X	X																		
Lingulodinium machaerophorum	X	X					X	X	X	X	X															
Lingulodinium solarum					X		X		X																	
Manumiella druggii																								X		
Nematosphaeropsis delicata ms										X																
Nematosphaeropsis rhizoma ms	X	X	X			X		X	X	X	X															
Operculodinium centrocarpum	A	C	A	X	X	C	C	X	F	X	X		X						CV			CV		CV	CV	CV
Operculodinium tabulatum ms								X		X			X						CV							
Pentadinium laticinctum		X		X				X	X	X	X															
Protoellipsodinium clavatus ms													X													
Protoellipsodinium mamilatus ms.	X	X	C					X																		
Protoellipsodinium n.sp.											X															
Protoellipsodinium simplex ms.	X	X	X	X	F	X	X	X	X	X	CV		CV				CV	CV						CV	CV	
Pyxidinopsis beta ms	X	X	X		F		X	X	X	X	X			X										CV		CV
Pyxidinopsis pontus ms	C	C	X	F	X	X		X	X		X			F			CV							CV	CV	CV
Pyxidinopsis waipawaensis											X															
Rottnestia borussica			X																							
Samlandia reticulifera									X	X	X															
Selemophemphix nephroides		X						X	X																	
Spiniferites spp.	A	A	A			C	C	C	C	X	X													X		X
Systematophora placacantha	X	X	X			X		X	X																	
Tasmanites sp.													X					X								
Tectatodinium ovatum ms		X	X																							
Tectatodinium pellitum								X	F	X																

Table-3: Species List for Great White-1, Gippsland Basin.

Sample Depths	3030m	3060m	3090m	3120m	3150m	3170m	3190m	3210m	3220m	3230m	3240m	3260m	3270m	3290m	3300m	3310m	3320m	3340m	3350m	3360m	3370m	3390m	3410m	3430m	3440m	3470m
Tectatodinium scabroellipticus ms	X	X				X	X				X		X				CV							CV		
Thalassiphora pelagica								F	F	X	X		X													
Trichodinium hirsutum																			X							
Tuberculodinium vancampoae	X							CV		CV																
Vozzhennikova rotunda											X															
OTHER PALYNOMORPHS																										
Botryococcus sp.						X	X	X		X	X					X										X
Fungal fruiting bodies	X		X				X	X																		
Fungal spores & hyphae	X	X	X				X		X	X										X						
Microforaminiferal liners	C	C	F		C	C	F	F	F	X	F		F							F				F		X
Scolecodonts			X			X	X											X								

	A	=	Abundant	CV	=	Caved		
	C	=	Common	T	=	Contamination		
	F	=	Frequent	RW	=	Reworked		
	X	=	Present	cf	=	Compare with		

RELINQUISHMENT LIST — PALYNOLOGY SLIDES

WELL NAME & NO: GREAT WHITE-1

PREPARED BY: A.D. PARTRIDGE

DATE: 25 February 1997 Sheet 1 of 2

Sample Type	Depth (m)	Catalogue Number	Description
Cuttings	3030	P197127	Kerogen slide filtered/unfiltered fractions
Cuttings	3030	P197128	Oxidised slide 2
Cuttings	3030	P197129	Oxidised slide 3
Cuttings	3030	P197130	Oxidised slide 4 - 1/2 cover slip
Cuttings	3060	P197131	Kerogen slide filtered/unfiltered fractions
Cuttings	3060	P197132	Oxidised slide 2
Cuttings	3060	P197133	Oxidised slide 3
Cuttings	3060	P197134	Oxidised slide 4 - 1/2 cover slip
Cuttings	3090	P197135	Kerogen slide filtered/unfiltered fractions
Cuttings	3090	P197136	Oxidised slide 2
Cuttings	3090	P197137	Oxidised slide 3
Cuttings	3120	P197138	Kerogen slide filtered/unfiltered fractions
Cuttings	3150	P197139	Kerogen slide filtered/unfiltered fractions
Cuttings	3170	P197140	Kerogen slide filtered/unfiltered fractions
Cuttings	3170	P197141	Oxidised slide 2 - 1/4 cover slip
Cuttings	3190	P197142	Kerogen slide filtered/unfiltered fractions
Cuttings	3190	P197143	Oxidised slide 2 - 1/2 cover slip
Cuttings	3210	P197144	Kerogen slide filtered/unfiltered fractions
Cuttings	3210	P197145	Oxidised slide 2
Cuttings	3220	P197146	Kerogen slide filtered/unfiltered fractions
Cuttings	3220	P197147	Oxidised slide 2 - 1/2 cover slip
Cuttings	3230	P197148	Kerogen slide filtered/unfiltered fractions
Cuttings	3230	P197149	Oxidised slide 2 - 1/2 cover slip
Cuttings	3240	P197150	Kerogen slide filtered/unfiltered fractions
Cuttings	3240	P197151	Oxidised slide 2
Cuttings	3240	P197152	Oxidised slide 3
Cuttings	3260	P197153	Kerogen slide filtered - 1/2 cover slip
Cuttings	3270	P197154	Kerogen slide filtered/unfiltered fractions
Cuttings	3290	P197155	Kerogen slide filtered/unfiltered fractions
Cuttings	3300	P197156	Kerogen slide filtered/unfiltered fractions
Cuttings	3310	P197157	Kerogen slide filtered/unfiltered fractions
Cuttings	3320	P197158	Kerogen slide filtered/unfiltered fractions
Cuttings	3340	P197159	Kerogen slide filtered/unfiltered fractions
Cuttings	3340	P197160	Oxidised slide 2
Cuttings	3350	P197161	Kerogen slide filtered/unfiltered fractions
Cuttings	3350	P197162	Oxidised slide 2
Cuttings	3350	P197163	Oxidised slide 3

RELINQUISHMENT LIST — PALYNOLOGY SLIDES

WELL NAME & NO: GREAT WHITE-1

PREPARED BY: A.D. PARTRIDGE

DATE: 25 February 1997 Sheet 2 of 2

Sample Type	Depth (m)	Catalogue Number	Description
Cuttings	3360	P197164	Kerogen slide filtered/unfiltered fractions
Cuttings	3360	P197165	Oxidised slide 2
Cuttings	3360	P197166	Oxidised slide 3
Cuttings	3360	P197167	Oxidised slide 4
Cuttings	3370	P197168	Kerogen slide filtered/unfiltered fractions
Cuttings	3370	P197169	Oxidised slide 2 - 1/2 cover slip
Cuttings	3390	P197170	Kerogen slide filtered - 1/2 cover slip
Cuttings	3410	P197171	Kerogen slide filtered/unfiltered fractions
Cuttings	3430	P197172	Kerogen slide filtered/unfiltered fractions
Cuttings	3440	P197173	Kerogen slide filtered/unfiltered fractions
Cuttings	3470	P197174	Kerogen slide filtered/unfiltered fractions
Cuttings	3470	P197175	Oxidised slide 2
Cuttings	3470	P197176	Oxidised slide 3
Cuttings	3470	P197177	Oxidised slide 4