APPENDIX-1

PALYNOLOGICAL ANALYSIS OF HARLEQUIN-1 GIPPSLAND BASIN.

by

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INTERPRETED DATA

INTRODUCTION

Sixty-five samples comprising fifty-four sidewall cores, one conventional core sample and eleven cuttings samples were processed from Harlequin-1 and examined for spores, pollen and microplankton.

Thirty-two of the sidewall cores were analysed by M.K. Macphail and the remaining thirty-three samples were analysed by A.D. Partridge.

Both oxidized organic residue yields and palynomorph concentrations were, in the main, moderate to high, and this was reflected in the moderate to high spores and pollen diversity recorded from the majority of samples. Average diversity was 23.5 species per sample. Low spore-pollen diversity directly correlated to barren or low yield samples. The coal fractions extracted from cuttings were the only exceptions because, although they gave high organic residue yields, they were either barren of palynomorphs or contained only low diversity assemblages. Dinoflagellates were only common in the Late Eocene and Oligocene samples, and their diversity also increased in these younger rocks.

Preservation of palynomorphs was satisfactory without any noticeable trend or pattern.

Lithological units and palynological zones from base of Lakes Entrance Formation to T.D. are given in the following summary. Interpretative data with zone identifications and confidence ratings are recorded in Table-1 and basic data on residue yields, preservation and diversity are recorded in Table-2. All species which can be identified with binomial names are tabulated on the accompanying range chart.

PALYNOLOGICAL SUMMARY OF HARLEQUIN-1

AGE	UNIT/FACIES	SPORE-POLLEN ZONES (Dinoflagellate Zones)	DEPTH RANGE (mKB)
Oligocene	Lakes Entrance Formation	*P. tuberculatus*	1391.0-1400.0
Oligocene		Upper *N. asperus*	1407.0
	1408.0m		
Late Eocene	Latrobe Group (Gurnard facies)	Upper *N. asperus*	1413.0
		(*P. comatum*)	(1413.0)
Late Eocene		Middle *N. asperus*	1419.0
		(*G. extensa*)	(1419.0)
	1420.0m		
Late Eocene	Latrobe Group (Coarse clastic facies)	Middle *N. asperus*	1422.0-1434.0
		(*G. extensa*)	(1422.0)
Middle Eocene		Lower *N. asperus*	1458.5-1525.5
Early Eocene		*P. asperopolus*	1594.0-1624.0
Early Eocene		Middle *M. diversus*	1686.5
Early Eocene		Lower *M. diversus*	1735.5-1780.0
Paleocene		Upper *L. balmei*	1830.0-2001.5
	2039.0m		
	Unnamed volcanics		
	2053.0m		
Paleocene	Latrobe Group (coarse clastic facies)	Lower *L. balmei*	2112.0-2197.8
Maastrichtian		Upper *T. longus*	2228.5-2390.0
Maastrichtian		Lower *T. longus*	2457.5-2498.3
Campanian		*T. lilliei*	2514.5-2548.0
	T.D. 2574.0m		

GEOLOGICAL COMMENTS

1. The 'coarse clastic' or undifferentiated portion of the Latrobe Group is virtually entirely non-marine. Microplankton occurrences through the undifferentiated Latrobe Group (with the exception of the shallowest sample at 1422m) are characterized by low specimen numbers and low diversity. The typical dinoflagellates are 'diaphanous' peridinacean cysts which are interpreted to indicated non-marine lacustrine to brackish lagoonal environments. The lack of distinctive marine dinoflagellates is consistent with the location of Harlequin-1 on the northern flank of the Central Deep. This structurally controlled depositional centre constrains the geographic distribution of most of the marine incursions recognised by Partridge (1976).

2. The earliest definite marine dinoflagellates in Harlequin-1 are the 'flood' of *Gippslandica extensa* found at 1422m immediately overlying the top (at 1423m) of the shallowest coal in the well. This sample from a 3 metres thick carbonaceous siltstone is immediately overlain by marine rocks consisting of 12 metres of glauconitic siltstone identified as Gurnard Formation, which is in turn overlain by calcareous claystones of the Lakes Entrance Formation. There are distinct step-like increases in both dinoflagellate abundance and diversity across the lower boundaries of both these formations (see Table-2). This data is interpreted to reflect abrupt increases in palaeobathymetry and it is therefore likely that both these boundaries represent either Sequence Unconformities or parasequence boundaries (see Van Wagoner *et al.*, 1988).

3. The non-marine part of the Latrobe Group can be characterized by its changing coal content, viz:

ZONES	TOP OF INTERVAL	INTERVAL THICKNESS	TOTAL COAL	THICKEST COAL	PERCENTAGE COAL
N. asperus	1423m	167m	44.8m	9.5m	26.8%
P. asperopolus to *M.diversus*	1590m	237m	17.3m	4.2m	7.3%
L. balmei	1827m	397m	8.2m	1.2m	2.1%
T. longus to *T. lilliei*	1224m	350m	12.1m	1.5m	3.4%

The increasing coal content in the younger sediments reflects the progressive encroachment of the palaeoshoreline as the basin subsided. Environmentally it represents a transition from alluvial plain through upper coastal plain to lower coastal plain.

4. In the above compilation the interval 1525.5m to 1990m is assigned to the *N. asperus* Zones even though it lies in an uncontrolled section between the base of the Lower *N. asperus* Zone at 1525.5m and the top of the *P. asperopolus* Zone at 1594.0m. The interval is significant as it contains 17.5 metres of coal, in two major seams and one minor seam between 1555-1579m. These major coals, the thickest in the well, represent 10.5% out of the 26.8% total coal in the *N. asperus* Zones. Their age assignment is based on electric log correlation of these thick coals with the thickest coals in the adjacent Barracouta and Wirrah fields, where based on a synthesis of all available palynological age datings they appear to lie at the base of the Lower *N. asperus* Zone.

5. The igneous rock unit intersected in Harlequin-1 between 2039-2053m is interpreted as a volcanic extrusion because it occurs in a similar relative stratigraphic position to volcanic extrusions in the nearby Wirrah, Whiting and Snapper fields. Within the thicker section of these fields the volcanics lie within the Lower *L. balmei* Zone. In Harlequin-1 the volcanics separate the Lower and Upper subzones of the *L. balmei* Zone. Assuming the volcanics are concordant in age it would appear that most of the thickening of the *L. balmei* Zone in the fields east and south-east of Harlequin-1 is occurring in the upper part of the Lower and lower part of the Upper *L. balmei* Zones. On current age correlations this would equate to the relatively low sea levels between 56.5 Ma and 60 Ma in the Paleocene shown on the sequence charts of Haq *et al.* (1987, 1988).

BIOSTRATIGRAPHY

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

Author citations for most spore-pollen species can be sourced from Stover and Partridge (1973, 1982), Helby *et al.* (1987) and Dettmann and Jarzen (1988) or other references cited herein. Species names followed by "ms"

are unpublished manuscript names. Zone names have not been altered to conform with recent nomenclatural changes to nominate species such as *Forcipites* (al.*Tricolpites*) *longus* (Stover & Evans) Dettmann & Jarzen 1988. Author citations for dinoflagellates can be found in Lentin and Williams (1985, 1989).

Tricolporites lilliei Zone: 2514.5-2548.0 metres Campanian.

Palynofloras within this interval are dominated by *Proteacidites* spp. or *Laevigatosporites* spp. (at 2540.0m & 2542.8m) and gymnosperms including *Araucariacites australis*. *Nothofagidites senectus (sensu lato)* is usually frequent. *Triporoletes reticulatus* and *Latrobosporites amplus* are frequent at 2542.9m and 2548.0m respectively.

The lower boundary, at 2548.0m, is defined by a poorly preserved specimen of *Triporopollenites sectilis*. Reworked Early Cretaceous spores are moderately frequent in this, the basal, sidewall core.

Tricolporites lilliei (multiple specimens) first appears at 2542.9m in association with well preserved *Triporopollenites sectilis*, *Tricolpites waiparensis* and frequent *Peninsulapollis gillii*. The sample at 2540.0m contains *Forcipites sabulosus* and a population of *F. stipulatus*.

The upper boundary is picked at 2514.5m, based on the absence of definitive indicators of the *T. longus* Zone.

Lower *Tricolpites longus* Zone: 2457.5-2498.3 metres Maastrichtian.

The three sidewall core samples assigned to this Lower subzone each contain of *Forcipites longus*, but lack the frequent to common *Gambierina rudata* so characteristic of the Upper subzone in this well. *Stereisporites (Tripunctisporis)* spp. is also absent. Other indicator species are rare but are represented by *Tetracolporites verrucosus*, *Proteacidites reticuloconcavus* ms (*sensu stricta*), and *P. wahooensis* ms all of which occur at 2484.5m.

The acritarch *Micrhystridium* sp. and a probable freshwater dinoflagellate are also present at 2484.5m.

Upper *Tricolpites longus* Zone: 2228.5-2390.0 metres Maastrichtian.

All samples within this interval contain either *Stereisporites (Tripunctisporis)* spp. extending down to 2347.1m, or frequent to abundant *Gambierina rudata* extending as deep as the sidewall core at 2381.0m and cuttings sample at 2390m. The top of the zone is picked at the LADs (Last Appearance Datums) of the indicator species *Forcipites longus*, *Camarozonosporites horrendus* ms, and *P. otwayensis* ms which all occur at 2228.5m associated with common *Gambierina rudata*. Aside from the abundances of the last species, *Proteacidites* spp. and *Stereisporites* spp. are common through the zone.

The sample at 2232.3m is unusual in that (i) the nexinous thickenings around the pores of the *Gambierina rudata* specimens are weakly developed and (ii) a population of *Beaupreaidites orbiculatus* is present. The Late Cretaceous form of *Beaupreaidites elegansiformis* occurs at 2247.5m.

Lower *Lygistepollenites balmei* Zone: 2112.0-2197.8 metres Paleocene.

The top of the zone is picked on the common occurrence of *Proteacidites angulatus* at 2112.0m while the three underlying samples are assigned to the zone on the presence of *Tetracolporites verrucosus*. Palynofloras in this interval are dominated by gymnosperm pollen and *Proteacidites* spp. Most contain low numbers of the eponymous species *Lygistepollenites balmei* and *Australopollis obscurus*. *In situ* Upper *L. balmei* and Upper *T. longus* Zone indicator species are absent. All dates are of relatively low confidence.

The single sample from Core-1 yielded a low diversity assemblage which probably belongs to the Lower subzone but can only be confidently assigned to the broader *L. balmei* Zone.

Upper *Lygistepollenites balmei* Zone: 1830.0-2001.5 metres Paleocene.

Although seven of the eight samples over this interval contain moderately diverse assemblages (average of 20+ species in the 7 productive samples) indicator species for the Upper subdivision are rare. These are restricted to *Proteacidites annularis* at 1921.1m and *Verrucosisporites kopukuensis* at 1921.1m and 2001.5m. Relative to the Lower *L. balmei* Zone the species *Lygistepollenites balmei* and *Gleicheniidites* spp. increase in abundance.

Lower *Malvacipollis diversus* Zone: 1735.5-1780.0 metres Early Eocene.

Three samples are assigned to this zone with varying degrees of confidence.

The lowest sample, at 1780.0m, contains low numbers of the marine dinoflagellate *Deflandrea obliquipes*. The spore-pollen assemblage is diverse, including (recycled) *Lygistepollenites balmei* and the lowest records in Harlequin-1 of a number of species which first appear within the Upper *L. balmei* Zone, e.g. *Anacolosidites acutullus*, *Banksieaeidites arcuatus*, *Cupanieidites orthoteichus*, *Malvacipollis subtilis*, *Proteacidites grandis* and *P. incurvatus*. Rare species recorded include *Dictyophyllidites arcuatus* Pocknall & Mildenhall 1984, and *Retistephanocolporites nixonii* ms. Specimens of *Triporopollenites heleosus* ms indicate that the sample is no older than Lower *M. diversus* Zone.

The SWC sample at 1762.5m yielded a general *M. diversus* Zone palynoflora.

The highest sample, at 1735.5m, contains essentially the same palynoflora as 1780.0m, except that *Proteacidites tuberculotumulatus* ms is present.

The immediately overlying sample at 1729.0m which is zone indeterminate contains only *L. balmei* Zone contaminants while the sample at 1708.0m was dominated by a small (less than 20 microns) undescribed species of *Proteacidites*.

Middle *Malvacipollis diversus* Zone: 1686.5 metres Early Eocene.

This sample is assigned to the zone on the oldest undoubted occurrence of the species *Proteacidites ornatus* and *P. tuberculiformis*, and the absence of the key younger zone species *P. pachypolus* and *Myrtaceidites tenuis*. The presence of a fragment of the pollen *Clavastephanocolporites meleosus* ms is considered to be an anomalously old occurrence.

Proteacidites asperopolus Zone: 1594.0-1624.0 metres Early Eocene.

The lower boundary of this zone is placed at the sidewall core at 1624.0m which yielded *Conbaculites apiculatus ms*, *Myrtaceidites tenuis* and frequent *Proteacidites pachypolus*, an association of species typical of the *P. asperopolus* Zone. The top of the zone is placed at the sidewall core at 1594.0m which contains the LAD of *M. tenuis*. This sample also contains *Proteacidites asperopolus*.

The immediately overlying sample at 1577.5m contains a low diversity assemblage which is not zone diagnostic.

Lower *Nothofagidites asperus* Zone: 1458.5-1525.5 metres Middle Eocene.

An increase in abundance of *Nothofagidites emarcidus/heterus* above the LAD of *M. tenuis* is basis for placing the base of the zone. As is often typical of this zone the First Appearance Datums (FADs) of key species are recorded above a interval of low confidence zone determinations. Important FADs are *Tricolporites leuros* and *Proteacidites reflexus* (1525.5m); *Nothofagidites asperus* (1505.0m); *N. falcatus* and *Proteacidites recavus* (1493.0m); and, *Tricolpites simatus* (1458.5m).

Middle *Nothofagidites asperus* Zone 1419.0-1434.0 metres Late Eocene.

Palynofloras in this and the overlying Upper *N, asperus* Zone section are wholly dominated by *Nothofagidites* spp., including low numbers of *N. falcatus*.

The Middle *N. asperus* Zone interval is delineated by occurrences of *Tricolpites thomasii* at 1434.0m and *Triorites magnificus*, *Aglaoreidia qualumis* and *Proteacidites tuberculatus* (only at 1422.0m) in the overlying two sidewall cores.

The sample at 1434.0m lacks marine indicators. The overlying sample 1422.0m is dominated by a monospecific assemblage of the dinoflagellate *Gippslandica extensa*, while the shallowest sample at 1419.0m, although only containing a low abundance of dinoflagellates, shows a significant rise in diversity consistent with the lithological assignment of this sample to the Gurnard Formation. The age of this transition to a marine environment parallels the observations made in Stover and Partridge (1982, p.74-77).

Upper *Nothofagidites asperus* Zone: 1407.0-1413.0 metres
Late Eocene-Early Oligocene.

Common *Phthanoperidinium comatum* at 1413.0m and a specimen of *Granodiporites nebulosus* at 1407.0m provide a reliable Upper *N. asperus* Zone age for this interval. Both palynofloras are dominated by marine dinoflagellates. *Cyatheacidites annulatus* was not recorded, although could

have perhaps been expected at 1407.0m as the samples is from the base of the Lakes Entrance Formation.

Proteacidites tuberculatus Zone: 1391.0-1400.0 metres Oligocene.

This interval is confidently assigned to the *P. tuberculatus* Zone on the occurrence of the spore *Cyatheacidites annulatus* in the deepest and shallowest samples. Of particular note is the frequent occurrences of *Deflandrea phosphoritica* and *Cyatheacidites annulatus* in the shallowest sample. This association is very rare being only found in what are interpreted as shallow water sequences in the Bass, Otway and Gippsland Basins. The species identified as *Deflandrea* sp. cf *D. heterophylcta* is a morphological end-member characterized by a *D. phosphoritica* shaped epicyst and verrucate endocyst.

Reworked specimens of the Permian spores *Dulhuntyispora parvithola* and *Pseudoreticulatispora pseudoreticulata* were recorded at 1400.0m and 1393.0m respectively.

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TABLE 1: INTERPRETATIVE PALYNOLOGICAL DATA HARLEQUIN-1, GIPPSLAND BASIN

SAMPLE TYPE	DEPTH (M)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 60	1391.0	*P. tuberculatus*	(*P. simplex*)	0	Frequent *Cyatheacidites annulatus*
SWC 59	1393.0	*P. tuberculatus*		2	
SWC 58	1400.0	*P. tuberculatus*		1	Rare *C. annulatus*; Permian reworking
SWC 57	1407.0	Upper *N. asperus*		2	
SWC 56	1413.0	Upper *N. asperus*	*P. comatum*	1	Common *Phthanoperidinium comatum*
SWC 55	1419.0	Middle *N. asperus*	*G. extensa*	0	
SWC 54	1422.0	Middle *N. asperus*	*G. extensa*	0	
SWC 53	1434.0	Middle *N. asperus*		2	*Tricolpites thomasii*
SWC 52	1458.5	Lower *N. asperus*		1	
SWC 51	1493.0	Lower *N. asperus*		1	Non-marine dinoflagellates present
SWC 50	1505.0	Lower *N. asperus*		2	
SWC 49	1525.5	Lower *N. asperus*		2	
SWC 47	1577.5	Indeterminate			
SWC 45	1594.0	*P. asperopolus*		1	LAD *Myrtaceidites tenuis*
SWC 44	1624.0	*P. asperopolus*		1	FAD *Conbaculites apiculatus* ms
SWC 42	1686.5	Middle *M. diversus*		1	*Clavastephanocolporites meleosus* ms present
SWC 41	1708.0	Indeterminate			No key species recorded
SWC 40	1729.5	Indeterminate			Contaminated from *L. balmei* Zone
SWC 39	1735.5	Lower *M. diversus*		1	
SWC 38	1762.5	Lower *M. diversus*		2	
SWC 37	1780.0	Lower *M. diversus*		1	
SWC 35	1830.0	Upper *L. balmei*		1	
SWC 34	1844.0	Indeterminate			
SWC 33	1870.0	*L. balmei*		1	
SWC 32	1875.0	Indeterminate			Barren of palynomorphs
SWC 30	1895.9	*L. balmei*		1	
SWC 29	1921.1	Upper *L. balmei*		1	*Proteacidites annularis* present
SWC 28	1930.0	*L. balmei*		1	
SWC 27	1972.0	*L. balmei*		1	

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SAMPLE TYPE	DEPTH (M)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 26	1989.0	*L. balmei*		1	
SWC 25	2001.5	Upper *L. balmei*		2	*Verrucosisporites kopukuensis* present
SWC 24	2047.0	Indeterminate			Barren because sample is a tuff
SWC 23	2056.0	Indeterminate			Fossils very sparse
Core 1	2084.6	*L. balmei*		1	
SWC 22	2112.0	Lower *L. balmei*		2	Common *Proteacidites angulatus*
SWC 21	2141.0	Lower *L. balmei*		2	
SWC 20	2189.5	Lower *L. balmei*		1	
SWC 19	2197.8	Lower *L. balmei*		2	
Cuttings	2225.0	Indeterminate			
SWC 18	2228.5	Upper *T. longus*		1	LAD *Forcipites longus*
SWC 17	2232.2	Upper *T. longus*		1	
SWC 16	2247.5	Upper *T. longus*		1	
Cuttings	2255.0	Upper *T. longus*		3	
SWC 15	2256.0	Upper *T. longus*		1	
SWC 14	2281.5	Upper *T. longus*		1	Early Cretaceous reworking conspicuous
SWC 13	2293.0	Indeterminate			
Cuttings	2300.0	*T. longus*		3	
SWC 12	2347.1	Upper *T. longus*		1	FAD *Stereisporites (Tripunctisporis)* spp.
SWC 11	2368.5	*T. longus*		2	
Cuttings	2370.0	Upper *T. longus*		3	Common *Gambierina rudata*
SWC 10	2381.0	Upper *T. longus*		2	Abundant *G. rudata*
Cuttings	2390.0	Upper *T. longus*		3	Common *G. rudata*
Cuttings	2440.0	*T. longus / T. lilliei*			
SWC 7	2457.5	Lower *T. longus*		1	
Cuttings	2465.0	*T. longus / T. lilliei*			

TABLE 1: INTERPRETATIVE PALYNOLOGICAL DATA HARLEQUIN-1, GIPPSLAND BASIN

SAMPLE TYPE	DEPTH (M)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 6	2484.5	Lower *T. longus*		1	
SWC 5	2498.3	Lower *T. longus*		1	FAD *Forcipites longus*
Cuttings	2500.0	Indeterminate			
SWC 4	2514.5	*T. lilliei*		1	
Cuttings	2515.0	*T. lilliei*		3	
Cuttings	2525.0	*T. longus / T. lilliei*			
SWC 3	2540.0	*T. lilliei*		1	
Cuttings	2540.0	Indeterminate			
SWC 2	2542.8	*T. lilliei*		1	FAD *Tricolporites lilliei*
SWC 1	2548.0	*T. lilliei*		2	Cannot be older than *N. senectus* Zone

LAD = Last appearance datum
FAD = First appearance datum

PALYNOLOGY DATA SHEET

BASIN: *Gippsland* ELEVATION: KB: *+21.0m* GL: *-43.0m*

WELL NAME: *Harlequin-1* TOTAL DEPTH: *2574.0m*

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										
PALEOGENE	*P. tuberculatus*	*1391*	*0*				*1400*	*1*			
	Upper *N. asperus*	*1407*	*2*				*1413*	*1*			
	Mid *N. asperus*	*1419*	*0*				*1434*	*2*			
	Lower *N. asperus*	*1458.5*	*1*				*1525.5*	*2*			
	P. asperopolus	*1594*	*1*				*1624*	*1*			
	Upper *M. diversus*										
	Mid *M. diversus*						*1686.5*	*1*			
	Lower *M. diversus*	*1735.5*	*1*				*1780*	*1*			
	Upper *L. balmei*	*1830*	*1*				*2001.5*	*2*	*1921.1*	*1*	
	Lower *L. balmei*	*2112*	*2*				*2197.8*	*2*	*2189.5*	*1*	
LATE CRETACEOUS	Upper *T. longus*	*2228.5*	*1*				*2390*	*3*	*2381*	*1*	
	Lower *T. longus*	*2457.5*	*1*				*2498.3*	*1*			
	T. lilliei	*2514.5*	*1*				*2548*	*2*	*2542.8*	*1*	
	N. senectus										
	T. apoxyexinus										
	P. mawsonii										
	A. distocarinatus										
EARLY CRET.	*P. pannosus*										
	C. paradoxa										
	C. striatus										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: *All depths in metres. The following dinoflagellate zones were identified:*

Phthanoperidinium comatum 1413.0m

Gippslandica extensa 1419.0-1422.0m

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 & A.D. Partridge* DATE: *October 1989*

DATA REVISED BY: _____ DATE: _____

BASIC DATA

TABLE-2: BASIC DATA

RANGE CHART

TABLE 2: BASIC PALYNOLOGICAL DATA HARLEQUIN-1, GIPPSLAND BASIN

SAMPLE TYPE	DEPTH (M)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER S-P SPECIES	DINOFLAGELLATE ABUNDANCE	DINOFLAGELLATE NO. SPECIES
SWC 60	1391.0	78212 C	Calcareous claystone	Moderate	Moderate	Poor-fair	31+	High	14+
SWC 59	1393.0	78212 B	Calcareous claystone	High	Moderate	Poor	21+	High	10+
SWC 58	1400.0	78212 A	Calcareous claystone	Moderate	High	Poor	36+	Moderate	8+
SWC 57	1407.0	78211 Z	Calcareous claystone	Moderate	Low	Fair	32+	Low	4+
SWC 56	1413.0	78211 Y	Glauconitic siltstone	High	High	Fair	28+	High	3+
SWC 55	1419.0	78211 X	Glauconitic siltstone	Low	Low	Poor-fair	32+	Low	5+
SWC 54	1422.0	78211 W	Carbonaceous siltstone	High	High	Good	35+	Moderate	1
SWC 53	1434.0	78211 V	Siltstone	Moderate	Moderate	Good	27+		
SWC 52	1458.5	78211 U	Siltstone	High	Moderate	Good	39+	Very low	1
SWC 51	1493.0	78211 T	Siltstone	Low	Moderate	Good	40+		
SWC 50	1505.0	78211 S	Siltstone	Low	Moderate	Good	27+		
SWC 49	1525.5	78211 R	Siltstone	Low	Low	Fair	28+	Very low	1
SWC 47	1577.5	78211 Q	Claystone	Very low	Very low	Fair	10+		
SWC 45	1594.0	78211 P	Siltstone	Moderate	Moderate	Good	26+		
SWC 44	1624.0	78211 O	Claystone	Low	Low	Good	22+		
SWC 42	1686.5	78211 N	Siltstone	High	High	Good	49+	Very low	1
SWC 41	1708.0	78211 M	Claystone	Very low	Very low	Poor	15+		
SWC 40	1729.5	78211 L	Siltstone	Very low	Very low	Fair	12+		
SWC 39	1735.5	78211 K	Claystone	High	High	Fair	46+	Very low	1+
SWC 38	1762.5	78211 J	Siltstone	Low	Low	Good	28+		
SWC 37	1780.0	78211 I	Siltstone	High	High	Good	61+	Very low	1+
SWC 35	1830.0	78211 H	Claystone	Low	Low	Poor	13+		
SWC 34	1844.0	78211 G	Claystone	Low	Low	Poor	4+		
SWC 33	1870.0	78211 F	Claystone	Moderate	Low	Fair	14+		
SWC 32	1875.0	78211 E	Siltstone	Barren					
SWC 30	1895.9	78211 D	Claystone	High	Low	Fair	13+		
SWC 29	1921.1	78211 C	Siltstone	High	High	Good	27+		
SWC 28	1930.0	78211 B	Siltstone	High	High	Good	19+		
SWC 27	1972.0	78211 A	Claystone	Low	Low	Fair-poor	11+		

TABLE 2: BASIC PALYNOLOGICAL DATA HARLEQUIN-1, GIPPSLAND BASIN

SAMPLE TYPE	DEPTH (M)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER S-P SPECIES	DINOFLAGELLATE ABUNDANCE	DINOFLAGELLATE NO. SPECIES
SWC 26	1989.0	78210 Z	Siltstone	High	High	Fair	26+		
SWC 25	2001.5	78210 Y	Siltstone	High	High	Good	32+		
SWC 24	2047.0	78210 X	Altered tuff ?	Barren					
SWC 23	2056.0	78210 W	Siltstone	Very low	Very low	Fair	4+		
Core 1	2084.6	78209 L	Siltstone	High	Moderate	Fair	15+		
SWC 22	2112.0	78210 V	Claystone	Low	Low	Poor	14+		
SWC 21	2141.0	78210 U	Claystone	High	High	Fair	28+		
SWC 20	2189.5	78210 T	Claystone	Low	Low	Fair	32+		
SWC 19	2197.8	78210 S	Siltstone	Low	Low	Poor	21+		
Cuttings	2225.0	78209 A	Coal fraction	High	Barren				
SWC 18	2228.5	78210 R	Claystone	High	Moderate	Poor-fair	21+		
SWC 17	2232.2	78210 Q	Siltstone	Moderate	Moderate	Fair	28+		
SWC 16	2247.5	78210 P	Claystone	Low	Low	Fair	31+		
Cuttings	2255.0	78209 B		High	High	Fair-good	15+		
SWC 15	2256.0	78210 O	Siltstone	High	High	Good	24+		
SWC 14	2281.5	78210 N	Siltstone	High	High	Good	28+	Very low	1
SWC 13	2293.0	78210 M	Siltstone	Very low	Very low	Fair	14+		
Cuttings	2300.0	78209 C		High	Moderate	Poor-fair	17+		
SWC 12	2347.1	78210 L	Claystone	Moderate	Moderate	Poor-fair	17+		
SWC 11	2368.5	78210 K	Claystone	Very low	Very low	Fair	13+		
Cuttings	2370.0	78209 D		High	Moderate	Fair	14+		
SWC 10	2381.0	78210 J	Claystone	High	High	Good	31+		
Cuttings	2390.0	78209 E		High	Moderate	Fair	19+		
Cuttings	2440.0	78209 F	Coal fraction	High	Low	Fair-poor	7+		
SWC 7	2457.5	78210 G	Siltstone	Moderate	Moderate	Poor	16+		
Cuttings	2465.0	78209 G		High	Moderate	Fair	17+		

TABLE 2: Basic Palynological Data Harlequin-1, Gippsland Basin

SAMPLE TYPE	DEPTH (M)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBER S-P SPECIES	DINOFLAGELLATE ABUNDANCE	DINOFLAGELLATE NO. SPECIES
SWC 6	2484.5	78210 F	Claystone	High	High	Good	34+	Very low	2
SWC 5	2498.3	78210 E	Siltstone	Moderate	Moderate	Good	35+		
Cuttings	2500.0	78209 H	Coal fraction	High	Barren				
SWC 4	2514.5	78210 D	Siltstone	Moderate	Moderate	Poor	25+		
Cuttings	2515.0	78209 I		High	Moderate	Fair	29+		
Cuttings	2525.0	78209 J		High	Low	Fair	17+		
SWC 3	2540.0	78210 C	Siltstone	High	High	Good	25+		
Cuttings	2540.0	78209 K		Moderate	Low	Poor-fair	15+		
SWC 2	2542.8	78210 B	Siltstone	Moderate	Moderate	Moderate	26+		
SWC 1	2548.0	78210 A	Siltstone	Low	Low	Poor	24+		

(ADP185)