



APPENDIX-4

MICROPALAEONTOLOGICAL ANALYSIS OF TARWHINE-1
GIPPSLAND BASIN, VICTORIA.

by

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PART I

INTERPRETATIVE DATA

Introduction

Biostratigraphy

Summary Table

Geological Comments

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INTRODUCTION:

The foraminiferal content of thirty-six sidewall cores and two cuttings samples from the marine section of Tarwhine-1 has been examined. Although the entire marine section below the 13.3/8" inch casing shoe was sampled, the majority of sidewall cores come from the transitional interval between the non-marine Latrobe Group and the marine Lakes Entrance Formation. Both the planktonic and benthonic foraminiferal assemblages were scrutinized. However because of their importance to biostratigraphy the planktonics have been accorded the greatest attention. Because of this emphasis the benthonic identifications should be regarded as tentative.

The well penetrated datable marine sediments which range in age from Late Eocene (Zone K) to Mid-Late Pliocene (Zone A4). Mid Miocene to Early Pliocene sediments (Zones F to B1) were not recognised possibly due to either a condensed sequence or an hiatus.

Preservation of microfossils throughout the well is poor to moderate. Only during the interval representing zones I to G (straddling the Oligo-Miocene boundary) does preservation improve. At the top of the section, above sidewall core 148 (980 metres), preservation is so poor that species identification and hence biostratigraphic determinations, become impossible.

Diversity is also low in each sample examined. Again the exception to this is during Zones I to G where diversity of both planktonic and benthonic forms become moderate to high.

BIOSTRATIGRAPHY:

PLIOCENE - ZONE A4: 1010.3 to 1039.9 metres

Recognition of zone based on presence of Globorotalia puncticulata without Globorotalia inflata ss. The lack of Globorotalia crassaformis probably indicates that the two samples come from the early part of the zone. (Early-Middle Pliocene). Preservation is poor and diversity of assemblages (especially the keeled planktonic forms) is low. In the six sidewall cores examined above 1010.3 metres and below the casing shoe preservation is so poor that species identification and hence biostratigraphic determination is impossible. The very few specimens that do occur are very badly recrystallized.

Sidewall core 145 at 1070 metres contains only indeterminate foraminifera. However, specimens present show the same preservational style as those found above, linking this sample with the upper part of the section

EARLY MIOCENE ZONE G: 1100 to 1190.1 metres
ZONE H1: 1250 metres

The four sidewall cores assigned to Zone G contain Globigerinoides trilobus without Globigerinoides bisphericus thus restricting them to this zone.

Preservation of the faunas in these sidewall cores is in sharp contrast to those above. Quality of preservation is probably the best found anywhere in the well. The number and diversity of both planktonic and benthonic forms is also higher over this interval.

The latest Early Miocene, Middle and Late Miocene representing zones B1 to F have not been recognised in Tarwhine-1. This could be a result of either a hiatus or a condensed section in the interval 1039.9 - 1100 metres.

Sidewall core 139 at 1250 metres contains both Globigerina woodi woodi and Globigerina woodi connecta fixing the age as Zone H1. Preservation continues to be good and foraminiferal numbers and diversity remains high. Zone H2 (G. woodi woodi without G. woodi connecta) was not recognised possibly because of the wide sample spacing over this interval.

LATE OLIGOCENE - ZONE I - SWC 138 at 1280 metres.
The presence of Globorotalia opima in this sample is sufficient for the zonal assignment.

EARLY OLIGOCENE - ZONE J1: 1310 metres
ZONE J2: 1320 & 1340 metres.

The sidewall core at 1310 metres contains Globigerina angiporoides without Globigerina brevis or Globigerina gemma. The recognition of these latter two species in the two cuttings samples allows them to be assigned to Zone J2 with a reasonable degree of confidence. G. woodi woodi and G. woodi connecta also occur as contaminants in the cuttings. Preservation of faunas in the sidewall core material is moderate whereas it is variable in the cuttings.

LATE EOCENE - ZONE K: 1348 to 1367.1 metres

Most remaining samples come from the greensand between the top of Latrobe Group and basal Lakes Entrance Formation. The four lowest sidewall cores examined (Nos 115, 116, 117 and 118, at 1394, 1392, 1388 and 1386 metres respectively) consist largely of quartz sand and are part of the Latrobe Group.

Foraminifera first appear, after several metres of barren greensand, in sidewall core 123 at 1375.1 metres. They occur in low numbers and diversity only and are very poorly preserved. Only indeterminate specimens are present.

Sidewall core 127 at 1367.1 metres, containing Globigerina linaperta and Globigerinatheka index, is tentatively assigned to Zone K. However, the non-appearance of Globigerina brevis means that this assignment is less than certain. It is possible that the sample is marginally older than K and is actually equivalent to the onshore Browns Creek Section. The immediately overlying sample (SWC 128) contains all three determinate species, Globigerina linaperta, Globigerina brevis and Globigerinatheka index providing a solid K determination for the sample (Confidence rating 0). Globigerina linaperta continues to be found, sporadically, up to and including SWC 134 at 1348 metres confirming a Late Eocene age for this interval.

The disappearance of Globigerina linaperta marks the Eocene/Oligocene boundary in the Gippsland Basin. The greensand lithology continues above this event to SWC 135 at 1345 metres. This sample, however, is devoid of foraminifera.

GEOLOGICAL COMMENTS:

Geological comments are restricted to a brief discussion of the contentious interval between the non-marine Latrobe Group and the marine Lakes Entrance Formation. In Tarwhine-1 these two units are separated by about 41 metres of greensand - the Gurnard Formation.

There are two distinct phases to the greensand. The lower, sampled in sidewall cores at 1383 metres and 1380.9 metres respectively, is composed almost entirely of pelletal glauconite. Some pyrite and large angular quartz grains are also present, however, there is no carbonate in either sample. Some fish remains have been found in the sidewall core at 1383 metres.

SUMMARY OF PALAEOLOGICAL ANALYSIS
TARWHINE-1 - GIPPSLAND BASIN
INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (METRES)	MICRO-FOSSIL YIELD	PRESERVATION	DIVERSITY	ZONE	RATING	AGE
SWC 153	815.0	Very Low	Very very poor	Very very low	Indeterminate	-	(No planktonic foraminifera)
SWC 152	860.2	Very Low	Very poor	Very low	Indeterminate		
SWC 151	889.9	Very Low	Very very poor	Very low	Indeterminate		
SWC 150	920.1	Very Low	Very Poor	Very Low	Indeterminate		
SWC 149	950.2	Very Low	Very Poor	Low	Indeterminate		
SWC 148	980.0	Very Low	Very Poor	Low	Indeterminate	-	(Preservation makes species identification almost impossible).
SWC 147	1010.3	Low	Poor	Low	A4	1	Early Pliocene - Mid/Late Pliocene
SWC 146	1039.9	Low	Poor	Moderate	A4	1	Early Pliocene - Mid/Late Pliocene
SWC 145	1070	Low	Poor	Low	Indeterminate		
SWC 144	1100	Moderate	Good	High	G	1	
SWC 143	1130.1	High	Good	High	G	1	Early Miocene
SWC 142	1160	Moderate	Moderate	Moderate	G	1	Early Miocene
SWC 141	1190.1	High	Moderate	High	G	1	Early Miocene
SWC 139	1250	High	Good	High	H1	2	Early Miocene
SWC 138	1280	High	Good	High	I	1	Late Oligocene
SWC 137	1310	High	Moderate	High	J1	2	Early Oligocene
Cuttings	1320	High	Variable	High	J2	3	Early Oligocene
Cuttings	1340	Moderate	Variable	Moderate	J2	3	Early Oligocene
SWC 135	1345	NFF	-	-	-	-	
SWC 134	1348	Low	Moderate	Low	K	1	Late Eocene
SWC 133	1351.1	Low	Poor	Low	K	1	Late Eocene
SWC 132	1353	Moderate	Moderate	Low	Indeterminate	-	
SWC 131	1356.1	Moderate	Moderate	Moderate	Indeterminate	-	
SWC 130	1359	Low	Poor	Low	K	1	Late Eocene
SWC 129	1361.9	Moderate	Moderate	High	K	1	Late Eocene
SWC 128	1365.1	Moderate	Poor	High (esp. Benth.)	K	0	Late Eocene

TARWHINE-1 Cont..

NATURE OF SAMPLE	DEPTH (METRES)	MICRO- FOSSIL YIELD	PRESERVATION	DIVERSITY	ZONE	RATING	AGE
SWC 127	1367.1	Low	Poor	Moderate	K	2	Late Eocene
SWC 126	1369.1	Very Low	Poor	Low	Indeterminate	-	(Rotalid benthonics and indeterminate planktonics)
SWC 125	1370.9	Very Low	Poor	Very Low	Indeterminate	-	(Few agglutinated benthonics only).
SWC 124	1373	Very Low	Poor	Very Low	Indeterminate	-	(Few indeterminate Rotalid and and agglutinated benthonics)
SWC 123	1375.1	Very Low	Poor	Very Low	Indeterminate	-	(Few agglutinated benthonics only)
SWC 121	1379.1	NFF	-	-	-	-	-
SWC 120	1380.9	NFF	-	-	-	-	-
SWC 119	1383	NFF	-	-	-	-	-
SWC 118	1386	NFF	-	-	-	-	-
SWC 117	1388.6	NFF	-	-	-	-	-
SWC 116	1392	NFF	-	-	-	-	-
SWC 115	1394.5	NFF	-	-	-	-	-

NFF = No foraminiferal fauna.

MICROPALAEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND

ELEVATION: KB: 21m GL: -48m

WELL NAME: TARMIINE-1

TOTAL DEPTH: 2500 metres

AGE	FORAM. ZONULES	HIGHEST DATA					LOWEST DATA					
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	
PLEISTOCENE	A ₁											
	A ₂											
PLIOCENE	A ₃											
	A ₄	1010.3	2				1039.9	1				
MIOCENE	B ₁											
	B ₂											
	LATE	C										
		D ₁										
		D ₂										
	MIDDLE	E ₁										
		E ₂										
		F										
		G	1100	1				1190.1	1			
	EARLY	H ₁	1250	2				1250	2			
		H ₂										
	OLIGOCENE	LATE	I ₁	1280	1							
			I ₂					1280	1			
		EARLY	J ₁	1310	2				1310	2		
J ₂			1320	3				1340	3			
K			1348	1				1367.1	2	1365.1	0	
Pre-K												

COMMENTS: The non-occurrence of zone H₂ is likely to be a result of a sampling gap. The lack of Zones F to B₁ indicates either a very condensed sequence or a hiatus. Species identification above 1010.3 metres is impossible due to very poor preservation.

CONFIDENCE O: SWC or Core - Complete assemblage (very high confidence).

PART II

BASIC DATA

Summary of basic Palaeontological Analyses

Range Charts

SUMMARY OF PALAEOLOGICAL ANALYSIS
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 BASIC DATA

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SWC 153	815.0	Very Low	Very very poor	Very very low
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SWC 149	950.2	Very Low	Very Poor	Low
SWC 148	980.0	Very Low	Very Poor	Low
SWC 147	1010.3	Low	Poor	Low
SWC 146	1039.9	Low	Poor	Moderate
SWC 145	1070	Low	Poor	Low
SWC 144	1100	Moderate	Good	High
SWC 143	1130.1	High	Good	High
SWC 142	1160	Moderate	Moderate	Moderate
SWC 141	1190.1	High	Moderate	High
SWC 139	1250	High	Good	High
SWC 138	1280	High	Good	High
SWC 137	1310	High	Moderate	High
Cuttings	1320	High	Variable	High
Cuttings	1340	Moderate	Variable	Moderate
SWC 135	1345	NFF	-	-
SWC 134	1348	Low	Moderate	Low
SWC 133	1351.1	Low	Poor	Low
SWC 132	1353	Moderate	Moderate	Low
SWC 131	1356.1	Moderate	Moderate	Moderate
SWC 130	1359	Low	Poor	Low
SWC 129	1361.9	Moderate	Moderate	High
SWC 128	1365.1	Moderate	Poor	High
SWC 127	1367.1	Low	Poor	Moderate
SWC 126	1369.1	Very Low	Poor	Low
SWC 125	1370.9	Very Low	Poor	Very Low
SWC 124	1373	Very Low	Poor	Very Low
SWC 123	1375.1	Very Low	Poor	Very Low
SWC 121	1379.1	NFF	-	-
SWC 120	1380.9	NFF	-	-
SWC 119	1383	NFF	-	-
SWC 118	1386	NFF	-	-
SWC 117	1388.6	NFF	-	-
SWC 116	1392	NFF	-	-
SWC 115	1394.5	NFF	-	-

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