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1. ABSTRACT

Paynesville-1 was drilled to 709m KB in PEP 98, onshore Gippsland Basin. Sidewall core samples from 442.0m to 630.0m have been examined for calcareous nannoplankton, foraminifera and palynomorphs and indicate the following stratigraphic subdivision.

DEPTH (mkB)	UNIT	ZONE	AGE
442-492	Gippsland Lst	NN4-NN5 (F-G)	Early Miocene
561	Lakes Entrance Fm ('upper member')	G	Early Miocene
571-574.5	Lakes Entrance Fm ('lower member')	NP25, P. tuberculatus	Oligocene
576.5-579	Lakes Entrance Fm or Latrobe Group	P. tuberculatus	Early Oligocene
586-597	Lakes Entrance Fm or Latrobe Group	Middle N. asperus - P. tuberculatus	Late Eocene-Early Oligocene
605	Lakes Entrance Fm or Latrobe Group	Middle-Upper N. asperus	Late Eocene
608.5-630	Indeterminate		

The environment of deposition from 442m to 571m is inner to middle neritic and from 574.5m to 576.5m is undifferentiated marine. The samples from 579m to 605m also appear to be deposited in a marine environment but the indications may, however, be drilling mud contaminants.

Moderate organic contents in the samples from 571m to 576.5m proved to have only a poor source rock potential. Spore fluorescence of light yellow correlates with mean reflectances of 0.35% to 0.37% indicating the section is immature.

VII SOURCE ROCK POTENTIAL AND MATURITY

Three samples at 571.0m, 574.5m and 576.5m were examined for source rock potential and organic maturity. Data on kerogen components in these samples are shown in Tables 1A, 1B and 1C, and the methods and terms used are explained in Appendix No. 1.

All three samples yielding around 1.0ml/10g organic matter suggest a good source rock potential. However, the percentage of liptinite was low, that of fluorescing liptinite being even lower which contradicts a good source rock potential. Most of the palynomorphs were oxidised and non-fluorescing. The fluorescence colours were light yellow to yellow as against yellow to light orange spore colours. These data would suggest the maturity level of very early oil to early oil generating capabilities.

Vitrinite reflectance determinations were made on two samples (Appendix 2). Five determinations from 571m indicate a mean reflectance of 0.35% with a range of 0.31%-0.40%. At 574.5m 27 determinations indicate a mean of 0.37% and a range of 0.28%-0.53%. This agrees with the light yellow fluorescence colours noted above indicating the section is immature.

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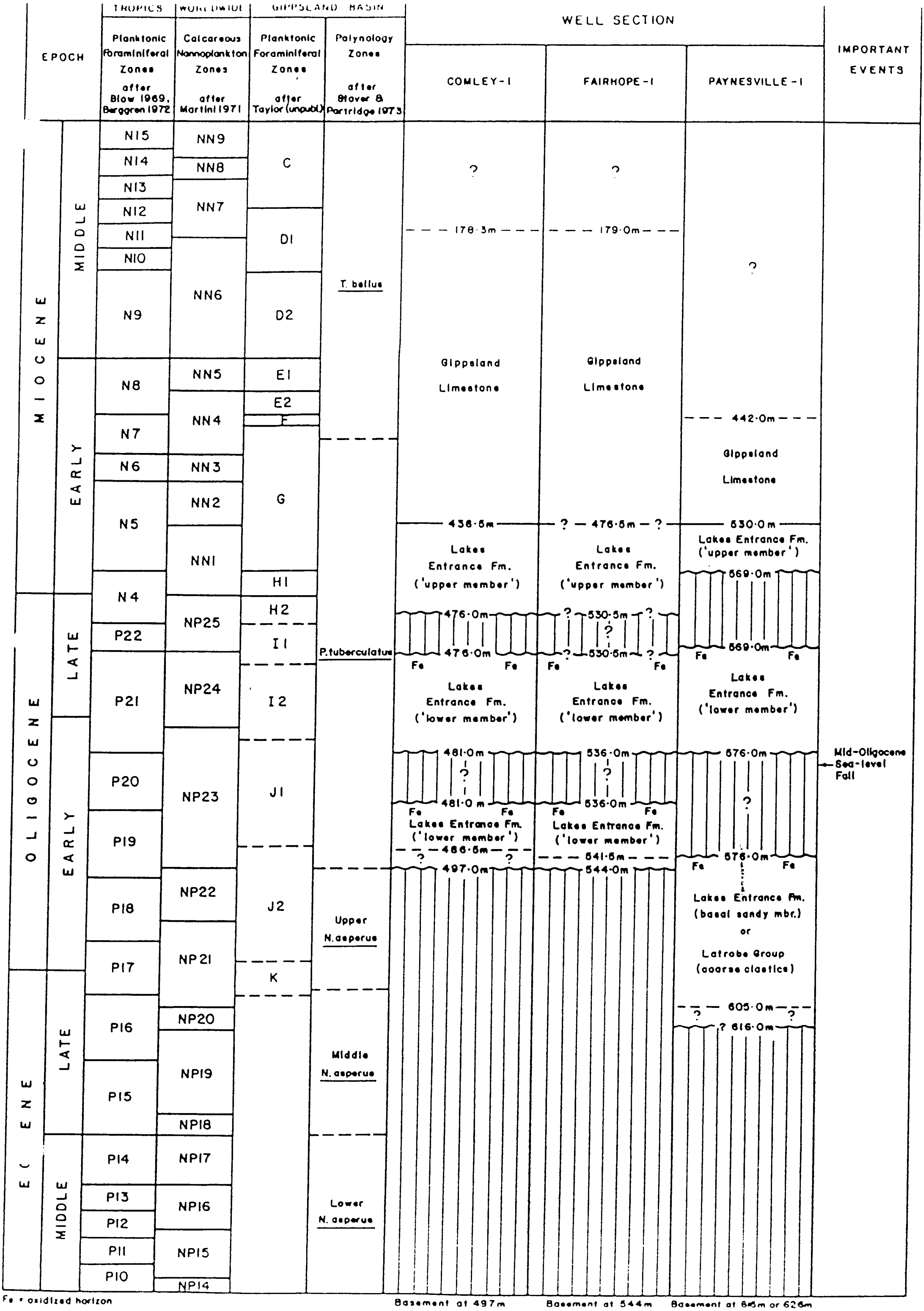
FIGURE 1 : SUMMARY CHART, PAYNESVILLE-1

DEPTH (mKB)	LITHOLOGY *	UNIT	NANNOFOSSIL ZONE	PLANK FORAM ZONE	PALYNOLOGY ZONE	AGE	ENVIRONMENT
442.0	* Calcarenite	Gippsland	NN4-NN5	F	Not studied	Early Miocene	Inner neritic
492.0	* Calcarenite	Limestone	NN4-NN5	G	Not studied	Early Miocene	Inner/middle neritic
			-----log break at 530.0m-----				
551.0	* Calcisiltite	Lakes Entrance Fm ('upper member')	Indeterm.	G	Not studied	Early Miocene	Middle neritic
			-----log break at 569.0m-----				
571.0	* Sandy glauconitic marl	Lakes Entrance	NP25	Indeterm.	*P. tuberculatus*	x Late Oligocene	Middle neritic
574.5	* Slightly glauconitic fine grained sandstone	Formation ('lower member')	Indeterm.	Indeterm.	*P. tuberculatus*	Early Oligocene	o Marine
			-----log break at 576.0m-----				
576.5	* Oxidised glauconitic sandstone		Indeterm.	Indeterm.	*P. tuberculatus*	Early Oligocene	o Marine
579.0	?	Lakes	Not studied	Not studied	*P. tuberculatus*	Early Oligocene	o Marine
586.0	?	Entrance Formation	Not studied	Not studied	Middle *N. asperus* - *P. tuberculatus*	Late Eocene - Early Oligocene	? Marine (+)
597.0	= Sandstone	(basal sandy member) or	Not studied	Not studied	Middle *N. asperus* - *P. tuberculatus*	Late Eocene - Early Oligocene	? Marine (+)
605.0	= Sandstone	Latrobe Group (coarse clastics)	Not studied	Not studied	Middle *N. asperus* - lower part of Upper *N. asperus*	Late Eocene	? Marine (+)
608.5	= Sandstone		Not studied	Not studied	Indeterm.	Indeterm.	Indeterm.
			-----log break at 616.0m-----				
617.0	(economic basement)		Not studied	Not studied	Indeterm.	Indeterm.	Indeterm.
630.0			Not studied	Not studied	Indeterm.	Indeterm.	Indeterm.

TD 709m KB

* Lithology based on washed residue
= Lithology based on wireline log character.

o Environment based on palynomorph data.
x Age based on calcareous nannoplankton.
+ Dinoflagellates (greater than 25%) may be drilling mud contaminants.



EPOCH
TROPICS
Planktonic Foraminiferal Zones after Blow 1969, Berggren 1972
WORLDWIDE
Calcareous Nannoplankton Zones after Martini 1971
GIPPSLAND BASIN
Planktonic Foraminiferal Zones after Taylor (unpubl.)
Palynology Zones after Stover & Partridge 1973
WELL SECTION
COMLEY-1
FAIRHOPE-1
PAYNESVILLE-1
IMPORTANT EVENTS
MIOCENE
MIDDLE
EARLY
OLIGOCENE
LATE
EARLY
EOCENE
LATE
MIDDLE
N15
N14
N13
N12
N11
N10
N9
N8
N7
N6
N5
N4
P22
P21
P20
P19
P18
P17
P16
P15
P14
P13
P12
P11
P10
NN9
NN8
NN7
NN6
NN5
NN4
NN3
NN2
NN1
NP25
NP24
NP23
NP22
NP21
NP20
NP19
NP18
NP17
NP16
NP15
NP14
C
D1
D2
E1
E2
F
G
H1
H2
I1
I2
J1
J2
K
T. bellus
P. tuberculatus
Upper N. asperus
Middle N. asperus
Lower N. asperus
178·3m
179·0m
442·0m
Gippsland Limestone
436·5m
476·5m
530·0m
Lakes Entrance Fm. ('upper member')
569·0m
476·0m
530·5m
Fe
Lakes Entrance Fm. ('lower member')
481·0m
536·0m
576·0m
Mid-Oligocene Sea-level Fall
486·5m
541·5m
497·0m
544·0m
Lakes Entrance Fm. (basal sandy mbr.) or Latrobe Group (coarse clastics)
605·0m
616·0m
Fe = oxidized horizon
Basement at 497m
Basement at 544m
Basement at 6?5m or 626m

Tentative chronostratigraphic correlation between COMLEY 1, FAIRHOPE 1 & PAYNESVILLE 1 wells, onshore Gippsland Basin - revised by Ampol Exploration Ltd

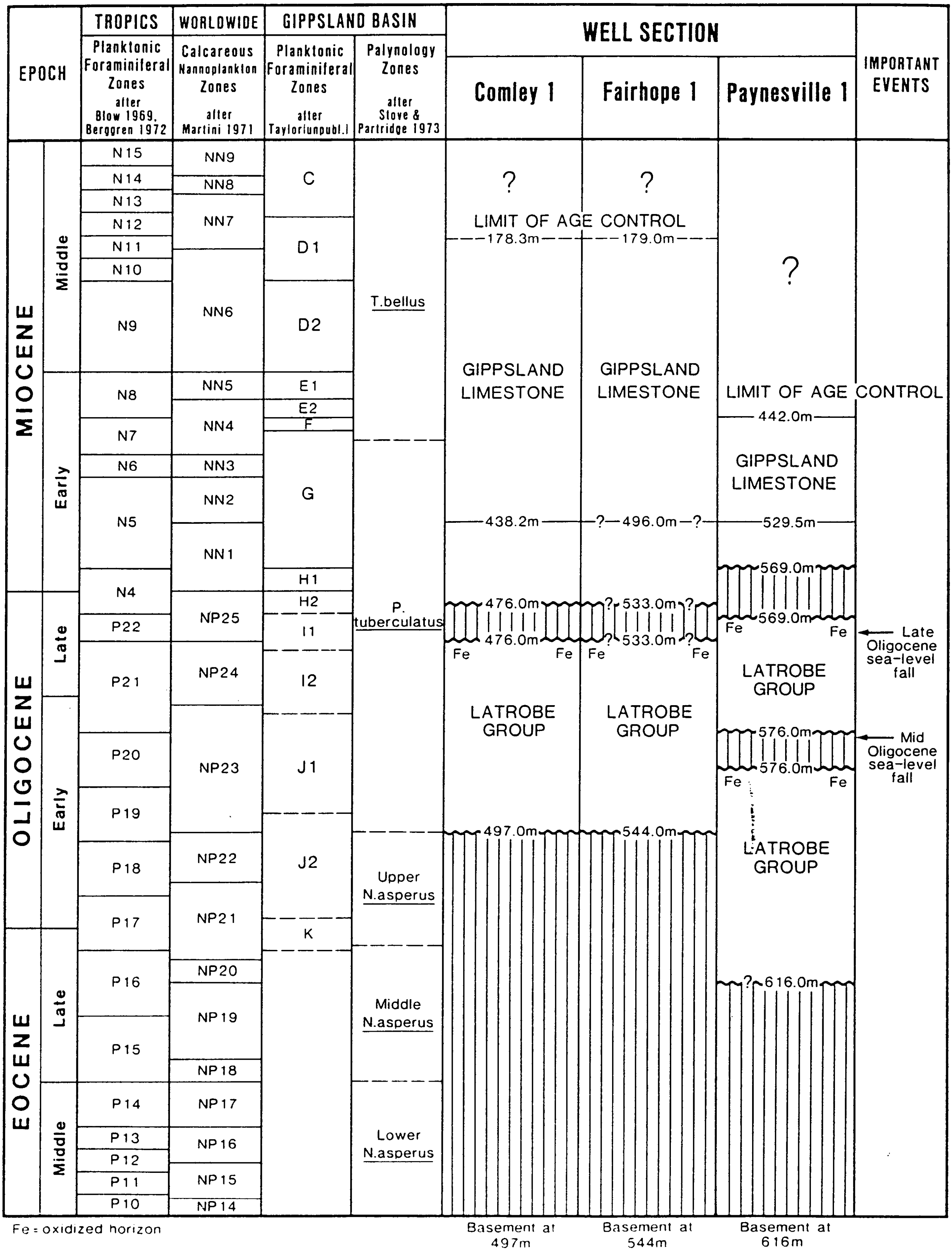


FIGURE 3

Spores and pollen recorded in Paynesville-1

KEY:

x present
• common
cf compared with

	571.0m	574.5m	576.5m	579.0m	586.0m	597.0m	605.0m
Alisporites varius			x	x		x	x
Araucariacites australis	x	x	x	x			x
Baculatisporites comaumensis		x	x				
Banksieaeidites arcuatus	x						
Camarozonosporites sherlockensis				x			
Cingutriletes comaumensis		x		x			
Cyathidites australis	x	x	x	x	x	x	x
Cyathidites minor	x	x	x	x	x	x	x
Cyathidites subtilis	x	x	x	x			
Dacrycarpites australiensis	x	x	x	x		x	
Foveotriletes balteus			?				
Foveotriletes palaequetrus			?				
Gleicheniidites circinidites			x				
Gleicheniidites senonicus	x	x	x	x	x	x	
Haloragacidites harrisii	x	x	x	x	x	x	x
Herkosporites elliottii	x	x					
Ischyosporites gremius	cf	cf				x	
Laevigatosporites major	x		x	x	x	x	x
Laevigatosporites ovatus	x	x	x	x	x	x	x
Lygistepollenites florinii	x	x	x	x	x	x	x
Malvacipollis subtilis		x		x			
Matonisporites mullerii			x				x
Matonisporites ornamentalis		cf					
Monoporites annulatus	x						
Myrtaceidites verrucosus			x		x		
Nothofagidites asperus						x	
Nothofagidites deminutus	x	x	x	x			
Nothofagidites emarcidus	x	x	x	x	x	x	x
Nothofagidites falcatus	x	x				x	
Nothofagidites flemingii	x	x	x				
Nothofagidites goniatus		x	x	x			
Nothofagidites heterus	x	x	x	x	x	x	x
Nothofagidites incrassatus				x			
Nothofagidites vansteenisii			x		x		
Osmundacidites wellmanii	x		x				
Parvisaccites catastus		x	x		x	x	x
Phyllocladidites mawsonii							x
Phyllocladidites verrucatus	x	x					
Podocarpidites ellipticus	x	x	x	x		x	
Podocarpidites microreticulatus	x						
Polypodiaceoisporites tumulatus							x
Propylipollis annularis		cf	x				
Propylipollis beddoesii		x	x	cf			
Propylipollis latrobensis							x
Proteacides recavus	cf	cf					
Proteacidites adenanthoides	x	x					
Proteacidites obscurus					x		
Proteacidites pseudomoides			x				
Proteacidites stipplatus	x						
Proteacidites tenuiexinus	cf	cf				x	
Retitriletes austroclavatidites	x	x					
Rhoipites sphaerica		x	x	x	x		
Rugulatisporites micraulaxus				x		x	
Tricolporites leuros		x	cf				
Tricolporites scabratus			x				
Triletes ornamentalis					x		x
Triletes tuberculiformis				x	x	x	x
Verrucatosporites confragosus				x		x	
Verrucosisporites cristatus	x						x
Verrucosisporites kopukuensis		cf					x

FIGURE 4

Dinoflagellates and acritarchs recorded in Paynesville-1

<u>KEY:</u>

x = present
c = common
cf = compared with

	571.0m	574.5m	576.5m	579.0m	586.0m	597.0m	605.0m
Achomosphaera alcicornu				x			
Areosphaeridium polypetellum				cf			
Ascostomocystis granulatus	x						x
Cleistosphaeridium spinulastrum		x					
Cordosphaeridium gracilis				x			
Cribroperidinium apione				x			
Dapsilidinium pastielsii				x		x	
Eatonicysta n.sp.	x			x			
Eatonicysta ursulae	x						
Hafneasphaera sp.				x			
Hystrichokolpoma rigaudae		x					
Hystrichokolpoma salacium		x					
Kallosphaeridium biarmatum	x			x			
Leiosphaeridia sp.	x			x			
Lingulodinium funginum				x			
Lingulodinium machaerophorum		x		x			
Melitasphaeridium choanophorum	x						
Micrhystridium sp.	x	x	x				
Millioudodinium sp.	x			x		x	
Operculodinium bellulum	x	x	x	x			x
Operculodinium centrocarpum	x	x	x	x	x	x	x
Operculodinium israelianum	x						
Operculodinium microtriainum				x			x
Operculodinium nanaconulum	x						
Pterodinium cingulatum	x					x	
Selenopemphix nephroides			x				
Senoniasphaera n.sp.				x			x
Spiniferites membranaceous	x		x				
Spiniferites mirabilis	x	x		x			
Spiniferites pachydermus	x	x	x	x			
Spiniferites pseudofurcatus	x						x
Spiniferites ramosus gracilis	x	x	x	x		x	x
Spiniferites ramosus granomembranaceous				x			
Spiniferites ramosus granosus	x						
Spiniferites ramosus multibrevis	x	x	x				
Spiniferites ramosus ramosus	x	x	x	x	x	x	x
Spiniferites ramosus reticulatus							x
Spiniferites spp.	x	x	x	x	x	x	x
Tuberculodinium sp.	x	x					

APPENDIX NO.1.

Explanation of the source rock parameters recorded using palynological techniques.

INTRODUCTION

A rapid and reliable technique for estimating the abundances of the various kerogen components and relating these back to the source rock potential of the sediments has been developed.

Samples that are to be examined for palynology and source rock potential are processed using standard techniques that include acid digestion in cold HCl, cold HF and then boiling HCl. Any remaining mineral matter is removed by flotation of the organic material in a Zn2Br solution of SG 2.10. The heavy liquid is removed by washing and the volume of organic material (VOM, see below) recovered is measured in a 10ml conical centrifuge tube after spinning at 3000 rpm for 5 minutes. A measured proportion by volume of the organic residue (kerogen) is dried on a coverslip with PVA and is then mounted on to a microscope slide with a plastic resin (Elvacite or Eukit).

Counts of the various kerogen components are made on the kerogen slide using modified point-counting procedures and the results related back to the weight of rock processed. For example, a kerogen slide may represent the residue from 1/25g (0.04g) of the sediment. It has been measured that the field of view of the 20X objective on a Nikon microscope used by ECL is 1/4000 (1/4E3) of the total area of the kerogen slide. If, on average, there are 4 palynomorphs observed in each field of view when scanning the slide, then the number of palynomorphs estimated per gram of sediment is 4x25x4E3 = 4E5/g (400,000 per gram). This would be regarded as a good yield that could provide a significant contribution to the source rock potential of the sediment.

Each of the measured kerogen components usually show a wide size range that also must be taken into consideration during the counts. In an effort to reduce the subjective element of the estimates, the same microscope objective is used to count the same parameter where this is possible. It is not feasible to directly relate the measured number of particles of a particular kerogen component or their area to an estimated volume or mass for that component. However, an empirical relationship between the abundance estimates and source rock potential has been determined based on the examination of known source rock sequences. To facilate the display of the abundance data and discussion of these results, a simplified four point scale has been developed based on comparisons with source rocks from a wide variety of locations. For example, palynomorph abundances vary from less than 1000(1E3)/g in poor source rocks to more than 1000000(1E6)/g in very good source rocks.

GLOSSARY

1. PALYNOMORPH YIELD

   The estimated number of palynomorphs per gram of sediment expressed in terms of low (=1), moderate (=2), high (=3) and very high (=4) when compared with other source rocks (1=<1E3/g; 2=1E3-<3E4/g; 3=3E4-1E6/g; 4=>1E6/g; 20X Objective).

2. PRESERVATION

   Estimate of the general preservation level of the palynomorphs, recorded in terms of poor (=1), moderate or fair (=2), good (=3) and very good (=4).

3. SPORE-POLLEN AND MICROPLANKTON DIVERSITY

   The estimated number of different species in the sample expressed in terms of low (=1), moderate (=2), high (=3) and very high (=4) when compared with other source rocks (1=1-5; 2=6-15; 3=16-25; 4=>25).

4. PERCENT MICROPLANKTON

   The estimated proportion of dinoflagellates, acritarchs and other algal cysts expressed as a percentage when compared with the total palynomorph assemblage.

5. CUTICLE ABUNDANCE

   The estimated number of cuticle fragments (large and small) per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E2/g; 2=1E2-<3E3/g; 3=3E3-1E5/g; 4=>1E5/g; 10X Objective).

6. PERCENTAGE OF LIPTINITES

   The proportion of the unfiltered kerogen (as observed on a kerogen slide) that comprises palynomorphs (spores, pollen and algal cysts) and cuticle fragments is estimated and expressed as a percentage of the total organic matter. Only the larger, properly identifiable liptinites can be included in this category. Finely degraded liptinites (less than 1 micron) are regarded as part of the sapropel group of macerals except when distinguishable by UV fluorescence.

7. PERCENTAGE OF FLUORESCENT LIPTINITES

The proportion of the unfiltered kerogen (as observed on a kerogen slide) that comprises fluorescing palynomorphs (spores, pollen and algal cysts) and fluorescing cuticle fragments is estimated and expressed as a percentage of the total organic matter. This includes the finely degraded liptinites that are regarded as Amorphous Sapropel (see below). Those liptinites that are unoxidised and able to auto-fluoresce are regarded as the most oil-prone fraction of the organic matter.

8. HYLOGEN ABUNDANCE

The estimated number of partially translucent woody or lignitic fragments per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E3/g; 2=1E3-<3E4/g; 3=3E4-1E6/g; 4=>1E6/g; 20X Objective). Broadly equivalent to vitrinite and previously referred to as fusain or fusinite.

9. MELANOGEN ABUNDANCE

The estimated number of opaque and angular woody fragments per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E3/g; 2=1E3-<3E4/g; 3=3E4-1E6/g; 4=>1E6/g; 20X Objective). Broadly equivalent to inertinite. As there is usually a gradation between melanogen and hylogen the two components can be difficult to distinguish,

10. GRANULAR SAPROPEL YIELD

The estimated number of clumps of granular sapropel per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E4/g; 2=1E4-<3E6/g; 3=3E6-1E7/g; 4=>1E7/g; 40X Objective). Granular sapropel is regarded as the very fine, fluffy, degraded and oxidised organic matter that shows no fluorescence and is usually a darker colour than the amorphous sapropel. The measurement of "clumps" of sapropel is highly subjective but provides a good order of magnitude estimate that is relatively consistent provided the sample processing is constant and the same objective is used.

11. AMORPHOUS SAPROPEL YIELD

The estimated number of clumps of amorphous sapropel per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E4/g; 2=1E4-<3E6/g; 3=3E6-1E7/g; 4=>1E7/g; 40X Objective). Amorphous sapropel is here regarded as weakly fluorescing, finely degraded liptinitic material. It appears to consist of fragments of palynomorphs eg. algae, and cuticles but may also include adsorbed hydrocarbons onto the organic debris, however, the particles are usually too small to be resolved by the microscope. The measurement of "clumps" of sapropel is highly subjective but provides a good order of magnitude estimate that is relatively consistent provided the sample processing is constant and the same objective is used.

12. PERCENTAGE OF SAPROPEL

The proportion of the unfiltered kerogen (as observed on a kerogen slide) that comprises sapropel, here regarded as very fine, (less than 1 micron) degraded organic matter is estimated and expressed as a percentage of the total organic matter. This includes both Granular and Amorphous Sapropel (see above).

13. SAPROPEL COLOUR

The overall colour of the dispersed organic matter and was the original parameter observed to estimate Thermal Alteration Index (TAI). Generally the most dominant colour is that of the granular sapropel which usually has a darker colour than the amorphous sapropel. Not usually recorded as it reflects both the environment of deposition and the maturation level.

14. SPORE COLOUR

The colour of the spore or pollen exines in transmitted white light. Variables that can affect the colour (apart from maturation) are the species type and exine thickness as well as any exposure to oxidising environments during and after deposition. The darkest colours of the least oxidised exines are taken as being the most significant. The change in colour from yellow to orange is regarded as indicating the onset of oil generation. Gas generation is suggested as becoming significant as the colours change to brown. Oil generation appears to cease as the spore colours approach dark brown and when they become black significant gas generation also probably ceases.

15. UV LIPTINITE FLUORESCENCE COLOUR

The dominant colour of the unoxidised liptinites (exines, cuticle and some amorphous sapropel) in reflected UV light observed with a Nikon EF-D UV330-380/4000M/420K filter combination and a 20x UV-Fluor objective. Liptinites that have been oxidised prior to deposition (mostly by recycling) show reduced intensities. The fluorescent colours observed are a complex mixture not comparable to normal colours as seen with white light. The hues range from light blue to white to light yellow with increasing maturity. The colours change to yellow at the beginning of the oil window (as here interpreted) and change to gold, dull yellow, orange and dull orange to dull red at the base of the oil window. The maturation level of sediments near the base of the oil window and deposited in an oxidising environment can be difficult to interpret.

16. VOLUME OF ORGANIC MATTER (VOM)

The measured volume of organic matter (VOM) left after removal of the mineral matter in the sample (see Introduction above) provides a rapid and reliable indication of the organic richness of the samples. From experience it has been found that the values of VOM when expressed as ml/10g approximate the %TOC determinations. Generally, <0.5 ml/10g is regarded as a poor (lean) source rock, 0.5-<2.5 ml/10g is moderate, 2.5-4.5 ml/10g is good (rich) and >4.5 ml/10g is very good (very rich). However, the abundance of unoxidised liptinites in the kerogen must also be considered in assessing the oil source rock potential of the sediments.

17. VOLUME OF FLUORESCENT LIPTINITES

The total amount of potential oil generating liptinites is calculated by multiplying the Volume of Organic Matter (VOM/10g) with the percentage of fluorescent liptinites observed in the sample (see above). The results are expressed as microlitres per gram. On an empiric basis, values greater than 200 are regarded as good source rocks.

18. OIL INDEX

An estimate of the overall abundance of liptinitic material in the kerogen expressed on a scale of 1-4 (being equivalent to poor, moderate, good and very good). This provides a broad indication of the potential of the sample to generate oil or condensate. The OIL INDEX is calculated by averaging the values for Palynomorph Abundance, Cuticle Abundance and Amorphous Sapropel Abundance (see above) and rounding the result to one digit.

19 GAS INDEX

An estimate of the overall abundance of that part of the organic matter in the kerogen that is regarded as being capable of generating gas if a high enough maturation level is reached. The estimate is expressed on a scale of 1-4 (being equivalent to poor, moderate, good and very good). The GAS INDEX is calculated by averaging the values for Palynomorph Abundance, Cuticle Abundance, Amorphous Sapropel Abundance, Granular Sapropel Abundance and Hylogen Abundance (see above) and rounding the result to one digit.

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II. INTRODUCTION

ECL Geological Laboratory was contracted by Ampol Exploration Ltd to undertake laboratory studies of sidewall core samples from the well Paynesville-1. The well is located in onshore exploration Permit PEP 98, Gippsland Basin, Victoria, and was drilled to a total depth of 709m KB.

Sidewall core samples from the interval 179.0 to 541.5m were analysed for calcareous nannoplankton, foraminifera, palynomorphs, source rock potential and maturity. The objective of this study was to provide biostratigraphic zonations, interpretation of depositional environment and information on hydrocarbon habitat for geological evaluation of the well section.

III. ROCK-STRATIGRAPHIC NOMENCLATURE

(A) Basal Siliciclastics - Upper Member of Latrobe Group or Lower Member of Seaspray Group

Palynological and wireline log character evidence indicates uncertainty whether the clastic sequence (including clean quartz sands) between 576m and 616m in Paynesville-1 represent a facies of the upper part of the Latrobe Group or a facies of the lower part of the Seaspray Group (Lakes Entrance Formation). Palynological evidence indicates that the interval is Middle *N. asperus* to *P. tuberculatus* in age (Late Eocene-Early Oligocene). The common occurrence of dinoflagellates in samples between 579m and 605m indicates that the siliciclastics are marine and probably represent the basal part of the Early Oligocene Lakes Entrance Formation transgression. On the basis of wireline log character, however, the siliciclastic sequence (greater than 50% clean sands between 576m and 616m) appears to be more characteristic of the Latrobe Group (non-marine to marginal marine siliciclastics). It is possible that dinoflagellates recorded in these sands represent downhole contaminants from the glauconitic and marly facies higher in the well. Because of the uncertainty whether these dinoflagellates are *in situ*, the siliciclastic sequence between 576 and 616m in Paynesville-1 is interpreted to represent a sand facies of the upper part of the Latrobe Group or the lower part of the Seaspray Group.

(B) Lakes Entrance Formation (Lower Member)

In this investigation Early-Late Oligocene glauconitic sandstone, oxidized glauconitic sandstone/siltstone and glauconitic marl, are referred to informally as the "lower member" of the Lakes Entrance Formation. The "lower member" includes the following formal onshore stratigraphic units : Colquhoun Sandstone Member, Cunninghame Greensand Member, Metung Marl Member, Giffard Sandstone Member and Seacombe Marl Member.

(C) Lakes Entrance Formation (Upper Member)

In this investigation Late Oligocene-Early Miocene marls (relatively clean carbonate with subordinate amounts of glauconite and quartz) are referred to informally as the "upper member" of the Lakes Entrance Formation in Paynesville-1.

(D) Gippsland Limestone

In Paynesville-1 Early-Middle Miocene clean skeletal limestone and calcarenites with common bryozoan fragments are referred to as the Gippsland Limestone.

IV. GEOLOGICAL COMMENTS

The Late Eocene-Early Oligocene siliciclastics in Paynesville-1 between 576.0 and 616.0m are inferred to be disconformably overlain by the "lower member" of the Lakes Entrance Formation. An oxidized horizon (observed in sidewall core sample at 576.5m) occurs at the top of the siliciclastic sequence between 576m and 577m. This oxidized horizon was also present in Comley-1 (481-482m) and Fairhope-1 (536-537m) and is interpreted to have resulted from subaerial exposure during the mid-Oligocene major global fall in relative sea-level at 30 Ma. Vail et al. (1977) indicate this event to occur near the top of Zone NP23.

The "lower member" of the Lakes Entrance Formation between 569.0 and 576.0m comprises non-calcareous glauconitic sandstone between 576 and 573.5m (characterised by high gamma ray log character) and sandy glauconitic marl between 573.5 and 569m. Calcareous nannoplankton indicate a Late Oligocene (Zone NP 25) age for the sample at 571.0m. The basal glauconitic sandstone between 576 and 573.5m is interpreted to be younger than the 30Ma mid-Oligocene event although this cannot be confirmed on palaeontological grounds. The thickness of the Lakes Entrance Formation ('lower member') between the mid-Oligocene and late-Oligocene disconformities in Paynesville-1 is 7m and is nearly identical to that recorded in Comley-1 (5m) and Fairhope-1 (5.5m).

The "upper member" of the Lakes Entrance Formation is considered to disconformably overlie the "lower member" of the Lakes Entrance Formation at 569m in Paynesville-1. An oxidized horizon is interpreted to occur between 569m and 570.5m on the basis of wireline log character. The hiatus between the 'lower member' and 'upper member' of the Lakes Entrance Formation in Paynesville-1 spans the basal Early Miocene. The occurrence of Zone G planktonic foraminifera at 561.0m (8m above disconformity) indicates the likely absence of basal Early Miocene sediments (Aquitainian) in the well.

The Gippsland Limestone is interpreted to conformably overlie the Lakes Entrance Formation at approximately 530m. The log break at 530m is based on log correlation with Comley-1 where there is better sample control across the Lakes Entrance Formation - Gippsland Limestone boundary.

V. MICROPALAEONTOLOGY

A total of 7 sidewall core samples from the interval 442.0-586.0m were analysed for foraminifera and calcareous nannoplankton. Calcareous microfossil species identified in the well section, interpreted zonation and depositional environment subdivision have been plotted on the micropalaeontological distribution chart (Enclosure 1).

The planktonic foraminiferal letter zonal scheme of Taylor (in prep.) and the NP-NN calcareous nannoplankton letter scheme of Martini (1971) are used in this investigation. Foraminiferal studies by Carter (1964) and Jenkins (1971), and calcareous nannoplankton investigations by Edwards (1971) and Siesser (1979) have also been consulted.

(A) Calcareous Nannoplankton Biostratigraphy

i) 442.0-492.0m : Zones NN4-NN5 (Upper Early Miocene)

The occurrence of *Sphenolithus heteromorphous* in the interval indicates assignment to Zones NN4 or NN5.

ii) 561.0m : Indeterminate

The assemblage from 561.0m is not age-diagnostic.

iii) 571.0m : Zone NP25 (Late Oligocene)

The rare occurrence of *Dictyococcites bisectus* without *Chiasmolithus oamaruensis* is indicative of Zone NP25. The assemblage also equates with the *Discoaster deflandre* Zone of Edwards (1971).

iv) 574.5-586.0m : Indeterminate

The interval is barren of calcareous nannoplankton.

B) Planktonic Foraminiferal Biostratigraphy

i) 442.0m : Zone F (upper Early Miocene)

The rare occurrence of _Globigerinoides sicanus_ without members of the _Orbulina_ - _Praeorbulina_ group indicates that the sample at 442.0m is assignable to Zone F.

ii) 492.0-561.0m : Zone G (Early Miocene)

The occurrence of _Globigerinoides trilobus_ without its descendant _G. sicanus_ indicates that the interval is assignable to Zone G.

iii) 571.0-576.5m : Indeterminate

The sample at 571.0m contains rare planktonic foraminifera of little biostratigraphic value while the samples at 574.5 and 576.5m are barren. The sample at 571.0m contains the benthonic foraminiferal species _Almaena gippslandica_ which in Comley-1 and Fairhope-1 is restricted to the nannofossil zone NP25. The presence of this species at 571.0m confirms the Late Oligocene nannofossil age-dating.

C) Environment of Deposition

i) 442.0m : Inner neritic

The association of _Amphistegina lessonii_ with rare _Brizalina_ spp., and the absence of _Uvigerina_ spp., indicates an inner neritic environment of deposition for the sample at 442.0m. The common occurrence of bryozoan fragments in the sample confirms this environmental interpretation.

ii) 492.0m : inner-middle neritic

The common occurrence of bryozoan fragments, the very low yield of planktonic foraminifera, and the presence of common Cassidulina subglobosa with rare Euvigerina and Brizalina, indicates that the sample at 492.0m was deposited in an inner to middle neritic environment.

iii) 561.0-571.0m : middle neritic

Moderate numbers of Sphaeroidina bulloides and Brizalina spp., together with low numbers of planktonic foraminifera, indicates that the interval was deposited in a middle neritic environment.

iv) 574.5-576.5m : Indeterminate

Samples from the interval are either barren or contain very impoverished foraminiferal faunas which are no environmental value.

VI. PALYNOLOGY

Ten sidewall core samples ranging in depths from 571.0m to 630.0m in Paynesville-1 were palynologically examined. The upper seven samples yielded moderate to very rich organic residues with rich to very rich palynomorph contents. The lower three samples were poor in organic contents and barren of palynomorphs.

The rich palynomorph yields consist mostly of relatively long-ranging species which mask the rare age-significant species. Also, the dinoflagellates recorded mostly have ranges beyond the interval dated by spore-pollen assemblages and only a few species were biostratigraphically useful.

The sampled interval is palynostratigraphically classified as follows according to the scheme of Stover and Partridge (1973), updated by Raine (1984) and ECL file data.

A) 571.0m-579.0m : Proteacidites tuberculatus Zone (Early Oligocene)

The interval is not older than the Proteacidites tuberculatus Zone of Oligocene age due to the occurrence of Cyathidites subtilis which has its basal occurrence in the zone. Dinoflagellate cyst Kallosphaeridium biasmatum occurring at the top and the bottom of the interval is known to be restricted to the Early Oligocene. Also, Operculodinium israelianum and Tuberculodinium are not known from rocks older than the Oligocene, and the acritarch Ascostomocystis granulatus is not known to be younger than the Oligocene.

The occurrence of _Rugulatisporites micraulaxus_ at 579.0m is considered to be by contamination as it does not occur in any overlying sample.

ii) 586.0m-597.0m : Middle _Nothofagidites asperus_-_Proteacidites tuberculatus_ Zones (Late Eocene-Early Oligocene)

Rhoipites sphaerica and _Verrucatosporites cristatus_ occurring in the interval have their basal occurrences in the Middle _Nothofagidites asperus_ Zone of Late Eocene age, while _Nothofagidites asperus_ and _Myrataceidites verrucosus_ have their top occurrences in the _Proteacidites tuberculatus_ Zone of Oligocene age. In this case, the interval can not be younger than the Early Oligocene.

The occurrence of _R. micraulaxus_ at 597.0m is considered to be by contamination.

iii) 605.0m : Middle-lower part Upper _Nothofagidites asperus_ Zone (Late Eocene)

The sample at 605.0m is dated Late Eocene on the basis of the occurrences of _Verrucosisporites cristatus_ with its base in the Middle _N. asperus_ Zone, and _Propylipollis latrobensis_ with its top in the lower part of the Upper _N. asperus_ Zone, also of Late Eocene age.

The occurrence of _Polypodiaceoisporites tumulatus_ is considered to be by contamination as the species does not occur in any overlying samples.

iv) 608.5m-630.0m : Indeterminate

The interval is barren of palynomorphs. The rare occurrences of palynomorphs recorded are considered to be by contamination.

(B) <u>Environment of Deposition</u>

The interval between 571.0m and 605.0m is considered marine on the basis of moderate to abundant and diverse dinoflagellate cyst assemblages and foraminiferal chamber-linings. The underlying interval between 608.5m and 630.0m is barren of palynomorphs and the environment of deposition is indeterminate.

TABLE 1

Summary of the source rock and maturity data from Paynesville-1

TABLE 1A

DEPTH (m)	PALYNOLOGICAL ZONE	AGE	ENVIRONMENT OF DEPOSITION	OIL POTENTIAL	MATURITY
571.0	Upper N. asperus (upper part)	Early Oligocene	Marine	Poor	Immature
574.5	Upper N. asperus (upper part)	Early Oligocene	Marine	Poor	Immature
576.5	Upper N. asperus (upper part)	Early Oligocene	Marine	Poor	Immature

TABLE 1B

DEPTH (m)	SAMPLE NO.	WEIGHT (g)	VOM (ml)	PRESER VATION (0-4)	% MICRO- PLANKTON	MICRO- PLANKTON DIVERSITY	SPORE- POLLEN DIVERSITY	PALYN YIELD (0-4)	CUT- ICLE (0-4)	HYL -OGEN (0-4)	MELAN -OGEN (0-4)	GRANULAR SAPROPEL (0-4)	AMORPHOUS SAPROPEL (0-4)
571.0	45	10	1.0	3	80	4	4	1	1	3	3	2	2
574.5	30	10	1.1	3	40	3	4	1	1	3	3	2	2
576.5	44	10	0.8	3	50	2	4	1	1	3	3	2	2

TABLE 1C

DEPTH (m)	VOM ml/10g	%SAPRO -PEL	%LIPT INITE	%FLUORESCENT LIPTINITES	VOL. FLUOR. LIPTINITES microlitres	OIL INDEX (0-4)	GAS INDEX (0-4)	SPORE COLOUR	UV LIPTINITE FLUORESCENCE COLOUR
571.0	1.00	90	5	3	30	1	2	Yellow - Lt orange	Lt yellow - yellow
574.5	1.10	85	5	4	44	1	2	Yellow - Lt orange	Lt yellow - Yellow
576.5	0.80	90	5	3	24	1	2	Yellow - Lt orange	Lt yellow - Yellow

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