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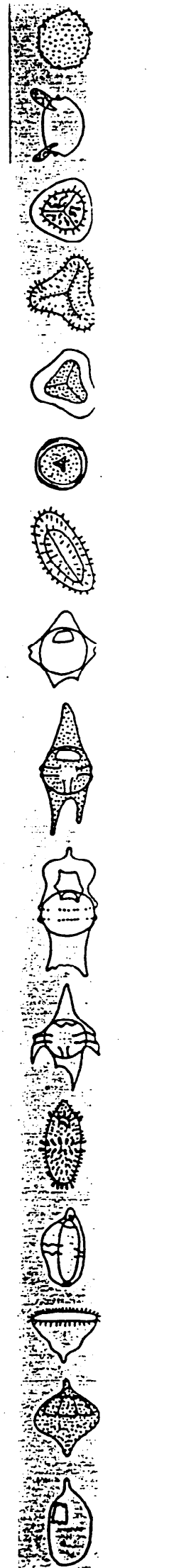

PALYNOLOGY OF ANGLO-AUSTRALIAN OIL KILLARA-1

OTWAY BASIN, AUSTRALIA

BY

ROGER MORGAN

NIGEL HOOKER

for CULTUS PETROLEUM
(AUSTRALIA) N.L.

MAY 1992
REF:OTW.KILLARA

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CONTENTS

I SUMMARY

Results of palynological analyses of six sidewall core samples from Killara-1 are summarised below.

1535.0m(swc) : hughesii : Aptian : non-marine : usually Eumerella Formation : immature/marginal mature

1565.0m(swc) : lower hughesii?/upper wonthaggiensis : Aptian?/Barremian : lower Eumerella?-upper Laira Formation : immature/marginal mature

1908.0m(swc) : upper wonthaggiensis : Barremian/Hauterivian : non-marine : usually upper Laira Formation or equivalents : marginal mature

2015.0m(swc) : indeterminate (very sparse)

2080.0m(swc) : lower wonthaggiensis : Hauterivian/Valanginian : non-marine : usually lower Laira Formation or equivalents : marginal mature

2405.0m(swc) : ?australiensis/?watherooensis : ?Berriasian/?Tithonian : non-marine : ?Pretty Hill Sandstone : marginal/early mature

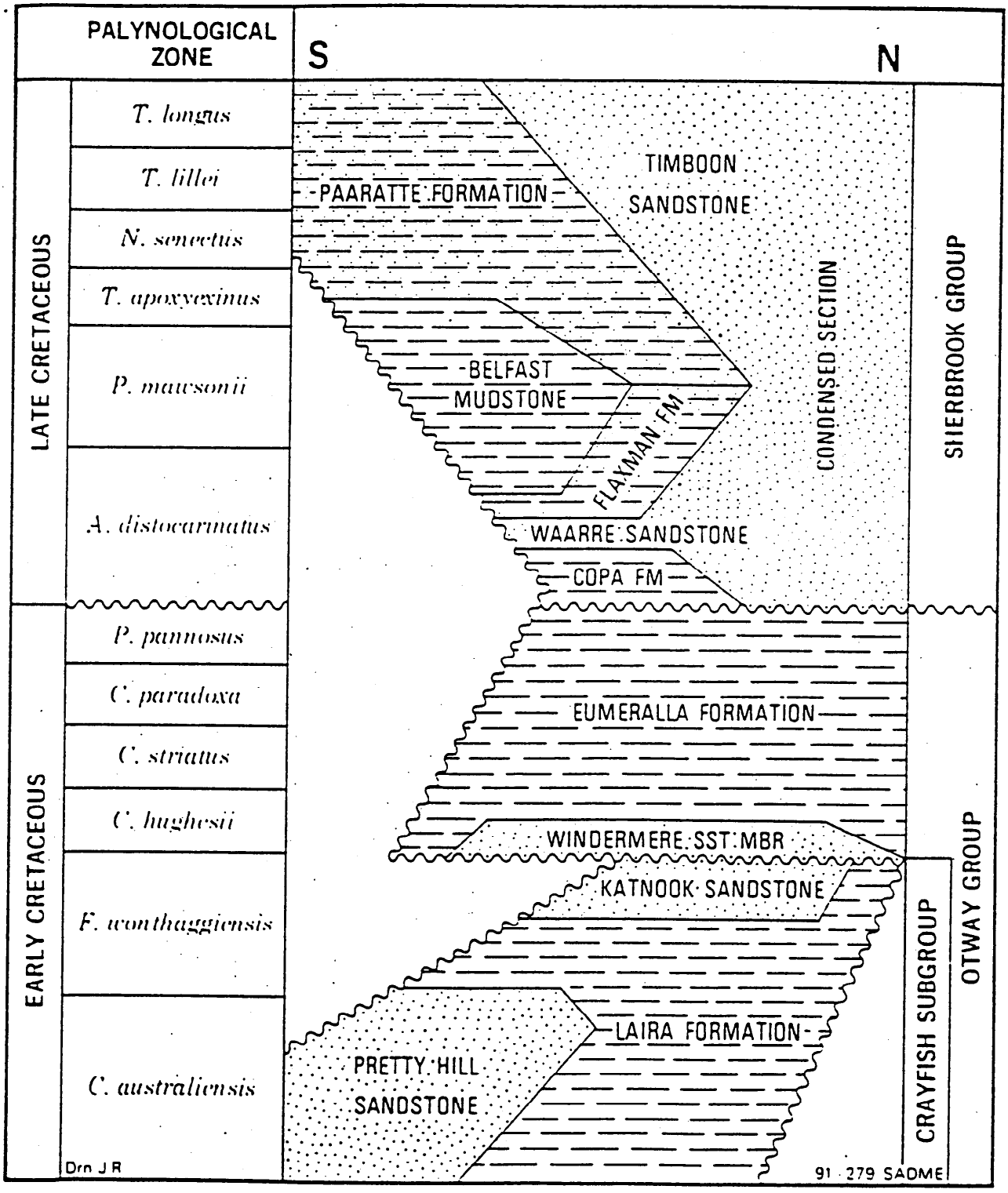
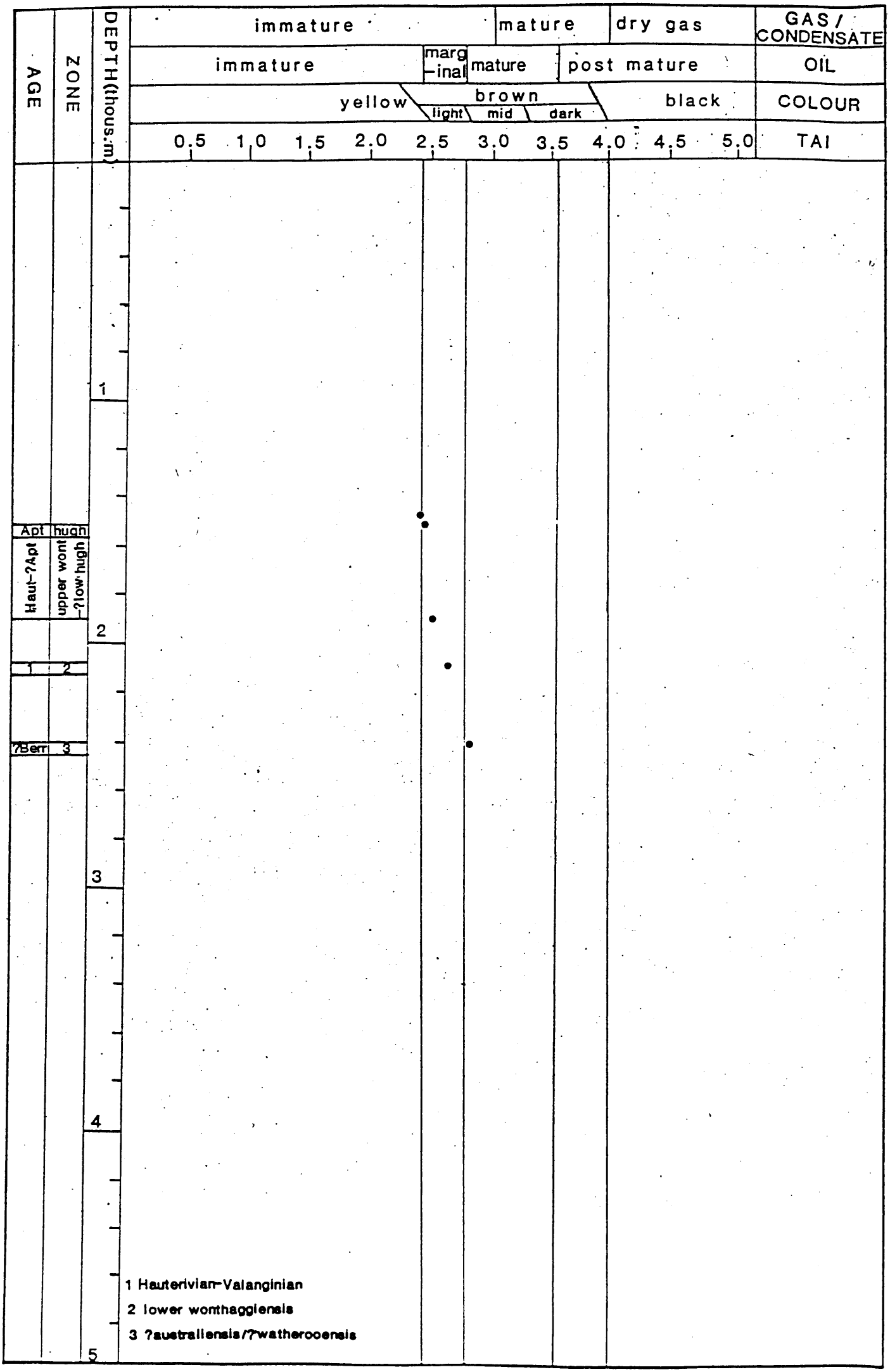


FIGURE 1 STRATIGRAPHIC NOMENCLATURE OF THE OTWAY BASIN.


AGE
ZONE
DEPTH(thous.m)
immature
mature
dry gas
GAS / CONDENSATE
immature
marg-inal
mature
post mature
OIL
yellow
brown
light
mid
dark
black
COLOUR
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
TAI
Apt
hugh
Haut-?Apt
upper wont
-?low hugh
1
2
?Berr
3
1 Hauterivian-Valanginian
2 lower wonthaggiensis
3 ?australiensis/?watherooensis

II INTRODUCTION

Palynological results on Killara-1 contained in this report are based on analyses of six sidewall cores, some of which are quite broadly spaced. Palynological recovery is variable but only one sample remains zonally indeterminate.

The zonation used is that of Helby, Morgan and Partridge (1987), which draws on all previous work and is designed for pan-Australian use. Minor modification for Otway Basin use has been necessary. The zones of Dettmann and Douglas (1976) have proved very difficult to use due to extreme scarcity of some fossils.

Lithostratigraphic nomenclature is taken from Morton J.G.G. (1990) and is summarised in Figure 1.

Maturity data was generated in the form of Thermal Alteration Index, of Staplin (using spore colour) and is plotted on Figure 2 - Maturity Profile of Killara-1. The oil and gas windows follow the general concensus of geochemical literature. The oil window corresponds to spore colours of light-mid brown (2.7) to dark brown (3.6). This would correspond approximately to Vitrinite Reflectances of 0.6% to 1.3%. Geochemists, however, have not reached universal agreement on these values, and argue variations based on kerogen type, basin type and basin history. The maturity interpretation is thus open to reinterpretation using the basic colour observations as raw data. However, the range of interpretation philosophies is not great, and would probably not move the oil window by more than two hundred metres.

III PALYNOSTRATIGRAPHY

A 1535.0m(swc) : C. hughesii Zone

Assignment to the Cyclosporites hughesii Zone of Aptian age is indicated by the youngest occurrence of Cyclosporites hughesii and the oldest occurrence of Pilosisporites notensis.

Assemblage is dominated by Cyathidites australis with frequent to common P. notensis, Cicatricosisporites australiensis and Aequitriradites spinulosus. Dictyosporites speciosus is present.

Environment is non-marine as indicated by abundant diverse miospores and absence of marine indicators. Rare occurrence of Schizosporis reticulatus and Botryococcus sp indicates freshwater influences.

The zone is usually associated with the lower Eumerella Formation.

Spore colour is yellow/light brown suggesting immaturity/marginal maturity for oil and immaturity for gas.

B 1565.0m(swc) : lower C. hughesii?-upper F. wonthaggiensis Zone

Definitive zonal assignment of this sample is precluded by relatively poor palynological recovery. A range of lower Cyclosporites hughesii-upper Foraminisporis wonthaggiensis is indicated by the youngest occurrence of Cooksonites variabilis and the oldest frequent occurrence of Cicatricosisporites australiensis. The absence of Pilosisporites notensis and Foraminisporis asymmetricus

suggest that an upper F. wonthaggiensis Zone assignment is more appropriate but a C. hughesii Zone assignment cannot be ruled out.

Environment is non-marine as indicated by abundant spore/pollen in the absence of marine indicators.

The lower hughesii is usually associated with the basal Eumerella Formation whilst upper wonthaggiensis is usually encountered in the upper Laira Formation and sandy equivalents.

Spore colour is yellow/light brown suggesting immaturity/marginal maturity for oil and immaturity for gas.

C 1908.0m(swc) : upper wonthaggiensis Zone

Assignment to the upper Foraminisporis wonthaggiensis Zone of Barremian-Hauterivian age is indicated by rare Cicatricosisporites australiensis together with a minor influx of Contignisporites cooksoniae and youngest Murospora florida. Cyclosporites hughesii and Dictyosporites speciosus are both present.

Assemblage is dominated by Cyathidites australis and Baculatisporites spp with common Falcisporites australis.

Environment is non-marine as indicated by abundant and diverse spore/pollen in the absence of marine indicators.

The zone is usually associated with the upper Laira Formation and sandy equivalents.

Spore colour is light brown suggesting marginal maturity for oil and immaturity for gas.

D 2015.0m(swc) indeterminate (very sparse)

Zonal assignment and age determination are precluded by very poor palynological recovery. Rare Ceratosporites equalis and Baculatisporites spp occur with frequent Falcisporites similis and Cyathidites australis, all of which are longranging forms.

E 2080.0m(swc) : lower wonthaggiensis Zone

Assignment to the lower Foraminisporis wonthaggiensis Zone of Hauterivian-Valanginian age is indicated by the occurrence of Dictyosporites speciosus in the absence of younger markers such as Cicatricosisporites australiensis.

Assemblage is dominated by Cyathidites australis and Baculatisporites spp with common Falcisporites similis and Retitriletes austroclavatidites.

Environment is non-marine as indicated by abundant spore/pollen in the absence of marine indicators.

The zone is usually associated with the Laira Formation and sandy equivalents.

Spore colour is light brown suggesting marginal maturity for oil and immaturity for gas.

F 2405.0m(swc) : ?australiensis-?watherooensis

A more definitive zonal assignment is precluded by the relatively sparse and low-moderate diversity assemblage. Possible assignment to Cicatricosisporites australiensis-Retitriletes watherooensis of Berriasian age is suggested by the frequent occurrence of Ceratorsporites equalis and the absence of younger indicators.

Assemblage is dominated by Baculatisporites spp and Cyathidites australis with common Falcisporites australis and Retitriletes austroclavatidites.

Environment is non-marine as indicated by abundant, low-moderate diversity spore/pollen in the absence of marine indicators.

The zones are usually associated with the Pretty Hill Sandstone.

Spore colour is mid/light brown suggesting marginal/early maturity for oil and immaturity for gas.

IV CONCLUSIONS

A Samples were variable in yield but do allow tentative identification of a Pretty Hill Sandstone section possibly in the australiensis-watherooensis Zone, a Laira Formation (and equivalents) in the wonthaggiensis Zone and a lower Eumerella Formation in the hughesii Zone. The boundary between Eumerella and Laira is not confidently picked on palynology but available evidence from this study suggests that the boundary might fall between 1535.0m (swc) (hughesii) and 1565.0m (swc) (lower hughesii?-upper wonthaggiensis).

This would place the Killara coals within the upper Laira Formation rather than the lower Eumerella Formation which is more regionally typical. However, a lower hughesii assignment (and therefore lower Eumerella) for 1565.0m cannot be totally ruled out. Further analyses over the interval 1565.0m-1908.0m is recommended in order to resolve this stratigraphic problem.

B Environments are non-marine throughout. Extensive fluvial influence is likely in the Pretty Hill Sandstone and Laira Formation which is apparently suppressing a lacustrine influence usually seen in the upper Laira Formation.

C Spore colours suggest marginal/early maturity for oil and immaturity for gas in the Pretty Hill at the base of the section. The Laira and Eumerella shows immaturity/marginal maturity for oil and immaturity for gas.

V RECOMMENDATIONS

A Further analyses over the interval 1565.0m-1908.0m is recommended to more definitively place the base of the Eumerella Formation.

VI REFERENCES

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LLARA #1 PALYNOLOGICAL DATA

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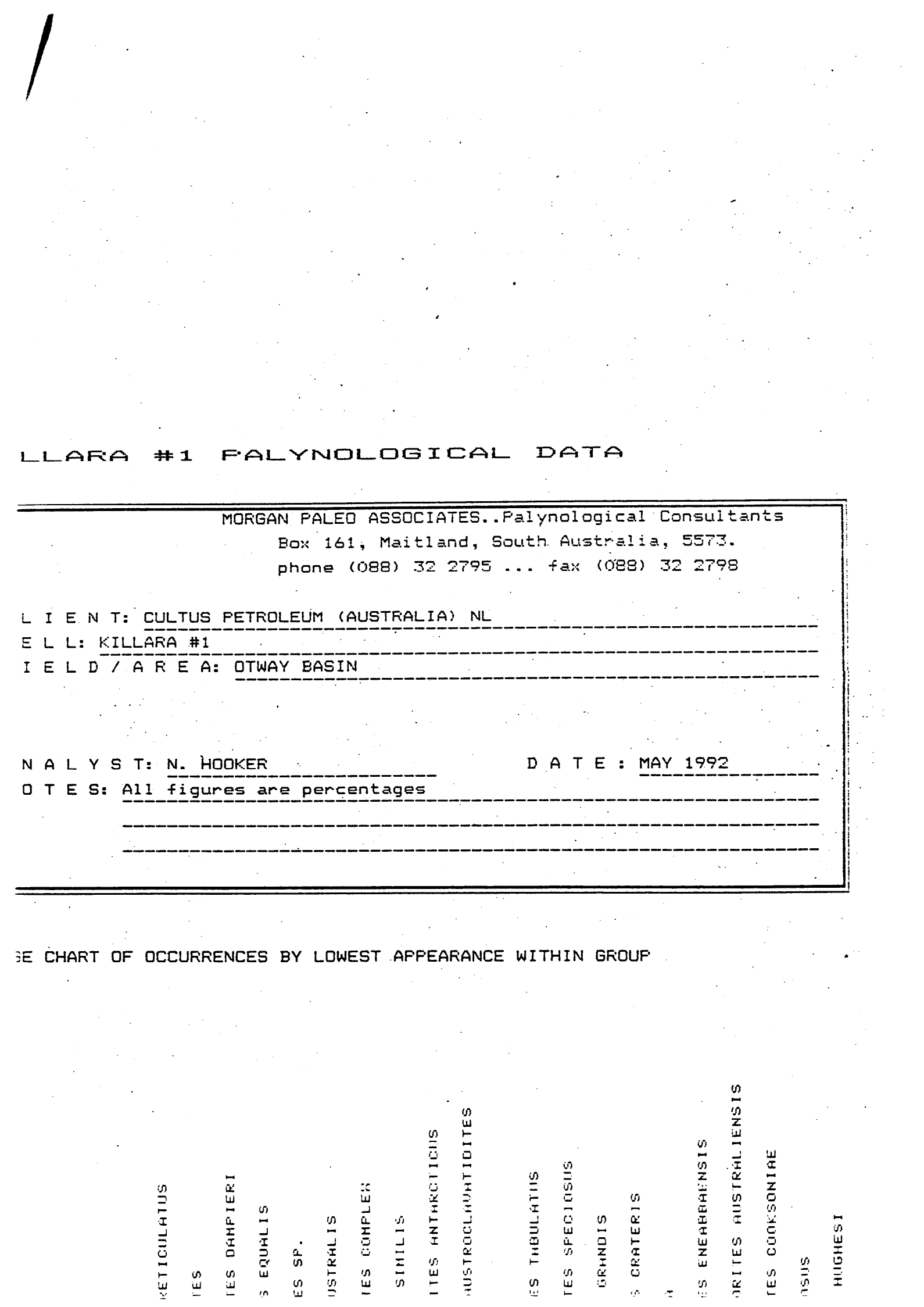
L I E N T: CULTUS PETROLEUM (AUSTRALIA) NL
E L L: KILLARA #1
I E L D / A R E A: OTWAY BASIN

N A L Y S T: N. HOOKER D A T E : MAY 1992
O T E S: All figures are percentages

GE CHART OF OCCURRENCES BY LOWEST APPEARANCE WITHIN GROUP



		BOTRYOCOCC	SCHIZOSPOR	BACULATISP	CALLIALASP	CERATOSPOR	COUPERISPO	CYATHIDITE	DICTYOTOSP	FALCISPORI	MICROCACHR	RETITRILET	UVAESPORIT	COUPERISPO	DICTYOTOSP	FALCISPORI	ISCHYOSPOR	NEORAISTRI	BIRETRISPO	CICATRICOS	CONTIGNISP	COROLLINA	CYCLOSPORI
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
75.0	swc	X	X	10	.	1	.	47	.	7	4	4	3	.	X	.	.	1	.	6	.	X	X
65.0	swc	.	.	2	.	.	.	48	.	35	.	3	.	.	1	.	.	.	.	5	.	2	.
08.0	swc	.	.	38	X	X	.	35	.	11	.	8	3	.	X	.	.	4	X	X	X	X	1
15.0	swc	.	.	X	.	X	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
30.0	swc	.	.	36	1	3	.	29	1	12	1	9	3	X	X	1	1	1	.	.	.	.	.
05.0	swc	.	.	29	2	5	?	25	?	15	3	12	8	.	.	.	.	.	.	.	.	.	.

SWC 1535.0

23	MUROSPORA FLORIDA	.
24	PROTEACIDITES SP	.
25	RETITRILETES WATHAROOENSIS	.
26	TRILOBOSPORITES TRIORETICULOSUS	.
27	AEQUITRIRADITES SPINULOSUS	5
28	COOKSONITES VARIABILIS	.
29	DICTOPHYLLIDITES SPP	.
30	TRIPOROLETES RADIATUS	.
31	AEQUITRIRADITES VERRUCOSUS	3
32	FORAMINISPORIS DAILYI	X
33	FORAMINISPORITES WONTHAGGIENSIS	X
34	PILOSISPORITES NOTENSIS	9

5.0 swc . . . . . 2015.0 swc
).0 swc . . . . . 2080.0 swc
5.0 swc . . . . . 2405.0 swc

ex numbers are the columns in which species appear.

EX BER	SPECIES
7	AEQUITRIRADITES SPINULOSUS
1	AEQUITRIRADITES VERRUCOSUS
3	BACULATISPORITES
3	BIRETRISPORITES ENEABBAENSIS
1	BOTRYOCOCCUS
4	CALLIALASPORITES DAMPIERI
5	CERATOSPORITES EQUALIS
7	CICATRICOSISPORITES AUSTRALIENSIS
0	CONTIGNISPORITES COOKSONIAE
3	COOKSONITES VARIABILIS
1	COROLLINA TOROSUS
6	COUPERISPORITES SP.
3	COUPERISPORITES TABULATUS
7	CYATHIDITES AUSTRALIS
2	CYCLOSPORITES HUGHESI
9	DICTOPHYLLIDITES SPP
8	DICTYOTOSPORITES COMPLEX
4	DICTYOTOSPORITES SPECIOSUS
5	FALCISPORITES GRANDIS
9	FALCISPORITES SIMILIS
2	FORAMINISPORIS DAILYI
3	FORAMINISPORITES WONTHAGGIENSIS
6	ISCHYOSPORITES CRATERIS
0	MICROCACHRYIDITES ANTARCTICUS
3	MUROSPORA FLORIDA
7	NEORAISTRICKIA
4	PILOSISPORITES NOTENSIS
4	PROTEACIDITES SP
1	RETITRILETES AUSTROCLAVATIDITES
5	RETITRILETES WATHAROOENSIS
2	SCHIZOSPORIS RETICULATUS
6	TRILOBOSPORITES TRIORETICULOSUS
0	TRIPOROLETES RADIATUS
2	UVAESPORITES