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**PALAEOGEOGRAPHIC STUDY
OF THE PALAEOCENE AND EARLY EOCENE
SEQUENCES OF THE EASTERN VIEW COAL
MEASURES IN T/25P**

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1 SUMMARY

The objective of this study was to develop palaeogeographic models for two of the most prospective sections of the Eastern View Coal Measures, the Palaeocene (lower and upper *L. balmei*) and Early Eocene (lower to middle *M. diversus*) sequences within permit T/25P. Both sequences are important in containing gas and condensate bearing reservoirs at Pelican Field in T/25P and at Yolla 1 in T/RL1.

The study involved the integration of earlier core facies, stratigraphic and reservoir studies which were used to compile a set of palaeogeographic maps which can be used to guide further exploration in T/25P where there has hitherto been a poor understanding of the regional controls on reservoir distribution. The study area was expanded outside of T/25P so that regional influences on the palaeogeographic maps could be assessed and incorporated. A total of 15 wells were studied, and wireline logs, core facies descriptions and major facies associations are displayed on a series of stratigraphic sections (Enclosures 1 to 3).

The depositional model developed for the Palaeocene and Early Eocene sequences of the Eastern View Coal Measures comprises a major fluvial system and associated wave-dominated delta system building into a restricted embayment or large lake.

Geographical control for the distribution of the various components of the depositional model is limited by the sparse well control. Previous attempts at seismic stratigraphy have failed due to poor seismic quality. An example of the difficulty this generates is the question of the orientation of the wave-dominated delta strandplain. It is possible for example, that given the well control in the Palaeocene the strandplain may be oriented at right angles to that shown in this report, building towards the northeast. The orientation used in this report relies on data from the later Eocene sediments, for example at Poonboon 1 and Narimba 1, which demonstrates more conclusively that at that time the strandplain was building to the northwest. Clearly this interpretation makes the assumption that there were no major changes in orientation of the depositional trends with time as there is no evidence to suggest an alternate model may be more appropriate.

2 INTRODUCTION

The reader is referred to two earlier reports which form the foundation for compiling the palaeogeographic models documented in this report. These reports are "Sedimentological Analysis of Bass Basin Cores - Final Project Report, Suttill R.J Williams B.P.J and Wild E.K, South Australian Oil and Gas Corporation Pty Ltd (now Boral Energy Resources Limited), 1987" and "T/25P Permit Assessment Project, Knowles D.J, Suttill R.J and Migliucci A.C, SAGASCO Resources Ltd (now Boral Energy Resources Limited), 1994".

In particular the first report provides detailed sedimentological descriptions of cores from the Eastern View Coal Measures, and documents the most likely depositional model for these sediments. The second report is important in providing a stratigraphic subdivision of the Eastern View Coal Measures using seismic, wireline and palynological data. It is this stratigraphic subdivision which has allowed, for the first time, a more detailed attempt at defining palaeogeographic maps.

The depositional model for the Eastern View Coal Measures comprises a fluvial system and associated wave-dominated delta system building out into a restricted embayment or large lake with minor marine incursions (Suttill, Williams and Wild, 1987).

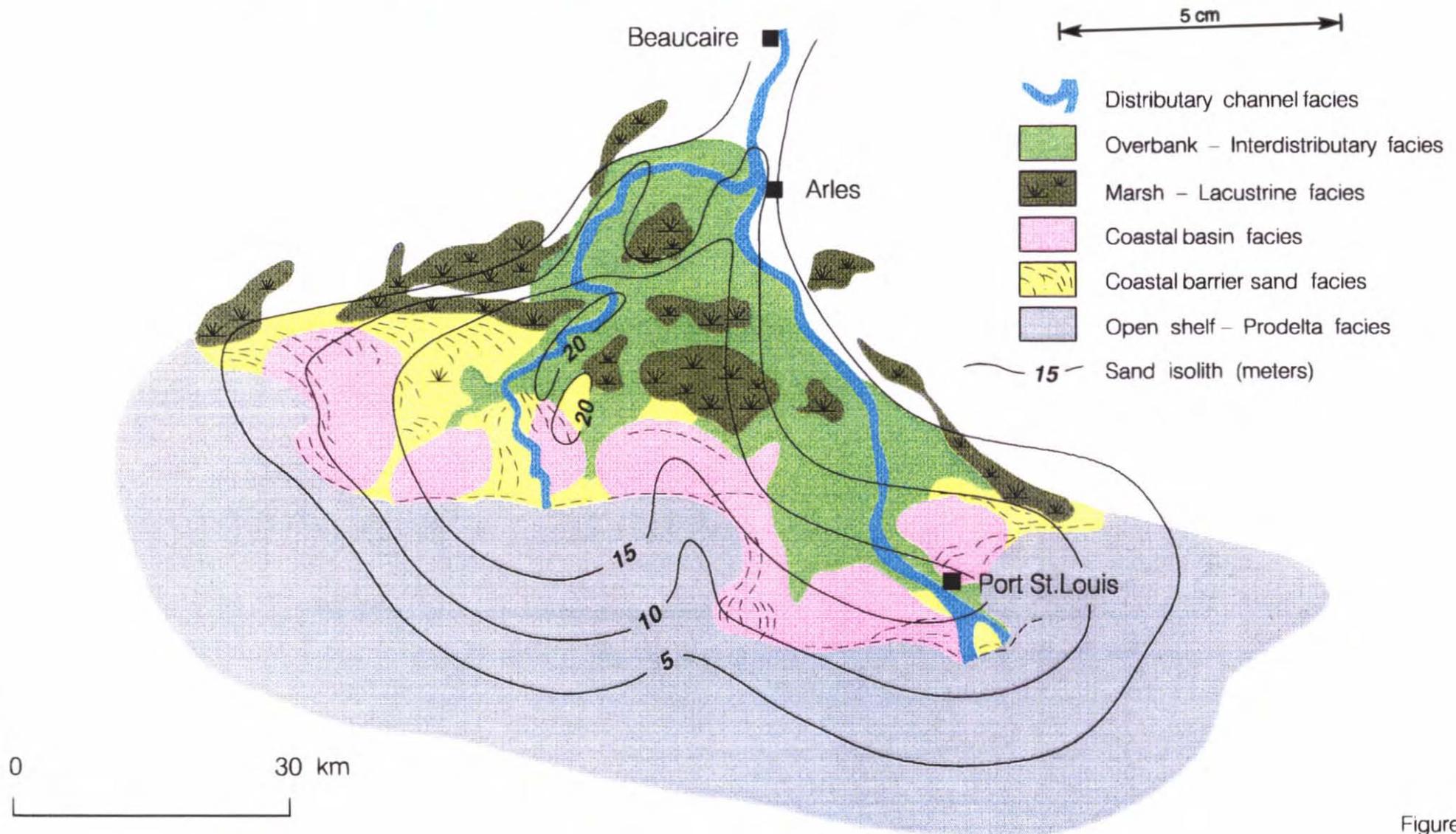
An example of a modern analogue of a wave-dominated delta building out into a lake is provided by the William River Delta which is prograding into Lake Athabasca, NWT, Canada (figure 1). The Rhone Delta building out into the Mediterranean Sea is an Holocene example of a wave-dominated delta which built into a restricted sea (figure 2). For further discussion on wave-dominated deltas the reader is referred to Galloway W.E and Hobday D.K (1983). Some of the nomenclature used in describing wave-dominated deltas is shown in figures 3 and 4.

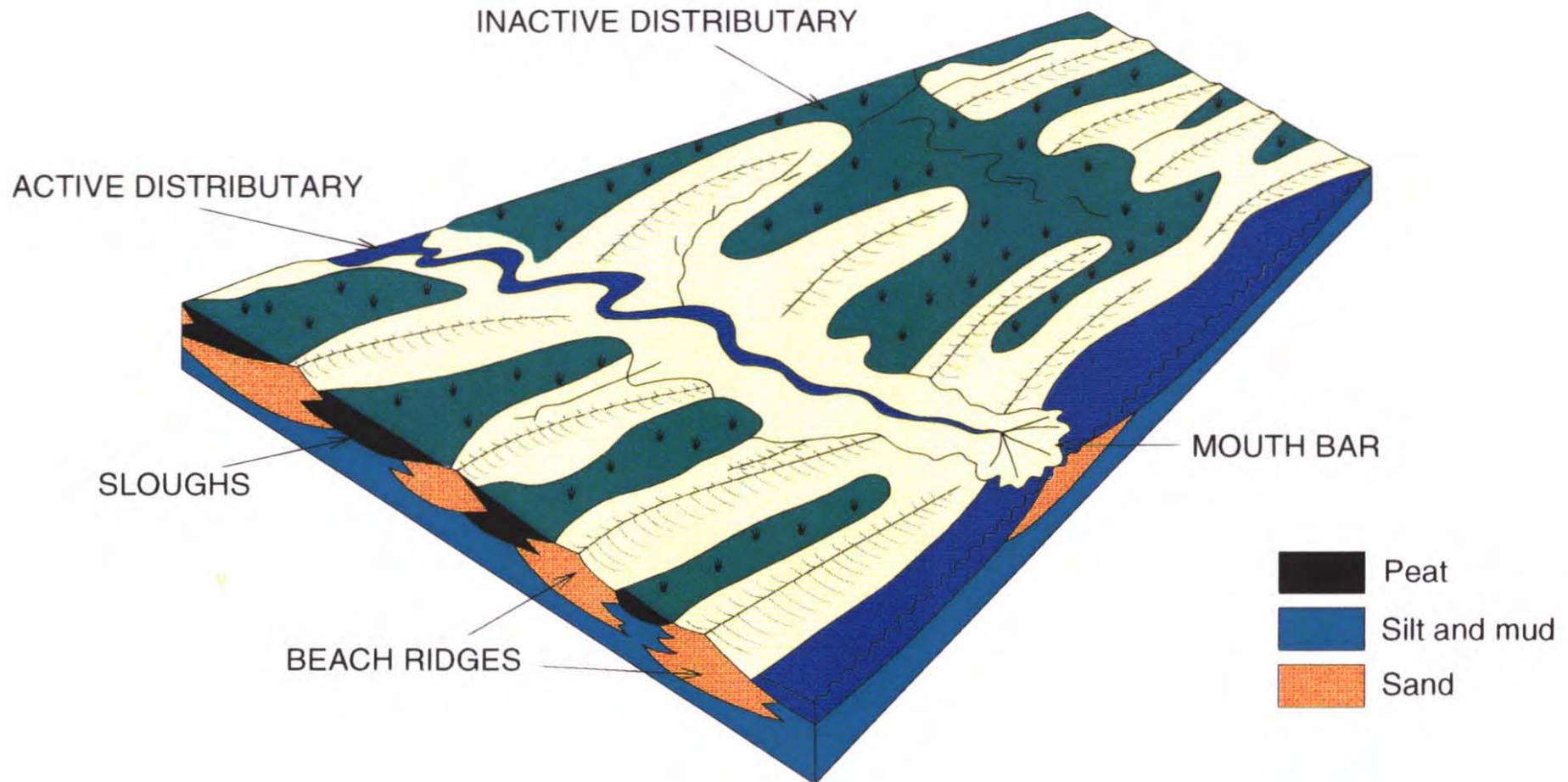
Oblique aerial photographs of the William River Delta, Lake Athabasca, NWT, Canada



Fig. 1

GENERALISED DEPOSITIONAL ENVIRONMENTS OF THE HOLOCENE RHONE DELTA, FRANCE



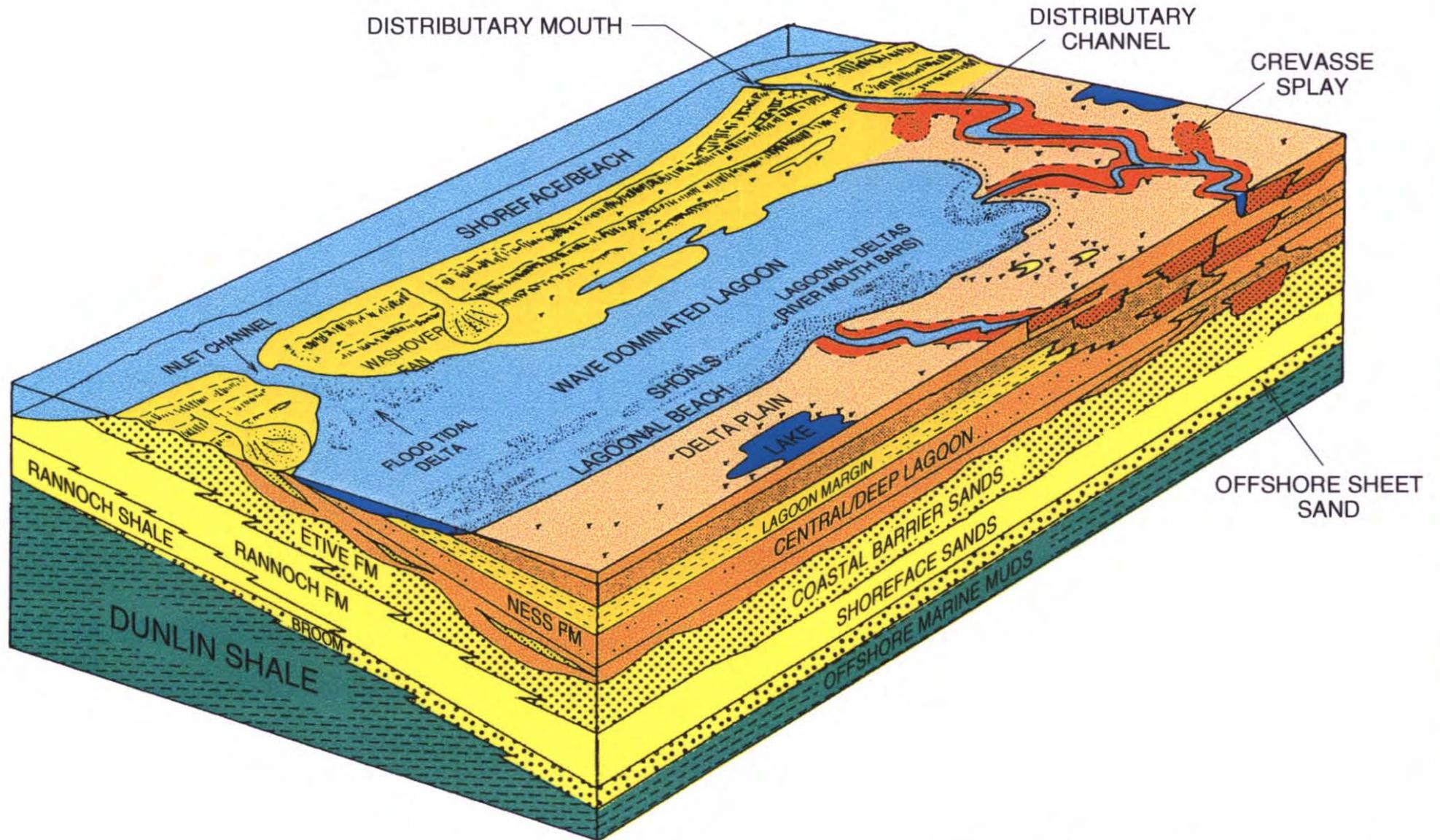


Modified after Galloway & Hobday (1983)

DEPOSITIONAL ENVIRONMENTS OF A WAVE DOMINATED DELTA

5 cm

Depositional model of the Brent Delta, North Sea.



5 cm

Modified after Budding & Inglin 1981

Fig. 4
No. 13509.0995

3 METHODOLOGY

The study area (figure 5) was expanded outside T/25P because of the relatively small number of wells in the permit (just nine wells, four of which form the Pelican Field), and because an enlarged area provides a better appreciation of the regional variation in depositional settings within the Eastern View Coal Measures.

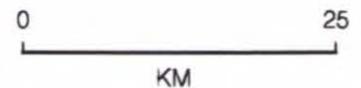
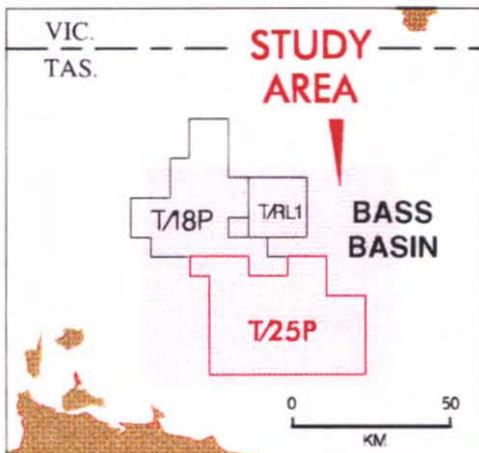
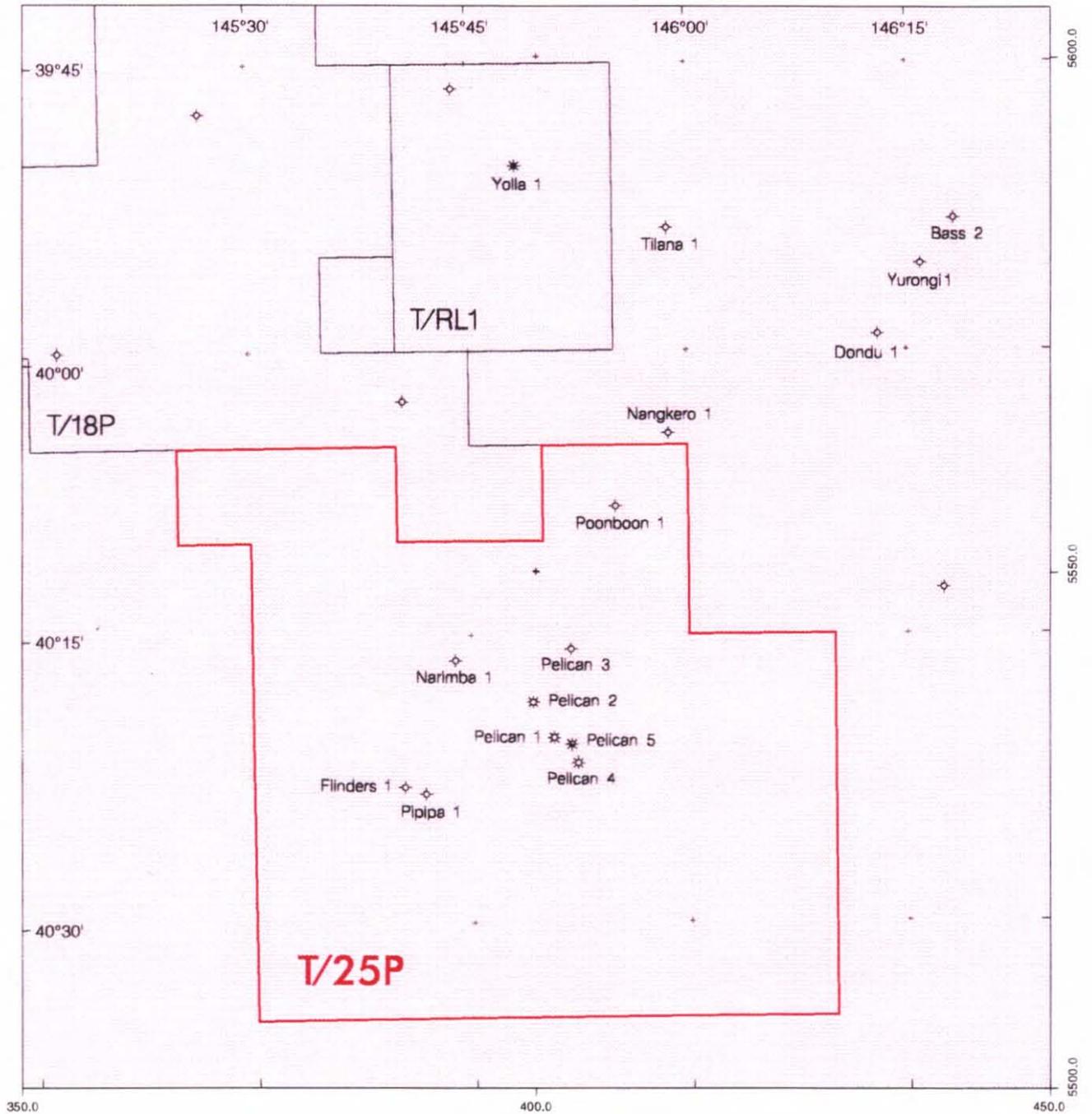
One particular problem which hinders the construction of palaeogeographic maps is the distribution of the wells which tend to be in a dip line trending south west to north east across the basin, with virtually no control in the direction of depositional strike, that is south east to north west. A total of 15 wells were studied which included all wells in T/25P together with Yolla 1, Tilana 1, Bass 2, Yurongi 1, Dondu 1 and Nangkero 1 located outside T/25P.

Initially, wireline correlations were prepared (Enclosures 1 to 3) with datums at the top middle *M. diversus* and top Palaeocene levels. On the wireline correlations are displayed the gamma and sonic logs, the position of core data marked by a green flag in the depth track, the position of test data marked by a red flag in the depth track, an interpreted lithology column (using wireline, cuttings and core data), histograms showing core derived porosity and permeability, palynological age dating and a brief description of the depositional environment interpreted from each of the cores.

Analysis of the wireline logs and core descriptions reveals that the sandstone facies and hence potential reservoirs can be classified into four main facies associations, two of which are represented in core and two of which are uncored:

- (a) Shoreface, backshore and lagoonal fill facies of the delta strandplain and crevasse splays of the fluvial flood plain. These facies commonly have upward coarsening grain size profiles which on wireline logs are represented by an upward reduction in the gamma ray response.
- (b) Low to moderate sinuosity fluvial channels, which typically have sharp erosional bases and have a gradational fining upward grain size profile also indicated by gamma ray profiles. The channel facies are often the thickest sandstones present, often due to vertical stacking.

LOCATION MAP OF STUDY AREA



Named wells were used in palaeogeographic reconstructions

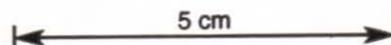


Figure 5

- (c) Distributary channels, which have not yet been represented in core, but on wireline logs are represented by sandstones with sharp bases and sharp tops, typical of the published profiles for vertically aggrading distributary sandstones.

- (d) Washover fan deposits consist of sandstones which on gamma ray logs have sharp bases and sharp tops and may be directly deposited on back barrier lagoonal coals.

4 PALAEOGEOGRAPHY OF THE PALAEOCENE EASTERN VIEW COAL MEASURES

The Palaeocene section of the Eastern View Coal Measures has been partially or completely penetrated in thirteen wells within the study area, six of which are located in T/25P. Ten of these wells are displayed in Enclosure 1. Nangkero 1, Pelican 1 and Pelican 4 are not included on Enclosure 1 as only a thin section of this sequence was penetrated at these locations.

Table 1 shows the intervals of Palaeocene section intersected in each of the wells in the study area. Note that only four wells have fully penetrated the Palaeocene and contain confirmed Cretaceous age rocks. One of these wells, Tilana 1 intersected Cretaceous rocks after penetrating a thick sequence of extrusive volcanics which makes accurate determination of the position of the top Cretaceous at that location difficult.

Table 1

Well Name	Top Palaeocene (mKB)	Top Cretaceous (mKB)	Total Depth (mKB)	Palaeocene Thickness (metres)
Yolla 1	2809	NR	3347	462*
Tilana 1	2779	3588	3900	809
Bass 2	1500	NR	1801	301*
Yurongi 1	1961	NR	2438	477*
Dondu 1	2360	2853	2927	493
Nangkero 1	2733	NR	2884	151*
Poonboon 1	2663	3242	3266	579
Narimba 1	NR	NR	3352	NR
Pelican 1	3149	NR	3178	29*
Pelican 2	NR	NR	3068	NR
Pelican 3	2417	NR	2907	490*
Pelican 4	2978	NR	3051	73*
Pelican 5	3108	3508	4267	400
Flinders 1	2459	NR	2723	264*
Pipipa 1	NR	NR	2115	NR

Notes: NR Not reached
* Partial penetration

Full hole cores were recovered from the Palaeocene in four wells, Tilana 1, Bass 2, Yurongi 1 and Poonboon 1.

The Palaeocene sequence is represented by the *L. balmei* palynological zone which can be subdivided into lower and upper zonations, however this subdivision is relatively poorly controlled in the Bass Basin (Enclosure 1) and it is not possible to use it as a reliable stratigraphic datum with which to further subdivide the sequence.

Palaeogeographic reconstructions have been attempted to represent depositional processes during Early Palaeocene and Late Palaeocene time (figures 6 and 7).

A regional Palaeocene isopach map is not available, because of the difficulty in mapping the top Cretaceous regionally, therefore the palaeotopography onto which the Early Palaeocene was deposited is not available for interpretation of either the Early or Late Palaeocene palaeogeographies.

4.1 Early Palaeocene

The Early Palaeocene time is the most poorly represented of the studied intervals in terms of the number of wells penetrating to this level and in the core control at this level. The sparsity of data leads to great uncertainty in determining the trend of the geographic features identified in each of the wells and therefore great care should be made in using the palaeogeographic map provided (figure 6). For example the orientation of the strandplain is deduced from analysis of data at shallower (younger) stratigraphic levels, therefore making the assumption that no change in orientation has occurred.

The facies interpreted in the Early Palaeocene suggest a fluvial to wave dominated delta system occupied the study area. The distribution of facies suggest that this system was sourced by river systems flowing from the southeast, probably constrained by the southeast to northwest structural grain of the basin.

PALAEO GEOGRAPHY AT EARLY PALAEOCENE TIME

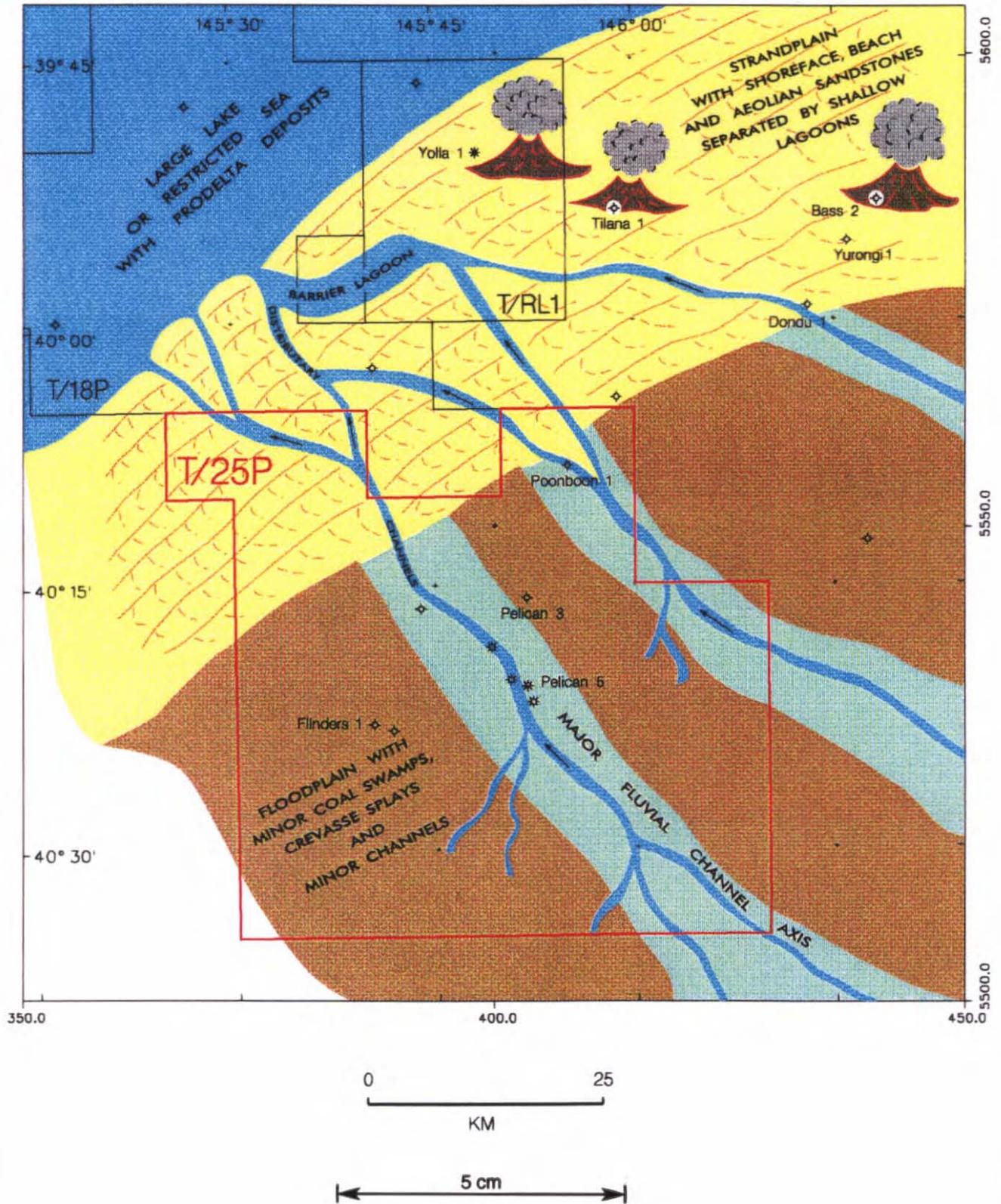


Figure 6

PALAEOGEOGRAPHY AT LATE PALAEOCENE TIME

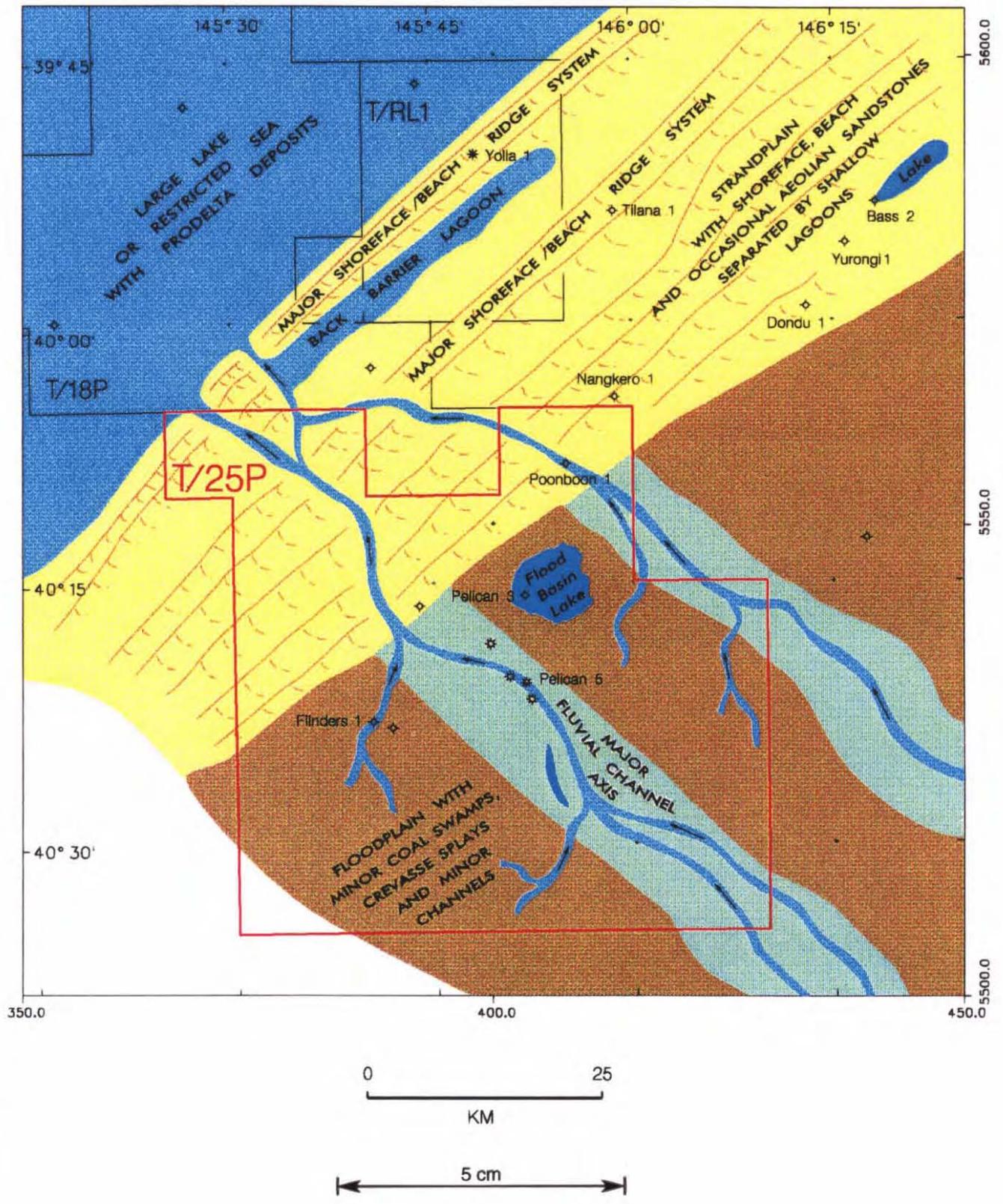


Figure 7

In the south east low to moderate sinuosity fluvial channels (Pelican 5, and Pelican 3) occupied broad low relief valleys surrounded by extensive floodplains with overbank deposits, including crevasse splays, minor coal swamps, and minor feeder fluvial channels (Flinders 1).

Moving to the northwest a large distributary system is interpreted at Poonboon 1 possibly marking the location where the river system loses energy and distributaries form as they cross the strandplain setting further to the northwest. This distributary system persisted for much of the Early Palaeocene in the Poonboon region where half of the preserved Palaeocene sequence is composed of this facies. It is possible that a similar distributary system formed at the head of the river system flowing through the Pelican area, possibly occupying the north and northwestern parts of T/25P.

At Dondu 1 predominantly upward coarsening deposits are observed with minor fluvial channels, probably located near the southeastern limit of the strandplain. Yurongi 1 is also interpreted to be located in the strandplain where upward coarsening shoreface profiles are separated by lagoonal shales.

The northeastern margin of the study area was dominated by extensive, probably subaerial, volcanism in the Early Palaeocene, as observed at Bass 2, Tilana 1 and Yolla 1. Interbedded sediments at Tilana 1 and Bass 2 suggest that around the volcanoes strandplain deposition occurred.

4.2 Late Palaeocene

The palaeogeography of the Late Palaeocene is broadly similar to that of the Early Palaeocene (figure 7). Several exceptions are noted which modify the Late Palaeocene palaeogeography. The distributary channel system in the Poonboon area at Early Palaeocene time has been replaced by strandplain deposition suggesting that a local landward transgression of the delta system commenced in the mid Palaeocene.

In the Yolla, Tilana and Bass 2 area volcanism ceased in the Early Palaeocene and the volcanic deposits were buried by strandplain shoreface, beach and lagoonal deposits. In Late Palaeocene times the shoreface and beach facies stack vertically at Yolla 1 and Tilana 1 possibly suggesting an active barrier beach ridge system or systems near to the Late Palaeocene coastline. These facies were deposited above a correlatable lagoonal shale unit present at both Yolla 1 and Tilana 1 which may represent an extensive back barrier lagoon or the shales of the lake or restricted sea into which the Palaeocene wave dominated delta was building.

4.3 Reservoir Quality

The following discussion is based on an analysis of all the core data available for the Palaeocene within the study area, and therefore includes both reservoir and non-reservoir facies.

Core derived porosity and permeability data for the Palaeocene reservoirs of the study area are shown in figure 8. The data show a moderate degree of scatter, which previous studies (Knowles, Suttill and Migliucci, 1994) have shown is mostly attributable to differences in depositional facies, although there are almost certainly diagenetic effects which further modify the trends. A best fit line to the porosity verses permeability data is shown in the crossplot (figure 8). The fit predicts 10 millidarcy permeability at 16.5% porosity, and 100 millidarcy permeability at 18.5% porosity.

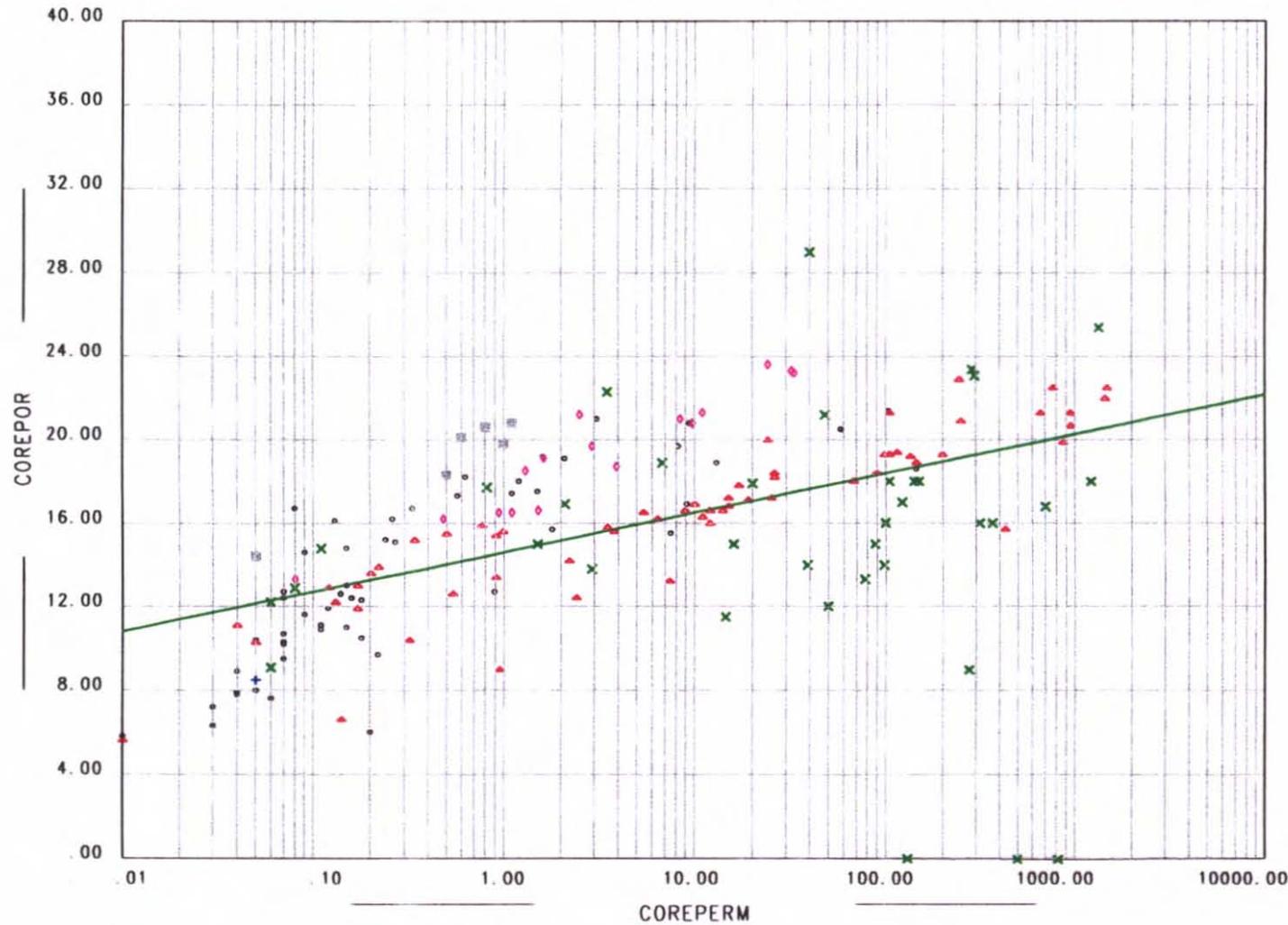
Porosity above 15% is represented in the core data from Pelican 3, Poonboon 1, Tilana 1, Yurongi 1, and Bass 2 (figure 9). In the 20 to 25% porosity range core from Yurongi 1 and Bass 2 is best represented. Few porosities over 25% are recorded and all were obtained from core at Poonboon 1.

Permeability measurements from core range from 0.01 to 1490 millidarcies (figure 10). The best permeabilities (between 100 and 1490 millidarcies) are recorded in core from Poonboon 1, Tilana 1 and to a lesser extent Pelican 3.



POROSITY v PERMEABILITY, PALAEOCENE DATA

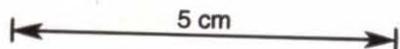
Regression of Y vs X Slope: 1.8924 Incpt: 14.6059 Corr Coef: .5324



- PELICAN 3
- PELICAN 1
- POONBOON 1
- TILANA 1
- YURONGI 1
- PELICAN 5
- BASS 2

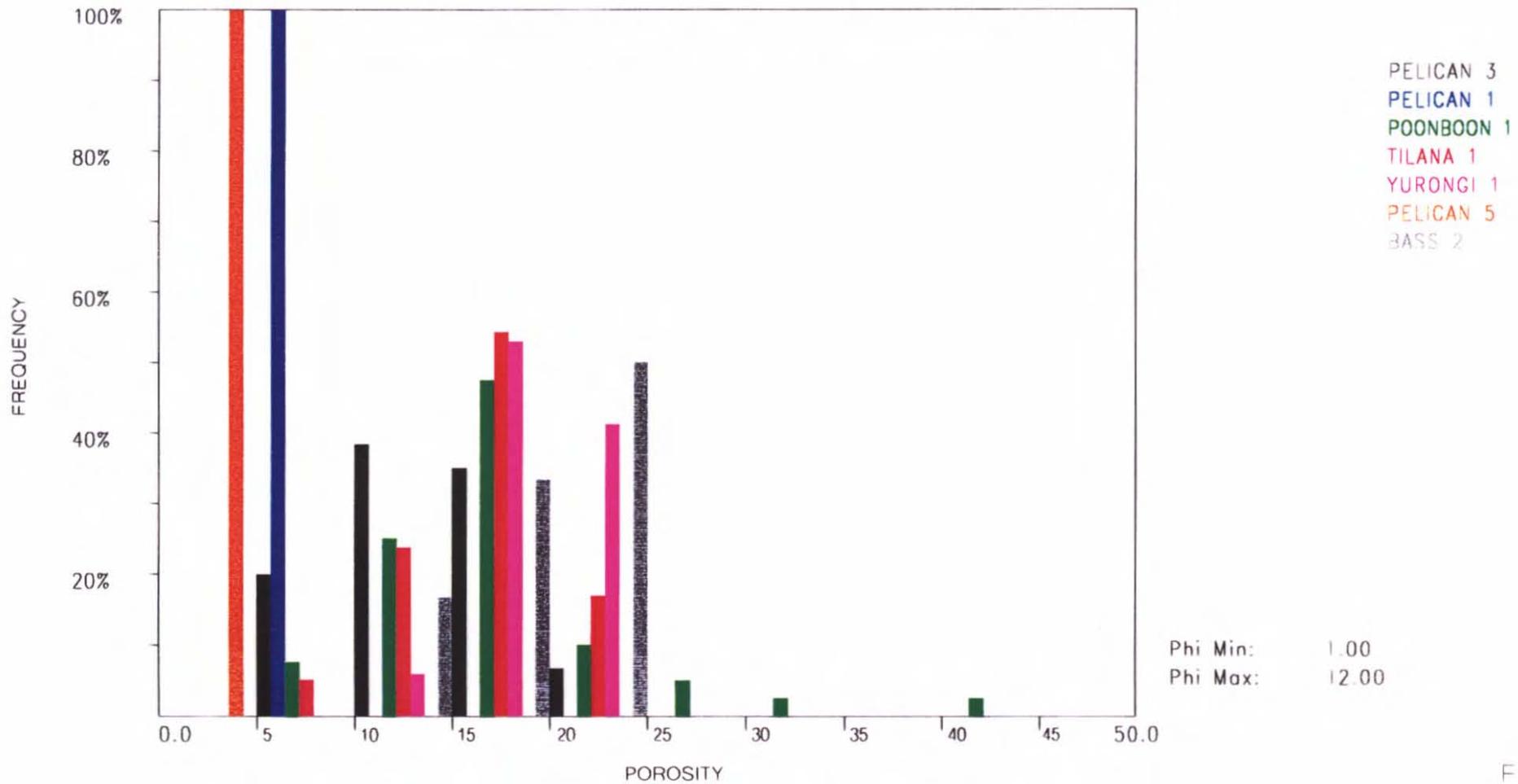
172 of 186 Pts plotted

Figure 8.





PALAEOCENE CORE POROSITY HISTOGRAM



5 cm

Figure 9
13498 0995



PALAEOCENE CORE PERMEABILITY HISTOGRAM

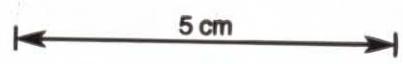
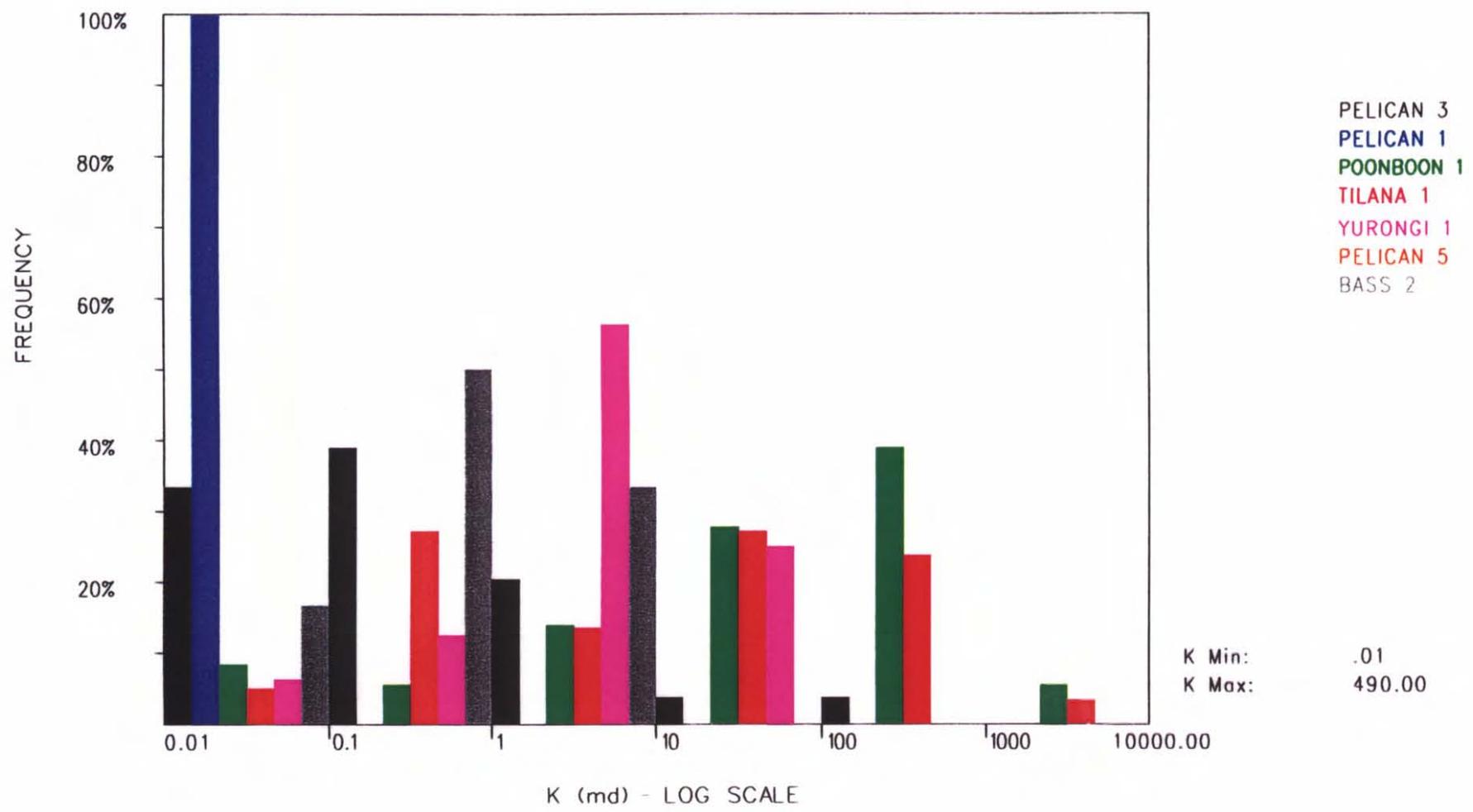


Figure 10
13497.0995

Test results from the top most Palaeocene sandstone at Yolla 1, a possible correlatable sandstone to that in core 2 at Tilana 1, confirm the deliverability (permeability) characteristics of the strandplain, shoreface beach and aeolian dune facies as being the best reservoir facies in the Palaeocene.

Disappointing test results from the low to moderate sinuosity fluvial reservoirs of the Palaeocene at Pelican 5 downgrade these as a potential exploration target.

There is no core and therefore no direct permeability data for the distributary channel reservoir facies intersected in the early Palaeocene at Poonboon 1. Wireline porosity logs (sonic and density) suggest that reservoir quality is at least as good as in the surrounding strandplain deposits represented in core 4 (Enclosure 1).

4.4 **Implications for prospectivity in T/25P**

The palaeogeographic models developed for the Palaeocene strongly suggest that the northern part of T/25P may offer the best potential for the development of good quality reservoir sandstones. These may belong to one of two main reservoir facies associations.

Firstly, the palaeogeographic models predict the possibility of distributary channel facies, similar to that intersected in the Early Palaeocene at Poonboon 1 in the northern part of the permit. As described above, these have potentially good reservoir quality but so far no core or test data exists to verify this hypothesis.

Secondly, there is the possibility that the northern part of the permit may contain strandplain deposits similar to those which form the main reservoirs of Yolla Field. The absence of any well control northwest of a line linking Pelican 3 and Flinders 1 at this level makes prediction of the position of the strandplain highly tentative, although by the Late Palaeocene strandplain deposits are observed at Poonboon 1.

The low to moderate sinuosity fluvial deposits of the Pelican Trough appear to have poor permeability as shown by the test results at Pelican 5 although moderate permeability is preserved at Pelican 3 where this facies is less deeply buried. Further exploration in areas likely to intersect this reservoir facies will therefore have a high risk of poor reservoir development.

There is limited well control on the southwestern flank of the Pelican Trough, Flinders 1 provides evidence that the depositional setting is likely to be dominated by floodplain deposits with minor fluvial channels. If Flinders 1 is representative then the risk of finding sufficient reservoir quality sandstones on the southwestern flank of the Pelican Trough is high. Only further drilling can demonstrate whether this is the case.

5 **PALAEOGEOGRAPHY OF THE EARLY EOCENE (LOWER TO MIDDLE *M. DIVERSUS*)**
EASTERN VIEW COAL MEASURES

The Early Eocene section of the Eastern View Coal Measures has been partially or completely penetrated in sixteen wells within the study area, ten of which are located within T/25P. Two stratigraphic wireline sections are included (Enclosures 2 and 3) to depict the Early Eocene sequence. Pipipa 1 is the only well in T/25P which did not reach sediments belonging to the Early Eocene lower and middle *M. diversus* palynological zones. The wireline sections provide a mainly dip orientated section across the Bass Basin (Enclosure 2) and a strike section along the central part of the Pelican Trough (Enclosure 3).

Table 2 shows the intervals of Early Eocene strata intersected in each of the wells in the study area.

Table 2

Well Name	Top Early Eocene (mKB)	Top Palaeocene (mKB)	Total Depth (mKB)	Eocene Thickness (metres)
Yolla 1	2467	2809	3347	342**
Tilana 1	2466	2779	3900	313
Bass 2	1370	1500	1801	170
Yurongi 1	1773	1961	2438	188
Dondu 1	2360	2080	2927	280
Nangkero 1	2381	2733	2884	352
Poonboon 1	2385	2663	3266	278
Narimba 1	2538	NR	3352	814*
Pelican 1	2448	3149	3178	701
Pelican 2	2514	NR	3068	554*
Pelican 3	2289	2417	2907	128
Pelican 4	2440	2978	3051	538
Pelican 5	2448	3108	4267	660
Flinders 1	2138	2459	2723	321**
Pipipa 1	NR	NR	2115	NR

Notes: NR Not reached
 * partial penetration
 ** thickness includes later Miocene intrusive

Full hole cores were recovered from the Early Eocene in eight wells; Bass 2, Dondu 1, Poonboon 1, Pelican 1, Narimba 1, Pelican 2, Pelican 5 and Pelican 4, within the study area.

The Early Eocene sequence is represented by the lower and middle parts of the *M. diversus* palynological zone.

Palaeogeographic reconstructions have been attempted to demonstrate depositional processes at the early lower *M. diversus* time and at the late middle *M. diversus* time (figures 11 and 12).

Isopach maps (using well and seismic data) of the lower and middle *M. diversus* intervals were available for the central part of T/25P (figures 13 and 14). The lower *M. diversus* isopach map depicts the approximate surface topography on to which the lower *M. diversus* sequence was deposited. The middle *M. diversus* isopach map is not strictly representative of the early middle *M. diversus* time because an unconformity at the top of the middle *M. diversus* has resulted in some erosion. However the broad form of this map has been used to guide the palaeogeographic model presented in this study.

5.1 Early lower *M. diversus* (Early Eocene)

The sediments of early lower *M. diversus* age are present in most of the wells in the study area, however the low well density in T/25P, and in the study area, still leaves a large degree of uncertainty in determining the trend of palaeogeographic features.

The facies represented in wells penetrating the early lower *M. diversus* demonstrate continued evolution of a fluvial to wave-dominated delta system (Figure 11). The same overall trends are likely to have persisted with river systems flowing from the southeast.

PALAEOGEOGRAPHY AT EARLY LOWER *M.diversus* TIME

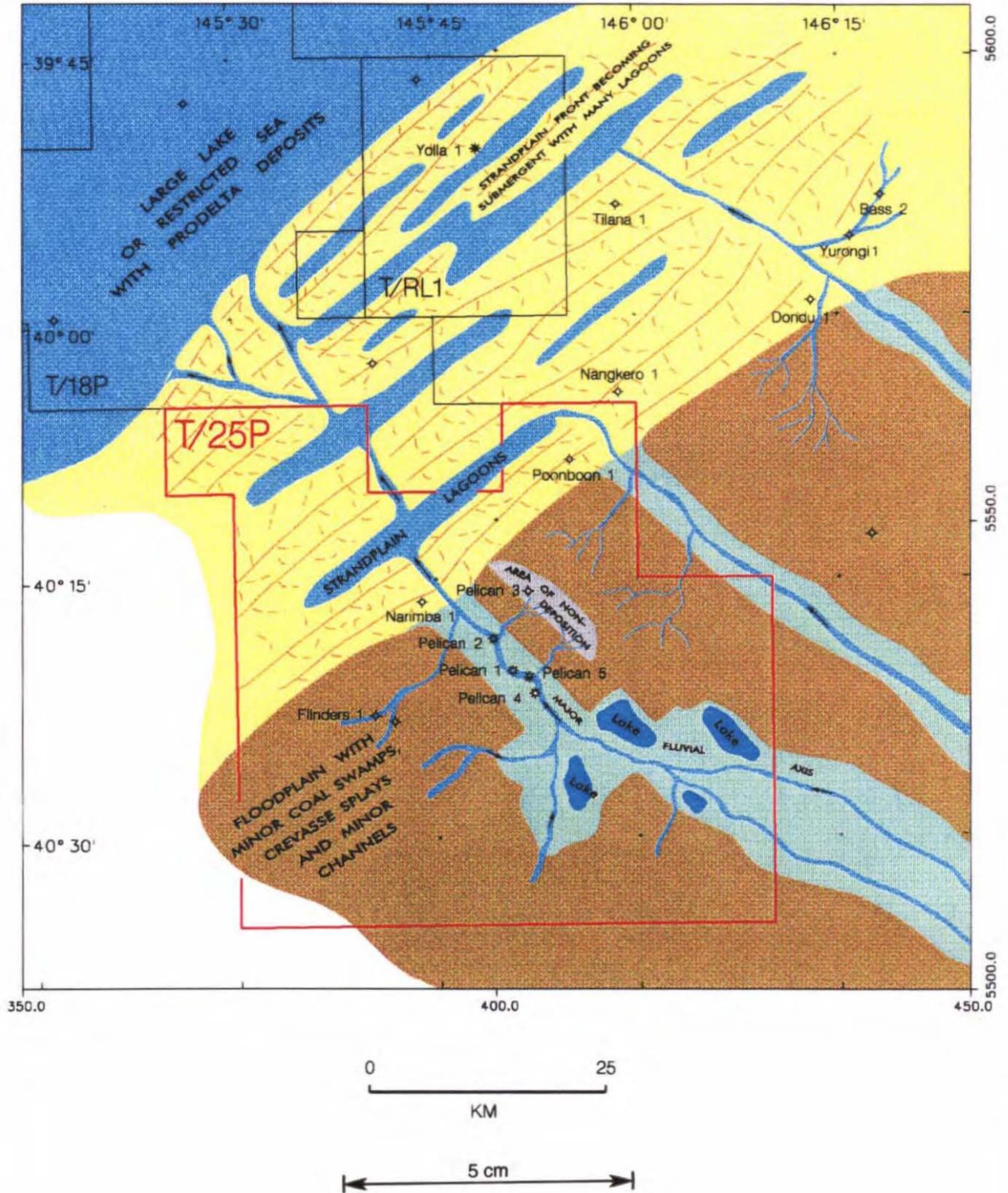


Figure 11

PALAEOGEOGRAPHY AT LATE MIDDLE *M.diversus* TIME

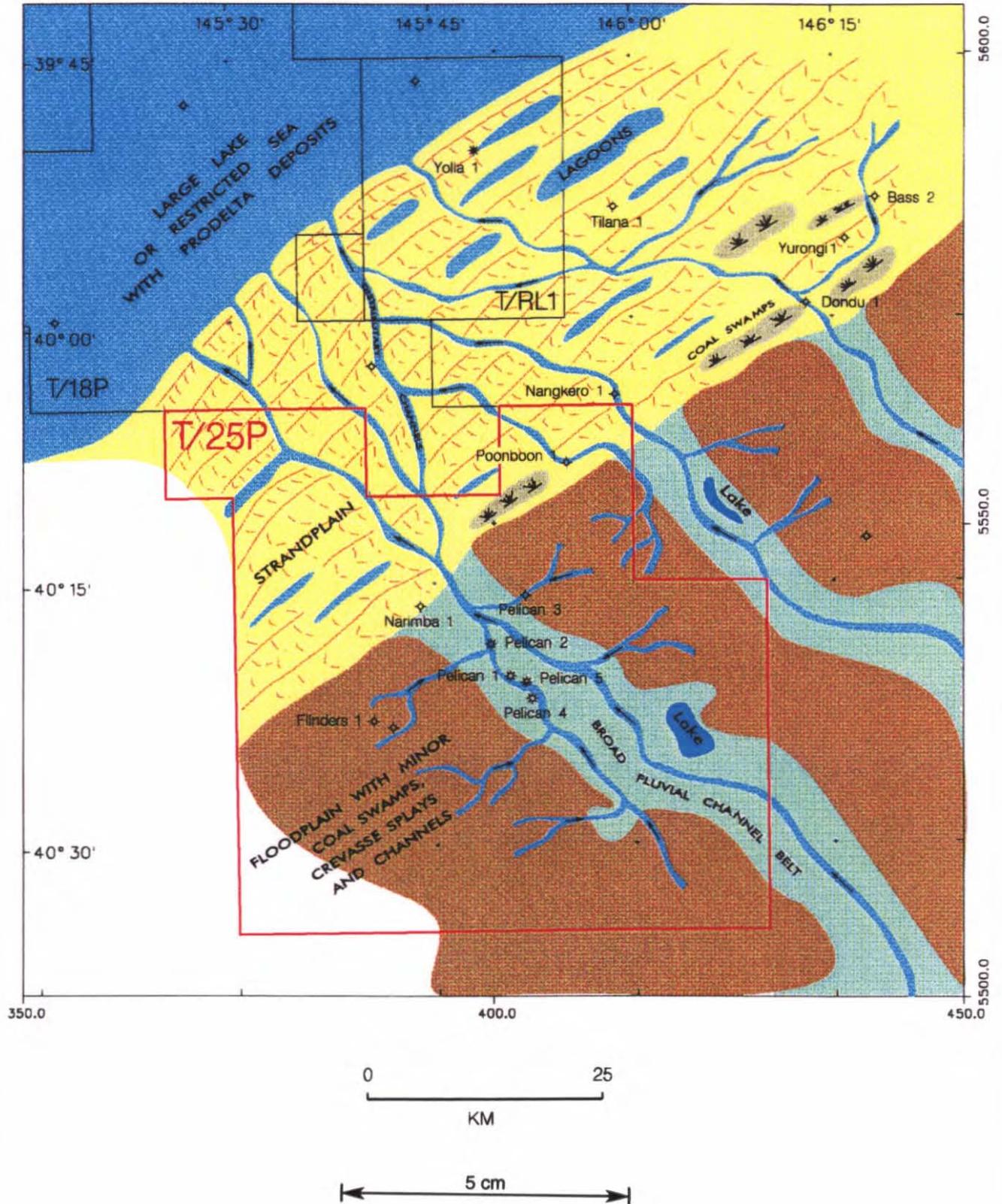
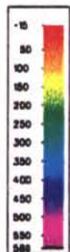
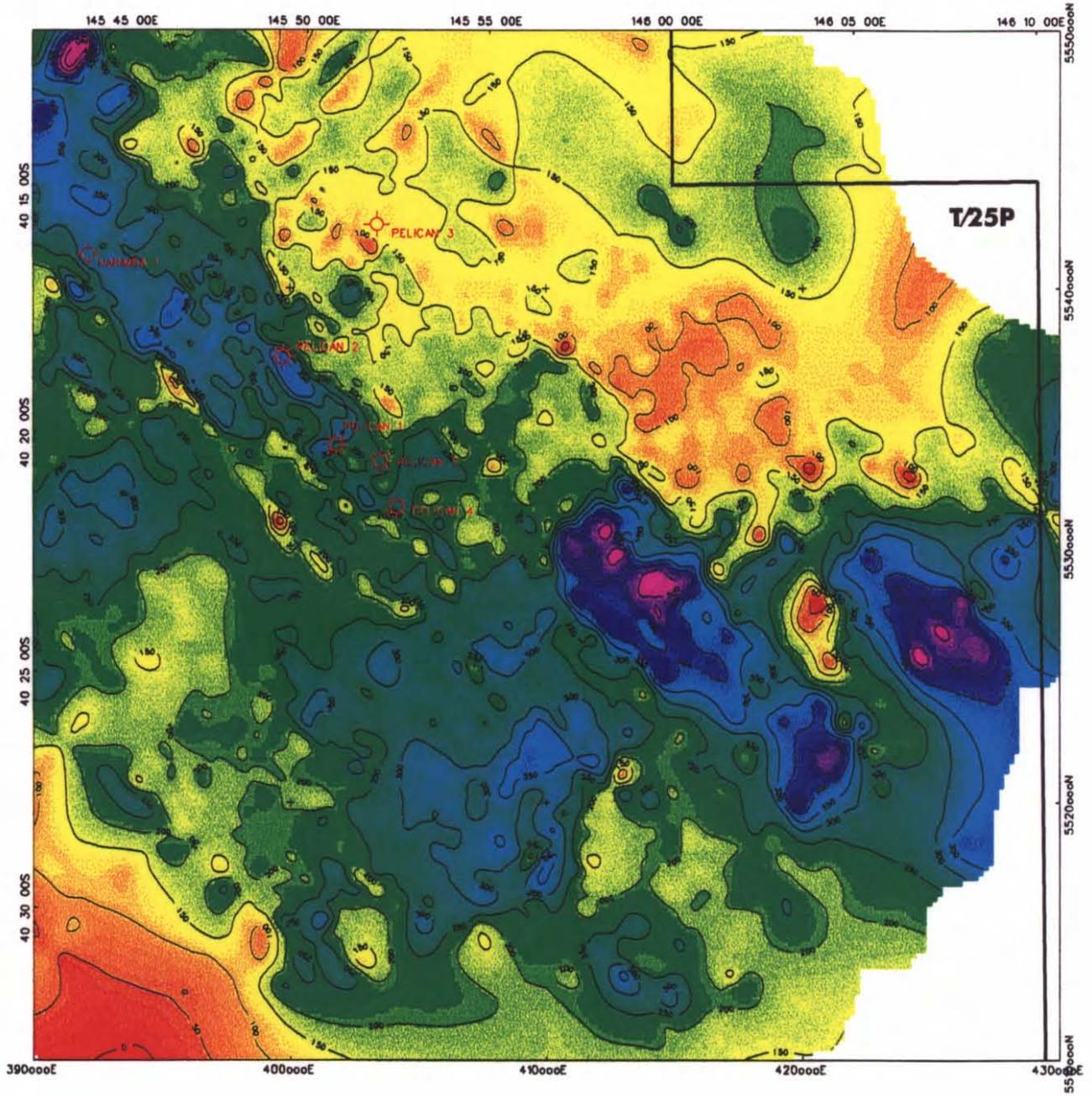


Figure 12

1994 ROCKY CAPE SEISMIC SURVEY LOWER M. DIVERSUS THICKNESS (metres)



UNIVERSAL TRANSVERSE MERCATOR PROJECTION
AUSTRALIAN NATIONAL SPHEROID
CENTRAL MERIDIAN 147 00 00E

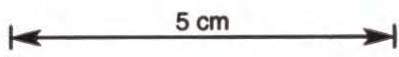


Figure 13

1994 ROCKY CAPE SEISMIC SURVEY MIDDLE M. DIVERSUS THICKNESS (metres)

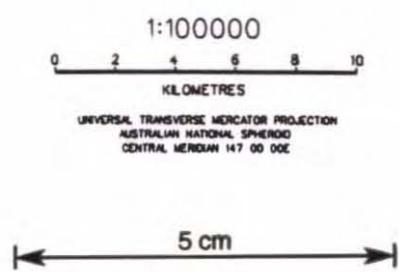
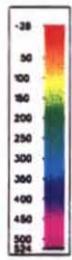
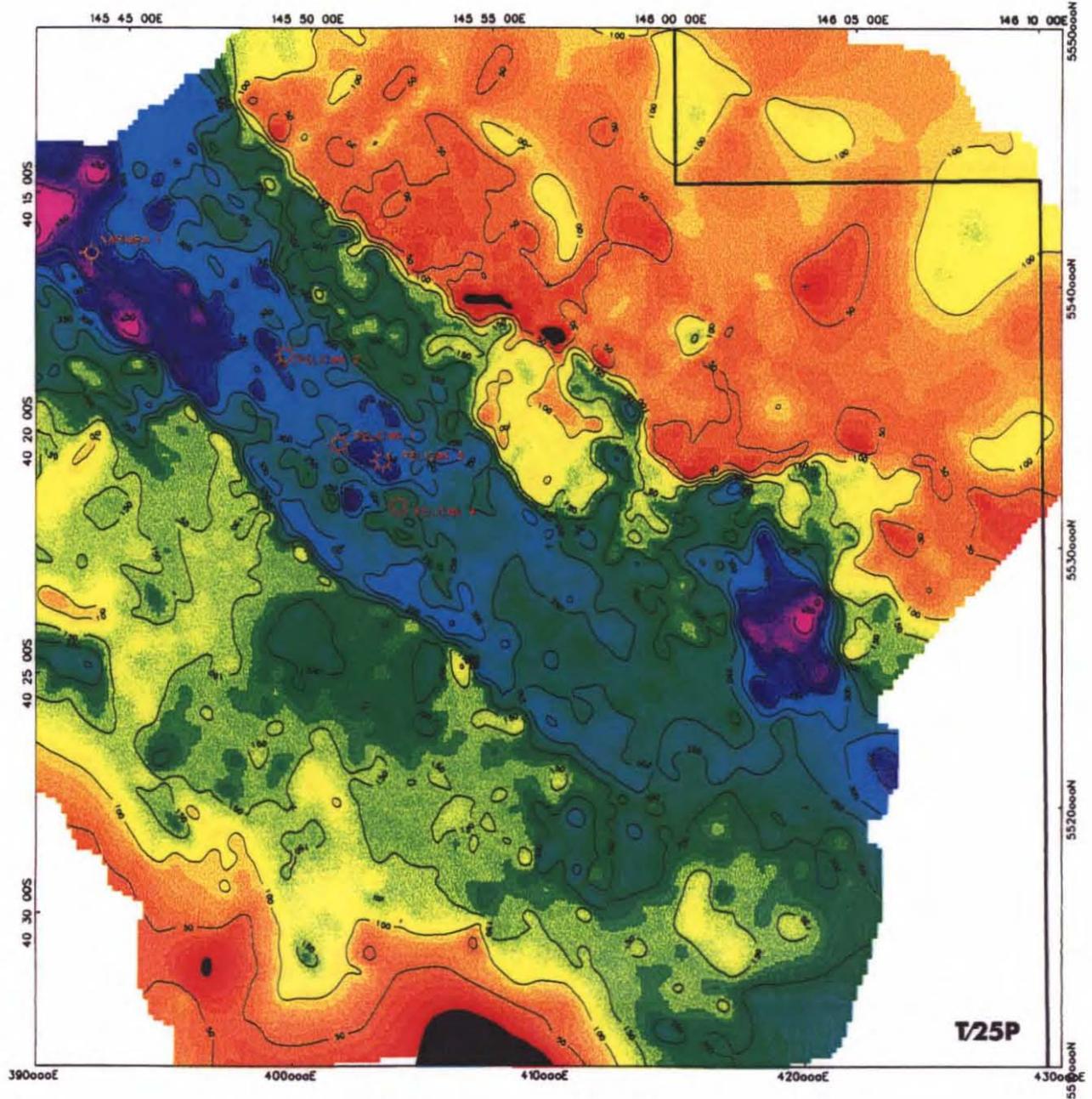


Figure 14
13515.0995

The major feature in T/25P was a broad fluvial tract trending along the Pelican Trough, with major channel deposits observed in Pelican 1, 2, 4 and 5 and minor fluvial deposition observed at Flinders 1. The Pelican 3 to Warrego area was probably a structural high at this time and may have been undergoing erosion, as no sediments of lower *M. diversus* age are observed at Pelican 3. Topographical lows interpreted on the lower *M. diversus* isopach map (figure 13) at the south eastern end of the Pelican Trough may have been occupied by moderate sized lakes (figure 11).

On the southwestern flank of the Pelican Trough Flinders 1 intersected a sequence of predominantly floodplain deposits with minor fluvial channel sandstones.

Moving to the north west at Narimba 1 the sequence appears to be more typical of strandplain deposition, containing dominantly lagoonal shales and upward coarsening sandstones, however the basal 100m interval also contains several coal seams and may represent an initial phase of floodplain deposition, nevertheless it is probable that Narimba 1 was located near to the transition from floodplain to strandplain at this time.

An uncored facies which is present between the two mapped levels at Narimba 1 is worthy of note in that it may offer a potential reservoir target in the northern part of T/25P. The facies occurs between approximately 2875 and 3100 mKB (Enclosure 3) and consists of blocky sandstones surrounded by predominantly lagoonal shales. The gamma ray character of the sandstones is similar to the distributary sandstone facies observed in the early Palaeocene at Poonboon 1, except that the sandstones typically are deposited directly onto coals. A possible interpretation is that the sandstones represent washover fan deposits formed where barrier beach deposits are breached and sand from them is deposited into the back-barrier lagoon and its associated coal swamp environments.

Strandplain deposition is observed extending north east from Narimba 1 to Poonboon 1, Nangkero 1, Dondu 1, Yurongi 1, and Bass 2. A possible correlatable shale unit extending from Poonboon 1 through Nangkero 1 to Dondu 1 may indicate a sub-regional flooding event.

Fluvial channels, possibly distributaries, crossing the strandplain are observed in the Bass 2 (core 7), Yurongi 1 and Dondu 1 region.

Finally, in the northern part of the study area at Tilana 1 and Yolla 1 the strandplain appears to be partially submerged with a progression north westwards to thicker more extensive lagoonal shales, separated by upward coarsening shoreface sandstones.

5.2 Late middle *M. diversus* time

The palaeogeography of the late middle *M. diversus* is broadly similar to that of the Early Eocene (figure 12). The main variations to the Early Eocene model are described below. Interpretation of this time interval is somewhat problematic because the scale of the top middle *M. diversus* unconformity is poorly understood. Therefore there is a probability that some of the facies described here as representing the late middle *M. diversus* may be older, due to erosion of younger sediments at the unconformity in some locations.

In the Pelican Trough (Enclosure 3 and figure 12) fluvial deposition continued, though with slightly fewer channels and more floodplain deposits. The fluvial tract extended northward to Narimba 1 over the back-barrier and lagoonal sediments of late lower *M. diversus* to early *M. diversus* time. There is also evidence that fluvial sedimentation was generally more extensive at late middle *M. diversus* time, with the once confined fluvial system of the Pelican Trough now extending across the intervening floodplains. For example fluvial channel deposits are observed outside of the Pelican Trough at Pelican 3, Poonboon 1, Nangkero 1, and Dondu 1. This is probably evidence of a lower relief topography at this time as the basin was gradually filling with sediment.

Further evidence of this low relief topography is provided by the extensive coals deposited at Poonboon 1, Nangkero 1 and Dondu 1. Coal deposition is indicative of relatively stable tectonic conditions and low clastic input, indicating a generally low energy depositional environment.

At Yolla 1 and Tilana 1 lagoonal and shoreface deposition continued from the early lower *M. diversus*, the only variation being the appearance of back barrier, lagoonal coals in the middle *M. diversus*.

5.3 Reservoir Quality

The following discussion is based on an analysis of all the core data available for the early Eocene within the study area, and therefore includes both reservoir and non-reservoir facies.

Core derived porosity and permeability data for the early Eocene reservoirs of the study area are shown in figure 15. The data show a large degree of scatter indicative of the wide range of facies represented in the data set (see also Knowles, Suttill and Migliucci, 1994). Overall however the plot shows a profile typical of Eastern View Coal Measures data whereby a large range of permeabilities are recorded for any particular porosity value. This obviously poses problems in trying to predict the occurrence of quality reservoirs when compounded with the low well and core sampling which typify the study area.

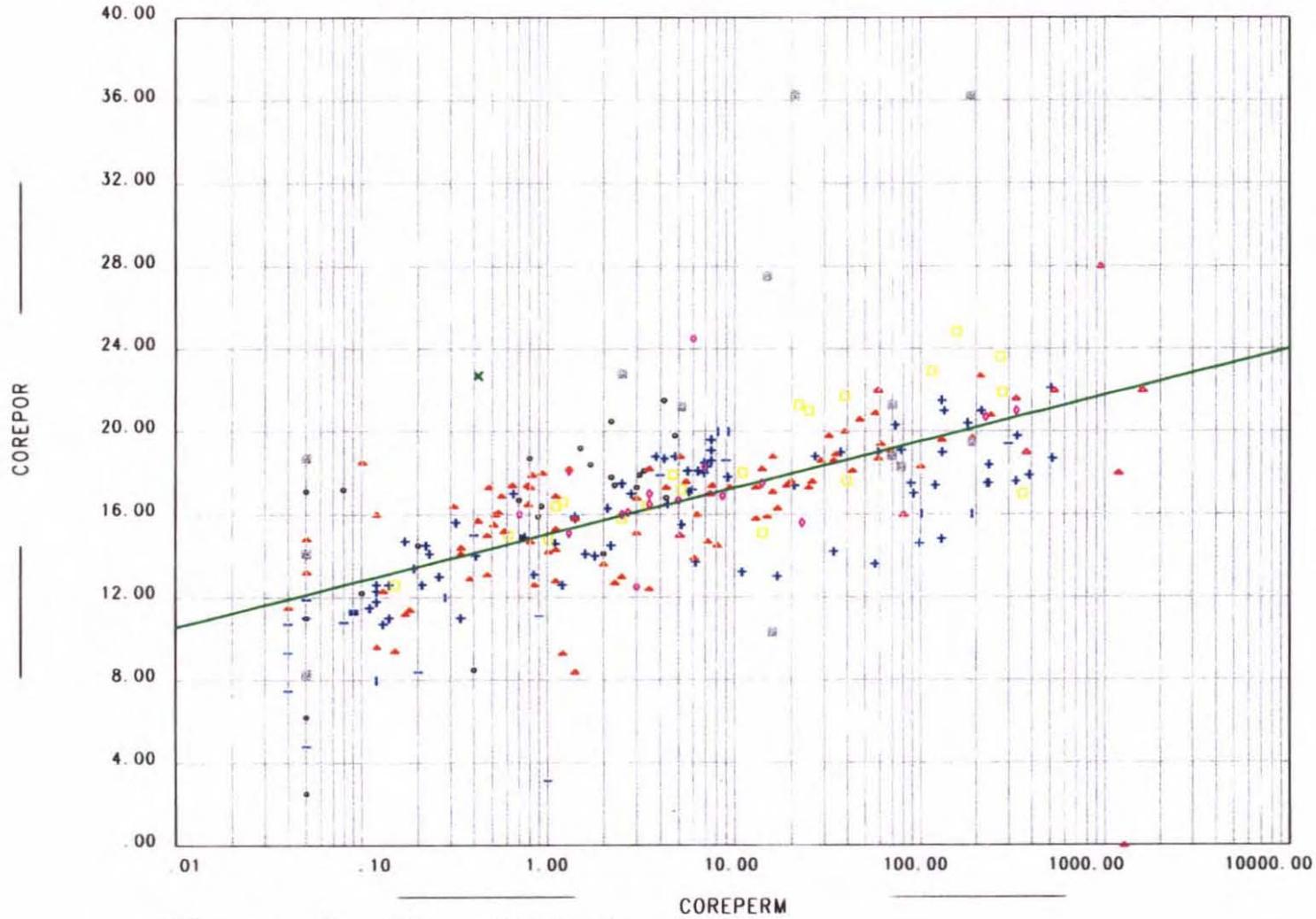
A best fit line to the data is shown on figure 15, the slope and intercept of this line are very similar to that obtained from the Palaeocene data set. Thus for permeability greater than 10 millidarcies, porosity greater than 16% is required and for permeability greater than 100 millidarcies, porosity greater than 19.5% is required.

The highest porosity measurements recorded from the Early Eocene occur in the most shallowly buried sediments of Bass 2 (figure 16). In the 25-30% porosity range samples are represented from Pelican 2 and Poonboon 1, whilst all the wells sampled have porosities recorded in the 20 - 25% range.



POROSITY v PERMEABILITY, EARLY EOCENE DATA

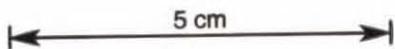
Regression of Y vs X Slope: 2.2388 Incpt: 15.0360 Corr Coef: .5986



- PELICAN 4
- PELICAN 1
- PELICAN 2
- POONBOON 1
- DONDU 1
- NARIMBA 1
- PELICAN 5
- BASS 2

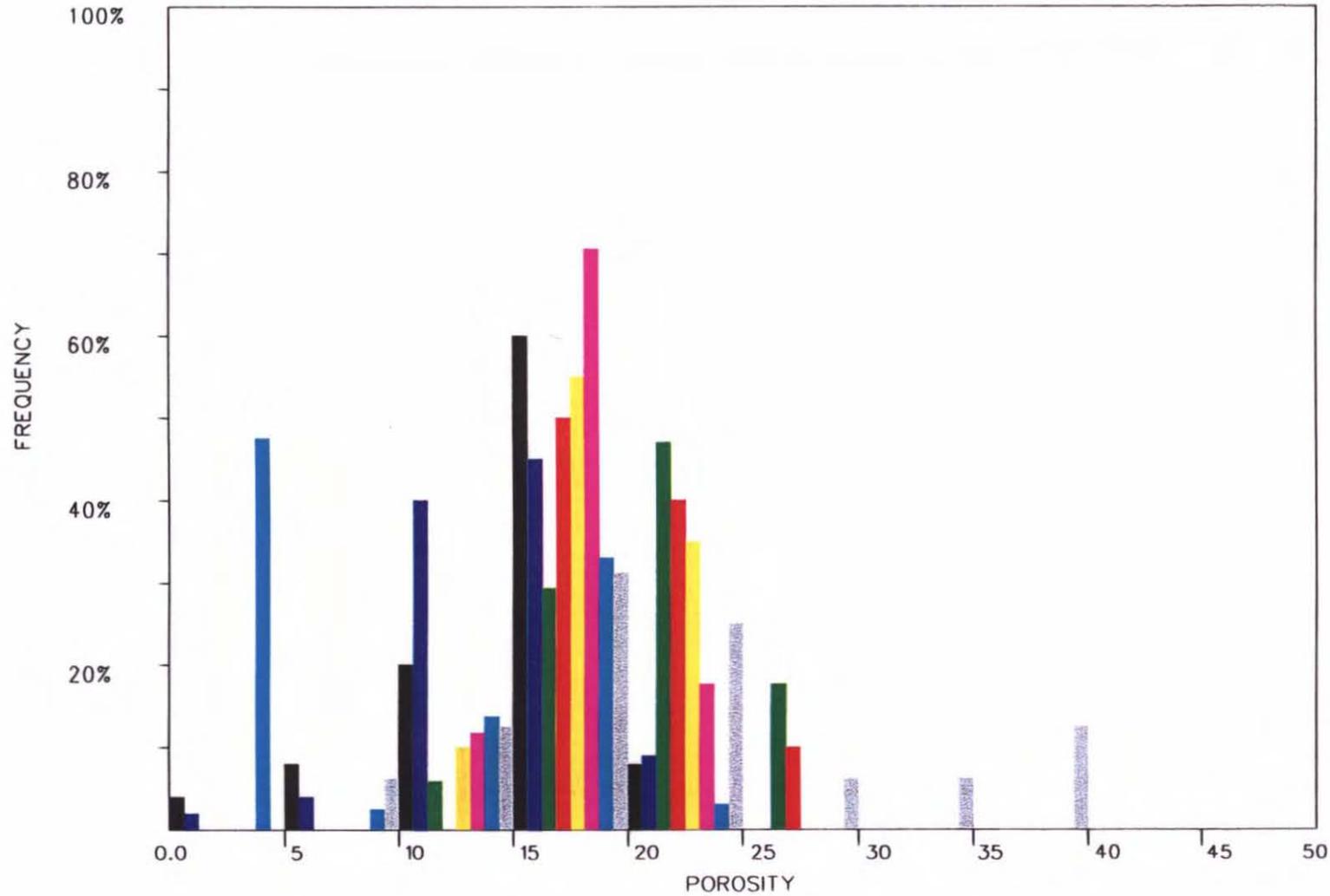
269 of 290 Pts plotted
Constraints: None

Figure 15





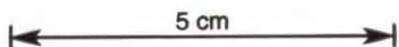
EARLY EOCENE POROSITY HISTOGRAM



- PELICAN 4
- PELICAN 1
- PELICAN 2
- POONBOON 1
- DONDU 1
- NARIMBA 1
- PELICAN 5

Phi Min: 1.00
Phi Max: 36.30

Figure 16



Permeability measurements from the Early Eocene in the study area range between .04 to 1600 millidarcies (figure 17). The highest permeabilities occur at Poonboon 1, core 2 where over 20% of the samples have permeabilities over 1000 millidarcies. In the 100 to 1000 millidarcy range samples from Pelican 1, Poonboon 1, Dondu 1, Narimba 1, Pelican 5 and Bass 2 are represented. This data however should be interpreted in the context of the facies from which the data is obtained, for example the high permeabilities at Pelican 1 were mostly obtained from core through minor shoreface and crevasse splay sandstones, with probable limited lateral extent.

5.4 Implications for prospectivity in T/25P

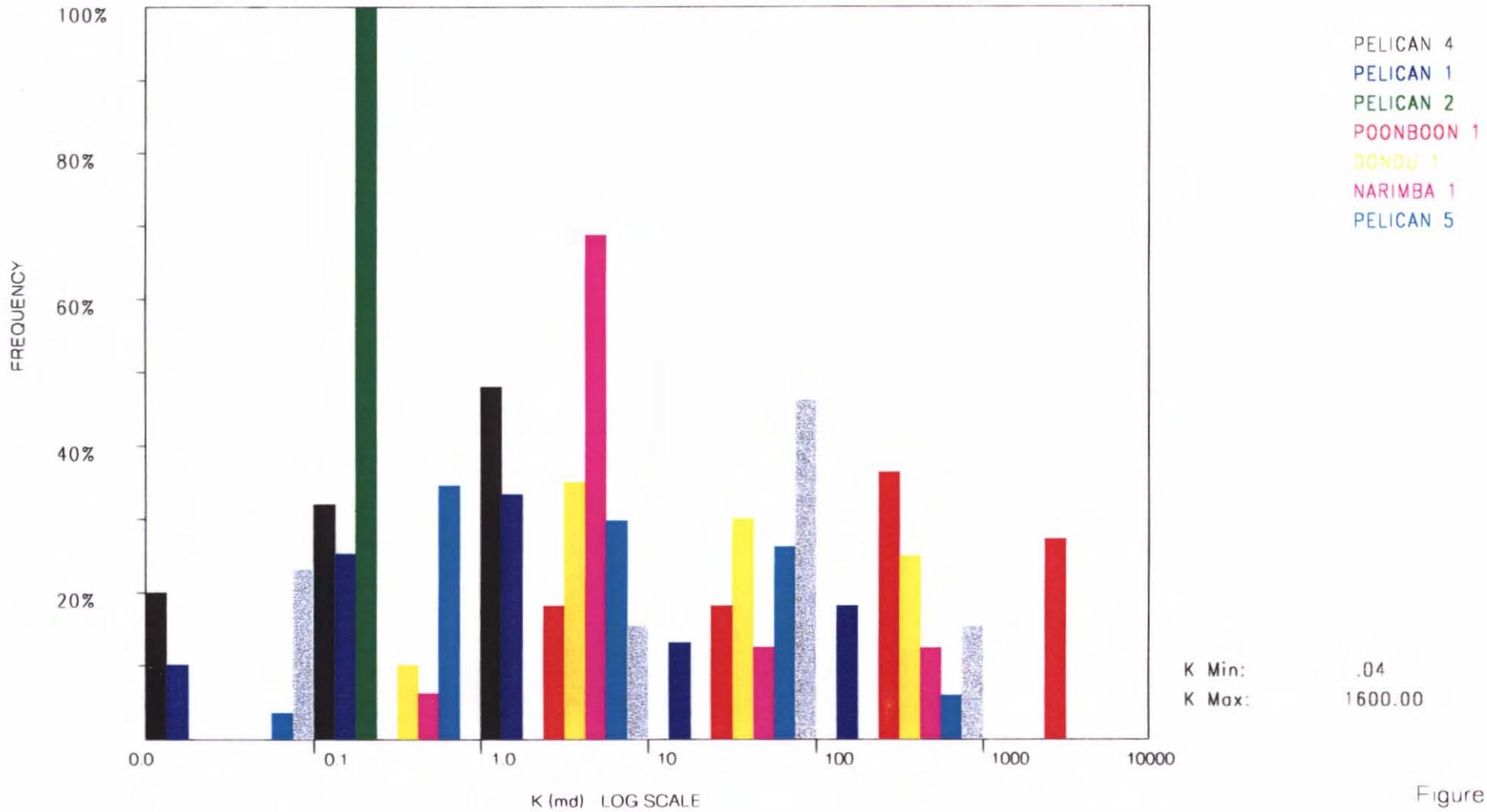
The palaeogeographic models developed for the Early Eocene sediments are similar to those developed for the Palaeocene in that they also suggest that the northern part of T/25P is likely to offer the best potential for the development of good quality reservoir sandstones.

As with the Palaeocene palaeogeographic models the favoured reservoir facies may include strandplain-shoreface and distributary channel sandstones, whilst the possibility of back barrier washover sandstones such as those interpreted in Narimba 1 offers another possibility in the northern part of the permit.

In the south eastern two thirds of the permit the floodplain setting appears to have more extensive fluvial channel deposits in the upper part of the sequence, which extend beyond the limits of the Pelican Trough. The occurrence of these more extensive fluvial channel sandstones on the flanks of the Pelican Trough may offer improved chance of reservoir to prospects such as Grindstone, Eddystone, Tourville, Warrego etc. Their shallower depth of burial compared to the fluvial deposits of the Pelican Field wells may also result in better preserved porosity and permeability.



EARLY EOCENE PERMEABILITY HISTOGRAM



5 cm

Figure 17

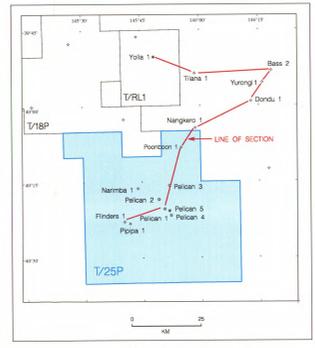
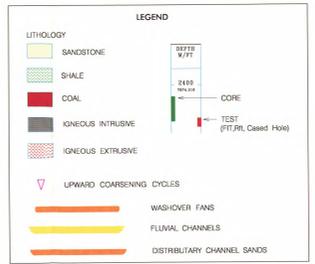
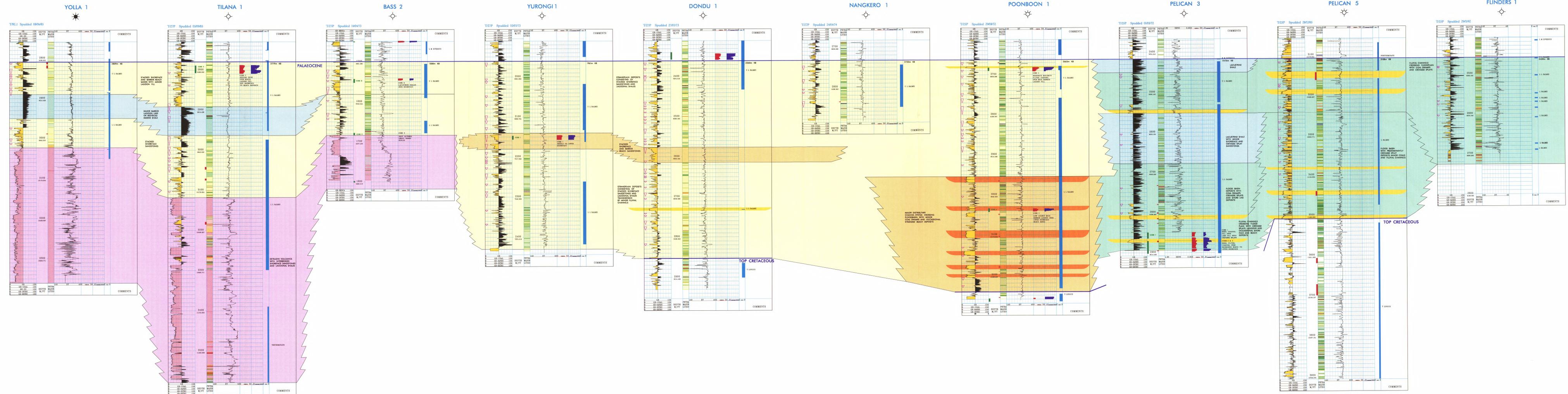
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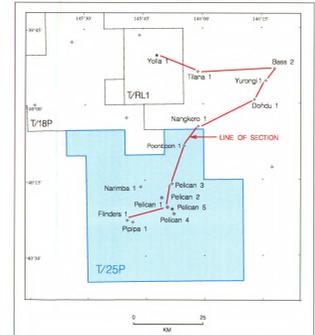
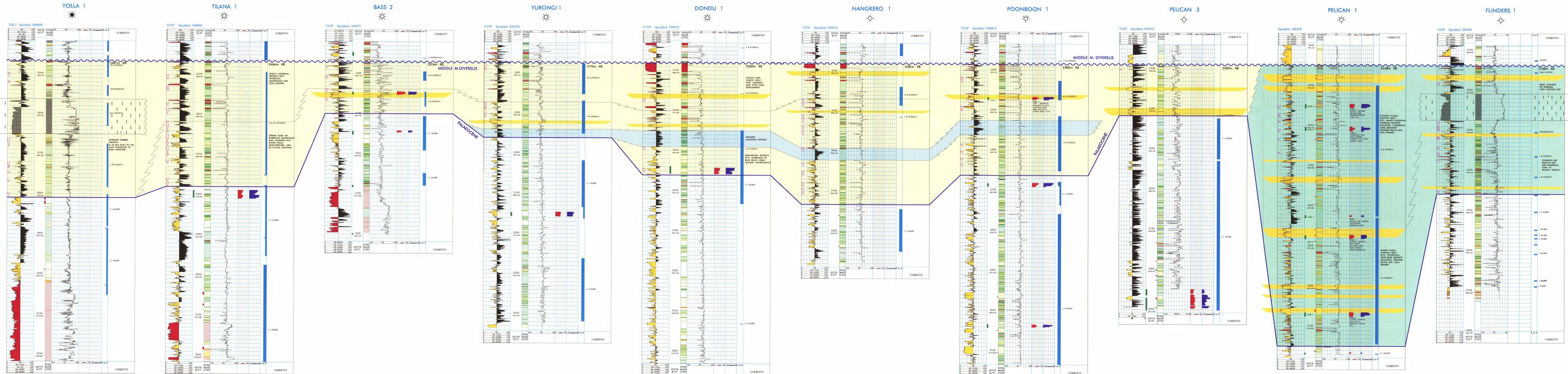
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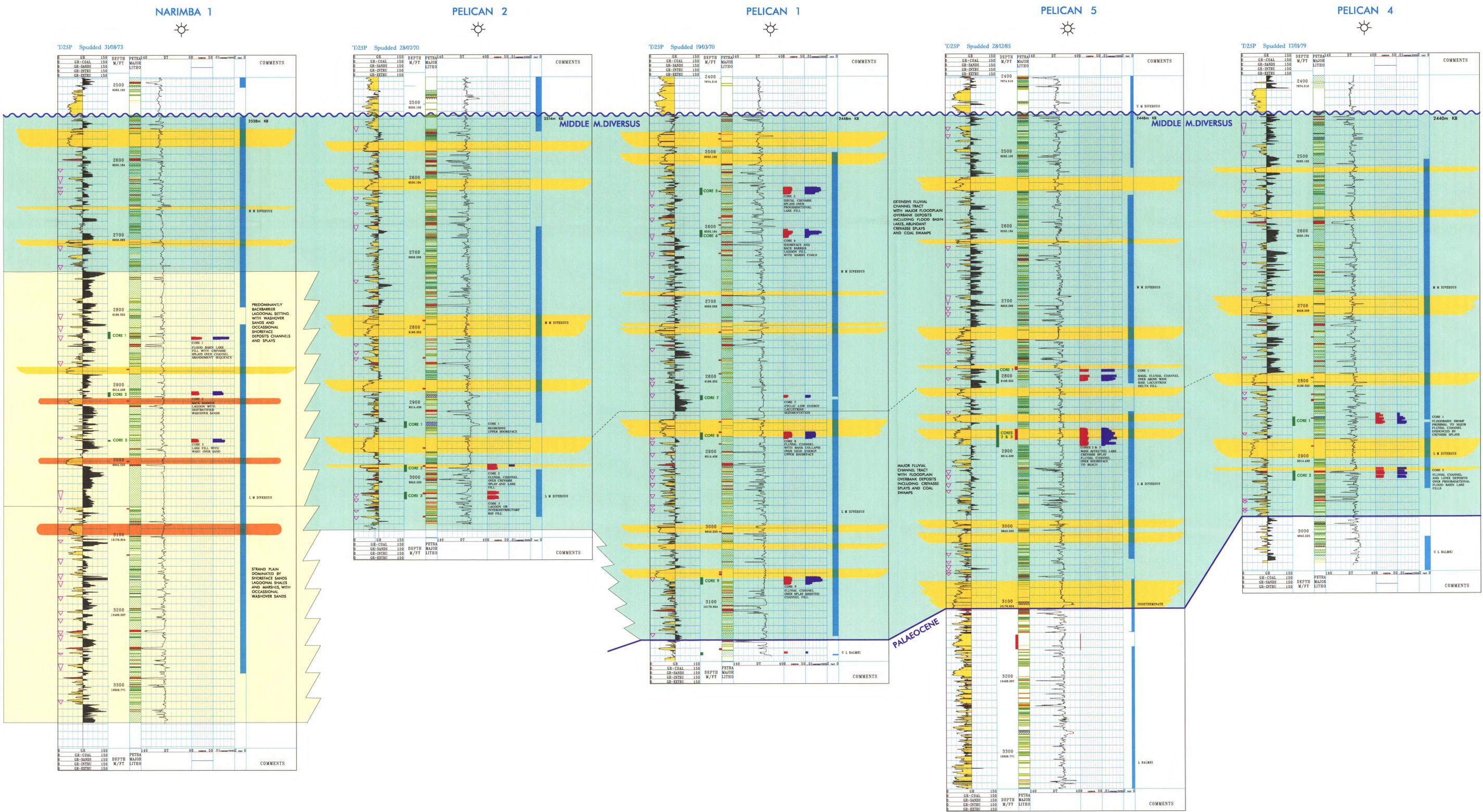
T25P BASS BASIN
STRATIGRAPHIC SECTION
WITH
PALAEOGEOGRAPHIC
INTERPRETATION
DATUM: TOP PALAEOCENE

AUTHOR: R. BOUTELL DATE: 05/11/05 ENCLOSURE: 1
 DRAWN: A. BOYACK SCALE: AS SHOWN DPL No. 13018.0095



T25P BASS BASIN
STRATIGRAPHIC SECTION
WITH
PALAEOGEOGRAPHIC
INTERPRETATION
DATUM: TOP MIDDLE M. DIVERSUS

AUTHOR: R. BUTTILL DATE: SEPT. '95 ENCLOSURE: 2
 DRAWN: A. BOVIC SCALE: AS SHOWN DTD: NO. 13118.095



BORAL ENERGY

T/25P BASS BASIN
 STRATIGRAPHIC SECTION
 WITH
 PALAEOGEOGRAPHIC
 INTERPRETATION
 DATUM: MIDDLE M.DIVERSUS

AUTHOR: R.SUTTILL DATE: SEPT. '96 ENCLOSURE: 3
 DRAWN: A.BOYACI SCALE: AS SHOWN DRG. No. 12518.0995