PEDIRKA SECTOR: A REASSESSMENT OF GEOLOGY, POROSITY, MATURITY AND MATURATION HISTORY

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1. INTRODUCTION

The Pedirka Sector lies to the west of longtitude 139^{0} and contains the little explored Arckaringa, Dalhousie, Pedirka, Lake Eyre and Mulka Blocks. The Poolowanna Trough which is the major depocentre in the region (Moore, 1982) accumulated sediments in the Warburton Basin (Cambro-Ordovician), Pedirka Basin (Permian), Simpson Desert Basin (Triassic), Eromanga Basin (Jurassic-Cretaceous) and Lake Eyre Basin (Neogene). The Arckaringa Basin was a subsidiary Permian depocentre in the Arckaringa Block to the southwest.

The main impetus to exploration to data was the discovery in 1977 of oil in the Early Jurassic Poolowanna Formation in Poolowanna 1. However reserves in the Poolowanna 1 well are probably small, and no significant discoveries have been made since then. The five wells drilled in 1985 (Poolowanna 2, Killumi 1, Glen Joyce 1, Oolarinna 1 and Miandana 1) failed to intersect significant hydrocarbons.

The purpose of this report is to present a review for the Permo-Triassic and Mesozoic of the distribution of reservoir units, porosity and seals, source rock maturity and maturity history in the Pedirka Sector. Provisional formation tops and thicknesses for the five recent Pedirka Sector wells are included here, and may be revised in the more comprehensive review as other data (e.g. palynology) become available, and the area is geophysically remapped.

All maps in this report are drawn on a base which shows leads and prospects, mapped geophysically by the exploration teams. In the Pedirka Block these are based on structures present at the 'C' horizon. In the Arckaringa Block the leads and prospects reflect mainly Permian structures, in some cases associated with earlier Palaeozoic plays. These have been recently remapped and Enclosure 1 shows an updated leads and prospects map which differs in the Arckaringa Block, from those in subsequent enclosures.

Data for some Birdsville Track Ridge wells are also considered in this report, because they show similar maturation trends to those in the Pedirka sector. The development of the Pedirka Sector basins and the Birdsville Track Ridge are closely related, and a review of the structural growth history of the latter is contained in Appendix 6.

2. GEOLOGY

The geology of the Pedirka Sector is summarised in Moore (1983 a, b and c). Isopach maps which show the geological evolution of the region from Permian to Cretaceous (Figs 1 to 9, Encls 2 to 10), are based on an update of formation tops defined in Johnstone (1985) (Appendix 1) which are included here in Enclosures 11 to 15.

For the purpose of illustrating geological evolution of the Pedirka Sector basins with time, 'formation' tops in this report are picked on the basis of 'log equivalents' rather than 'facies equivalent' boundaries. For the Triassic and Jurassic both are recorded in Appendix 1, and in the deeper part of the Poolowanna Trough they are coincident. The log equivalent tops are based where possible on palynological (Appendix 1) and seismic control, the latter reflected in the sonic log. Cognisance is also taken in the Pedirka Sector maps, of patterns of variation in the Cooper Sector.

Isopach maps for Triassic and younger units in the Pedirka Sector are based on a C-J1 (top Cadna-owie Fm to top Poolowanna Fm) isochron map (Moriarty, 1984) in the Pedirka Block, with modifications in the light of recent drilling. This interval will be extensively remapped geophysically in the next 12 months.

2.1 Cadna-owie Formation and Algebuckina Sandstone (Early Cretaceous to Early Jurassic)

The tops for the Cadna-owie Formation and the Algebuckina Sandstone in Enclosures 9 to 13, are essentially unmodified from Moore (1982, 1983a) except in the Arckaringa Block. There the Cadna-owie Formation was interpreted to be present, and the Algebuckina Sandstone absent. However, truncation of the Cadna-owie Formation towards the Peak and Denison Ranges is apparent in seismic sections (SA2 Team, 1985) and the Algebuckina Sandstone is now interpreted to be more widespread in that area.

The isopach maps of the Cadna-owie Formation, Algebuckina Sandstone and the combined interval (Figs 1 to 3, Encls 2 to 4) are based on well values and in the Pedirka Block the C-J1 isochron map. Thinning of the Cadna-owie Formation in Kuncherinna 1 and Miandana 1 is unusual given the regional C to J1 thickness pattern. Detailed log correlation suggests that the thinning is due to loss of part of the middle of the Cadna-owie, and not a proportional loss of thickness over the whole formation. The thinning is therefore attributed here to listric faulting, which is supported by the existence of bad hole conditions in Miandana 1 and the shaly nature of the formation.

The presence of Birkhead Formation in Miandana 1 and overlying economic basement in Poonarunna 1 (based on palynological control), indicates onlap of the Algebuckina Sandstone to the south; the edge of a top Hutton Sandstone correlative horizon lies to the north of that well.

East of the Pedirka Sector on the Birdsville Track Ridge, silty Westbourne and Birkhead Formations are present, dividing the Algebuckina Sandstone into three sandy units; the Namur, Adori and Hutton sandstones. The limit of a Birkhead Formation seal in the Pedirka Sector is based on its presence in Miandana 1, Poonarunna 1 and Pandieburra 1 on the BTR, although the distribution is probably patchy in the west based on seismic control (Appendix 3). The base of the Birkhead in Miandana 1 is sandy, but 30' of siltstone is present in the top. Therefore the limit of the Birkhead seal is now shown to the north of Miandana 1 in the Poolowanna Trough.

2.2 Poolowanna Formation (Early Jurassic).

Intraformational sands of the Poolowanna Formation are the main target in the Pedirka Sector, and thickness variation is shown in Figure 5 (Encl. 6). The pattern of thickness variation is based on that shown in the thicker Cadna-owie Formation plus Algebuckina Sandstone interval; a significant difference is the presence of a subsidiary depocentre in the north, defined by Erabena 1, which is supported by seismic correlation.

Based on the presence of a significant thickness of shaly Poolowanna Formation in Glen Joyce 1, which is confirmed by palynology, a thin shaly Poolowanna facies is now interpreted in Mokari 1. In Mokari 1 and further west, a Poolowanna Formation time equivalent top in the base of the Algebuckina Sandstone is shown, based on palynological control. The western limit of the Poolowanna Formation as a seal is drawn approximately at the 80% sand contour in the log equivalent formation after Moore (1980).

The southern limit of the Poolowanna Formation is based on limited seismic control and the presence of a restricted thin veneer of Poolowanna Formation further to the south is possible. However recent drilling suggests that a Poolowanna Formation edge occurs between Miandana 1 and Poonarunna 1, because of non-deposition due to contemporaneous structuring.

2.3 Peera Peera and Walkandi Formations (Triassic)

Thickness variations in the Peera Peera and Walkandi Formations are shown in Figures 6 and 7 (Encls 7 and 8). The Peera Peera Formation is unconformably overlain by the Poolowanna Formation, but probably conformably overlies the Walkandi Formation (Price et al., 1985). The Walkandi Formation unconformably overlies Permian and pre-Permian units. The western limit of Triassic is defined by well and seismic data, and is fault controlled. The boundary between the Peera Peera and Walkandi Formations in Enclosures 11 to 15 is a log equivalent top based on sonic character.

The sequence from the Walkandi Formation to Cadna-owie Formation shows a general pattern of concentric growth within the Triassic to Cretaceous depocentre.

2.4 Purni, Crown Point, Mt. Toondina, Stuart Range and Boorthanna Formations (Early Permian)

The Purni Formation in the Pedirka Basin is considered to be a time correlative of the Mount Toondina plus Stuart Range Formations in the Arckaringa Basin (Price et al., 1985). An isopach of the total Permian is shown in Figure 7 (Encl. 8). Thickness variation between adjacent wells in the southeast is large, reflecting basement relief, and a strong north-south structural grain is apparent.

The Permian depocentre in the Pedirka Basin is probably located north of the Mokari and Purni wells and is not better defined in Enclosure 8 because of a lack of seismic control. A thick sequence of flat-lying sediments is present west of the McDills Trend. Its age is unknown.

In the Arckaringa Basin the thickest Permian sequence is found in the Boorthanna Trough in the east (Moore, 1982). Two subsidiary depocentres defined by Boorthanna 1 and Cootanoorina 1 are recognised.

The Permian sequence is further divided in Figures 8 and 9 (Encls 9 and 10) into a lower interval comprising the Crown Point plus the 'lower' Purni Formation, and correlatives in the Arckaringa Basin, and an upper interval comprising the 'middle' plus 'upper' Purni Formation and correlatives ('lower', 'middle' and 'upper' following Youngs, 1976).

This subdivision is appropriate to demonstrate the geological evolution of the basin, because the greatest thickness variation is present in the lower interval (Crown Point plus 'lower' Purni), and the base of the sandy 'middle' Purni unit provides a basin-wide marker (W. Fawcett, S.A.3 Team, pers. comm.).

The Crown Point and Boorthanna Formations are considered to be of glacial origin (Youngs, 1973). The Crown Point Formation and, in places, the 'lower' member of the Purni Formation are absent on Permian structural highs, suggesting significant topographic relief and onlap in the lower isopached unit (Fig. 8). Thickness variation in the overlying fluvial and paludal upper interval generally follows that established in the lower interval but is not as well developed.

3. SOURCE ROCK POTENTIAL

Source rock potential in the Pedirka Sector is discussed by Johnstone (1985) and a brief summary is presented here. Based on liquid chromotography results and visual analysis of kerogen (Price, 1977), total organic carbon content is high to excellent (2 to >5 wt%) in the Poolowanna Formation in the Poolowanna Trough. The Poolowanna Formation also has a fair to very good oil potential over much of the Trough based on hydrocarbon yields (10 to 200 mg/g TOC) (Johnstone, 1985, enclosure III, parts A and B).

In Poolowanna 1, the Poolowanna Formation between the interval 7757 to 8440', contains up to 75% of oil prone cuticle, miospore and fine sapropelic detritus; in the best section less than 20% gas prone opaque matter is present (Price, 1977). The Triassic, although organic rich in the top is gas prone with about 50% opaque detritus (Price, 1977). Thus a reasonable source potential is assumed for the Poolowanna Formaton, although it should be noted that organic source facies are laterally variable in the Jurassic (P. Price, AAR pers. comm.).

Because of the coaly nature of much of the Permian sequence, a reasonable source potential is also assumed. However the Permian coals of the Pedirka Basin are inertinite rich, like their counterparts in the Cooper Basin, and thus Permian source rocks are here assumed to be gas prone.

4. MATURITY

4.1 Temporal Variation

The maturity of the Pedirka Sector sediments is here considered in terms of vitrinite reflectance. The method of generating the reflectance profiles is discussed, and the profiles are compiled in Appendix 2. The approximate reflectance at several horizons is shown on the profiles and these values are used to map the spatial variation of reflectance in Figures 10 to 15 (Encls 11 to 17.

4.2 Spatial Variation

In general the patterns of spatial variation also mirror Pedirka Block C to J1 isochron map to the top of the Permian, making allowance for the comparatively greater maturity in Poonarunna 1 to the south. The profile in Walkandi 1 shows a significant decrease in maturity (in terms of Rv) at each horizon, compared with surrounding wells. This may be due to the presence of cavings down to the level of the Jurassic which is supported by EVRE values in the well (Fig. A2.17). Elsewhere EVRE values are in good agreement with vitrinite reflectance values (e.g. Figs A2.11, A2.12, A2.13 and A2.8).

In the Permian, spatial variation of maturity is also largely controlled by Jurassic-Cretaceous structuring. Thus in the Permian, maturity increases towards the Jurassic-Cretaceous depocentre and not the Permian depocentre (Figs 14, 15 and 16; Encls 20, 21 and 22.

4.3 Post-Jurassic Structural History

The assumption is usually made that structuring in the Jurassic-Early Cretaceous was mild. Thus it is assumed that thickness variation in the interval reflects draping and compaction over Permo-Triassic or older structures. Recent uplift, which may be indicated by the separation of reflectance profiles when the data are plotted against present depth, is not large (Fig. 17), assuming that variation of geothermal regime across the region was not great.

The assumption of only mild Jurassic-Cretaceous structuring, is tested in Figure 18 by comparing reflectance at the top of the Cadna-owie and Poolowanna Formations with C-J1 thickness. There is a consistent relationship between the parameters, excluding Walkandi 1 and Purni 1 which are low, and Putamurdie 1 and Poonarunna 1 which are high. Reflectance in the Arckaringa Basin wells may also be high, implying high heat flow, although this is difficult to assess given the thin Jurassic-Cretaceous section present (Fig. 18).

In Figure 19 Rv is plotted at the C and J1 horizons, assuming that the original surface to C thickness was 2.5 times the C to J1 thickness (Table 1). Using this empirical relationship the C and J1 reflectance values are approximately co-linear (line 1 in Fig. 19) excluding Putamurdie 1, Poonarunna 1 and probably the Arckaringa Basin wells which are high, and Purni 1 and Walkandi 1 which are low. The regression line has been fitted to the high side of the data, closely following the gradient in Poolowanna 1 which is best controlled (Appendix 2).

This relationship may be used to estimate the maturity at the top of the Cadna-owie Formation, the Poolowanna Formation and possibly at lower horizons, where a C to J1 interval thickness is known or can be estimated. In Figure 21, Rv at C, J1 and Z is estimated in recent Pedirka Sector wells, using the known C-J1 thicknesses. The same device could be used to estimate the magnitude of recent uplift and erosion. Subsequent results for some of these wells (Figs A2.11 and A2.14) suggest that the nomogram yields values which are a little high - reflecting the fact that it is an optimistic fit to the data.

Table 1: Reflectance values and the ratio of "surface to C/C to Jl" for wells in the Pedirka sector and on the Birdsville Track Ridge.

PEDIRKA SECTOR - ARCKARINGA BLOCK

WELL	Surf to C (ft)	C to Jl (ft)	Ratio Surf -C/ C-Jl	Rv C %	Rv H %	Rv Jl %	Rv base Poolo-wanna %	Rv top Purni/ Mt To-ondina %	Rv Z %
Boorthanna 1	0	<138	0	0.28*		0.29*		0.34	0.57
Cootanoorina 1	370	245	1.9	0.27		0.28*		0.30	0.61
Weedina 1	0	212	0	0.28*		0.30*		0.39	0.66
Oodnadatta 1				70.34					

* base of overlying unit

PEDIRKA SECTOR - EX ARCKARINGA BLOCK

WELL	Surf to C (ft)	C to Jl (ft)	Ratio Surf -C/ C-Jl	Rv C %	Rv H %	Rv Jl %	Rv base Poolo-wanna %	Rv top Purni/ Mt To-ondina %	Rv Z %
Erabena 1	4420	2247	2.0	0.48	0.56	0.68	0.76		0.85
Kuncherinna 1	5110	2657	1.9	0.46	0.56	0.65	0.71		0.81
Macumba 1	4670	2511	1.9	0.47	0.62	0.78	0.84	0.99	1.08
McDills 1	1436	916*	1.6	0.29		>0.33*		0.38	0.46
Mt Crispe 1	610	855*	0.7	0.32	0.38	>0.45*			0.53
Poolowanna 1	5186	2646	2.0	0.58	0.73	0.88	0.97		1.14
Poonarunna 1	3822	1527*	2.5	0.51	>0.68*				0.68
Purni 1	3263	1327	2.5	0.27	0.29	0.32	0.34	0.35	0.42
Thomas 1	4583	2226	2.1	0.44	0.57	0.72	0.83		0.96
Walkandi 1	5540	2789	2.0	0.41	0.53	0.72	0.83		1.07
Witcherrie	920	898	1.0	0.25	0.31	0.36	0.37		0.44

Table 1: (cont.) Reflectance values and the ratio of "surface to C/C to J1" for wells in the Pedirka sector and on the Birdsville Track Ridge.

COOPER SECTOR

WELL	Surf to C (ft)	C to J1 (ft)	Ratio Surf -C/ C-J1	Rv C %	Rv H %	Rv J1 %	Rv base Poolo-wanna %	Rv top Purni/ Mt To-ondina %	Rv Z %
Pandieburra 1	4174	2128	2.0	0.47	0.53	0.60	0.62		0.69
Putamurdie 1	3927	1679	2.3	0.52	0.62	0.66	0.68		0.72
Koonchera 1	4195	2203	1.9	0.41	0.52	0.68	0.73		0.78
Adria Downs 1	3106	1641	1.9	0.38	0.46	0.54	0.57		0.57
Charo 1	4603	2078	2.2	0.47	0.58	0.65	0.68		0.68

* base of overlying unit

5. POROSITY

Estimates of porosity in Pedirka Sector wells are based on sonic porosity, mainly calculated by the Delhi Petroleum log-calc reservoir evaluation programme. Estimates of sonic porosity made in some of the older Pedirka Sector wells (Purni 1), usually appended to well completion reports, are included where available. Where no logs are available, visual estimates of porosity from the wellsite mudlog are used. Estimates of porosity in the wells are included in Appendix 1.

5.1 Spatial Variation

Spatial variation of porosity, based on a volumetric median value and range (±2%) for most sands, is shown in Figure 21 to 27 (Encl. 23 to 29). The contours are based on depth maps, because maximum depth of burial is considered to be the principal control of porosity, at least in the Eromanga Basin assuming equivalent provenance and geothermal regimes across the sector.

Small reversals in the downward decreasing porosity trend such as between the lower Algebuckina Sandstone and Poolowanna Formation may be due to cementation in the former, and/or leaching of framework or cement in the latter.

5.2 Temporal Variation

The Algebuckina Sandstone shows a large range of variation over its thickness, and is arbitrarily divided into a top, middle and lower part (thirds), the top being the possible reservoir section. Usually porosity reaches a maximum to the top of the Algebuckina Sandstone, although in Killumi 1 there is a decrease in the top 50 feet, due to increasing V_{shale}. The base of the Algebuckina Sandstone is cemented in places and porosity in the Poolowanna Formation may be higher by comparison.

Porosity in the lower Permian interval is highly variable, which may reflect their glacial origin, with the presence in places of clay matrix. On the basis of present information it is not possible to reasonably estimate spatial variation of porosity in these units.

6. MATURATION HISTORY

Maturation histories are examined in eight wells from the Pedirka Basin depocentre, which show the highest maturities in terms of vitrinite reflectance. Maturation history is examined from an analysis of burial and geothermal histories in a Lopatin model.

6.1 Burial History

Burial histories in the eight wells are based on the determination of sedimentation rates, refined by palynological control where available, and tied to the time scale of Harland et al. (1982), (Fig. A3.1). Thickness lost at the Permian and Triassic unconformities is calculated based on the reflectance curves in Appendix 2. The results are documented in Tables A3.1 to 5. The amounts calculated are small and do not significantly affect maturity in the Lopatin modelling because of the overall shallow burial prior to the Cretaceous. However, this is not the case for the post-Winton Cretaceous unconformity. Assuming proportional sedimentation in the Winton to Cadna-owie and Cadn-owie to Poolowanna intervals, which is supported by the reflectance data (Section 2, this report), significant sediment loss has occurred in wells away from the main depocentres of the Patchawarra and Nappamerri Troughs. In Beanbush 1 and Burley 1 the above ratio is 2.4 and 2.6; in the Poolowanna Trough the maximum ratio is 2.0. A ratio of 2.2 is adopted here to restore sediment at the Cretaceous unconformity in the Poolowanna Trough. The additional thickness increases maturity by about 0.05% Rv because of the depth of burial involved.

6.2 Geothermal History

Geothermal gradients measured in Pedika Sector, based on corrected bottom hole temperatures and a mean surface temperature of 73° (following Stanmore and Johnstone, 1983) are shown in Figure 28. The gradient is highest from surface to intermediate depth (usually the 'C' horizon) in all wells except Walkandi.

The median surface to T.D. gradient for the wells considered is 2.17^{o}F/100', which is significantly lower than the grand average for Pedirka and Cooper Sector wells of 2.4^{o}F/100' (Stanmore and Johnstone, 1983) but still significatly higher than a world average of about 1.9^{o}F/100' (Pitt, 1982).

6.3 Lopatin Modelling

Establishing a geothermal history for the region is problematic; the usual method for verifying a proposed history is to examine its implications for maturation history. The Lopatin modelling process facilitates this by providing a calculated equivalent vitrinite reflectance profile (derived from the time-temperature index - TTI), which is compared with a measured profile. In Figures 29 to 36 maturation histories in Poolowanna 1 and Macumba 1 are modelled using a variety of geothermal histories. Calculated and measured reflectance profiles are shown in Figures 37 and 38.

If maturation is modelled assuming the present geotherm operated throughout the history of the basin, then the calculated reflectance profiles are much too high (Figs 29, 30, 37 and 38). An implication is that present gradients are significantly hotter than in the past.

The two-part gradient (measured and/or estimated) is used in the model, which significantly increased maturation below the Cadna-owie due to the "pressure cooker" effect of the high surface to 'C' gradient (because C to Z is then significantly hotter compared with the case of an averaged surface to Z gradient).

In Figures 31 and 32, maturation is modelled assuming the thermal subsidence mechanism of Turcotte and Angevine (1982) (Appendix 3). In this case an initial cratonic geotherm of 20°C/km is assumed, based on Sass et al. (1976), and intermediate gradients (which are not significantly different) are calculated for the model at 100 and 1 Ma. The thermal subsidence model significantly underestimates maturity in both the wells (Figs 37 and 38).

Finally in Figures 33 to 36 maturation is modelled using thermal histories of 0.75 and 0.80 of the present gradient until 10 Ma, the gradient rising to the present level at 1 Ma. Pitt (1985) also sucessfully models maturation (in terms of matching measured reflectance profiles) in the Cooper Sector using gradients of about 0.7 to 0.8 of the present gradient until 10 Ma in areas not affected recent uplift. From Figures 37 and 38, a gradient of 0.80 of the present geotherm until 10 Ma produces a reasonable fit to the measured curve in the region of interest - i.e. in the Poolowanna Formation and the Permian.

Appendix 4 contains maturation histories based on the present geothermal gradient and 0.80 of the present gradient for the eight wells examined. The latter is taken as a reasonable approximation of present maturity in the wells.

Based on the association in the Cooper Sector of significant reserves of Eromanga Basin oils with present reflectance levels of >0.7% Rv, and Cooper Basin gas with >0.9% Rv, maturity in Glen Joyce 1 and Miandana 1 is maginal based on the Lopatin modelling.

However in the case of Miandana 1, the present geothermal gradient is anomalously low from intermediate depth to basement compared with the other wells (Fig. 28) and reflectance analyses are required to confirm the level of maturation. Although Glen Joyce is only marginally mature at the well site on the basis of the Lopatin modelling, it has access to mature Permian source rocks to the east, providing a migration pathway is present.

On the basis of the Lopatin modelling and vitrinite reflectance data, the other wells examined are suffiently mature, to generate oil, and gas in the case of Kuncherinna 1, Macumba 1, Poolowanna 1 and Walkandi 1.

7. DISCUSSION

From the analysis of present maturity and maturation history presented in this report, it is reasonable to conclude that the Jurassic Poolowanna Formation, is mature for oil generation over much of the deeper central part of the Poolowanna Trough, which is confirmed by the Poolowanna 1 discovery. Furthermore, where the Permian Purni Formation near its eastern limit is overlain by a thick Poolowanna Trough sequence, it has also reached the level of maturity necessary for significant oil and possibly gas generation.

In most of the deeper wells, critical maturity was achieved with deep burial in the Late Cretaceous and in this respect their maturation history is similar to many Cooper Sector wells (Pitt, 1985).

Conversely, away from the Poolowanna Trough, approximated by the 200' thickness contour of the Poolowanna Formation, the Jurassic-Cretaceous, (and if present the Permian sequence) must be considered immature. The Arckaringa Basin succession to the base of the Permian is also considered immature.

Geothermal gradients are significantly lower on average in the Pedirka Sector compared with the Cooper Sector. Thus equivalent maturity is reached at comparitively greater depths in the Pedirka compared with the Cooper Sector. This has adversely affected porosity, which is marginal over much of the central Poolowanna Trough and the underlying Pedirka Basin in the northwest.

Nevertheless there is a zone, radially disposed about the Poolowanna Trough, in which acceptable levels of porosity and maturity are present. In this respect the lightly explored southen portion of the Poolowanna Trough is possibly most propective, given the high level of maturity at relatively shallow depth in Poonarunna 1, which is suggestive of a higher geothermal gradient to the south.

Dependent on the timing of the diagenetic silicification processes reponsible for porosity reduction over much of the deeper Poolowanna Trough, with respect to the generation of significant volumes of hydrocarbons from the central Poolowanna Trough, the possibly also exists for updip migration from the depocentre.

Although the western Pedirka Basin has not be buried deeply enough to generate significant hydrocarbons, the rugged basement topography in the eastern portion, closely juxtaposes grabens of mature Permian sediments with structurally high intra-Permian reservoirs. Here also the possibly of updip migration is also dependent on the relative timing of significant hydrocarbon expulsion and diagenetic porosity loss.

Appendix 7 contains an appraisal of recent Pedirka Sector wells in terms of the factors previously discussed plus closure and structural growth. Maturity and source are rated as marginal in the Triassic, Jurassic and Cretaceous plays in several of the wells, if migration distances are considered to be <10 km. Many of these plays assume an oil prone source which is conjectural for the Permian and Triassic at this time.

However there is no obvious reason for the failure of the Permian play in Oolarinna 1, the Triassic gas and Jurassic oil plays in Miandana 1, and assuming migration of 10 to 20 km, of a Permian sourced play in Glen Joyce 1. Thus the structural aspect is suspect in several wells , particularly given the presence of thick carbonate cemented sands in the Jurassic and their associated velocity anomalies.

8. PLAY MAPS

Play maps based on various combinations of reservoir, source and seal are shown in Enclosures 30 to 33. Based on the occurrence of Eromanga Basin oil in the Cooper Sector (Moore, 1985) significant reserves are associated with a maturation level of greater than 0.7% Rv. Based on the occurence of Cooper Basin gas, significant reserves are associated with a maturation level of at least 0.8% Rv (Moore, 1985). These are the critical maturation contours shown for maturity of Jurassic and Permian source units in the play maps. The traditional porosity limit for reservoirs in the Cooper Basin is 9% and this is the critical contour shown in the play maps. However production is probably possible from lower porosity reservoirs, and because of the characterisation of porosity (ie +2%) a 7% contour is shown where appropriate.

8.1 Jurassic or Cretaceous Source

The first play map Enclosure 30 is based on a Cadna-owie Formation source and seal, and top Algebuckina Sandstone reservoir. Given a maximum maturity of about 0.55% Rv (max) in the central Poolowanna Trough, there is small likelihood finding significant reserves in this play.

A second play (Encl. 31) is based on a source and reservoir in the Poolowanna Formation, or where the Poolowanna Formation seal is ineffective, trapping in the Algebuckina Sandstone. A large part of the Poolowanna Trough contains mature Poolowanna Formation, although reservoir quality deteriorates into the middle of the trough.

The mature area of the Poolowanna Formation is extended well to the south on the basis of the vitrinite reflectance profile in Poonarunna 1. The Miandana 1 well drilled between the depocentre and Poonarunna 1, will provide a test of the extent of mature Poolowanna Formation.

8.2 Permian Source

Several plays based on Permian sourcing are possible. Enclosure 32 shows plays based on a mid-Permian source, with reservoiring in the Permian, Jurassic or Cretaceous, depending on the configuration of seal with respect to source and reservoir.
The Arckaringa Basin does not contain a mature mid-Permian source on the basis of the limits adopted. In the Pedirka Basin maturity increases to the southeast, although porosity is probably marginal in the same area. The limits of Poolowanna Formation and Triassic seals define the possibility for reservoirs in the Poolowanna Formation, Peera Peera Formation and Algebuckina Sandstone.

The area to the west of McDills contains a thick sequence of unknown age. This sequence is probably mature given its thickness, and is probably prospective.

A final play concept is based on a mid- or Early Permian source and Early Permian reservoir (Encl. 33). Once again the Arckaringa Basin is considered to be immature with respect to a Permian-source. In the Pedirka Basin, although maturity is adequate in the southeast, reservoir quality is highly variable in the critical zone.

9. CONCLUSIONS

Permian sedimentation was extensive in the west of the Pedirka Sector in the Arckaringa and Pedirka Basins. There was an eastwards shift of the locus of deposition to the Poolowanna Trough for Triassic and younger sediments.

Triassic and Jurassic sediments are mature for oil generation and on the threshold of significant gas generation over much of the central Poolowanna Trough, which is confirmed by Lopatin modelling. Permian sediments are mature for oil and gas generation only in the east of the Pedirka Basin as they approach the depocentre of the overlying Poolowanna Trough succession. Typing of source rocks in the region has yet to be adequately quantified.

Porosity in the Triassic and Jurassic reservoirs of the central Poolowanna Trough is marginal. Because of the cooler geothermal regime in the Pedirka compared with the Cooper Sector, greater depth of burial with consequent loss of porosity is required to achieve comparable levels of maturity. However there still remains a concentric zone about the Poolowanna Trough which contains optimum levels of maturity with acceptable levels of porosity for Jurassic oil plays.

On the basis of the higher than average geothermal gradient in Poonarunna 1, the south of the Polowanna Trough may be more prospective in terms of the above porosity/maturity relationship. A Birkhead Formation seal is also developed in this area.

The appraisal of structural closure and growth in many Pedirka Sector prospects is suspect because of velocity anomalies due to the widespread distribution of carbonate cemented sands. This factor may account for the failure of the several recent Pedirka Block wells.

10. REFERENCES

Harland, W.B., Cox, A.V., Llewellyn, P.G., Pickton, CA.G., Smith, A.G. and Walters, R., 1982. A geologic time scale. Cambridge Earth Science Series, Cambridge Univ. Press., 127pp.

Johnstone, D.C., 1985. Stratigraphic cross sections through the Pedirka region. Unpub. Report, Regional Studies Group, Delhi Petroleum Pty Ltd (Attachment 16 in Moore, 1985).

Johnstone, D.C., 1985. Liquid chromatography data available in PELs 5&6 and ATP 259P. Unpub. Report, Regional Studies Group, Delhi Petroleum Pty Ltd (Attachment 10, in Moore 1985).

Moriarty, N., 1984. 1982 Christmas Creek Seismic Survey. Pedirka Block, PELs 5 & 6, South Australia. C-J1 isopach. Drwg. 84 x P-3017.

Moore, P.S., 1980. Hydrocarbon prospectivity of OP177, Northern Territory. Unpub. Report of Delhi Petroleum Pty Ltd.

Moore, P.S., 1982. Mesozoic geology of the Simpson Desert region, northern South Australia. in Moore, P.S. and Mount, T.J. (compilers), Eromanga Basin Symposium summary papers. Geol. Soc. Aust. and Petrol. Explor. Soc. Aust., Adelaide.

Moore, P.S., 1983a. Block prospectivity summary, Arckaringa Block, Feb. 1983. Unpub. Report of Delhi Petroleum Pty. Ltd.

Moore, P.S. 1983b. Block prospectivity summary, Dalhousie Block Feb. 1983. Unpub. Report of Delhi Petroleum Pty. Ltd.

Moore P.S., 1983c. Block prospectivity summary, Pedirka Block, Feb. 1983. Unpub. Report of Delhi Petroleum Pty. Ltd.

Moore, P.S., 1985. Regional Studies Group annual status report 30 June 1985. Unpub. Report of Delhi Petroleum Pty Ltd.

Pitt, G.M., 1982. Geothermal gradients in the Eromanga/Cooper Basin regin. In Moore, P.S. and Mount, T.J., (compilers) Eromanga Basin Symposium, summary papers. Geol. Soc. Aust. and PESA.

Pitt, G.M., 1985. Geothermal gradients, geothermal histories and the timing of thermal maturation in the Eromanga-Cooper Basin. In Gravestock, D.I., Moore, P.S. and Pitt, G.M. (eds). Contributions to the geology and hydrocarbon potential of the Eromanga Basin, Geol. Soc. Aust., Spec. Publ., 12.

Price, P.L., Filatoff, J., Williams, A.J., Pickering, S.A. and Good, G.R., 1985. Late Palaeozoic and Mesozoic Palynostratigraphical units. Report No. 274/25, CSR Oil and Gas Division Palynology Facility (Unpub.).

Price, P.L., 1977. Palynological Lab. Report 13/103. Unpub. Report of Mines Admin. Pty Ltd.

S.A.2 Team, 1985. Arckaringa Block, August 1985. Unpub. report of Delhi Petroleum Pty Ltd.

Stanmore, P.S. and Johnstone, D.C., 1983. Geothermal gradients and petroleum potential in PEL's 5&6, and ATP 259P. Unpub. report of Delhi Petroleum Pty Ltd.

Turcotte, D.L. and Angevine, C.L., 1982. Thermal mechanisms of basin formation. Phil. Trans. R. Soc. Lond., 305, 283-294.

Youngs, B.C., 1976. The geology and hydrocarbon potential of the Pedirka Basin. Dept. Mines, Geol. Surv. of South Aust., Rep of Invest., 44 -47pp.

Sass, J.H., Jaeger, J.C. and Munroe, R.J., 1976. Heat flow and near-surface radioactivity in the Australian continental crust. U.S. Dept. Interior, Geol. Surv., Open-file Report 76-250, 90pp.

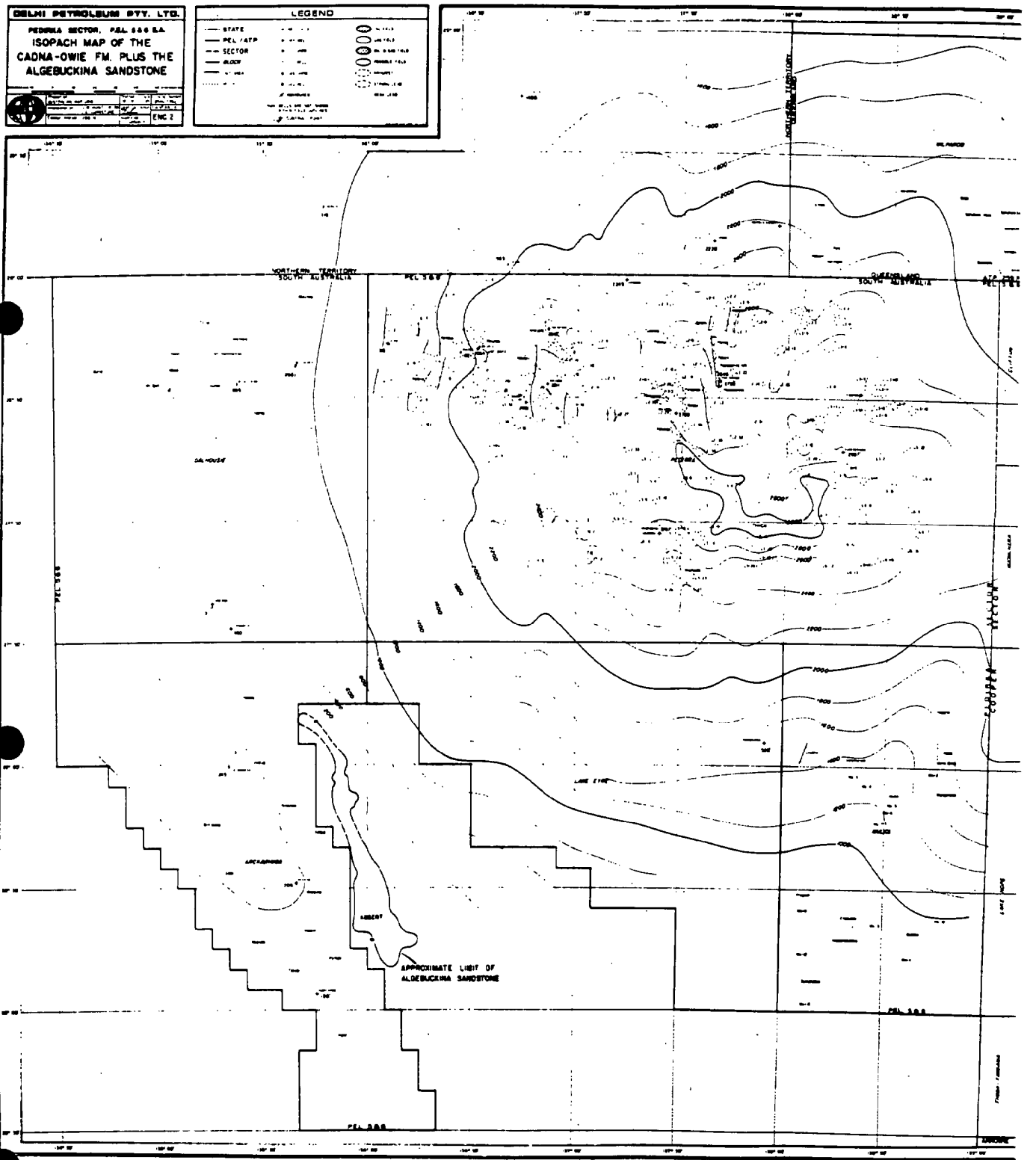


Figure 1 Isopach map of the Cadna-owie Formation plus the Algebuckina Sandstone.

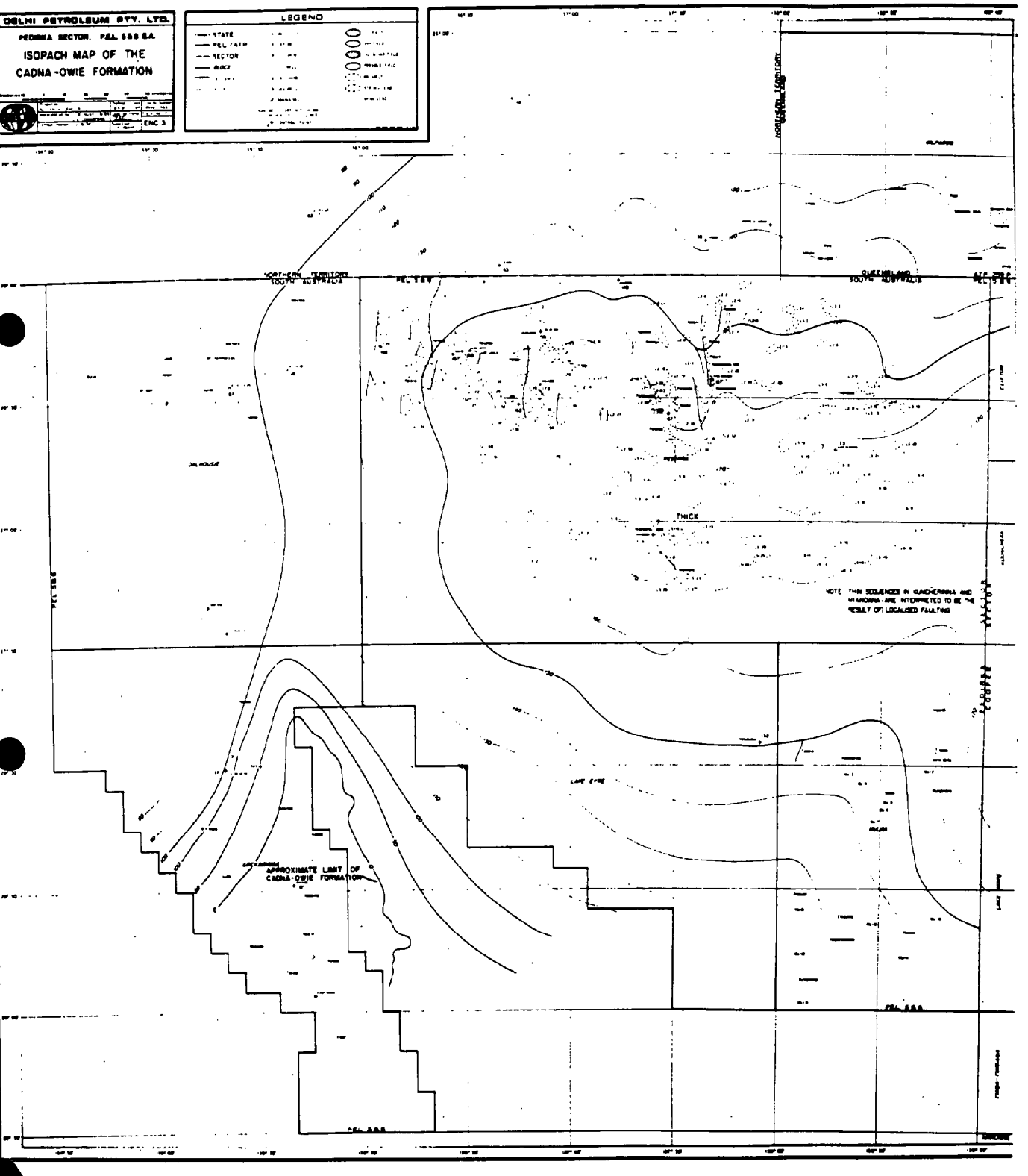


Figure 2 Isopach map of the Cadna-owie Formation.

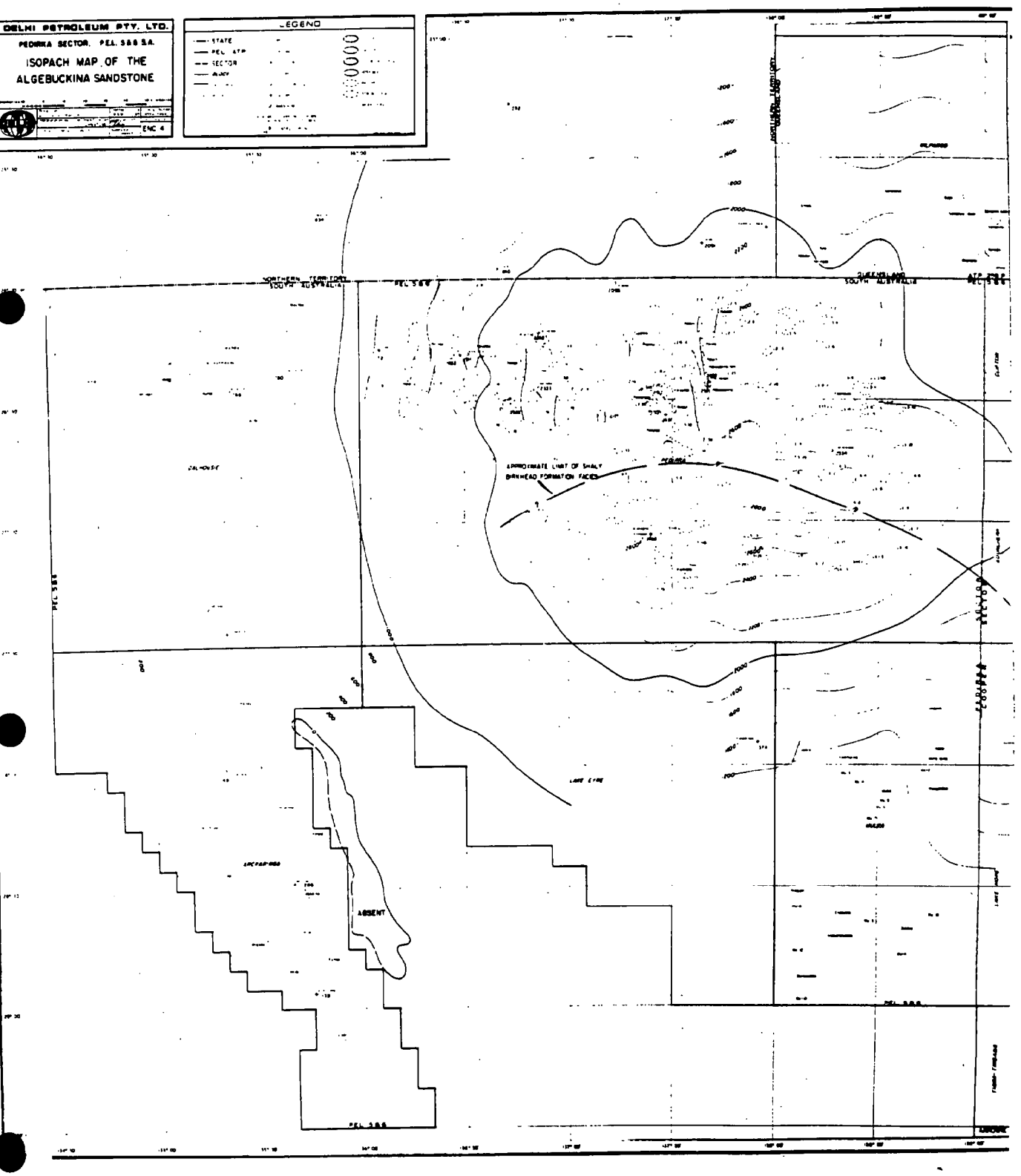


Figure 3 Isopach map of the Algebuckina Sandstone.

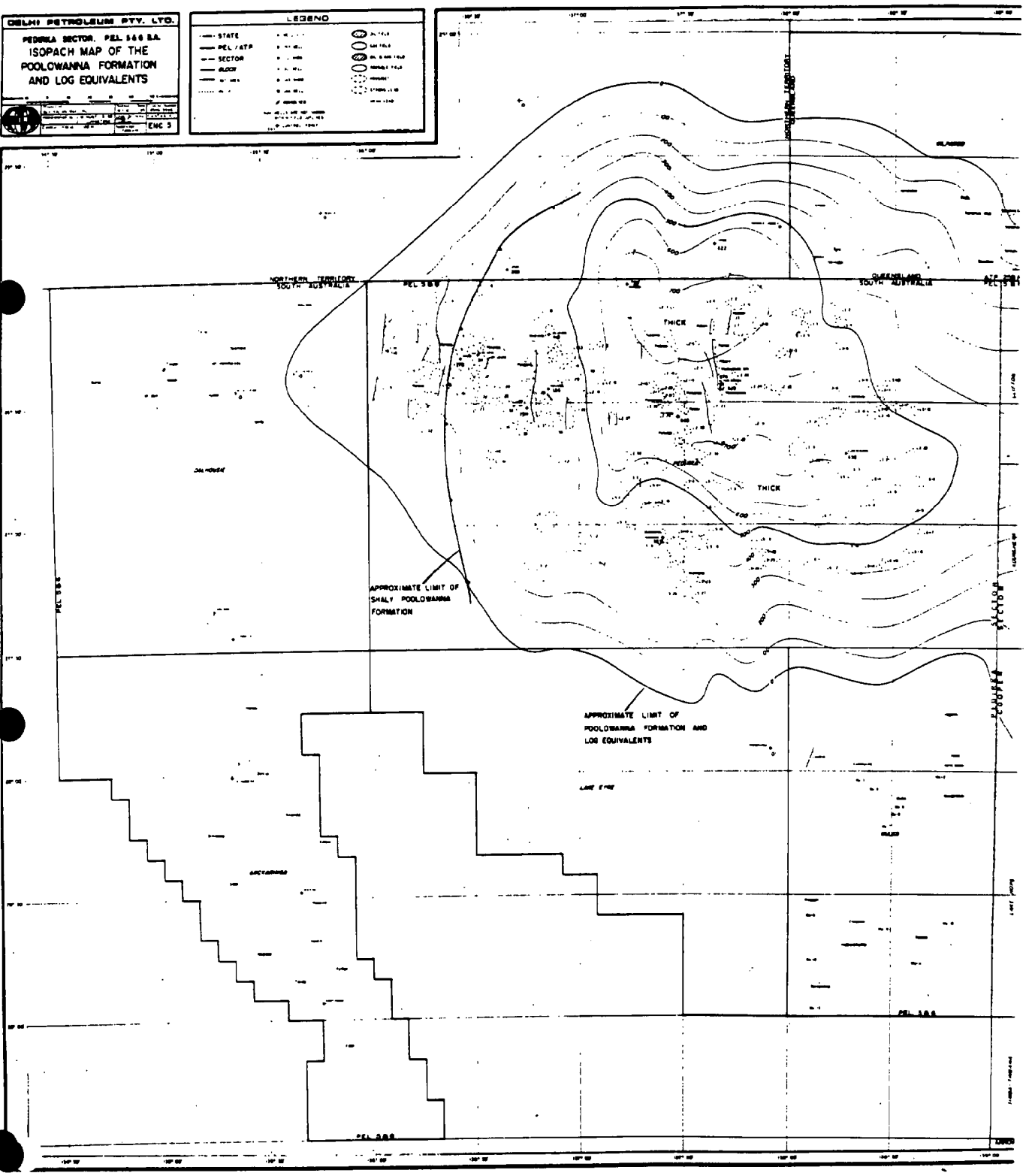


Figure 4 Isopach map of the Poolowanna Formation and log equivalents.

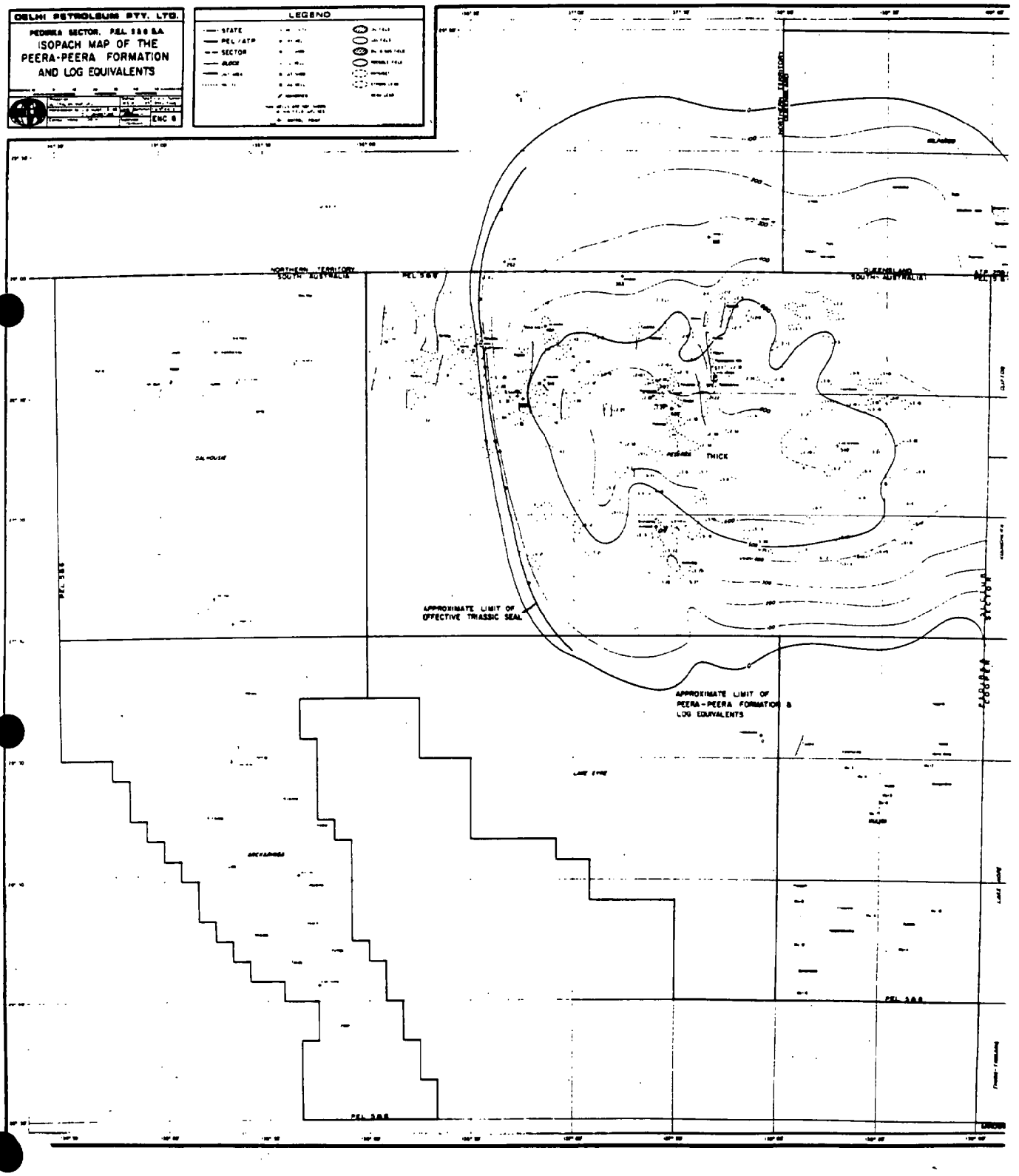


Figure 5 Isopach map of the Peera Peera Formation and log equivalents.

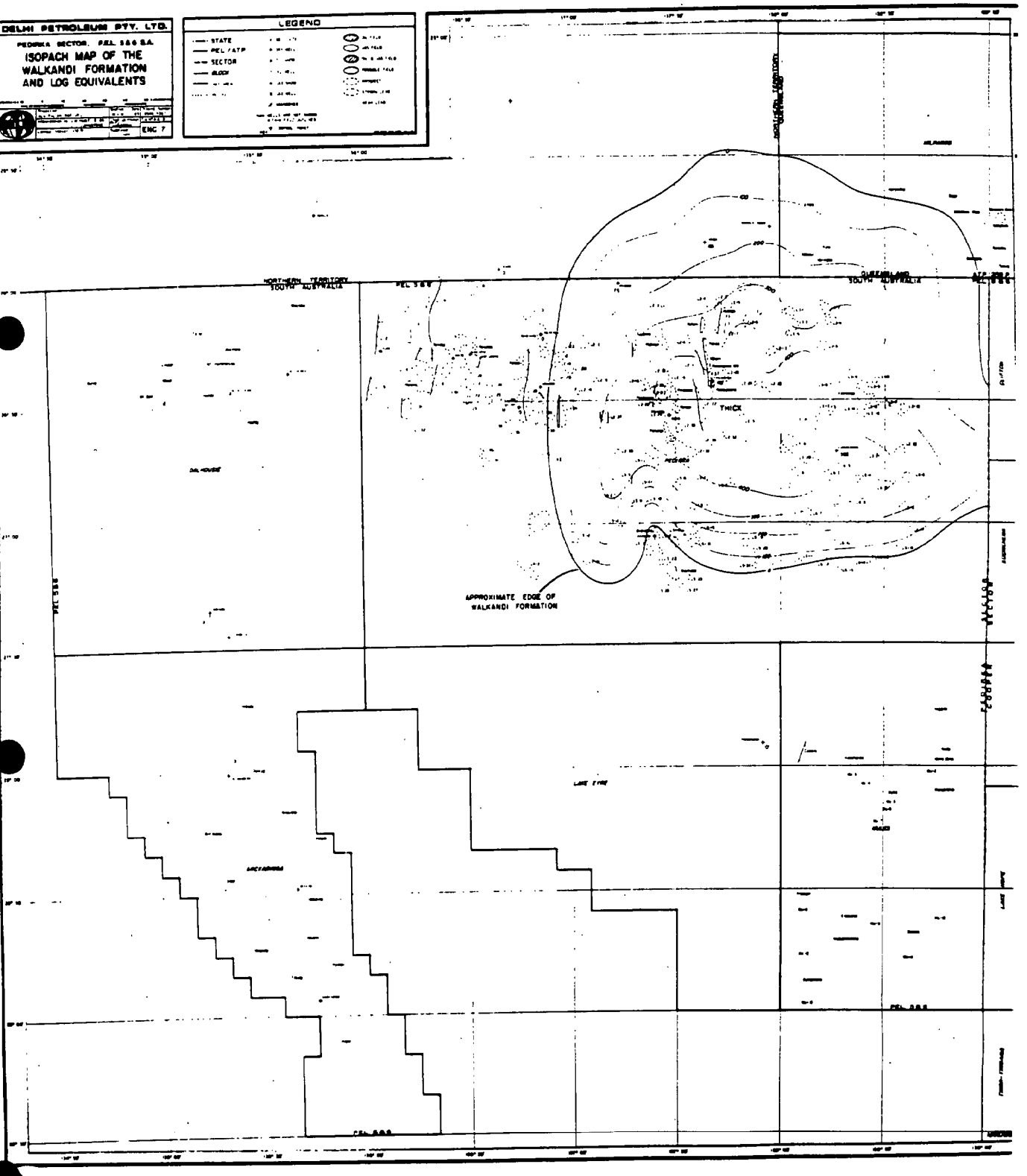


Figure 6 Isopach map of the Walkandi Formation and log equivalents.

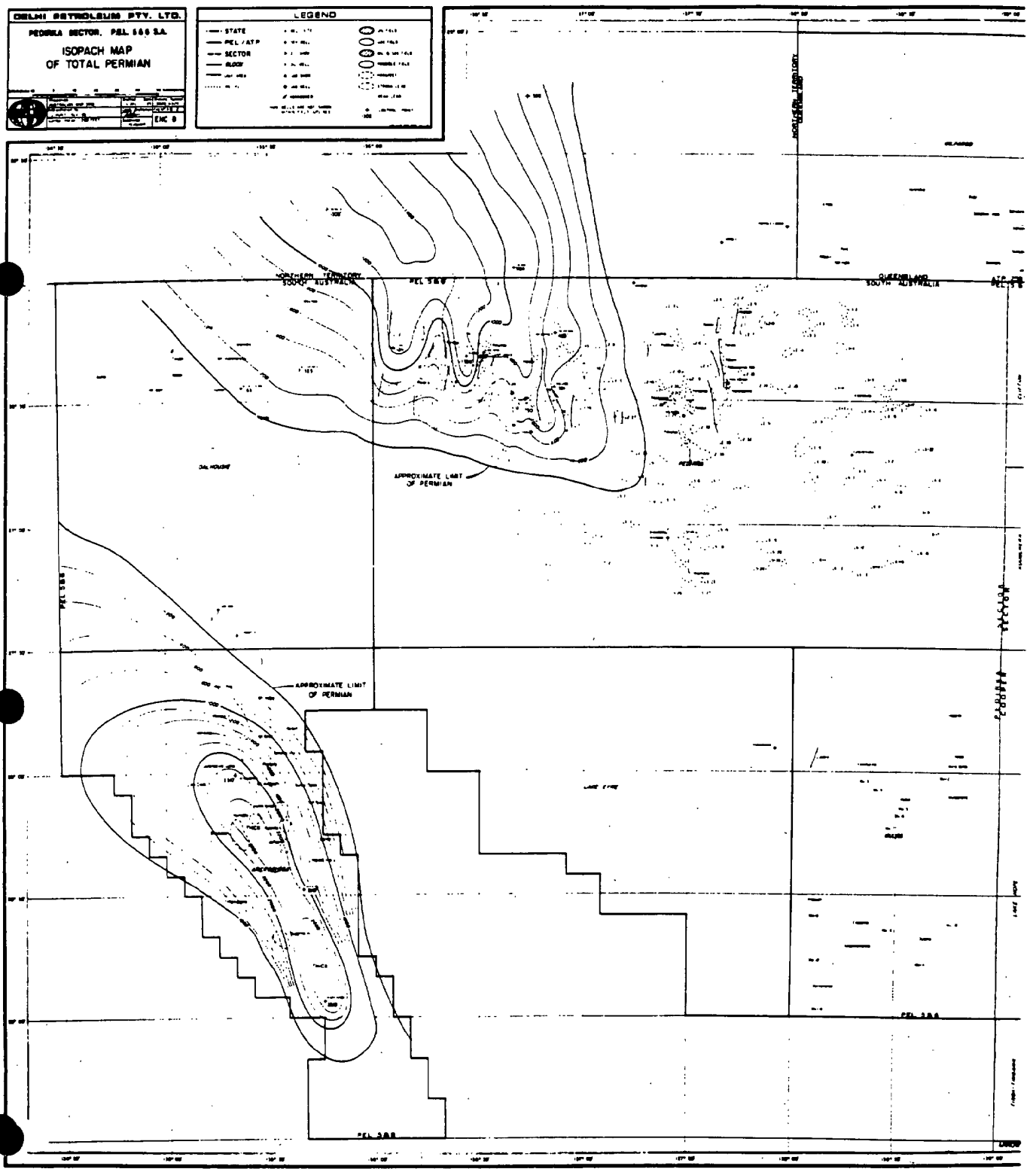


Figure 7 Isopach map of the total Permian.

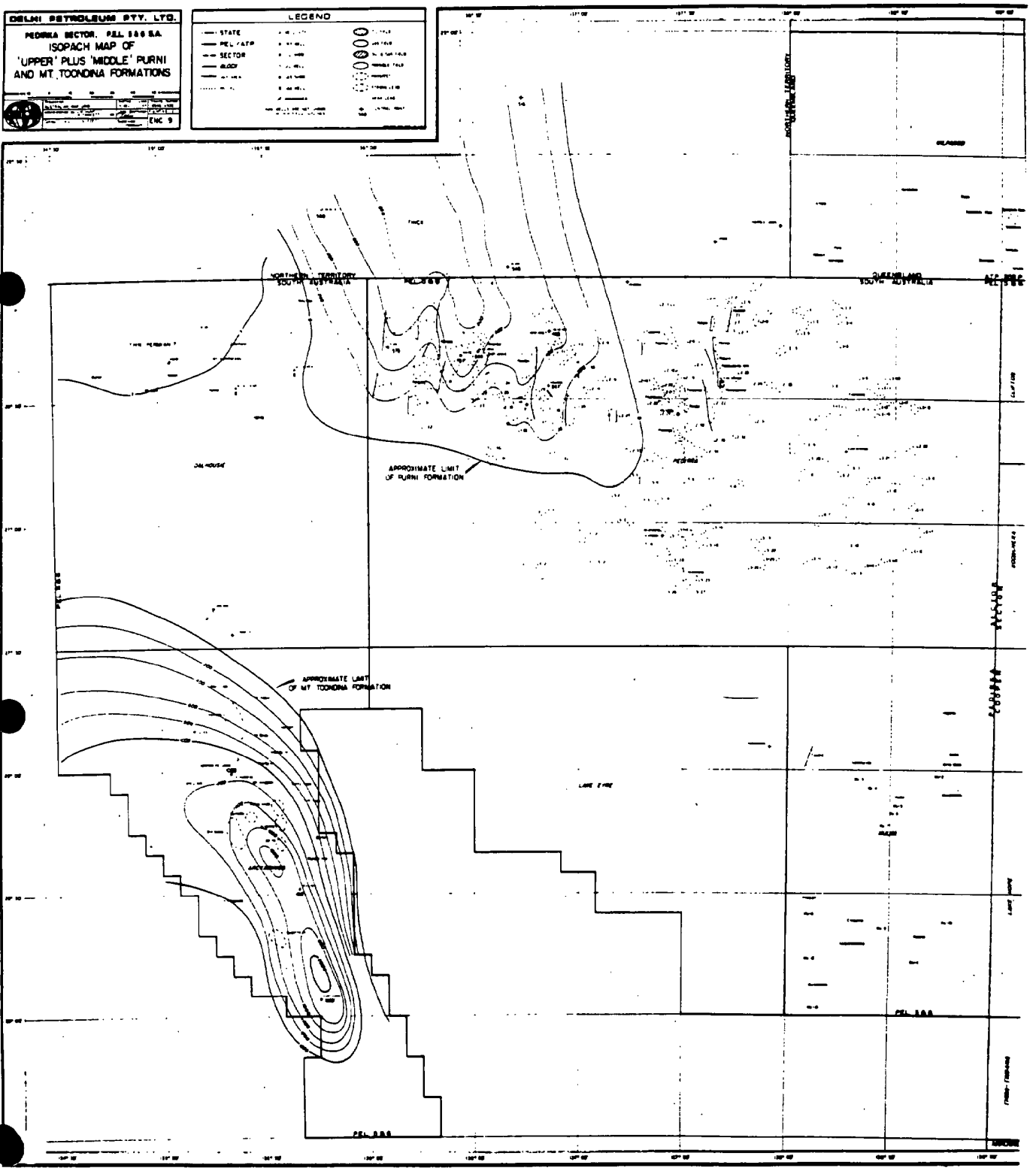


Figure 8 Isopach map of the 'upper' plus 'middle' Purni and the Mt Toondina Formations.

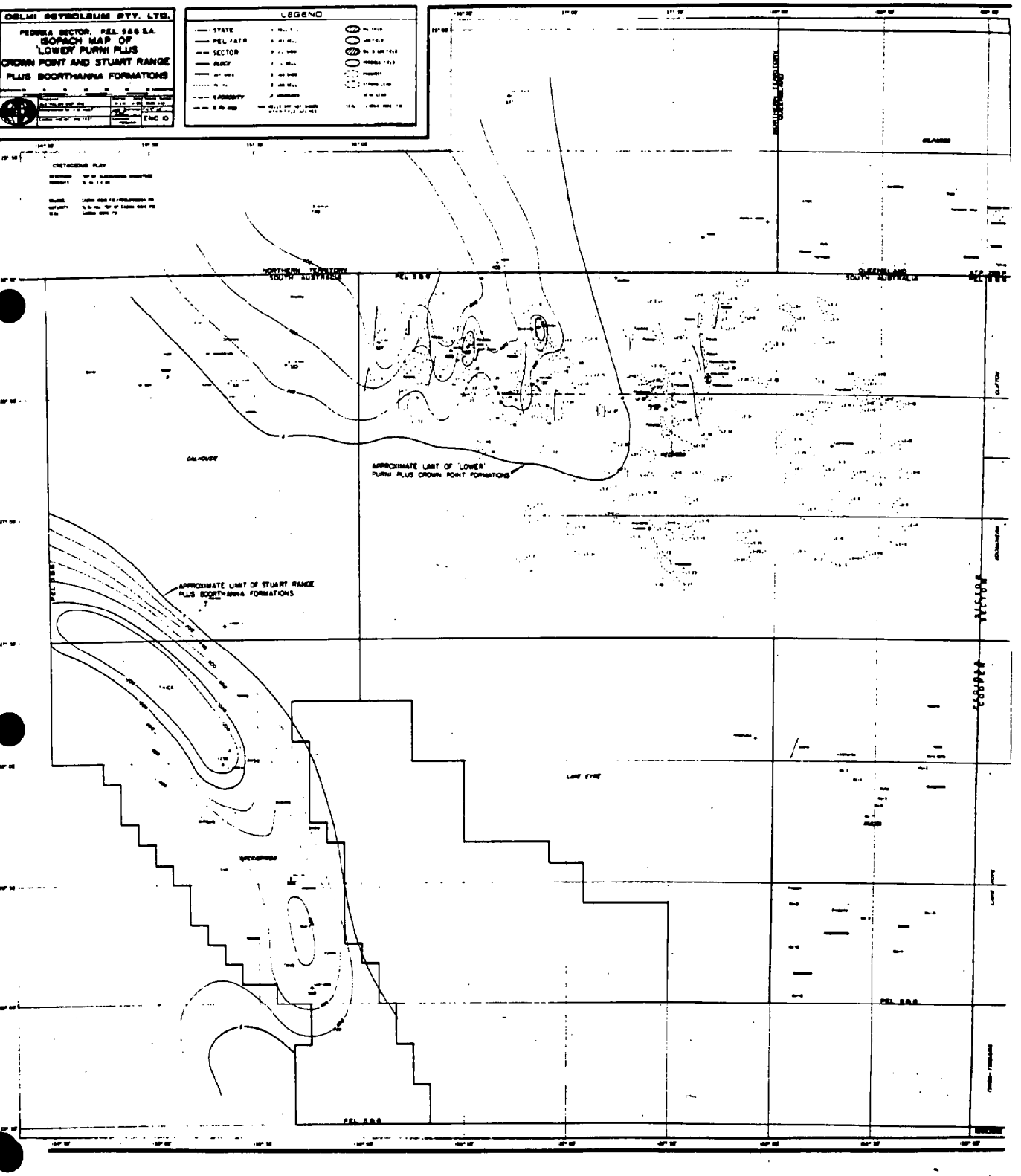


Figure 9 Isopach map of the 'lower' Purni plus Crown Point and Stuart Range plus Boorthanna Formations.

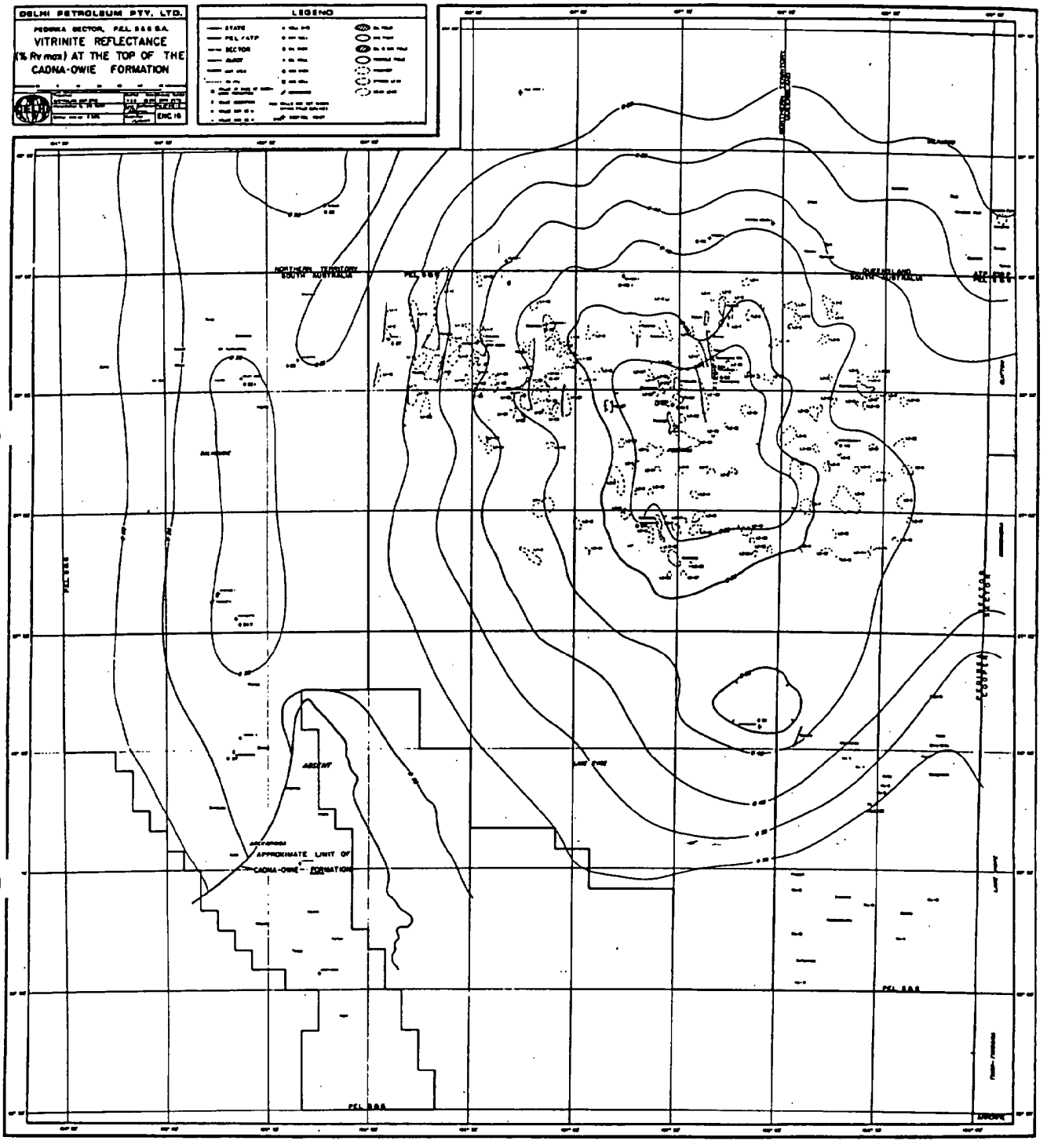


Figure 10 Vitrinite reflectance (Rv max %) at the top of the Cadna-owie Formation.

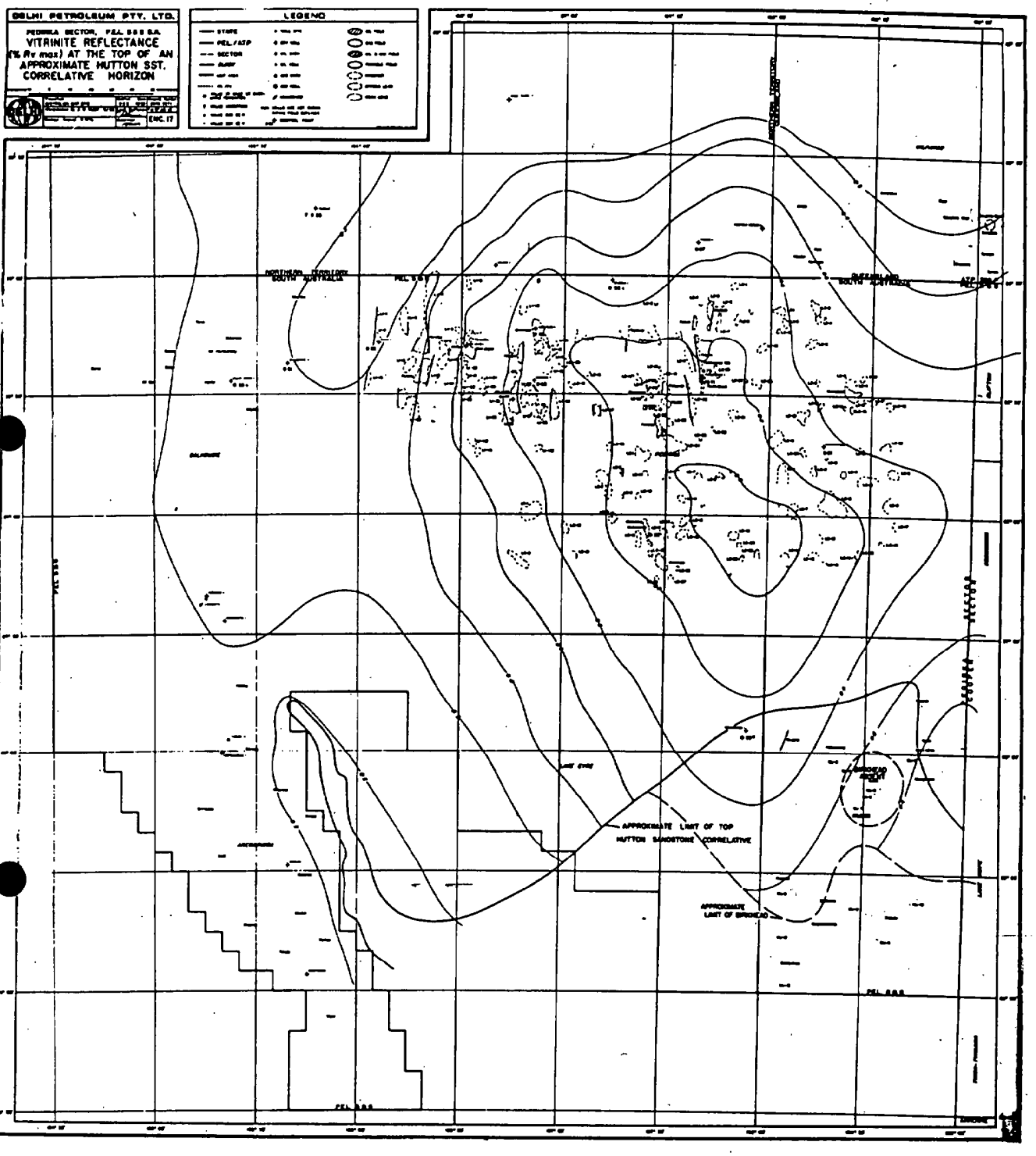


Figure 11 Vitrinite reflectance (Rv max %) at the top of an approximate Hutton Sandstone correlative horizon.

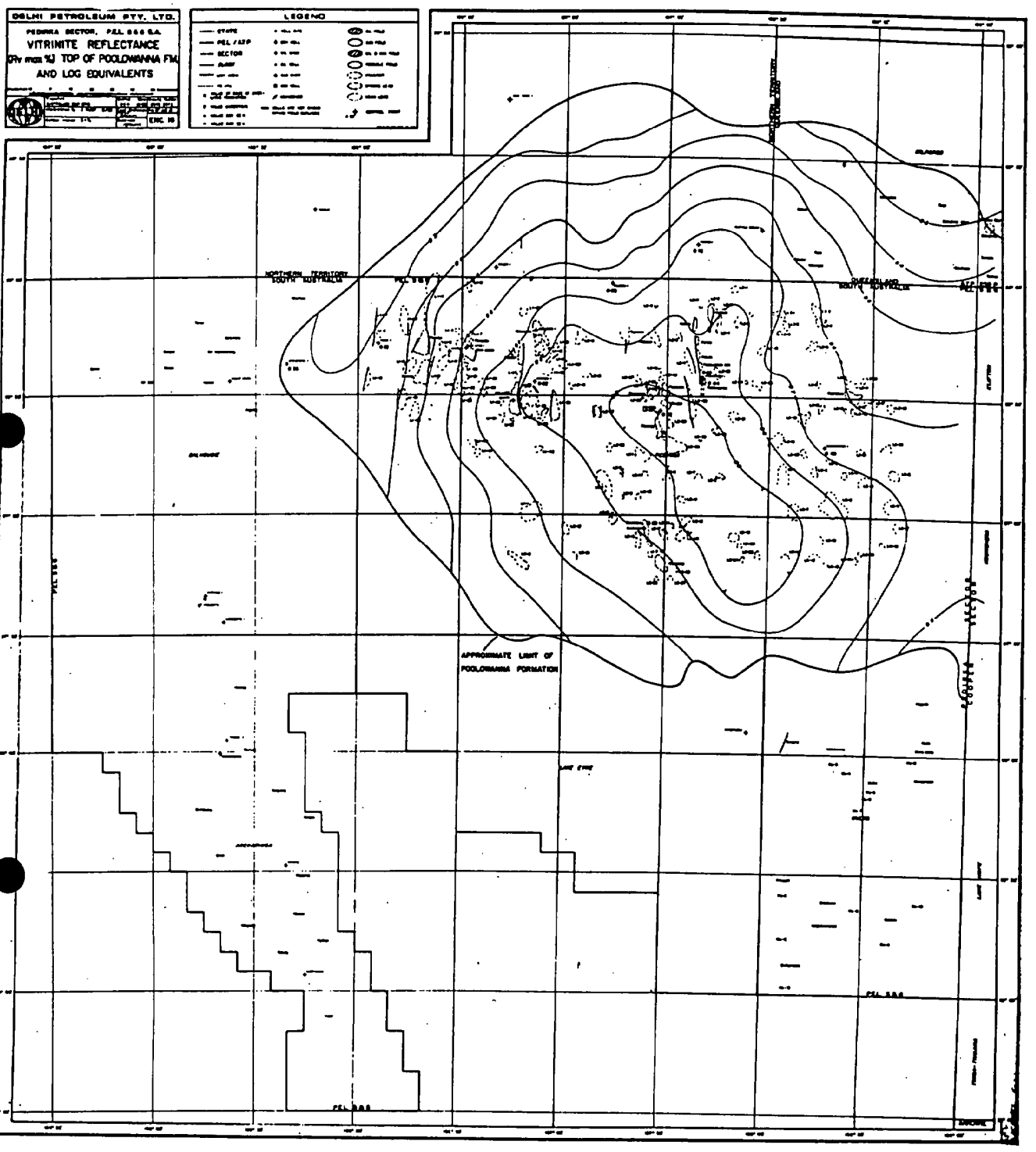


Figure 12 Vitrinite reflectance (Rv max %) at the top of the Poolowanna Formation and log equivalents.

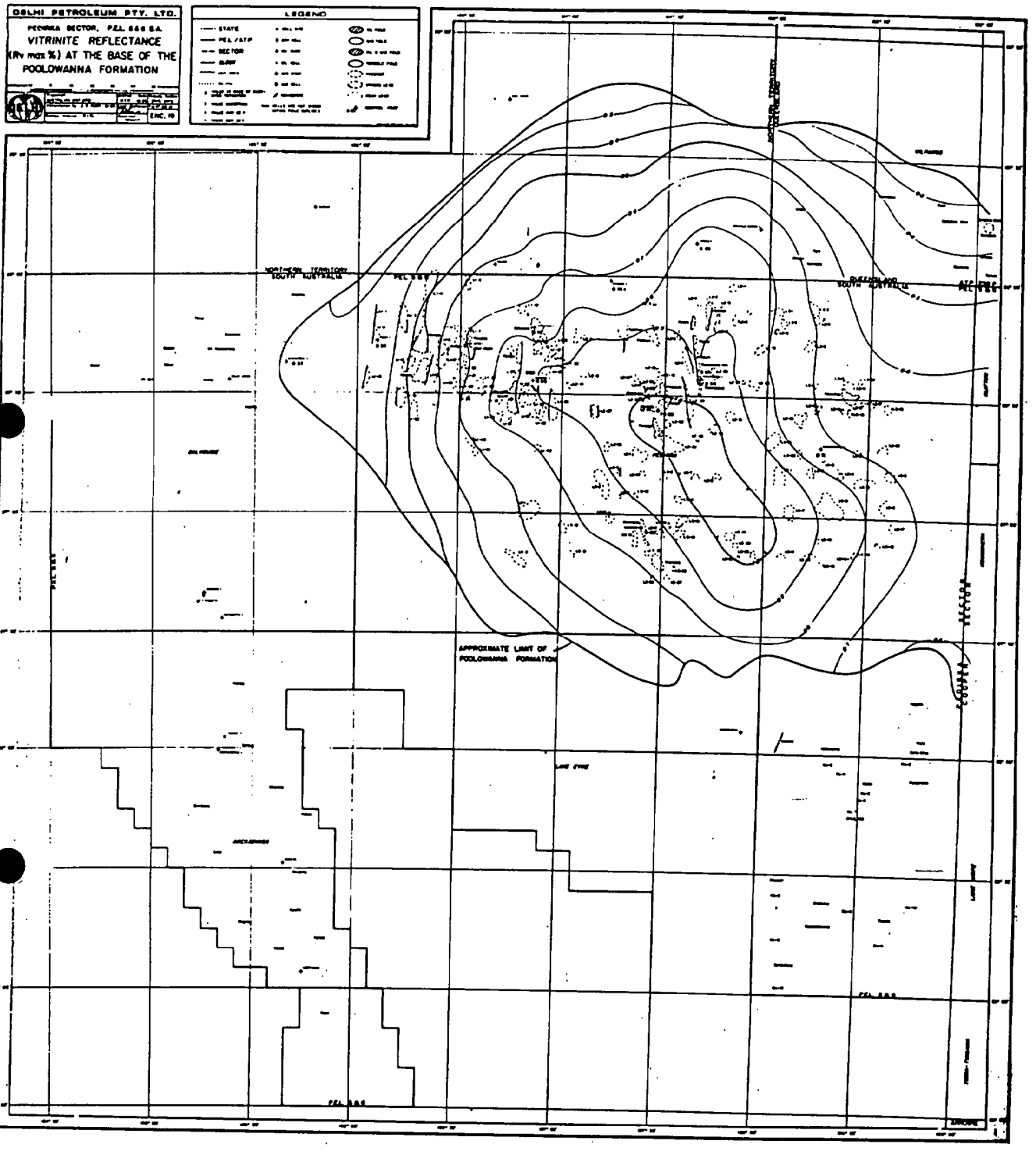


Figure 13 Vitrinite reflectance (Rv max %) at the base of the Poolowanna Formation.

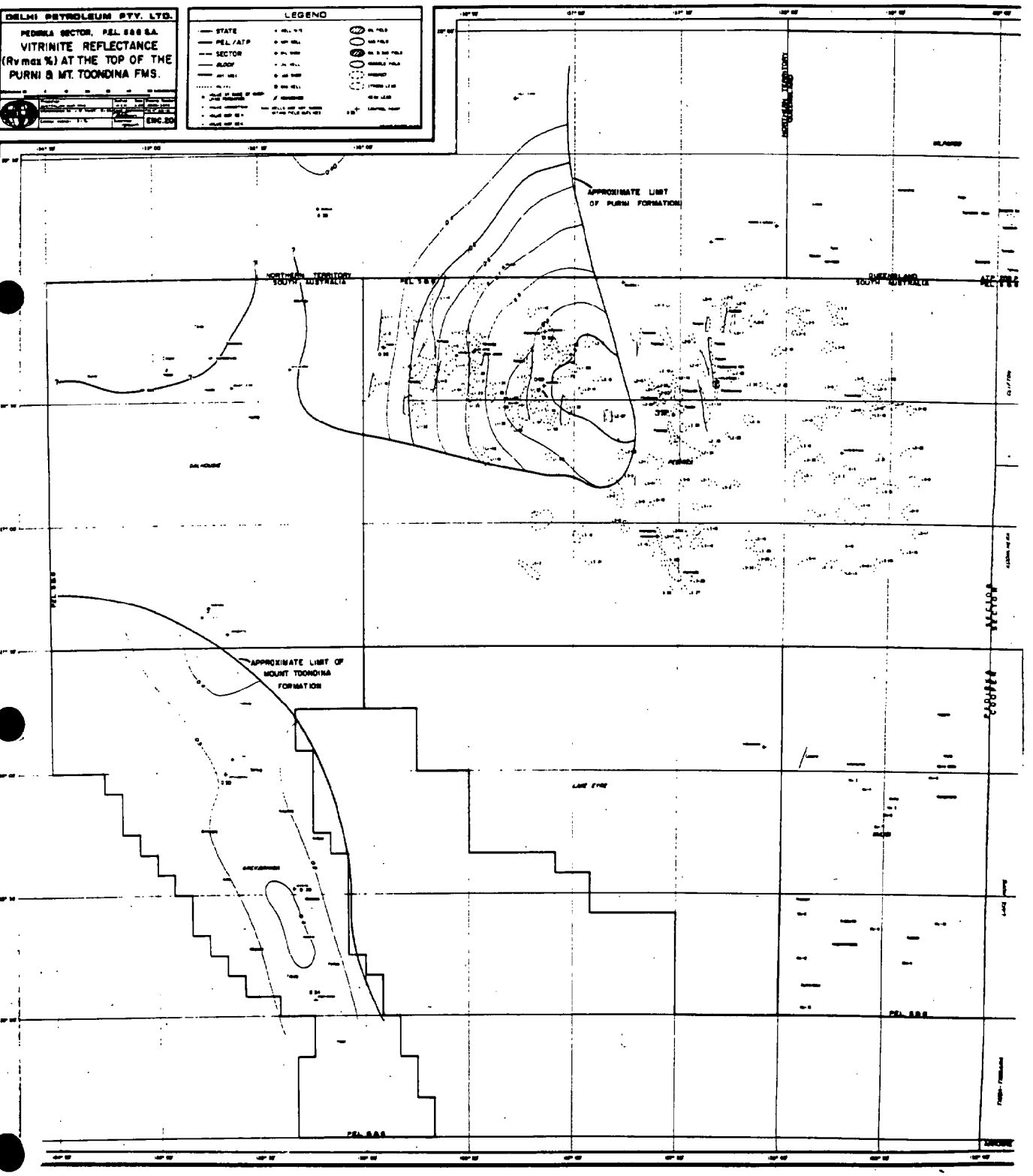


Figure 14 Vitrinite reflectance (Rv max %) at the top of the Purni and Mt. Toondina Formations.

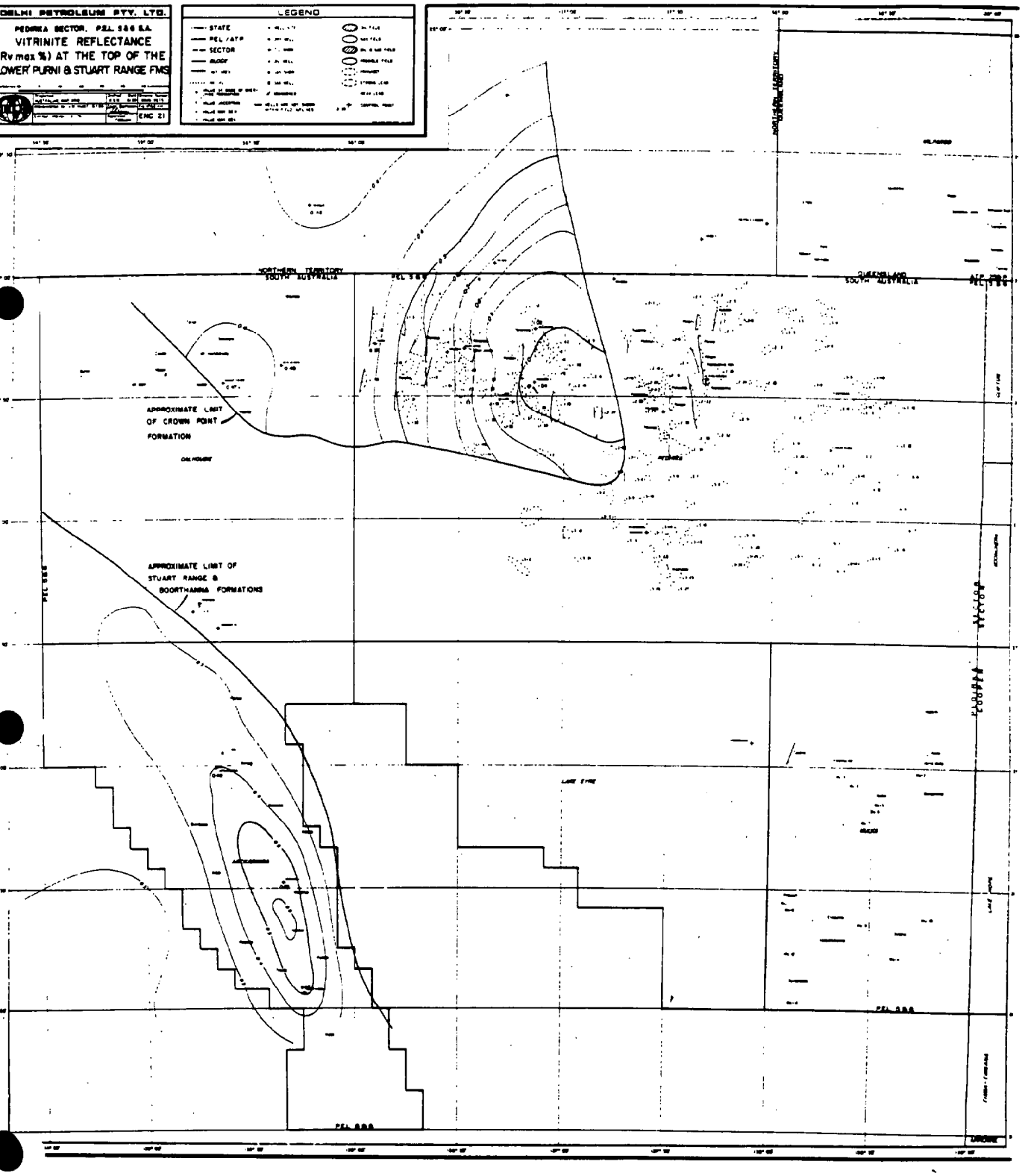


Figure 15 Vitrinite reflectance (Rv max %) at the top of the 'lower' Purni and Stuart Range Formations.

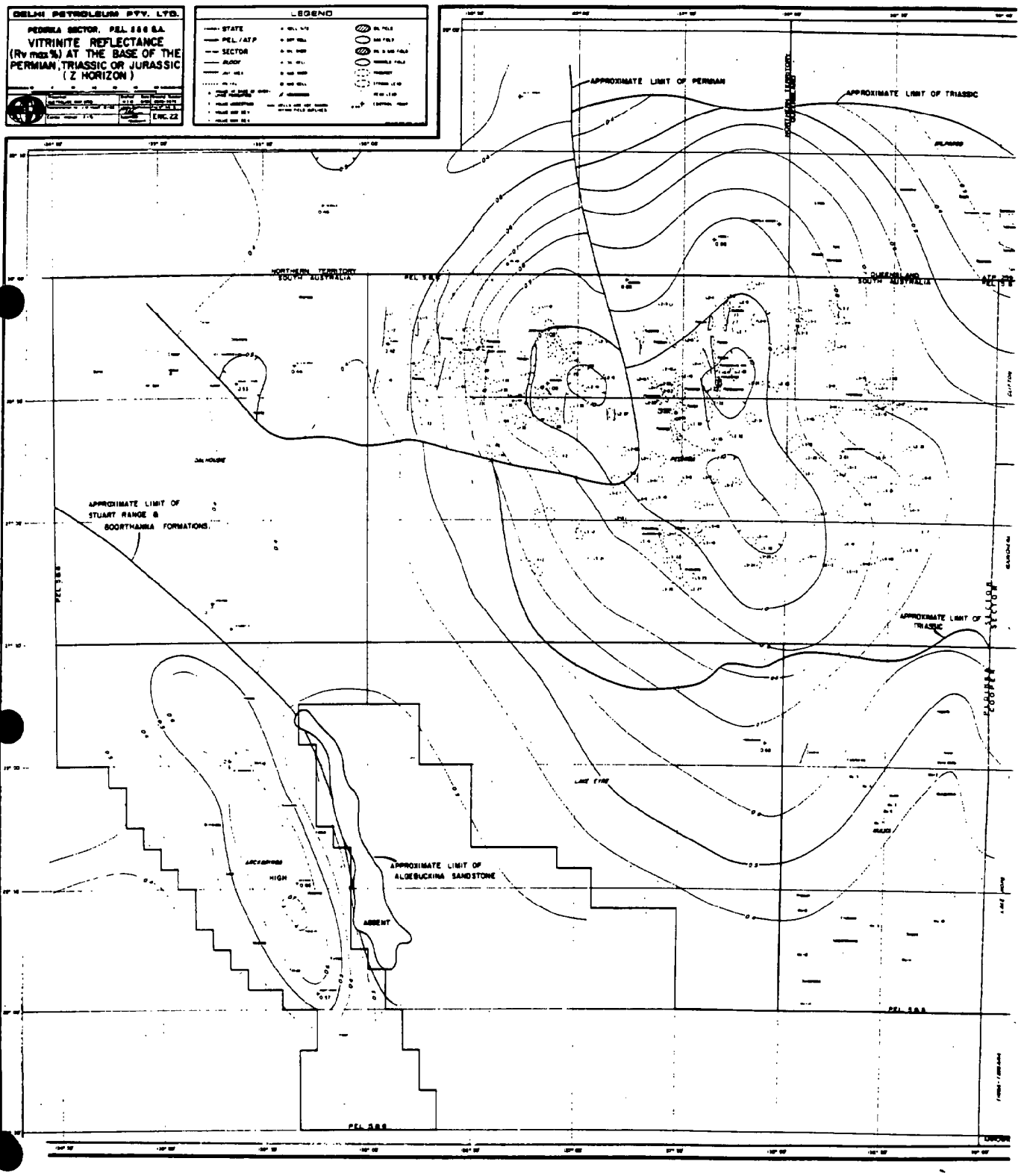
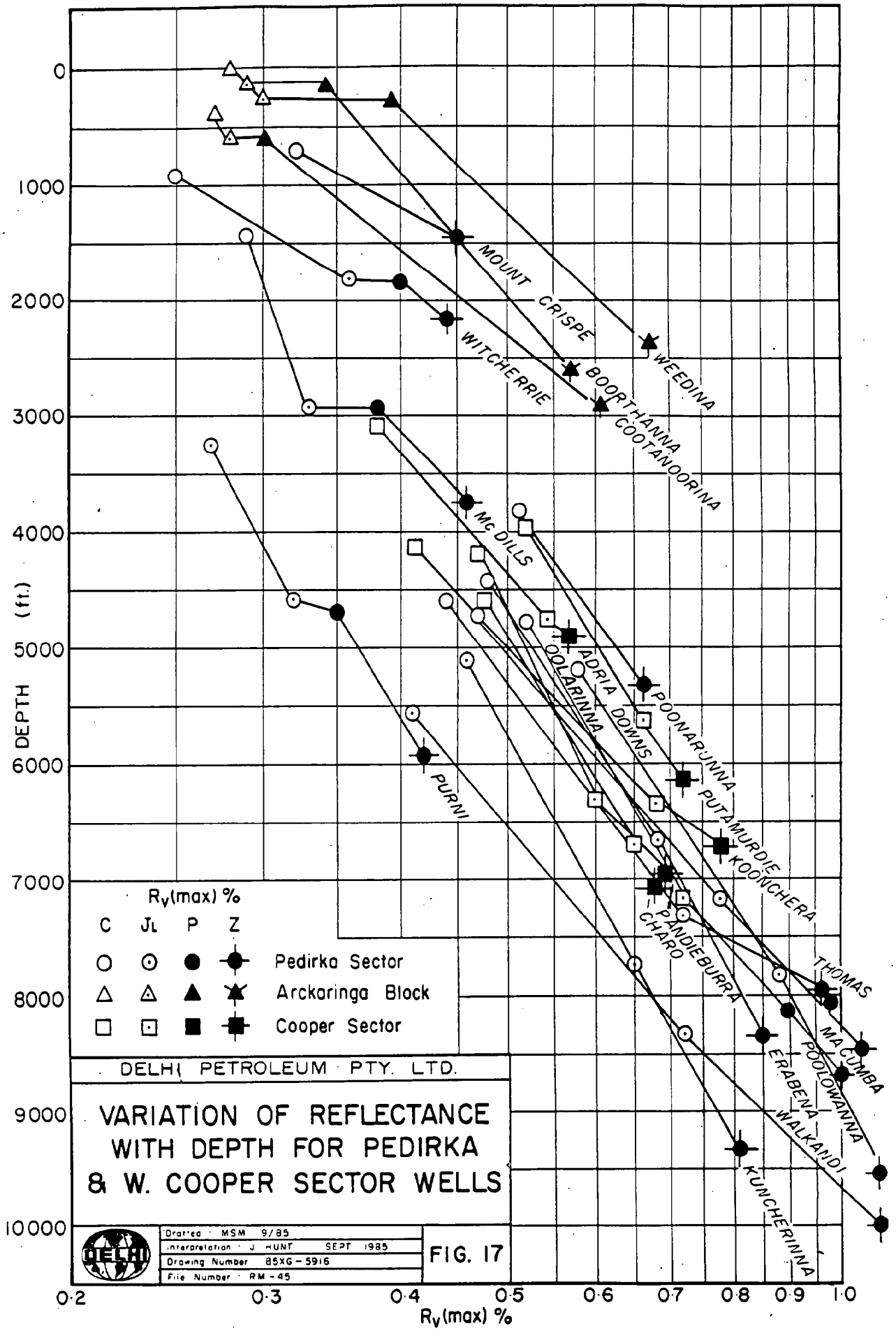


Figure 16 Vitrinite reflectance (Rv max %) at the base of the Permian, Triassic or Jurassic (Z horizon).



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VARIATION OF REFLECTANCE WITH DEPTH FOR PEDIRKA & W. COOPER SECTOR WELLS

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File Number RM-45

FIG. 17

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RELATIONSHIP BETWEEN REFLECTANCE AT C & JL & THE C-JL THICKNESS

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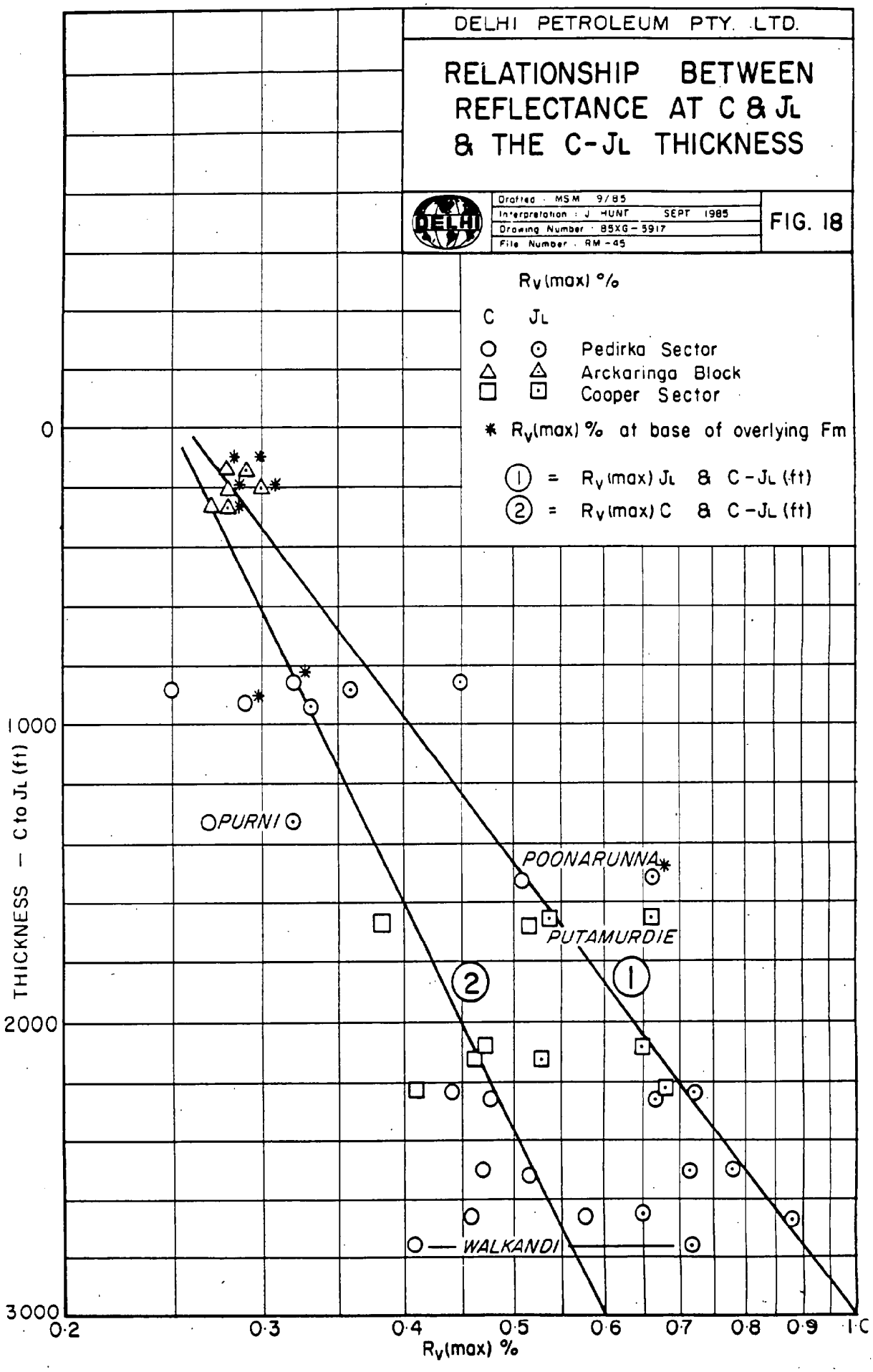
File Number : RM-45

FIG. 18



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REFLECTANCE AT C, JL & Z ASSUMING PRE-EROSION TO C = 2·5 x C TO JL

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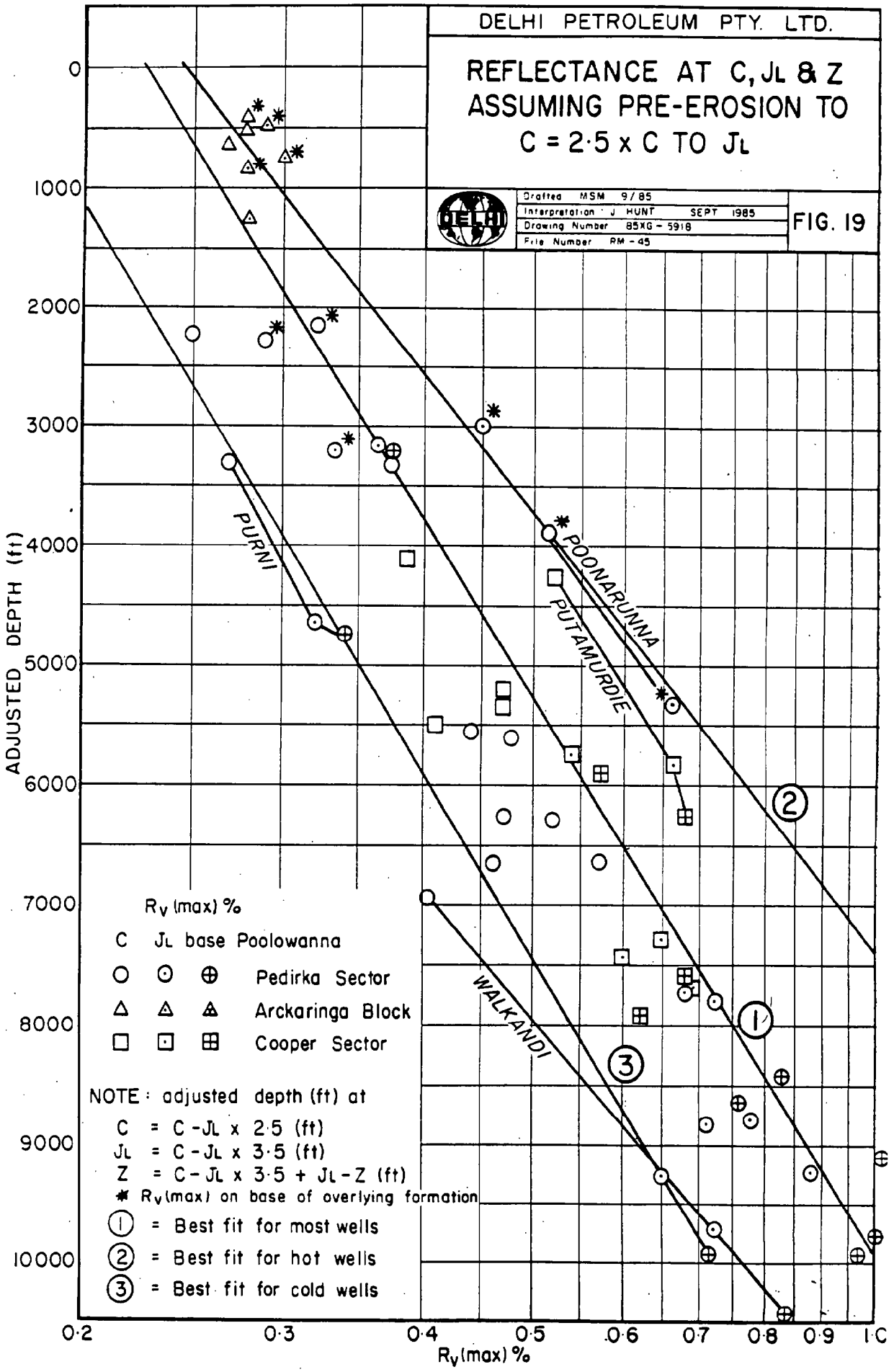
Interpretation J HUNT SEPT 1985
Drawing Number 85XG - 5918
File Number RM - 45

FIG. 19



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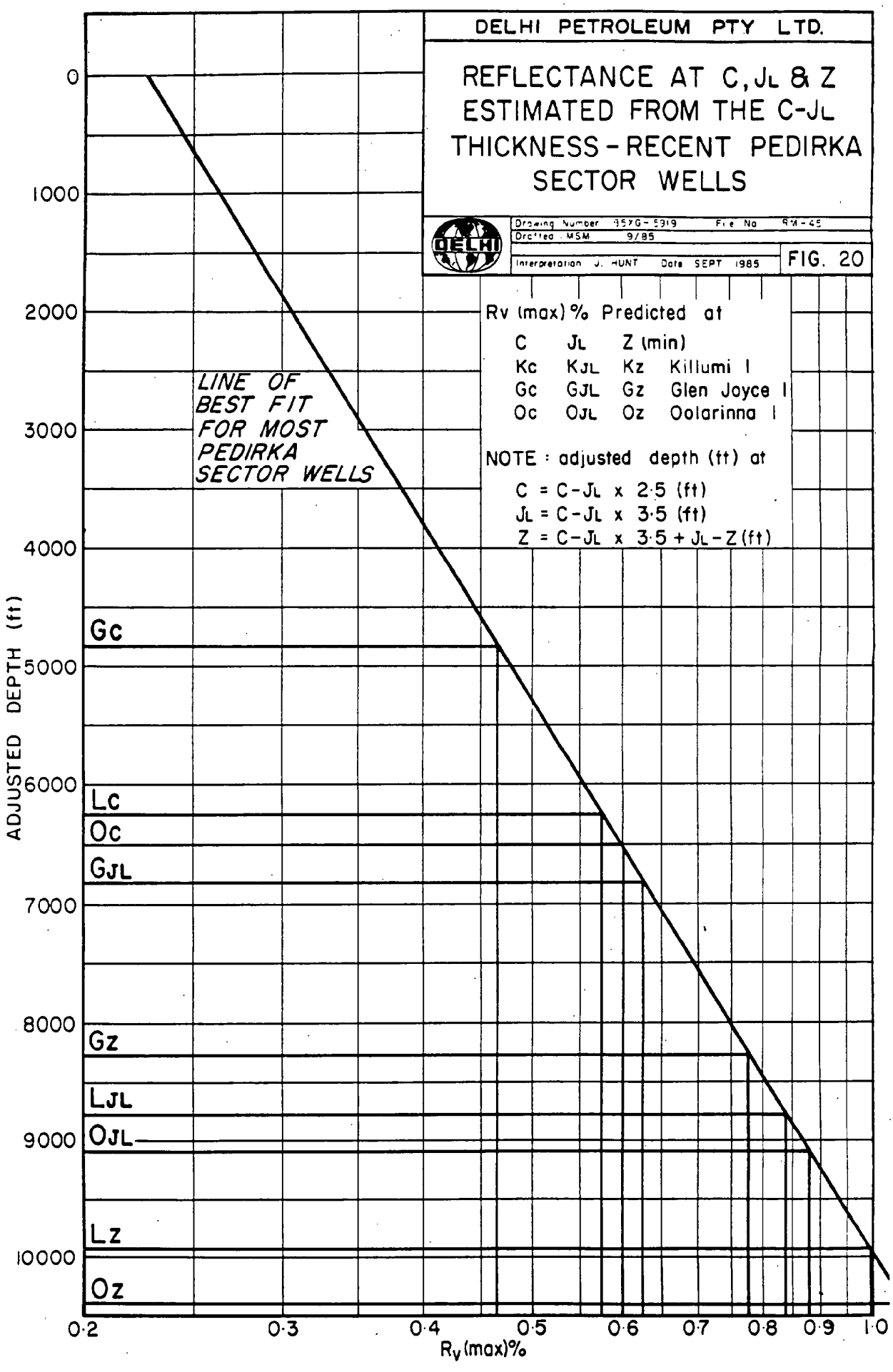

DELHI PETROLEUM PTY LTD.
REFLECTANCE AT C, JL & Z ESTIMATED FROM THE C-JL THICKNESS - RECENT PEDIRKA SECTOR WELLS
Drawing Number 85YG-5919 File No 9M-45
Drafted MSM 9/85
Interpretation J. HUNT Date SEPT 1985
FIG. 20
Rv (max) % Predicted at
C JL Z (min)
Kc KJL Kz Killumi 1
Gc GJL Gz Glen Joyce 1
Oc OJL Oz Oolarinna 1
NOTE : adjusted depth (ft) at
C = C-JL x 2·5 (ft)
JL = C-JL x 3·5 (ft)
Z = C-JL x 3·5 + JL-Z (ft)
LINE OF BEST FIT FOR MOST PEDIRKA SECTOR WELLS
ADJUSTED DEPTH (ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Gc
Lc
Oc
GJL
Gz
LJL
OJL
Lz
Oz
0·2
0·3
0·4
0·5
0·6
0·7
0·8
0·9
1·0
Rv (max)%

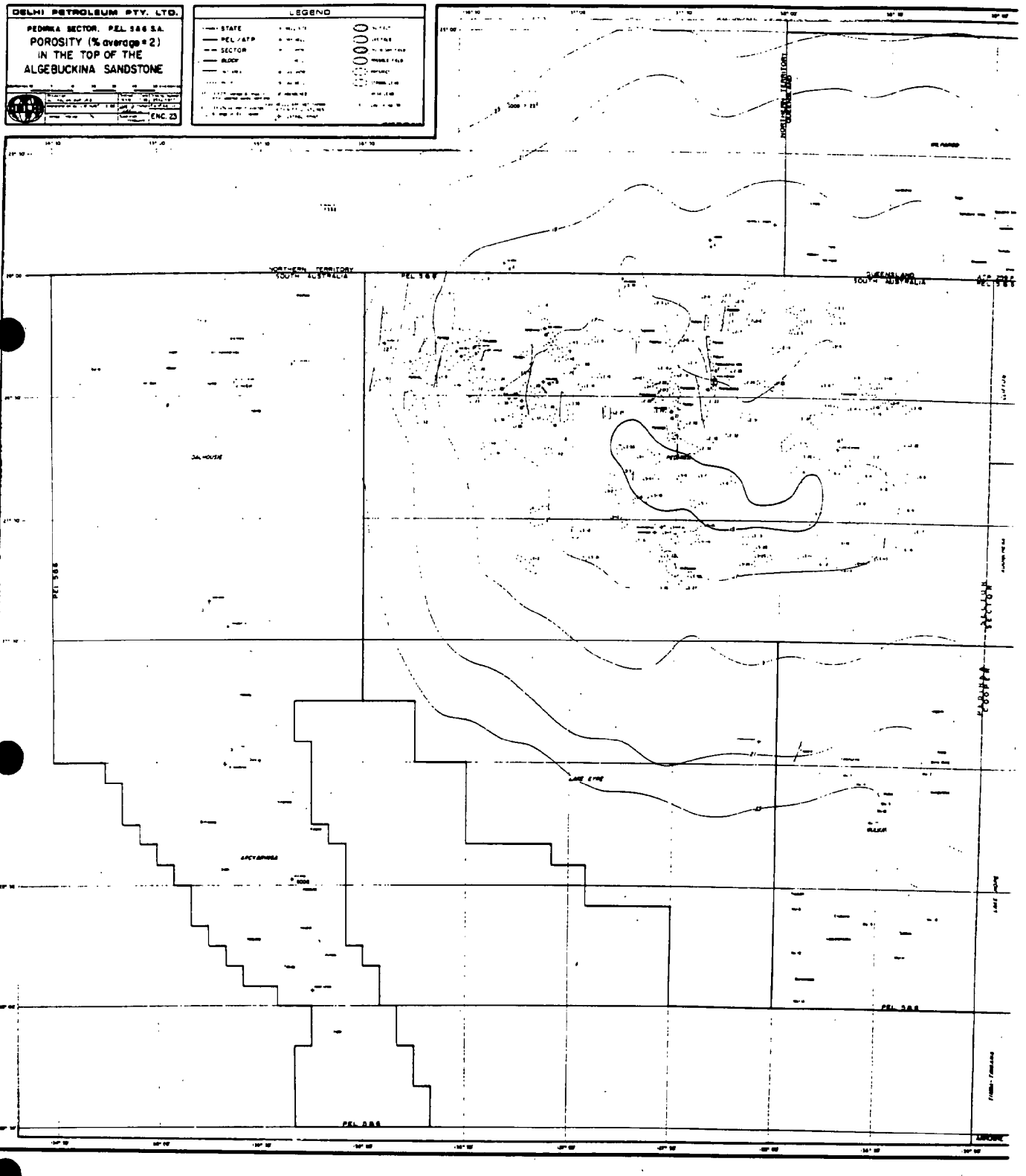


Figure 21 Porosity % (average ±2) in the top of the Algebuckina Sandstone.

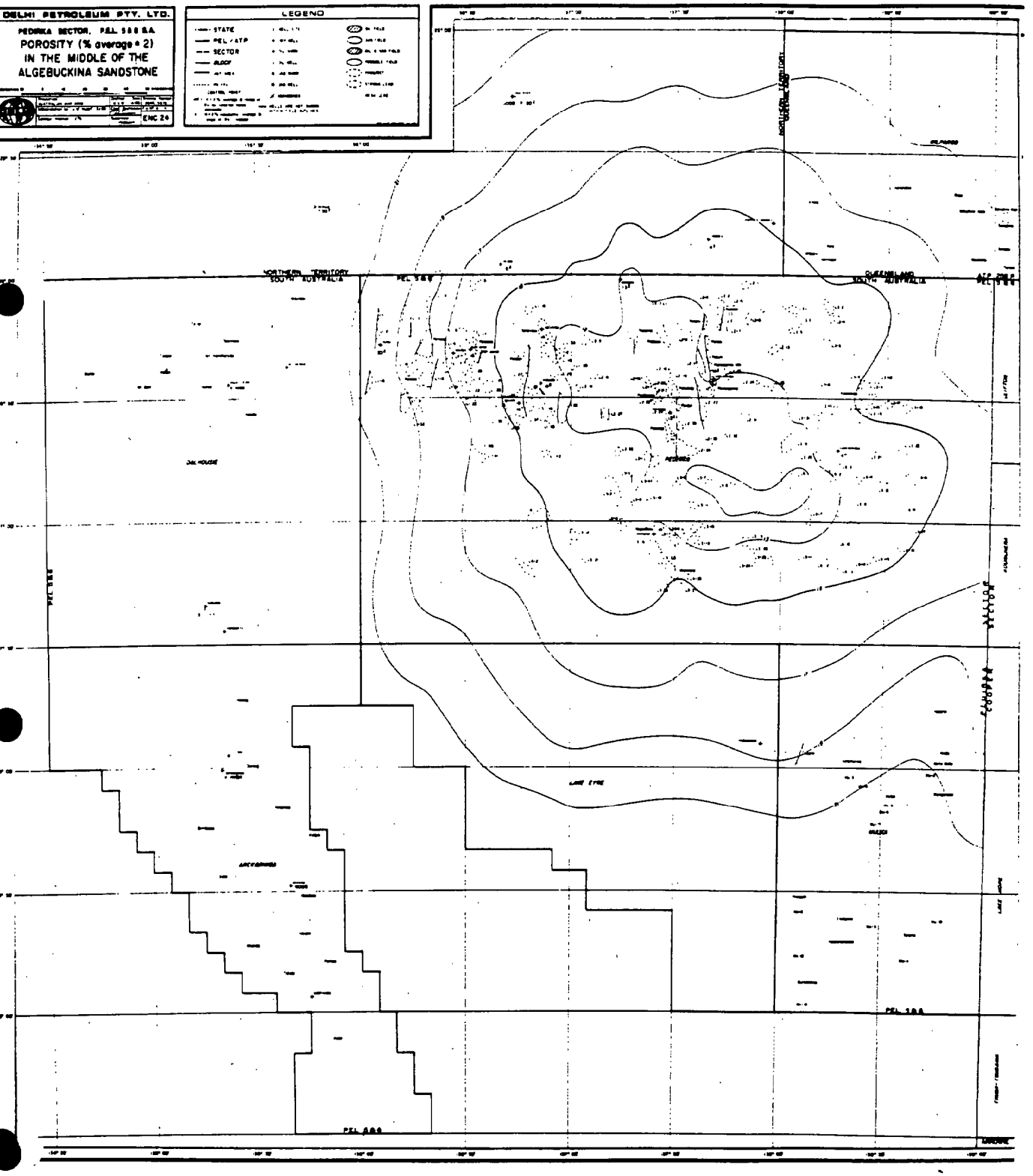


Figure 22 Porosity % (average ±2) in the middle of the Algebuckina Sandstone.

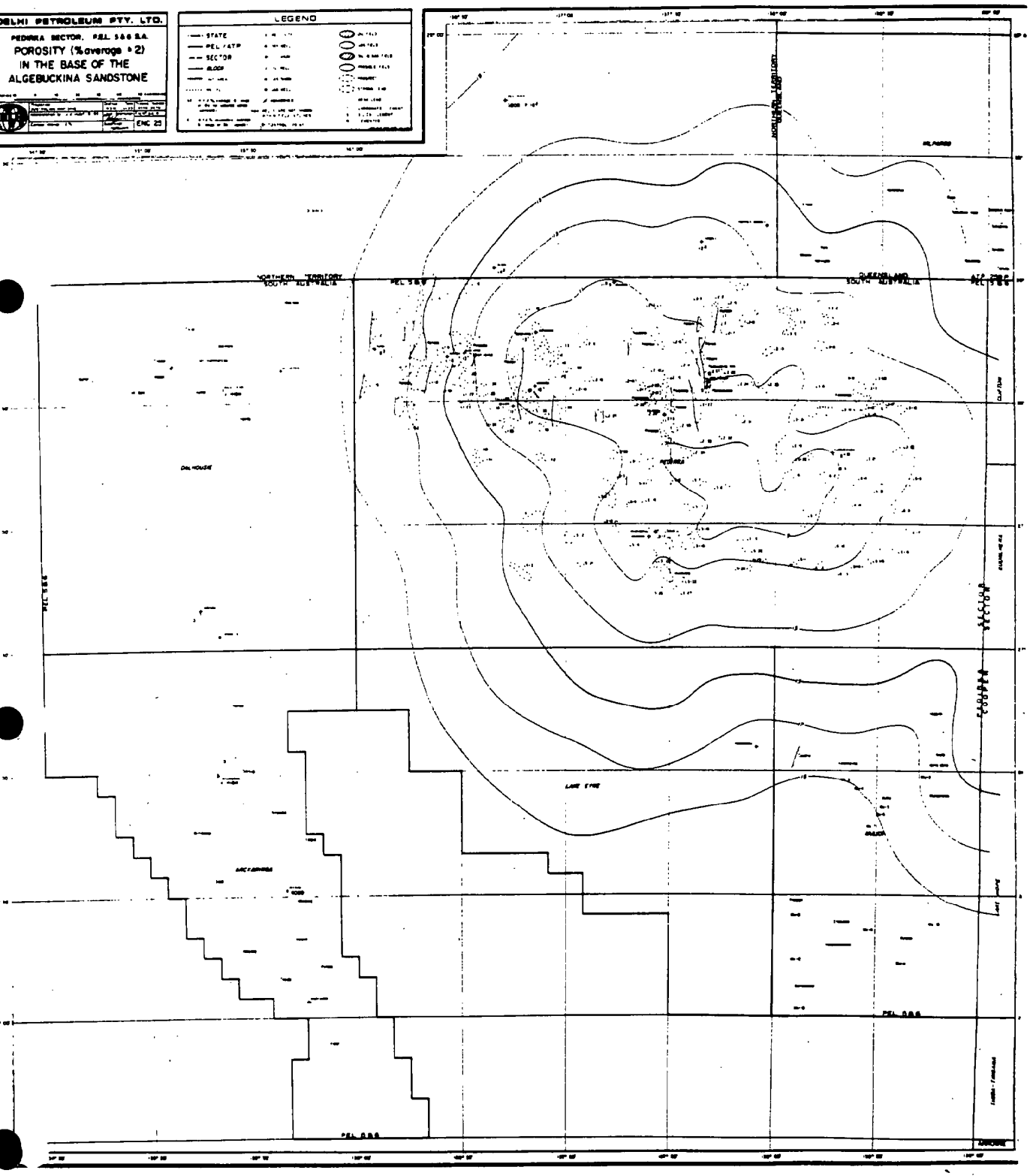


Figure 23 Porosity % (average ±2) in the base of the Algebuckina Sandstone.

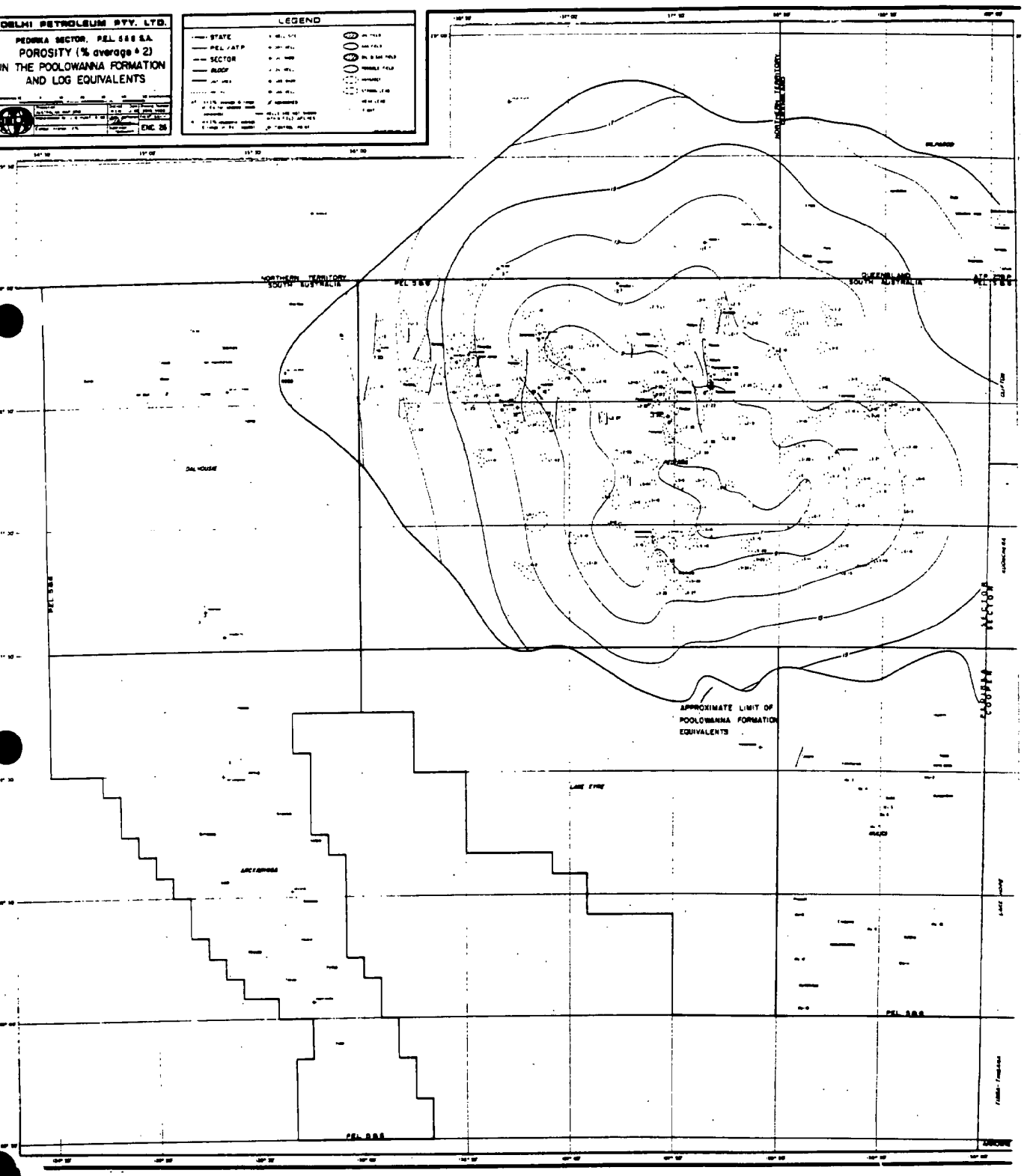


Figure 24 Porosity % (average ±2) in the Poolowanna Formation and log equivalents.

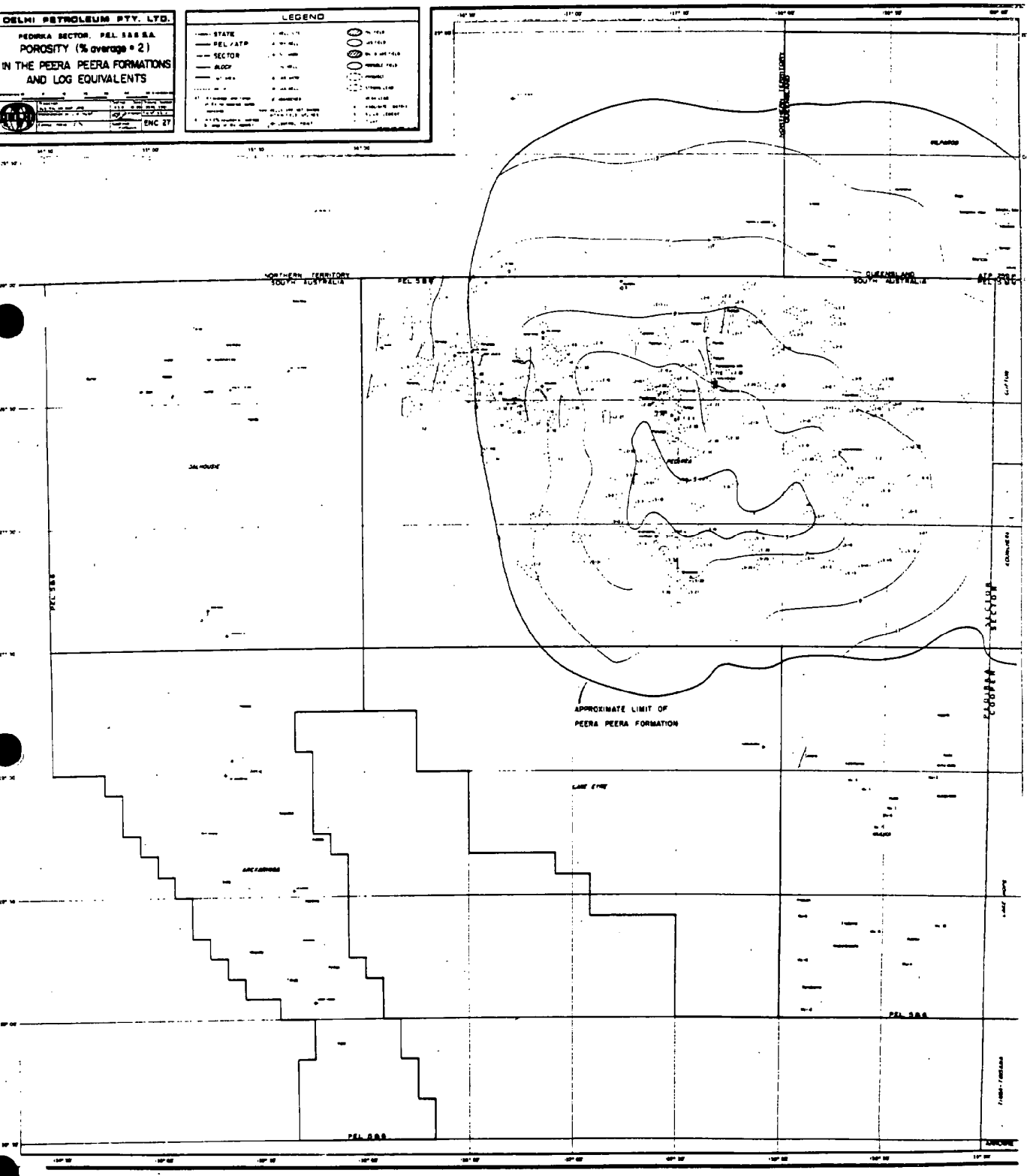


Figure 25 Porosity % (average ±2) in the Peera Peera Formation and log equivalents.

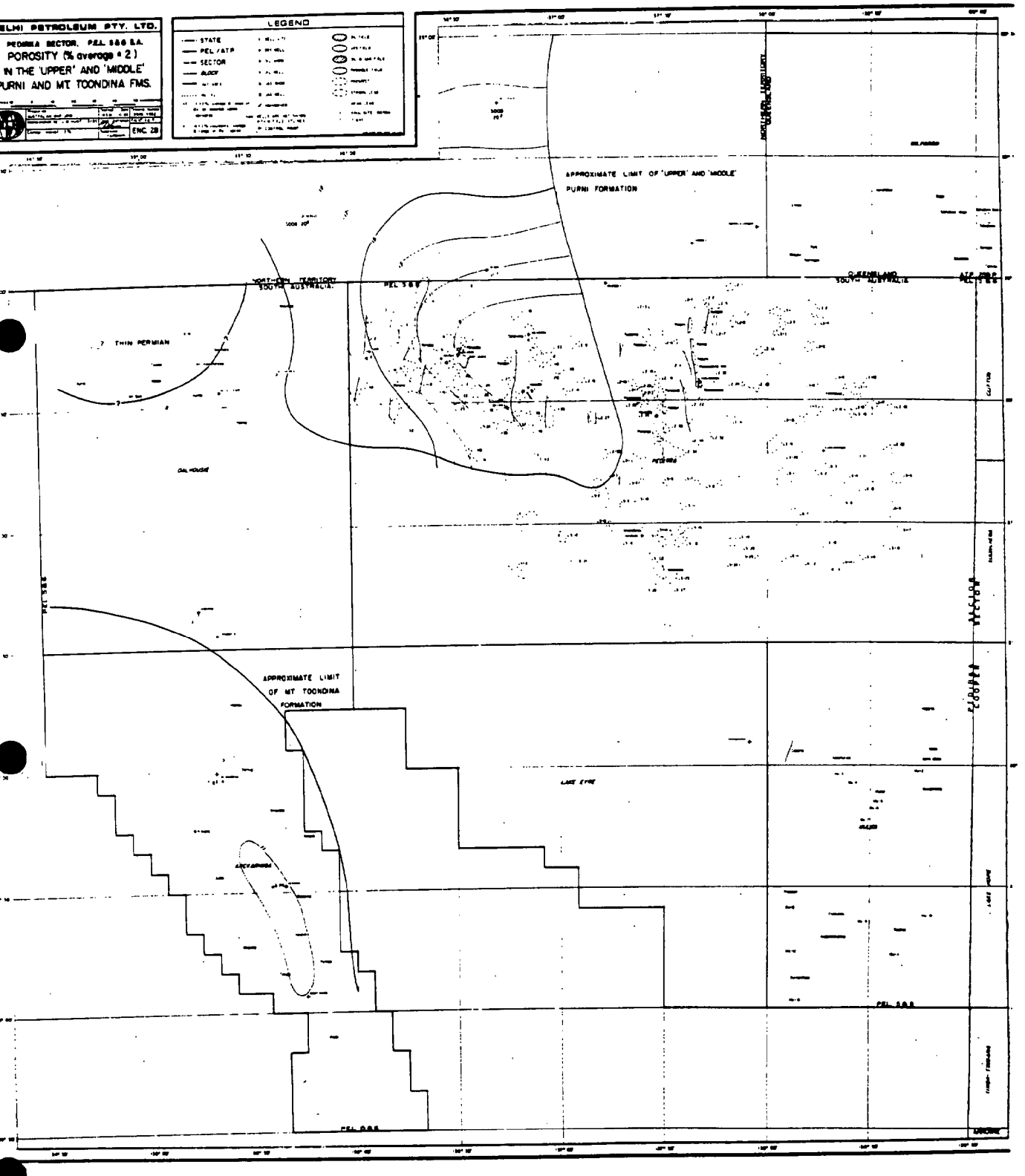


Figure 26 Porosity % (average ±2) in the 'upper' plus 'middle' Purni and Mt. Toondina Formations.

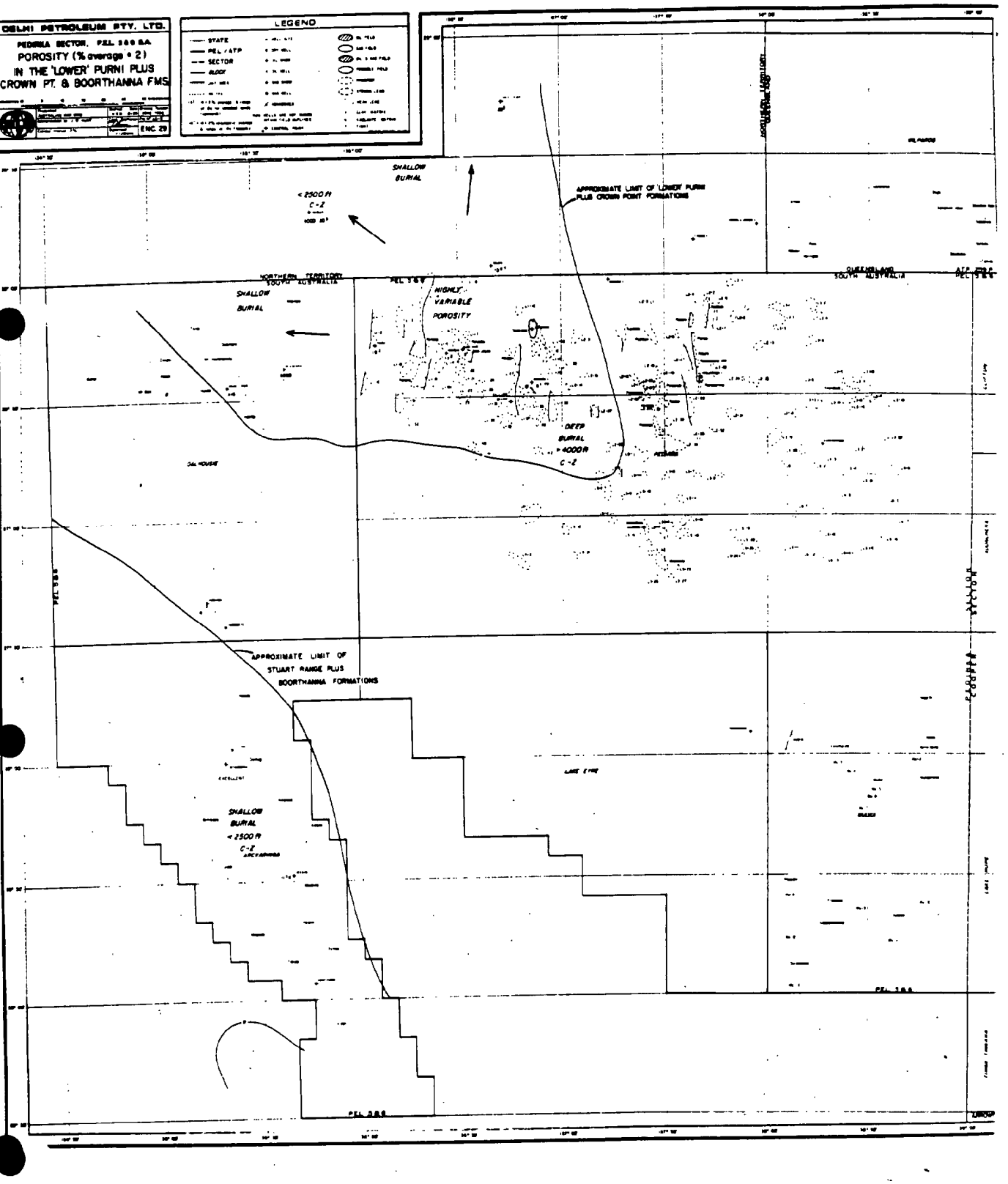
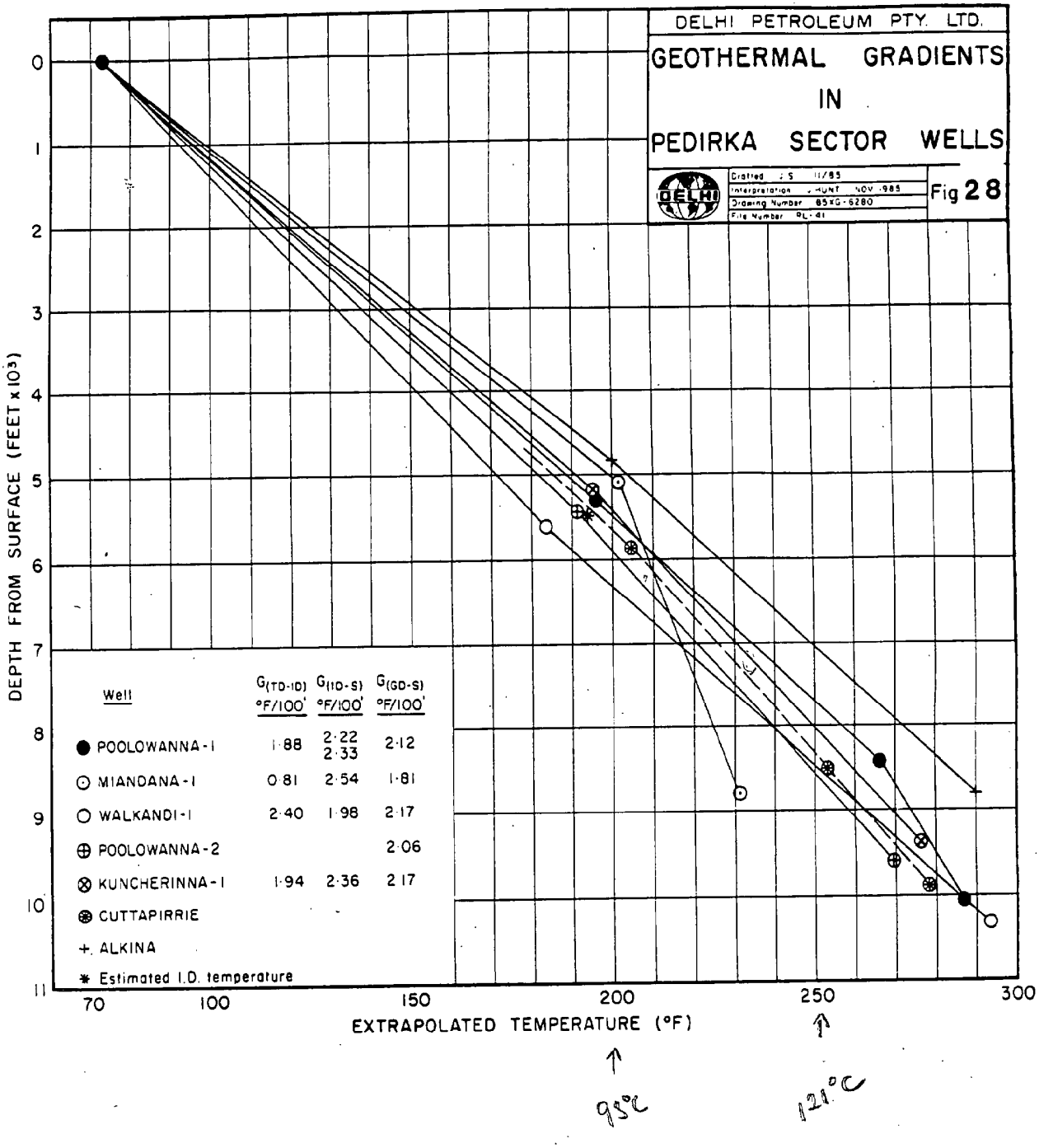
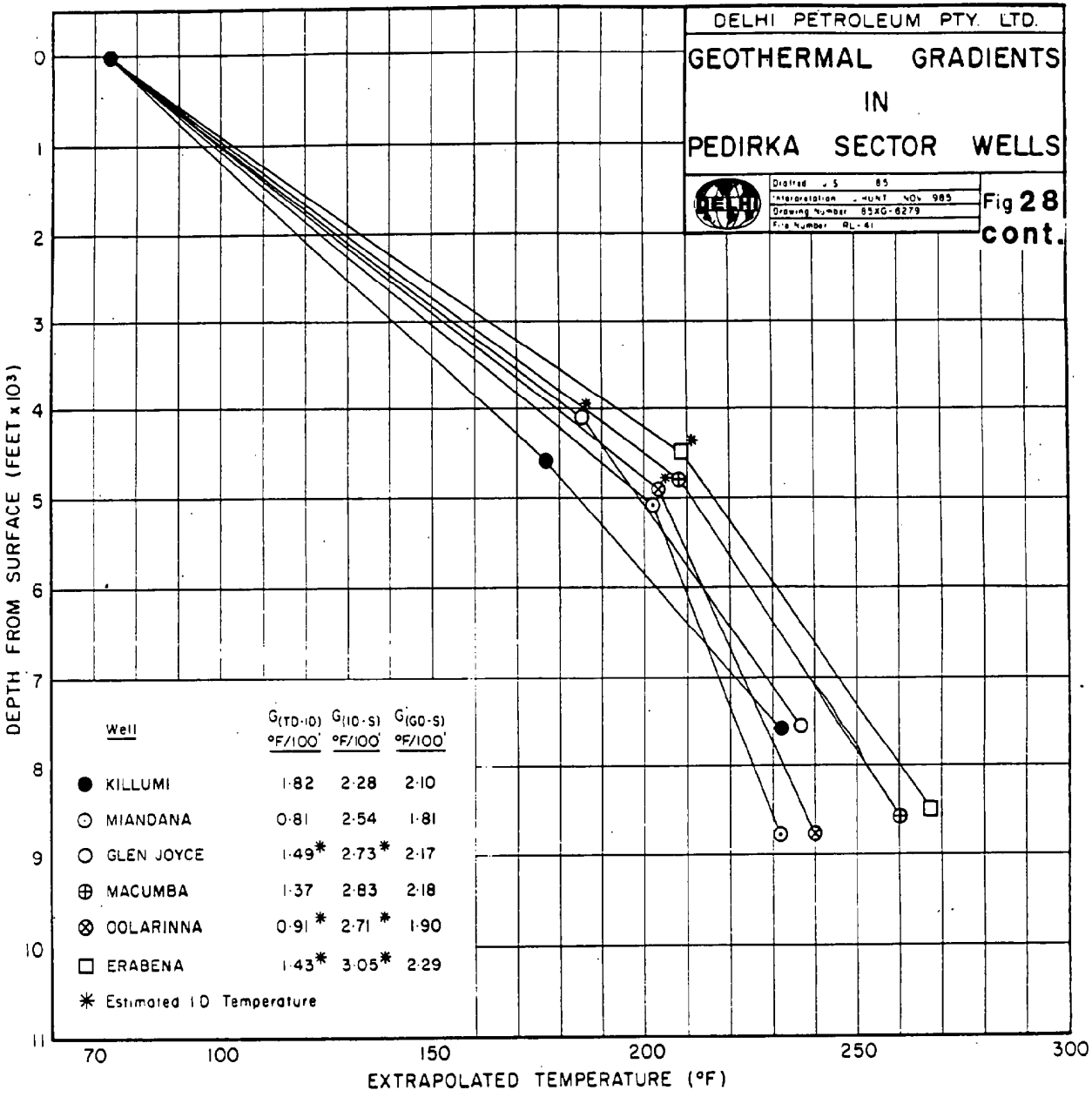


Figure 27 Porosity % (average ±2) in the 'lower' Purni plus Crown Point and Boorthanna Formations.


DELHI PETROLEUM PTY. LTD.
GEOTHERMAL GRADIENTS
IN
PEDIRKA SECTOR WELLS
DELHI
Drafted J.S. 11/85
Interpretation J. HUNT NOV. 1985
Drawing Number 85XG-6280
File Number PL-41
Fig 28
DEPTH FROM SURFACE (FEET x 10³)
0
1
2
3
4
5
6
7
8
9
10
11
70
100
150
200
250
300
EXTRAPOLATED TEMPERATURE (°F)
95°C
121°C
Well
G(TD-ID) °F/100'
G(ID-S) °F/100'
G(GD-S) °F/100'
POOLOWANNA-1 1·88 2·22 2·33 2·12
MIANDANA-1 0·81 2·54 1·81
WALKANDI-1 2·40 1·98 2·17
POOLOWANNA-2 2·06
KUNCHERINNA-1 1·94 2·36 2·17
CUTTAPIRRIE
ALKINA
Estimated I.D. temperature


DELHI PETROLEUM PTY. LTD.
GEOTHERMAL GRADIENTS
IN
PEDIRKA SECTOR WELLS
Fig 28 cont.
DEPTH FROM SURFACE (FEET x 10³)
EXTRAPOLATED TEMPERATURE (°F)
0
1
2
3
4
5
6
7
8
9
10
11
70
100
150
200
250
300
Well
G(TD-10) °F/100'
G(10-S) °F/100'
G(GO-S) °F/100'
KILLUMI 1·82 2·28 2·10
MIANDANA 0·81 2·54 1·81
GLEN JOYCE 1·49* 2·73* 2·17
MACUMBA 1·37 2·83 2·18
OOLARINNA 0·91* 2·71* 1·90
ERABENA 1·43* 3·05* 2·29
* Estimated 1D Temperature

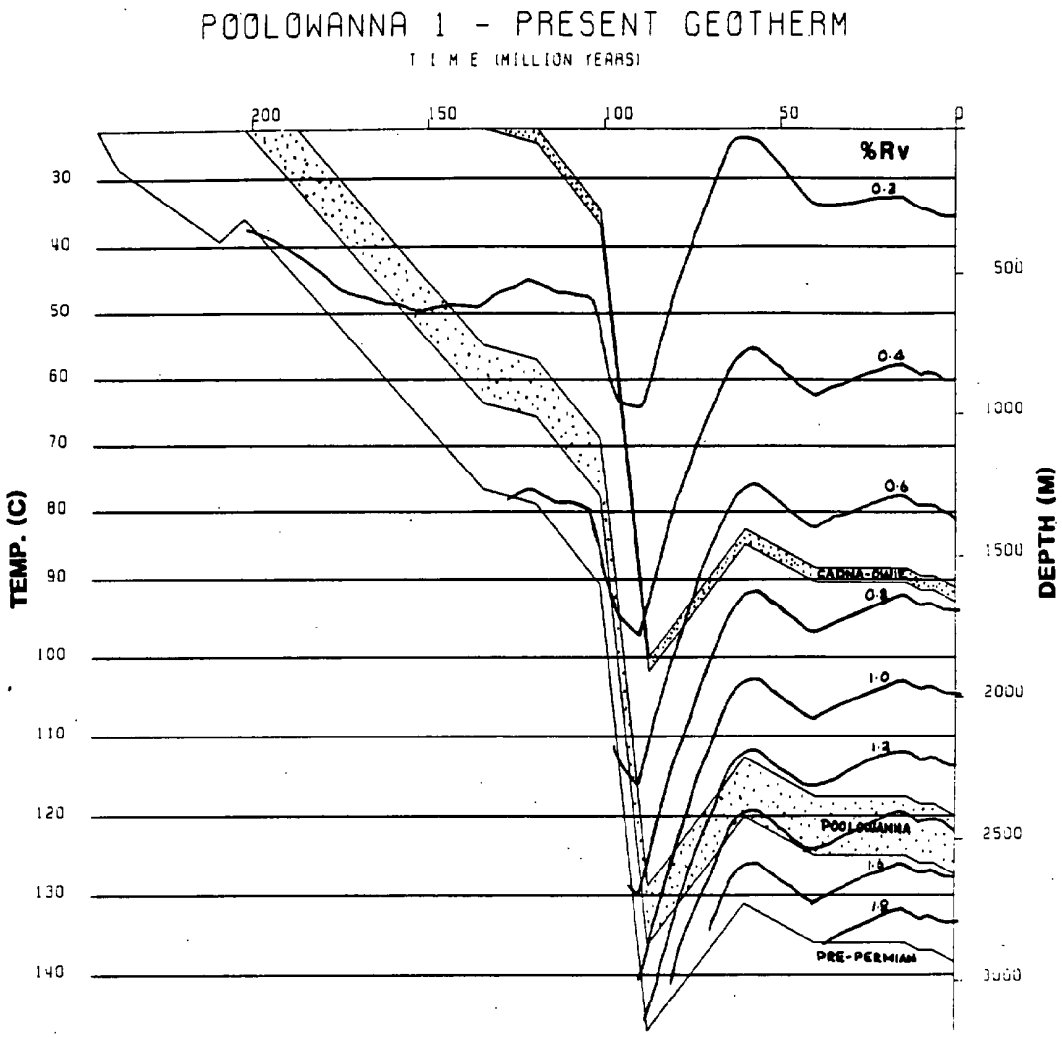


Figure 29 Maturation history using present geotherm - Poolowanna 1.

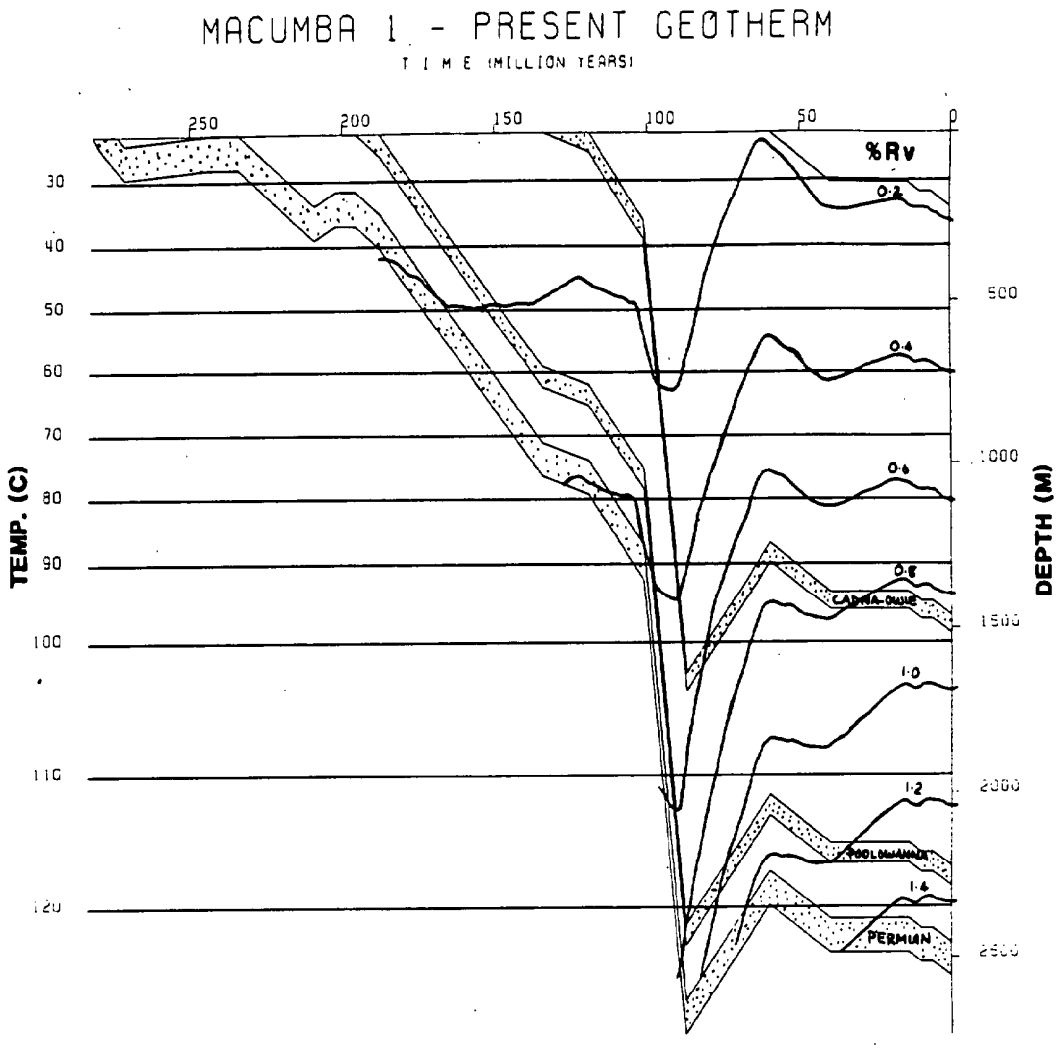


Figure 30 Maturation history using present geotherm - Macumba 1.

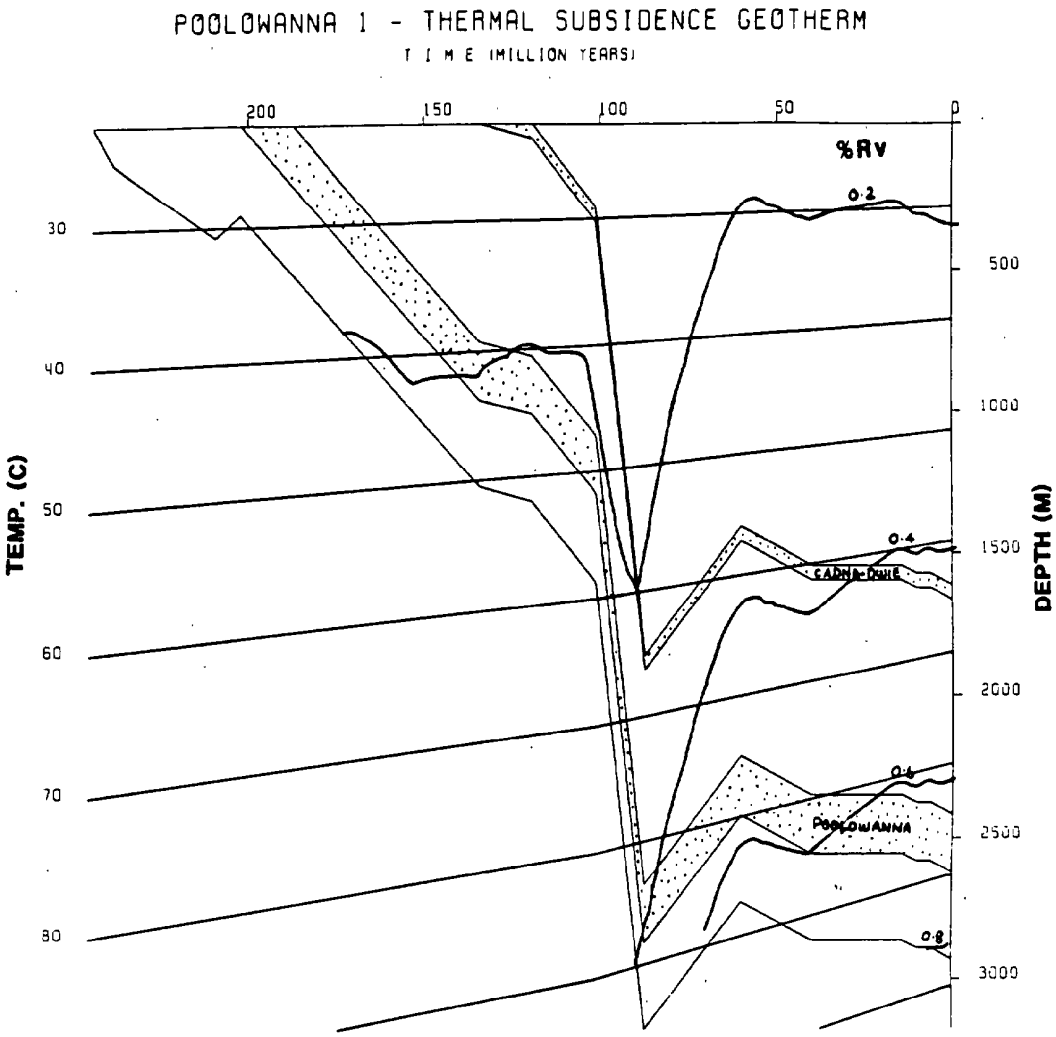
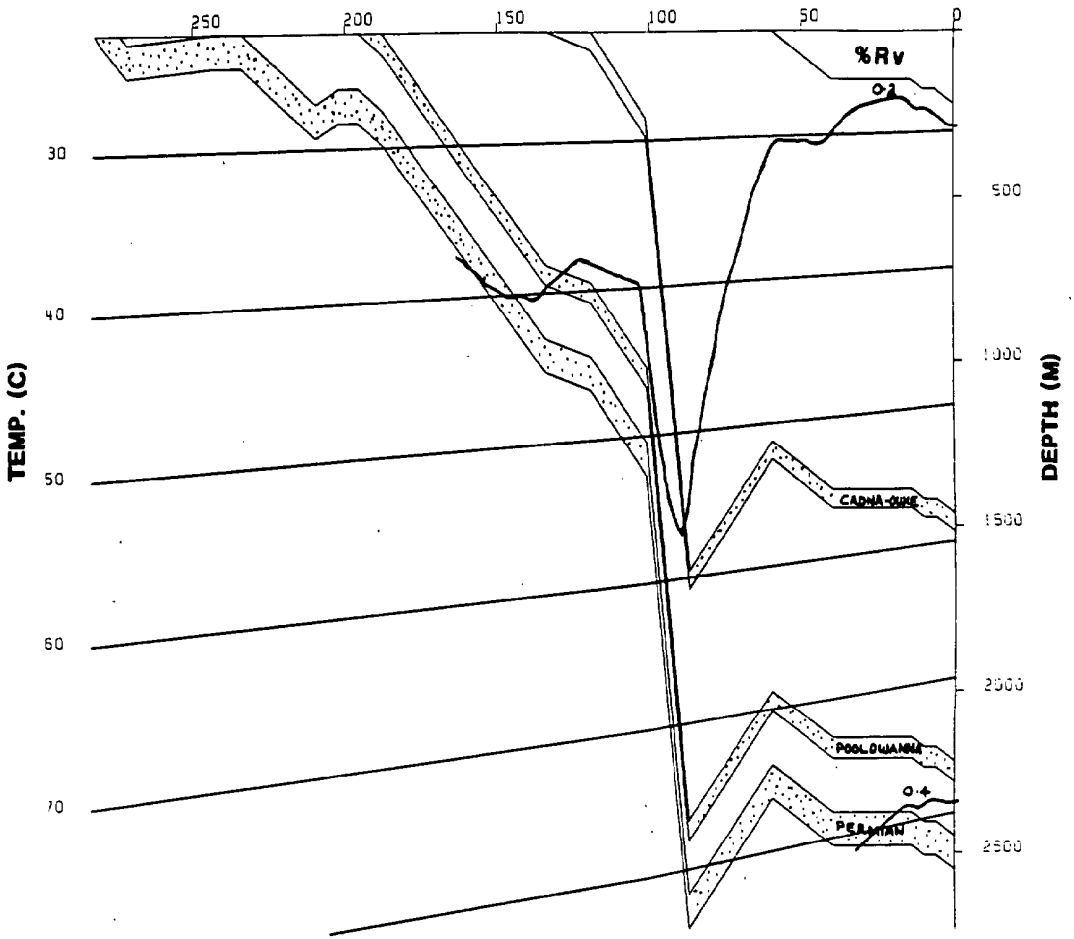


Figure 31 Maturation history using thermal subsidence geotherm - Poolowanna 1.

MACUMBA 1 - THERMAL SUBSIDENCE GEOTHERM



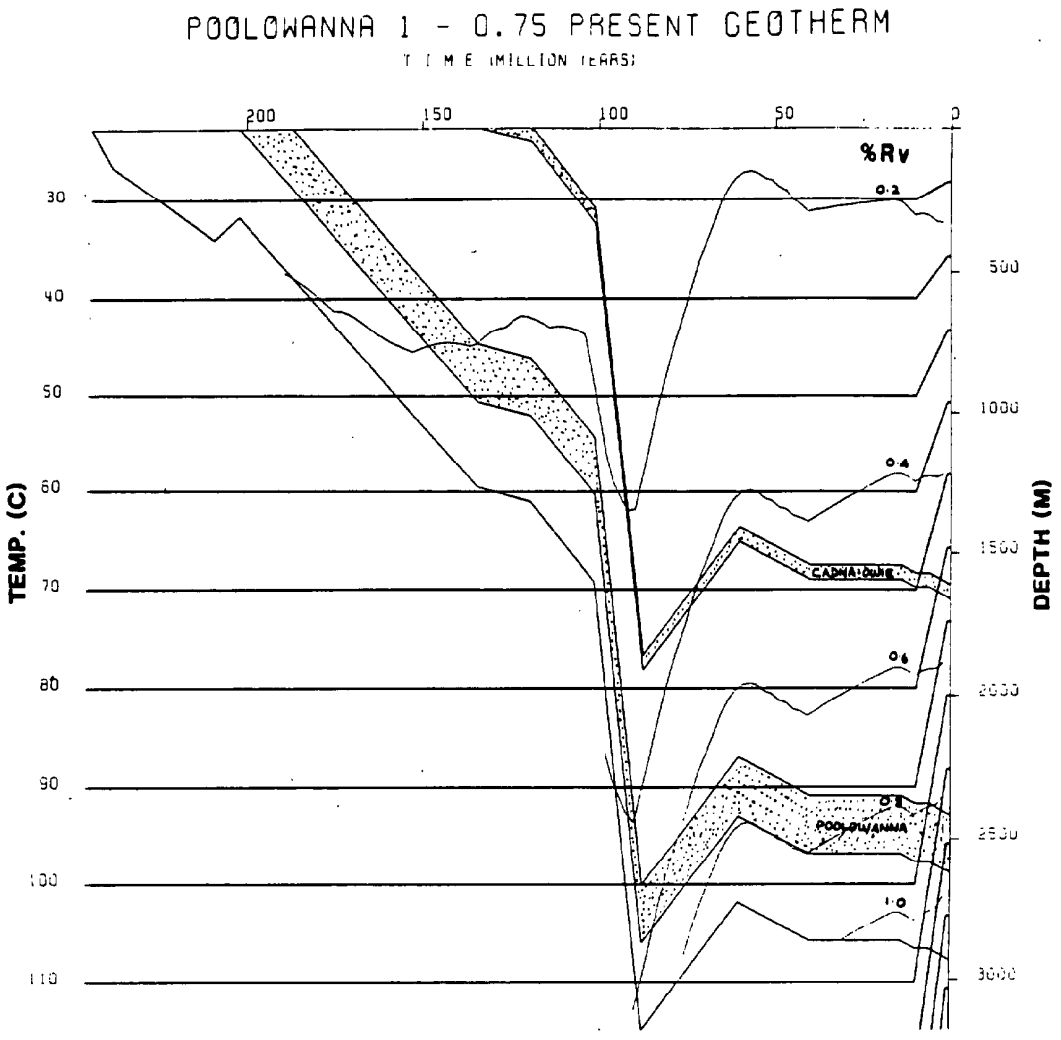


Figure 33 Maturation history using 0.75 present geotherm - Poolowanna 1.

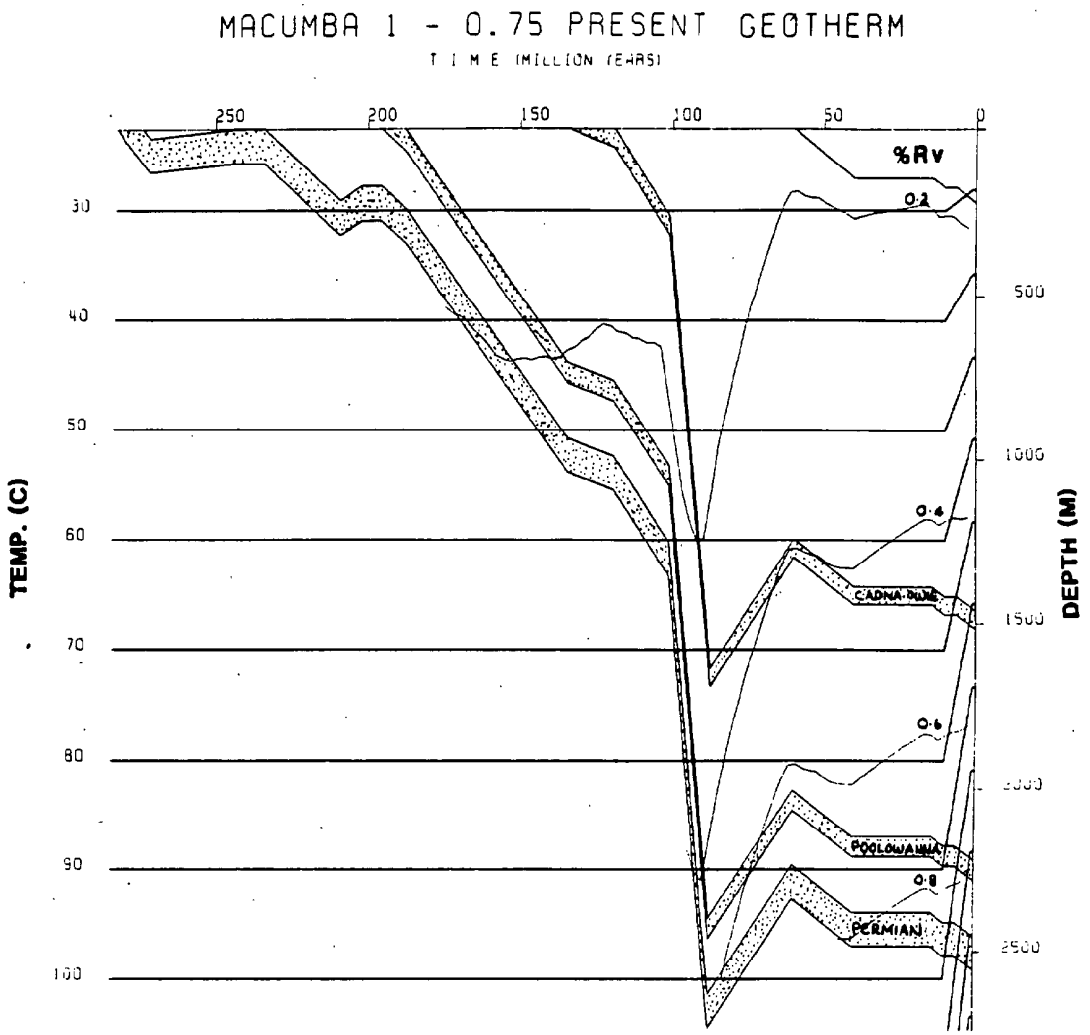
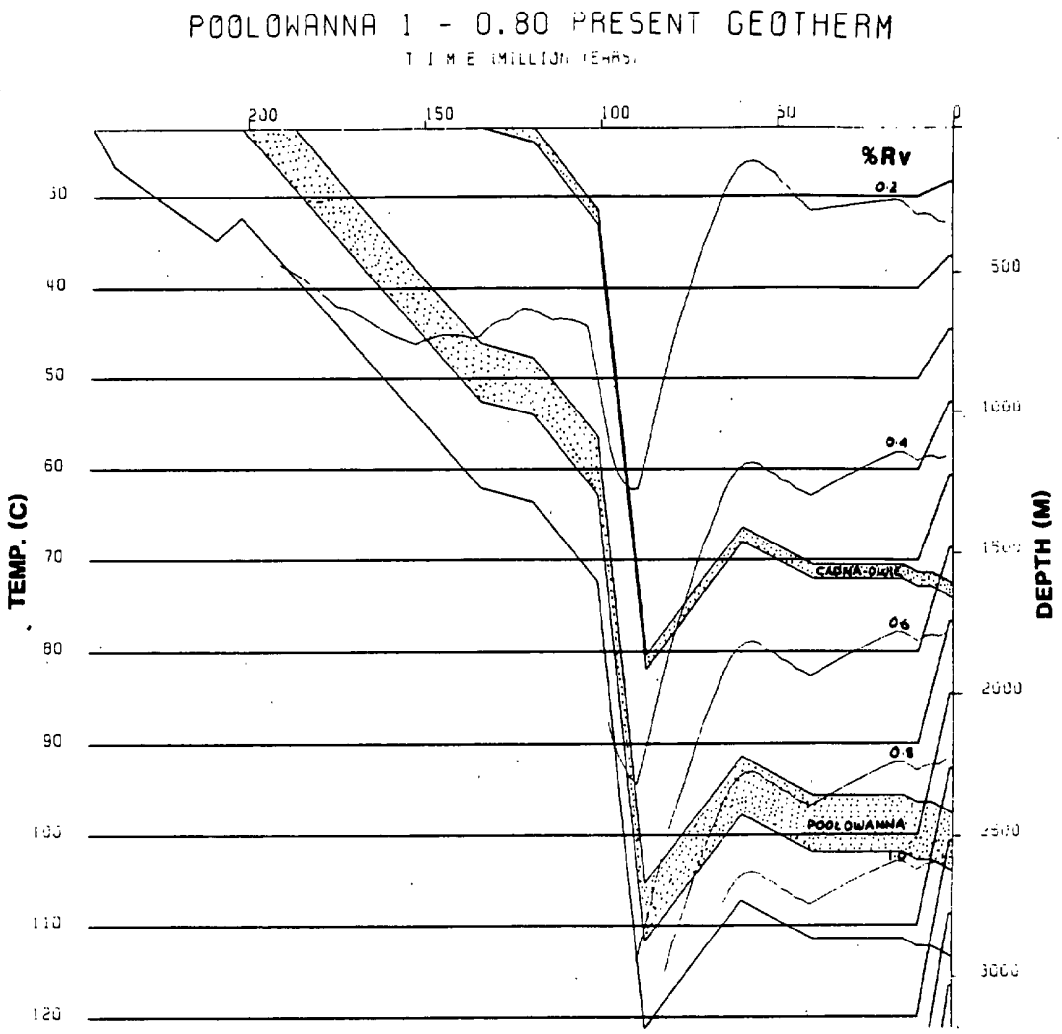


Figure 34 Maturation history using 0.75 present geotherm - Macumba 1.



Figur 35 Maturatio hi to y u i 0.80

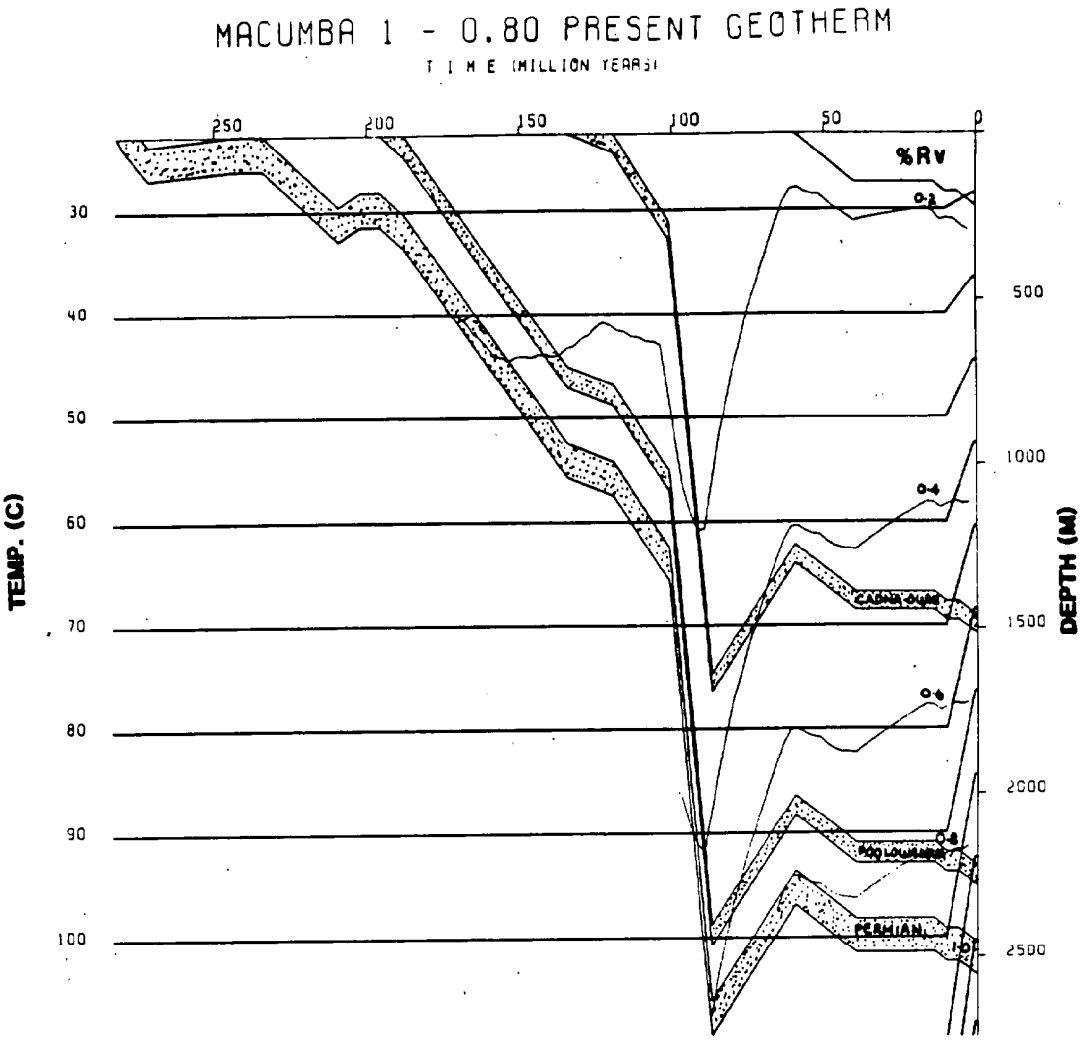


Figure 36 Maturation history using 0.80 present geotherm - Macumba 1.

4-OCT-85

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POOLOWANNA 1

VITRINITE REFLECTANCE PROFILE

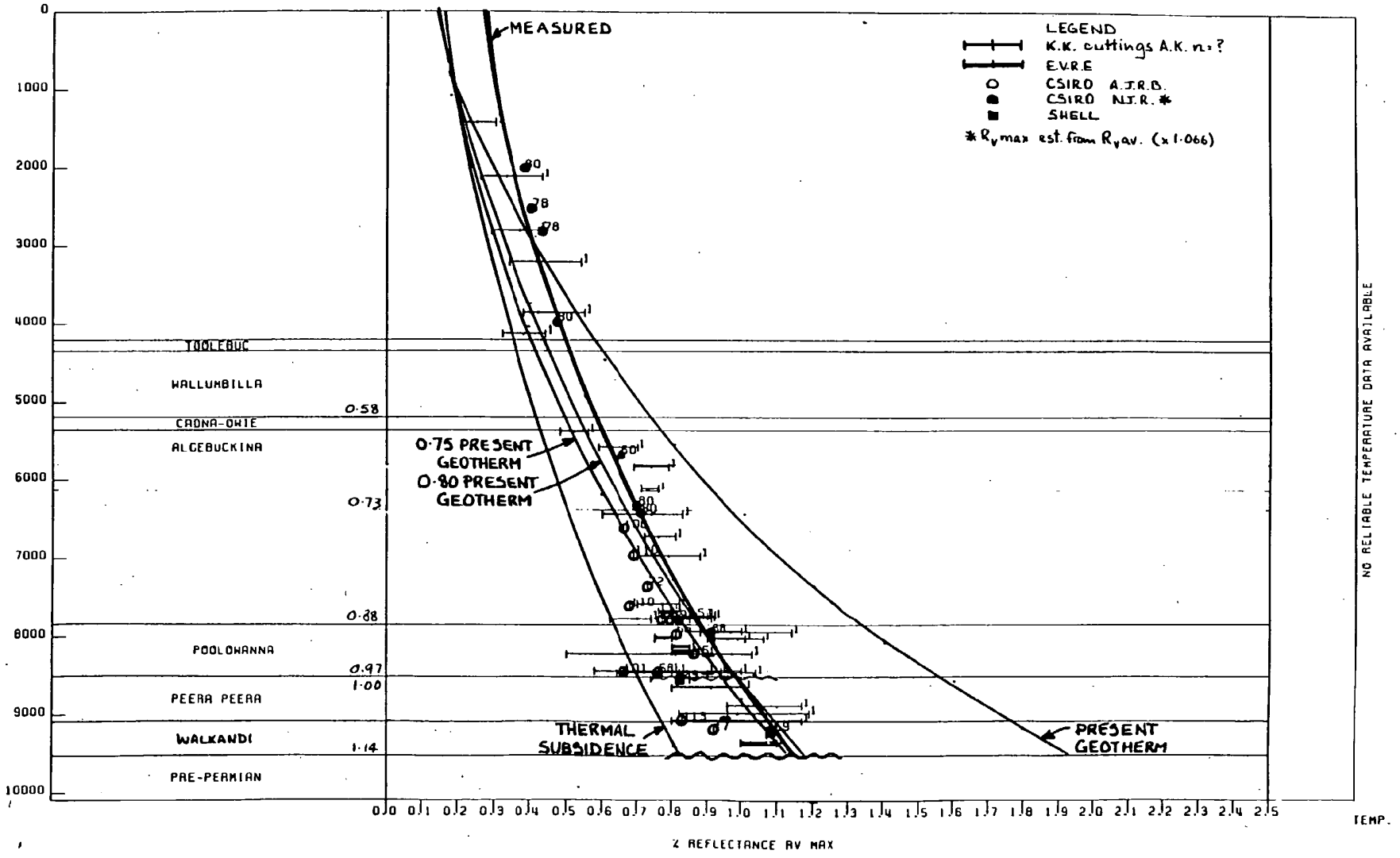

Figure 37 Measured and calculated reflectance profiles - Poolowanna 1.

TOTAL DEPTH ....: 10086

DELHI PETROLEUM PTY. LTD.

MACUMBA 1

VITRINITE REFLECTANCE PROFILE

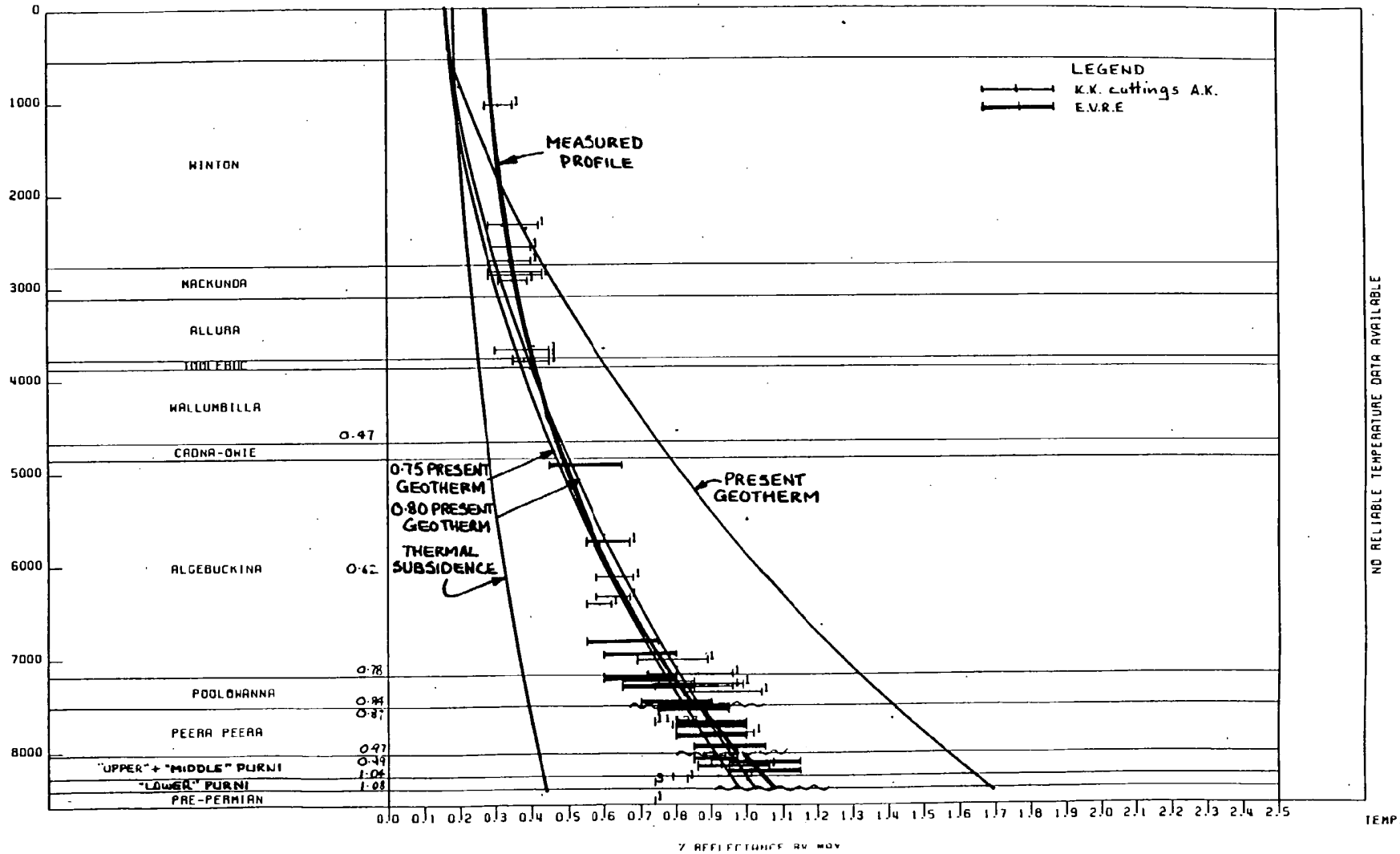

Figure 38 Measured and calculated reflectance profiles - Macumba 1.

TOTAL DEPTH ...: 8583

APPENDIX 1

STRATIGRAPHY, PALYNOLOGY, EVRE, POROSITY, CORES AND TEST RESULTS FOR PEDIRKA SECTOR AND BIRDSVILLE TRACK RIDGE WELLS

D.C. Johnstone,
J.W. Hunt &
G.R. Woods
Delhi Petroleum Pty Ltd.
October 1985

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TABLE A1.1 ADRIA DOWNS 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	228								
Cadna-owie Fm	3106	129	PK 2		3222				
Algebuckina Sst	3235	285							
Westborne Fm	3520	113							
Addori Sst	3633	154	PJ6		3727				
Birkhead Fm	3787	196	PJ5 PJ5		3903 3970				
Hutton Sst	3983	764	PJ5		4672				
Poolowanna Fm	4747	153	PJ3.3.1 PJ3.3.1		4752 4849				
Pre-Permian	4900	122					1	5012-5022 dips at 75°	74
T.D. (logger) (driller)	5022 5020								

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	3228'-3245'	Mooga Fm	WTS @ 1100 BWPD Rec. 49 BBL Fresh W.

INTERPRETATION: The entire section encountered in Adria Downs 1 is interpreted to be water wet with saturations generally in the range 86% - 100% and no pay is interpreted. One poor oil show was encountered at the top of the Cadna-owie Formation. Very few good seals were found between the top of the Mooga Formation and the Pre-Permian Basement. A basement core dips at approximately 75°.

TABLE A1.2 BOORTHANNA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	378								
Cadna-owie Fm	12	138	E. Cretaceous						
Mt. Toondina	150	1960	L. Permian						
Stuart Range	2110	310	L. Permian						
Boorthanna	2420	240	L. Permian						
Pre-Permian	2660	1140							
T.D. (logger)	4021								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

TABLE A1.3 CHARO 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	100								
Cadna-owie Fm	4603	197							
Murta Mbr	4800	146							
Namur Sst	4946	151	PK 1		5042				
Westbourne Fm	5097	398	PJ6.2.2		5140				
			PJ6.2.2		5148				
			PJ6.2.2		5251				
Adori Sst	5495	220	near PJ5-PJ6 boundary		5466				
Birkhead Fm	5715	202	PJ5		5758				
			PJ5		5915				
Hutton Sst	5917	764	PJ3-PJ5		6000				
			PJ3-PJ5		6585				
			PJ3-PJ5		6607				
			PJ3.2		6683				
Poolowanna Fm	6681	328	N.O.T. PJ3		6698				
			PJ3.2		6752				
			PJ2.1 (-PJ2.2?)		6849				
			PJ1-PJ2		6954				
Kalladeina Fm	7009	306					1	7309-7319	48
T.D. (logger)	7315								
(driller)	7319								

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	5798'-5829'	Birkhead Fm	NFTS Rec. 1041' Oil, 669' OCMW

INTERPRETATION: The Triassic and Jurassic section is interpreted to be water wet with the exception of the basal section of the Birkhead Formation. 10' of pay is mapped in this section with average porosity of 12.1% and average Sw of 56.9%. The interval was tested in DST 1.

TABLE A1.4 COLSON 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft) (driller)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	267				5992				
Cadna-owie Fm	4359	143							
Algebuckina Sst	4502	1840	N.O.T. PJ3		6255**	18± 2 top 16± 2 mid. 14± 2 base			
Poolowanna Fm log equiv. facies equiv.	6342 6409	288	N.O.T. PJ3 PJ3.3.2 PJ1 E Jurassic PJ1		6420** 6425 6492 6500 6524	15± 3 top 13± 2 av			
Peera Peera Fm	6630	252	Mesozoic PT4 PT4 Triassic?		6780 6780 -6790 6795 6810	10± 1			
Purni Fm "upper" and "middle"	6882	545	Permian? PP2 PP2.1		7030 -7040 7060 -7070 7236	11± 1 tight			
"lower"	7427	70				10± 2			
Crown Point Fm	7497	339	PP1 PP1		7490 -7500 7492	10± 1 tight			
Pre-Permian	7836	138				10± 2			
T.D.	7974								

* revised 04/85, ** cuttings.

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: The Jurassic section is interpreted to be water wet except for the interval 6508'-6534' which has an average Sw of 43% with porosities in the range 10-18%. Residual oil shows were recorded within various intervals of the Poolowanna Formation while drilling. Other weak shows of residual oil were noted within the Peera Peera Formation. Log interpretation indicates a possible hydorcarbon zone in the interval 7898'-7922' within Pre-Permian sandstones, which have porosities inthe range 9-12% and an Sw of 39-45%. No shows were recorded over this interval while drilling. Because no DSTs were run, only estimates on formation water resistivity have been used to calculate hydrocarbon saturation, which reduces the reliability of the results. The sequence contained few good seals.

TABLE A1.5 COOTANOORINA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
Bulldog Shale	6	364	E. Cretaceous						
Cadna-owie Fm	370	97	E. Cretaceous						
Algebuckina Sst	467	148	E. Cretaceous /Jurassic			very high			
Mt. Toondina Fm	615	1080	Permian			4.8%, kaolinite			
Stuart Range Fm	1695	855	Permian						
Boorthanna Fm	2550	375	Permian			excellent			
Pre-Permian	2925	186+	Devonian						
T.D.	3111								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

TABLE A1.6 ERABENA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	239								
Cadna-owie Fm	4422	149	E. Cretaceous			14± 2			
Algebuckina Sst	4571	2096	E. Cretaceous /Jurassic			17± 3 top 13± 2 mid. 11± 2 base			
Poolowanna Fm log equiv.	6667	789	Jurassic			12± 3	1	7018-7064	73
Peera Peera Fm	7426	383	Triassic			10± 3			
Walkandi Fm log equiv.	7809	175	Triassic						
Finke Group	7984	348	Devonian						
Pre-Devonian	8332	148					2	8470-8480	79
T.D. (logger) (driller)	8480 8480								

* revised 04/85.

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: Log interpretation indicates high water saturation throughout the Jurassic and Triassic section and no pay is interpreted. Trace fluorescense is noted in the Poolowanna and Peera Peera Formations. The Algebuckina Sandstone has porosity in the range 10-20% with high permeability. The Poolowanna Formation has moderate porosity (5-15%) but has low permeability. Porosity and permeability within the Peera Peera Formation is also interpreted to be low.

TABLE A1.7 GLEN JOYCE 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	249								
Cadna-owie Fm	4064	153			4076 4215				
Algebuckina Sst	4217	1911			5720 5744 6032 6072	19± 2 top* 16± 2 mid. 13± 2 base**			
Poolowanna Fm log equiv.	6128	311				13± 2			
facies equiv.	6212				6217 6229 6249 6268 6320	13± 3			
			PJ1-J2						
Purni Fm "upper" and "middle"	6439	644	- PP2.1-2.2 -		6550 6893 6992	6± 2 in "upper"*** 10± 2 in "middle"			
"lower"	7083	159	PPI PPI		7147 7194	9± 2			
Pre-Permian	7242								
T.D. (logger) (driller)	7512 7510								

* 12+ in top 50' ** 50' cemented zone in base., *** shaly sand

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests.		

INTERPRETATION: All potential reservoir sands are interpreted to be water wet. No pay is mapped.

TABLE A1.8 HALE RIVER 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	411								
Cadna-owie Fm	2756	114	E. Cretaceous						
Algebuckina Sst	2870	1292	E. Cretaceous /Jurassic			23± 2 top 20± 2 mid. 18± 2 base	1	3844-3864	65
Purni Fm "upper" and "middle"	4162	316	Permian			20± 2	2	4170-4185	30
"lower"	4478	67					3	4517-4132	100
Finke River Group			Devonian						
Horshoe Bend Shale	4545					22± 2			
Langra Fm	4615								
Basement	4705		Cambrian				4	4756-4763	100
Volcanics and sediments							5 6	4937-4968 5271-5288	97 88
T.D. (logger) (driller)	5558 5683						7 8	5558-5578 5671-5683	100 100

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: Good porosity exists within sandstones throughout the Jurassic and Permian section. No shows were encountered while drilling. The sequence is interpreted to be water saturated and no pay is interpreted. Basement cores revealed a gently dipping (10-20°) sequence of volcano-clastic sediments with interbedded basalt flows.

TABLE A1.9 KILLUMI 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	196								
Cadna-owie Fm	4479	163			4636			No core cut	
Algebuckina Sst	4642	2328			4685	16± 2 top*			
					4747	14± 2 mid.			
					4945	11± 2 base			
					5001				
					5101				
					5385				
					5649				
					5887				
					6220				
					6689				
					6765				
					6792				
Poolowanna Fm log equiv. = facies equiv.	6970	284			6973	12± 3			
					6993				
					7061				
					7134				
					7230				
					7243				
					7256				
					7268				
					7354				
					7412				
					7507				
Peera Peera Fm	7254	333+ (396**)				12± 3			
Purni Fm "upper" to "lower"	7650**	450**							
Crown Point	8100**	300**							
Pre-Permian	8400**								
T.D. (logger)	7587								
(driller)	7586								

11± 2 in top 50'
** based on prognosed thickness

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: All potential reservoir sands are interpreted to be water wet. No pay is mapped.

TABLE A1.10 KOONCHERA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	287								
Cadna-owie Fm	4195	180							
Murta Mbr	4375	113	PK 1.2		4382 -4481				
Namur Sst	4488	156							
Westbourne Fm	4644	276	PJ6.2.2 PJ6.1		4651 4914				
Adoria Sst	4920	258							
Birkhead Fm	5178	382	PJ5 PJ5		5180 5583				
Hutton Sst	5560	742	PJ5 PJ4.1 Jurassic PJ3		5605 5865 6041 6145				
Poolowanna Fm	6302	211	PJ3.2 PJ3.1 PJ2.2.2-PJ3		6405 6471 6501				
Peera Peera Fm	6513	223	PJ2 PJ2 PT5.1 PT4.2-PT5.1		6619 6641 6678 6693				
Pre-Triassic	6736	122							
T.D. (logger) (driller)	6858 6852						1	6842-6852	100

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: The entire section (Early Cretaceous to basement) is interpreted to be water saturated. A trace of dull yellow fluoresence was noted over the interval 5188'-5228' within the Birkhead Formation, but no hydrocarbon saturation is indicated on logs.

TABLE A1.11 KUNCHERINNA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	69								
Cadna-owie Fm				0.55-0.60	5050				
	5110	123	PK 3.1	0.55-0.60	5142				
			PK 2	0.60-0.65	5222				
Algebuckina Sst	5233	2534	PK 1.2	0.60-0.65	5295	18± 2 top			
			PJ 6.2	0.60-0.65	5828				
			-	-	6344	14± 2 mid.			
			-	-	6500				
			PJ4-PJ5	-	7002	9± 3 base**			
				0.70-0.75	7614				
Poolowanna Fm log equiv. = facies equiv.	7767	635	PJ3.3.2	0.70-0.75	7770	9± 2***			
			PJ3.2	0.75	7864				
			PJ3.1	0.75	8088				
			PJ2	-	8121				
			PJ2	-	8264	7± 2 base			
Peera Peera Fm	8402	542	PT4.2	0.80	8408	7± 2			
			PT4.2	0.80	8475				
			PT3-PT4	-	8645				
			PT4.2	0.80	8770				
			PT4	-	8866				
Walkandi Fm log equiv. = facies equiv.	8944	362	-	-	8960				
			-	-	9145	6± 2			
			-	-	9254				
			-	-	9283				
Pre-Permian	9306	99					1	9394-9405	18
T.D. (logger)	9405								
(driller)	9404								

* revised 04/85, ** Lower Algebuckina Sandstone variably cemented, *** 9± for good hole conditions, 7± 2 in the base.

TEST RESULTS

INTERVAL	FORMATION	REMARKS
8090'-8136'	L. Poolowanna Fm	NFTS Rec. 90' SOCM

INTERPRETATION: Sands of the Algebuckina Sandstone and Cadna-owie Formation have good porosity and permeabiity but are interpreted to be water wet. Bright yellow fluorescense was noted in the upper Poolowanna Formation and the middle and basal Peera Peera Formation. Sands within these formations have poor porosity and permeability and have high water saturations. No hydrocarbons were detected in other formations and no pay is interpreted.

TABLE A1.12 MACUMBA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	150								
Cadna-owie Fm.	4670	178							
Algebuckina Sst	4848	2333	Mesozoic	0.45-0.65	4917	16± 2 top			
						14± 2 mid			
			N.O.T. PJ3		6143	10± 2 base			
			Jurassic	0.55-0.75	6812				
			N.O.T. PJ3	0.60-0.80	6957				
Poolowanna Fm	7181	335	PJ3.1	0.60-0.80	7192	10± 2			
			PJ3.1	0.60-0.80	7222				
			PJ3.1	0.65-0.85	7254				
			PJ3.1	0.65-0.85	7304				
			PJ3.1	0.65-0.85	7312				
			PJ2 (?PJ2.1)		7386				
				0.70-0.90	7472				
Peera Peera Fm	7516	514	PT5.2	0.75-0.95	7520	9± 2*			
			PT4.2	0.75-0.95	7554	8± 2**			
			PT4.2	0.80-1.00	7693				
			PT4.2	0.80-1.00	7742				
			N.O.T. PT3	0.80-1.00	7836				
			PT2.2-PT3	0.85-1.05	7956				
			Triassic		8019				
Purni Fm "upper" and "middle"	8030	246	PP2.1		8074	10± 2* "upper"			
			PP2.1	0.95-1.15	8120	7± 2** "upper"			
			PP2.1	0.95-1.15	8216	8± 2 "middle"			
"lower"	8276	134				6± 2 to a maximum of 10			
Pre-Permian ?Horsehoe Bend Shale	8410	176	Devonian				3	8529-8539 bedding 20° fractures 70° weathered	100
T.D. (logger)	8586								
(driller)	8583								

* clean sand, ** shaly sand

TEST RESULTS

INTERVAL	FORMATION	REMARKS
8211'-8283'		NTS Rec. 4350' SGCW
7313'-7418'		Misrun
7312'-7456'		WTS @ 575 BWPD

INTERPRETATION: Good porosity (14-25%) and permiability exists throughout the sandier parts of the section which is interpreted to be water saturated. No significant hydrocarbon shows were encountered and no pay is interpreted.

TABLE A1.13 MCDILLS 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	412								
Cadna-owie Fm	1436	82							
Algebuckina Sst	1518	834				25-35*			
Purni Fm "upper" and "middle"	2352	568	PP2		2375-2390**	15-25*	1	2375-2390	87
							2	2690-2697	64
							3	2697-2740	21
"lower"	2920	217							
Crown Point Fm	3137	523	PP1		2959-2973**	15-25*	4	2959-2973	96
			PP1		3126-3138**		5	2973-2983	10
							6	3126-3138	100
			PP1-PP2		3645-3660**		7	3361-3376	93
Finke River Group									
?Idracowra Sst	3660		Devonian				8	3645-3660	100
Horseshoe Bend Shale	3790		Devonian				9	2822-3837	13
							10	3837-3850	62
Langra Sst	?3910		Devonian				11	4154-4167	100
							12	4469-4484	57
							13	4784-4796	100
							14	5102-5117	100
							15	5252-5267	70
							16	5544-5556	92
Polly Conglomerate	5596		Devonian				17	5815-5825	50
							18	6325-6335	60
							19	6592-6597	100
							20	7050-7060	80
							21	7079-7089	90
Mereenie Sst	7090		Devonian				22	7608-7622	100
							23	8108-8114	100
							24	8114-8119	100
unnamed	8200		Devonian				25	8314-8320	75
							26	8740-8741	0
							27	8915-8925	100
Todd River Dolomite	9024		L.Cambrian				28	9043-9053	70
							29	9354-9364	90
							30	9632-9642	100
							31	10058-10068	90
							32	10505-10515	100
T.D.	10515								

* = sonic porosity for clean sands from WCR, ** cuttings.

TEST RESULTS

INTERVAL	FORMATION	REMARKS
1950'-1955'	Algebuckina Sandstone	WTS @ 1200 BWPD

INTERPRETATION: Sandstone units throughout the sequence showed excellent porosity but are interpreted to be water wet. A weak? gas show was recorded over the interval 1365'-1380' within the Rumbalora Shale. No pay is interpreted in the well.

Mereenie Sandstone thins to the south - unnamed sandstone may be a lower unit of Mereenie or upper Stairway Sandstone.

TABLE A1.14 MIANDANA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	96								
Cadna-owie Fm	5010	104			5176 5216				
Algebuckina Sst	5114	1424			5781 6225 6236	18± 2 top 14± 2 base			
Birkhead Fm	6538	131			6542 6568 6584 6626	12± 2			
Hutton Sst	6669	1108			7344 7620	11± 2 top 9± base			
Poolowanna Fm log equiv. = facies equiv.	7777	325			7798 7814 7839 7936	9± 2			
			PJ1-PJ2		7986 7992 8002 8032				
Peera Peera Fm	8102	278	PT5		8106 8276	7± 2			
Pre-Permian	8380	392+					1	8767'-8772'	35
T.D. (logger) (driller)	8772 8768								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests.		

INTERPRETATION: All potential reservoir sands are interpreted to be water wet. No pay is mapped.

TABLE A1.15 MOKARI 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	236								
Cadna-owie Fm	3913	157							
Algebuckina Sst	4070	1665				18± 2 top 17± 2 mid. 16± 2 base			
Poolowanna Fm	5735	275	PJ3	0.50-0.70	5758	15± 2	1	5705-5815	76
log equiv.			PJ3		5790				
			N.O.T. PJ1		5795				
			?PP2		6075				
facies equiv.	5915		PP2.1		6555				
			PP2.1		6618				
			PP2.1		6651				
Purni Fm	6010	787				9± 2 "upper"			2
	6069-6103	86							
"upper" and "middle"						10± 2 "middle"	3	6536-6557	98
							4	6617-6625	99
							5	6635-6693	52
"lower"	6797	424				7± 2 "lower"			
Crown Point Fm	7221	174				3± 1 frac. Ø			
Pre-Permian	7395	432+	Ordovician				6	7822-7827	80
T.D.	7827								

* revised 04/85

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	5739'-5826'	Poolowanna Fm	WTS @ 1654 BWPD
2.	6468'-6557	Purni Fm	Misrun
3.	6593'-6693'	Purni Fm	WTS @ 1654 BWPD
4.	7011'-7131	Purni/Crown Point Fms	NFTS Rec. 366' M + Salt W.

INTERPRETATION: No significant hydrocarbon shows were recorded while drilling except for a weak gas show at the top of the Crown Point Formation. Porosity is generally poor to fair throughout the Permian section but increases within the Jurasic sands. The entire section is water saturated and no pay is interpreted. Absolute dating of sample taken from Core 6 (7826') using Ar^{40}/K^{40}, shows an age of 475 (±25) Ma (Ordovician).

TABLE A1.16 MOUNT CRISPE 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	462								
Cadna-owie Fm	610	87	E. Cretaceous						
Algebuckina Sst	697	768	E. Cretaceous /Jurassic			very high			
Crown Point Fm	1465	63	Permian			>16	1	1501-1502	98
?Larapinta Group ?Stairway Sst eqiv.		1528	Marine L. Palaeozoic Ordivician		1913	16-14	2	1586-1593	44 100
							3	1912-1922, 20°	62
							4	2360-2365	20
Peterman and Goyder equivs	2552		L. Ordovician		3347		5	2844-2852, 20°	89
							6	3340-3348, 50°	98
							7	3765-3777, 50°	44
							8	4083-4094, 50°	99
Pertaoorrta Group									
Deception equiv.	4200						9	4372-4385	109
Illara equiv.	4560						10	4596-4602	90
Tempe equiv.	4984						11	5028-5040, 30°	92
							12	5367-5369	25
Arumbera Fm	5457						13	5637-5647, 70°	80
T.D. (logger)	5647								

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	3729'-3777'	L. Ordovician	NFTS Rec. 975' W

INTERPRETATION: The entire section intersected is interpreted to be water wet. No shows were recorded during drilling and no pay is interpreted.

TABLE A1.17 OOLARINNA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	211								
Cadna-owie Fm	4786	156			4830				
Algebuckina Sst	4942	2362			5013 5876 6058 6383 7090 7305	18+ 2 top 14± 2 mid. 12± 2 base			
Poolowanna Fm log equiv. facies equiv.	7304 7392	410			 7395 7402 7429 7465	9± 3			
Peera Peera Fm	7714	461			7730 7825 7915 7990 8004 8043	?8+ 2 bad hole			
Purni Fm "upper" and "middle"	8175	373			8253 8282 8552 8558 8599	4+ 2 shaly sand and bad hole			
"lower"	8548	112							
Pre-Permian	8660						1	8779'-8789'	100
T.D. (logger) (driller)	8789 8776								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
8004'-8030'	Peera Peera Fm	NFTS, NOTS, Rec. 5310' GCW

INTERPRETATION: All potential reservoirs are interpreted to be water wet. No pay is interpreted. All formations are log to prognosis.

TABLE A1.18 PANDIEBURRA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	117								
Cadna-owie Fm	4174	196							
Namur Sst	4370	239							
Westbourne Fm	4609	249					1	4630-4640	100
Adori Sst	4855	194					2	5140-5150	100
Birkhead Fm	5052	300	PJ5?	0.45-0.65	5145				
Hutton Sst	5352	950					3	5750-5759	100
				0.45-0.65	5753		4	6150-6160	65
Poolowanna Fm	6302	468	N.O.T. PJ3 PJ3 (PJ3.1?)	0.50-0.70 0.55-0.75	6153 6582		5	6575-6585	100
Peera Peera Fm	6770	200	Late Triassic		6847		6	6847-6857	100
Pre-Triassic	6970	283	Ordovician basement cores contain graptolites				7	7023-7025	50
							8	7025-7029	75
							9	7132-7135 dips at 70°	100
							10	7250-7253 dips at 75°	66
T.D.	7253								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
6818-1857'	Peera Peera Fm	Rec. 190' MCW

INTERPRETATION: The section down to and including the Poolowanna Formation has water saturation in the order of 65% with the best porosity being developed in the Namur and Hutton Sandstones (20%). The Triassic section contains thin streaks of fair porosity (12%) with very low permeability. Golden fluorescence (20%) with no cut, was noted throughout the Triassic interval but no hydrocarbons were recovered in DST 1. No pay is interpreted. However laboratory tests indicate the presence of higher hydrocarbons within the formation fluid.

TABLE A1.19 POOLOWANNA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	115								
Eyre Fm			Tertiary			25			
Cadna-owie Fm	5186	164							
Algebuckina Sst	5350	2482	PK 1.1		5452	18± 2 top	1	7704-7744	90
			PK 1.1		7756	14± 2 mid.			
			PJ3.3 ?3.3.2		7758	12± 2 base			
			PJ3.3 ?3.3.2.		7837				
Poolowanna Fm	7832	674	PJ3.2		7924	12± 2 top	2	8327-8328	50
log equiv. =			PJ3.1	0.75-0.80	8002	11± 3 av.			
facies equiv.			PJ3.1	0.80-0.85	8119	9± 3 base			
			PJ3.1		8134				
			PJ3.1		8159				
				0.80-0.85	8174				
			PJ3.1	0.90	8215				
			PJ3.1		8225				
			PJ1-PJ2, ?PJ2		8366	9± 3 core			
			PJ1-PJ2		8426				
			PJ2		8430	up to 3%			
			PJ1-PJ2		8438	fracture			
			PJ1-PJ2		8440	porosity			
			PJ1-PJ2, ?PJ2		8442				
			PJ1-PJ2	0.90	8453				
Peera Peera Fm	8506	577		0.95	8520				
			PT4.1		8535	12 for	3	8425-8442	86
			PT4.1		8632	150',			
			Triassic		8906	otherwise			
			PT3?	0.95	9036	low.			
Walkandi Fm	9083	437			9347				
log equiv.					9353		4	9178-9185	100
			Triassic		9060-70**				
			Triassic		9100-10**				
			Triassic		9120-30**				
			Triassic	1.00-1.10	9140-50**				
			Triassic	1.00-1.10	9450-60				
Pre-Triassic	9520	565	Ordovician						
T.D. (logger)	10085						5	10080-10086	100
(driller)	10086							dips at 75°	

* revised 04/85, ** cuttings.

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	7938'-8007'	Poolowanna Fm	NFTS Misrun
2.	8216'-8328	Poolowanna Fm	NFTS Rec. 360' M+O, 2000' WCO, 2500' OCW, 640' O+W
3.	8585'-8642'	Peera Peera Fm	GTS @ RTSTM Rec. 110' mud + cond.

Production Tests (logger)

4.	8070'-8090 perforated		NGTS Rec. 160' Brine
5.	8223'-8239, 8242'-8260'		GTS @ RTSTM OTS @ 96 BOPD Rec 10 BBL Oil 60 BBL W
6.	8392'-8398', 8413-8425		NFTS @ RTSTM Rec 3.65 BBLS Oil, 4.25 BBLs water
7.	8452'-8466		NFTS Rec. 33.6 BBLs Brine
8.	8870'-8878', 8880'-8890', 8934'-8944'		NFTS Rec 200' salt water

INTERPRETATION: Porosity throughout the Jurassic section ranges from 14-18% within the Algebuckina Sandstone to 10-14% within the Poolowanna Formation and basal Algebuckina Sandstone. Permeability in this lower section is poor due to a higher degree of carbonate cementation. The Triassic section has fair porosity (12%) and permeability in the interval 8770'-8945' but elsewhere, both are very low. Rich cream-white fluorescence with good cut was noted in the mid-portion of the Poolowanna Formation. Sands below this showed scattered traces of fluorescence but when tested by DST 5, flowed oil at 96 BPD. All shows recorded within the Triassic and Jurassic section were accompanied by very low gas readings.

The occurence of oil sands of highest porosity suggest some dgree of migration. Pay is interpreted in the following intervals 7946-66, 8053-98, 8223-95, 8303-29 and 8340-400.

TABLE A1.20 POOLOWANNA 2 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	88								
Cadna-owie Fm	5130	157			5258				
Algebuckina Sst	5287	2571			6258 6818 7089 7350 7606	16+ 2 top 11+ 2 mid. 9+ 2 base			
Poolowanna Fm log equiv. = facies equiv.	7858	629			7860 7895 7916 7923 8004 8012 8018 8098 8110 8135 8152 8202 8344 8385	6+ 2 top 8+ 2 base			
Peera Peera Fm	8487	571			8516 8558 8754 8978	7+ 2 bad hole			
Walkandi Fm log equiv.	9058	412			9066	7+ 2 bad hole			
facies equiv.	9183				9384 9490				
Pre-Permian	9470	104+							
T.D. (logger) (driller)	9574 9568								

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	7924'-8009'	Poolowanna Fm	NFTS, NGTS, Rec. 350' SGCWC
2.	8154'-8187'	"	NFTS, NGTS, Rec. 1800' SGCMW, 2870' GCW
3.	8160'-8277'	"	NFTS, NGTS, Rec. 1026' VSGCMW, 306' SGCM
4.	8776'-8421'	"	Misrun
5.	8220'-8421'	"	Misrun
6.	8620'-8754'	Peera Peera Fm	NFTS, NGTS, Rec. 240' VSGCMW

INTERPRETATION: Log interpretation indicates all potential reservoir sands are water saturated. No pay is mapped. All tops are low to prognosis.

TABLE A1.21 POONARUNNA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	18								
Cadna-owie Fm	3823	152							
Algebuckina Sst	3975	385							
? Westbourne Fm	4360	405					1	4603-4629	
Adori Sst	4765	226							
Birkhead Fm	4991	155	PJ5	0.50-0.70	4992		2	4985-5021	98
log equiv.			PJ5	0.50-0.70	5020				
			N.O.T. PJ4		5119		3	5096-5126	100
facies equiv.	5146	203	PJ5	0.50-0.70	5195		4	5185-5223	82
			PJ5	0.50-0.70	5209				
			PJ5	0.50-0.70	5223				
				0.50-0.70	5242				
				0.55-0.75	5275				
			PJ5	0.60-0.80	5328		5	5223-5283	100
			PJ5		5338		6	5317-5377	66
Pre-Jurassic	5349	226	?Ordovician*				7	5546-5567 dips at 80°	100
T.D. (logger)	5575								
(driller)	5566								

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	4573'-4629'		WTS @ 64.8 MBWPD, Rec. 450' WC
2.	4976'-5021'		NFTS, Rec 800' W, 300' WC
3.	5344'-5382'		NFTS, Rec. 40' mud above tool

INTERPRETATION: The Jurassic section shows good porosity (27-29% within the Mooga Sandstone) but is water saturated. Minor gas shows were recorded in the Algebuckina Sandstone, but no recovery of hydrocarbons occurred when tested. A Permian section is absent and no pay is interpreted.

* Ar^{40}/K^{40} age on core 7 (556') is 435 ($\pm$25) Ma, but may be Proterozoic.

TABLE A1.22 PURNI 1 - DATA SUMMARY.

FORMATION**	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	300								
Cadna-owie Fm	3218	144							
Algebuckina Sst	3362	1172				22± 2 top 22± 2 mid. 18± 2 base			
Poolowanna Fm	4534	114				20	1	4584-4613	100
Purni Fm "upper" and "middle"	4648	575	PP2		4658	17± 2 "upper"			
			PP2		4659	21± 2 "middle"			
			PP2		4759		2	4749-4796	100
			PP2		5109		3	5084-5114	90
"lower"	5223	346	?PP2		5274	20± 2 "lower"	4	5273-5303	100
Crown Point Fm	5569	291	PP1		5684	18± 2	5	5651-5679	64
			PP1		5853				
			Permian		5856		6	5691-5693	100
			PP1		5810		7	5828-5846	89
			PP1		5857		8	6118-6187, 55°	100
Pre-Permian	5860	308							
T.D. (logger)	6168								
(driller)	6150								

* revised 04/85 ** gamma log low

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	5673'-5743'	Crown Point Fm	Misrun - Sand Invasion

INTERPRETATION: Good poorosity exists throughout the Jurassic sequence which is interpreted to be water saturated. Trace fluorescence was noted within porous sands in the Purni Formation with minor gas kicks. The Crown Point basal conglomerates contain very good matrix porosity and were unsuccessfully tested in DST 1 due to sand invasion. No pay is interpreted. The basement core shows dips of 55°.

TABLE A1.23 PUTAMURDIE 1 - DATA SUMMARY

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	136								
Cadna-owie Fm	3927	176							
Murta Mbr	4103	101							
Namur Sst	4204	159							
Westbourne Fm	4363	151	Mid-Jurassic		4472 -4482				
Adoria Sst	4514	211					1	4472-4782	15
Birkhead Fm	4725	155	PJ6	0.50-0.70	4780		2	4777-4787	90
			Mid-Jurassic		4787				
					4797				
			Mid-Jurassic		4833				
			Mid-Jurassic		4879				
Hutton Sst	4880	726	Mid Jurassic		5058		3	5243-5253	90
			N.O.T. PJ3		5476		4	5575-5576	50
			N.O.T. PJ2		5579		5	5576-5585	44
Poolowanna Fm	5606	397	N.O.T. PJ3		5726				
			PJ1-PJ2		5765		6	5799-5809	100
			Jurassic	0.60-0.80	5809				
			Jurassic		5881				
			Jurassic		5975				
			Jurassic		5996				
			Jurassic		6000				
Peera Peera Fm	6003	127	Jurassic?		6071		7	6070-6080	40
Pre-Triassic	6130	276					8	6154-6163	100
							9	6257-6267	90
							10	6402-6406	100
T.D. (logger)	6406								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: No hydrocarbon shows were recorded while drilling. The section is interpreted to be water wet. No pay is interpreted.

TABLE A1.24 THE BROTHERS 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	307								
Cadna-owie Fm	882	298	E. Cretaceous						
Algebuckina Sst	904	172	E. Cretaceous /Jurassic			very high			
Birkhead Fm	1076	77	Jurassic			very high			
Pre-Jurassic									
Unit 5 (lst.)	1153	139	L. Ord. or U. Camb.				1 2	1212-1222 1222-1247	71 89
Unit 4 (lst. + shale)	1292	860	?L. Camb.				3 4 5	1406-1426 1588-1603 1950-1956	88 97 97
Unit 3 (gy. shale)	2152	338					6	2400-1415	87
Unit 2 (lst. + shale)	2490						7 8 9	2889-2904 3437-3452 3911-3926	97 100 97
Unit 1 (massive lst.)	3980	1490	M. Camb. fauna				10	4153-4173	87
T.D. (logger) (driller)	4173 4173		Similar to Jay Ck and Wirrealpa Lst.						

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No tests		

INTERPRETATION: The Brothers 1 well was drilled primarily to identify seismic reflectors in the area. No oil shows were recorded while drilling. The Upper Cambrian Limestones have good fracture porosity, and erupted water at approximately 250,000 gal/day during drilling. No pay is interpreted. Dips recorded form basement cores range from flat lying to 60°.

TABLE A1.25 THOMAS 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY* (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	123								
Cadna-owie Fm	4583	135				14± 2			
Algebuckina Sst	4718	2091	(old terminology)			18± 3 top 14± 1 middle 12± base			
Poolowanna Fm	6809	622	J2-3 J2-3 J1-2 J1		6817 7101 7154 7252	11± 2	1	7242-7269	98
Peera Peera Fm	7431	326	Tr3c-d Tr3c-d ?Tr		7475 7581 7721	11± 2 tight			
Walkandi Fm	7757	185							
Unnamed Fm	7942	127							
Pre-Triassic	8069	516					2	8575-8585, dips at 70°	77
T.D. (logger) (driller)	8585 8570								

* WCR

TEST RESULTS

INTERVAL	FORMATION	REMARKS
7144'-7254'	Poolowanna Fm	NFTS Rec. 420',. 4531'W
7169'-7231'	Poolowanna Fm	NFTS Misrun, Rec. 1000'M, 848'MW, 580'SGCW

INTERPRETATION: Excellent porosity exists within the Cadna-owie Formation and Algebuckina Sandstone. This section is interpreted to be saturated with fresh water and no pay is interpreted. The Poolowanna Formation has porosity in the range 7-15% with fair permeability. Residual oil shows were encountered within this unit (over the interval 7162'-7474') in the form of spotty brown stain and dull orange fluorescence with slow crush cut with no associated gas show. Tests over this interval failed to recover significant amounts of hydrocarbon. The Peera Peera and Walkandi Formations have poor permeability. The lack of productible hydrocarbons may be due to only partial sealing by a crestal fault which bisects the structure. Core #2 from basement rocks shows dips of up to 70°.

TABLE A1.26 WALKANDI 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL** STAGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.*	103			0.30-0.50	1303				
				0.50-0.70	5299				
				0.60-0.80	5405				
Cadna-owie Fm	5541	157							
Algebuckina Sst	5698	2631				16+ 2 top			
						13∓ 2 mid.			
						11∓ 2 base			
Poolowanna Fm	8329	643	N.O.T. PJ3		8295	8+ 1 top			
			N.O.T. PJ3		8383	8∓ 2 av.			
			N.O.T. PJ3		8418	7∓ 1 base			
			N.O.T. PJ2		8427				
			N.O.T. PJ2		8563				
			PJ2.2.-PJ3.1		8614				
			PJ2.2.2?		8670				
			PJ2?		8719		1	8711-8758	88
			PJ2.2	0.80-1.00	8779				
Peera Peera Fm	8972	624	PT5		8978	6+ 2			
			PT5		9006	tight			
			PT5		9056				
			N.O.T. PT4		9130				
			PT5		9187				
			N.O.T. PT4		9230				
			Triassic		9345		2	9340-9367	72
			PT5		9404				
Walkandi Fm log equiv.	9596	404	PT3		9654	caved, tight			
			Triassic		9933	si/cb cement			
Pre-Triassic	10000	274					3	10262 -10274 dips at 75-80°	86
T.D. (logger)	10274		(driller)	10252					

** after Williams 1984 cross-sections, * revised 04/85.

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	8629'-8715'	1. Poolowanna Fm	NFTS Rec. 65' SGCWM
2.	8685'-8758'	1. Poolowanna Fm	NFTS Rec. 650' MW,, 1450' GCMW
3.	9139'-9212'	Peera Peera Fm	NFTS Rec. 46' M, 31' GCM
4.	9607'-9648'	Walkandi Fm	NFTS Rec. 4900' GCM, 480' Water Cushion
5.	9564'-9648	Peera Peera/Walkandi Fms	Misrun

INTERPRETATION: High water saturations are evident throughout the section to the base of the upper Poolowanna Formation. Thin sands in the lower Poolowanna Formation show SW's considerably less than 100%, but poor porosity prevents them from being potential reservoirs. No pay is interpreted. A basement core revealed metasiltstones dipping at 75-80°.

TABLE A1.27 WEEDINA 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	329								
Algebuckina Sst	12	206	E. Cretaceous /Jurassic			good			
Mt. Toondina Fm	218	1615	Permian			11± 3			
Stuart Range Fm	1833	323	Permian						
Boorthanna Fm	2156	227	Permian			11± 3			
Pre-Permian	2383 5279		?Devonian ?Ordovician						
T.D.	5329								

TEST RESULTS

INTERVAL	FORMATION	REMARKS
No Permian tests		

TABLE A1.28 WITCHERRIE 1 - DATA SUMMARY.

FORMATION	TOP (ft)	THICKNESS (ft)	PALYNOLOGICAL STAGE/AGE	E.V.R.E. %	S.W.C. (ft)	POROSITY (Sonic, %)	NO.	CORE DEPTH (ft)	REC %
K.B.	285								
Cadna-owie Fm	920	118							
Algebuckina Sst	1038	780				good			
Poolowanna Fm	1818	10	PJ3	0.50-0.70	1820	good	1	1820-2845	66
log equiv. =			PJ3.1-3.2		1824				
facies equiv.			PJ3.1-3.2		1827				
Crown Point Fm	1828	323	PP1		1830				
					+1835				
			PP1	0.65-0.85	1843	good	2	1891-1961	14
			PP1		1891				
			PP1		1893				
Finke River	2151		Devonian				3	2335-2350	78
beds III							4	2571-2592	67
(Polly Cong.)									
Finke River	2614		Devonian				5	2988-3048	71
beds II									
(Meerenie Sst)	3259		Devonian				6	3278-3316	93
II									
							7	3558-3586	86
Witcherrie	3838		Ordovician				8	3835-3843	88
Quartzite							9	3852-3858	100
(Stairway Sst)							10	4411-4419	100
T.D. (logger)	4803						11	4489-4501	83
(driller)	4803						12	4796-4803	41

TEST RESULTS

	INTERVAL	FORMATION	REMARKS
1.	2552'-2592'	Finke River Beds III	WTS @ 906 BWPD

INTERPRETATION: No shows were encountered while drilling. Good porosity and permeability exist within the Algebuckina Sandstone, and to a lesser degree within the Devonian 'Finke River Beds'. The section is interpreted to be water saturated and no pay is interpreted.

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APPENDIX 2

VITRINITE REFLECTANCE PROFILES OF PEDIRKA SECTOR AND BIRDSVILLE TRACK RIDGE WELLS

J.W. Hunt &
D.C. Johnstone
Regional Studies Group
October 1985

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Figure A2.25 Vitrinite reflectance profile, Miandana 1.

INTRODUCTION

Vitrinite reflectance data for 19 Pedirka Sector and nearby wells on the Birdsville Track Ridge are held in the DELHI geological data base. The profiles in this appendix are based on those data and the stratigraphies in Appendix 1. Curves have been fitted to the data in Figures A1.1 to A1.19 using the following procedure:

i) the curves are biased towards measurements of coaly samples where present,

ii) data for caving samples are ignored where identifiable,

iii) the profiles are broken at any unconformities often by a small arbitrary amount in the absence of definitive data,

iv) the curves are drawn asymtotic to a value of 0.2 to 0.3% Rv at the present surface, and

v) in the case of sparse data, (eg Purni 1) trends in nearby wells and estimated vitrinite reflectance equivalent (EVRE) data (based on spore colour) may be considered to fit a profile.

Where several sources of data are available for a well these are indicated on the diagram (e.g. Poolowanna 1). In many of the older Pedirka Sector wells vitrinite reflectance measurements may not be directly comparable because of different measurement procedures or parameters. The effect would usually be to produce a lower reading than in recent practice.

This point is illustrated in Poolowanna 1, where the results (including EVRE data from palynological analysis) from 4 different laboratories and 5 analysts are compiled. In the case of Poolowanna 1 the preferred curve is fitted principally to a data set for Rv(max) estimated from Rv(av).

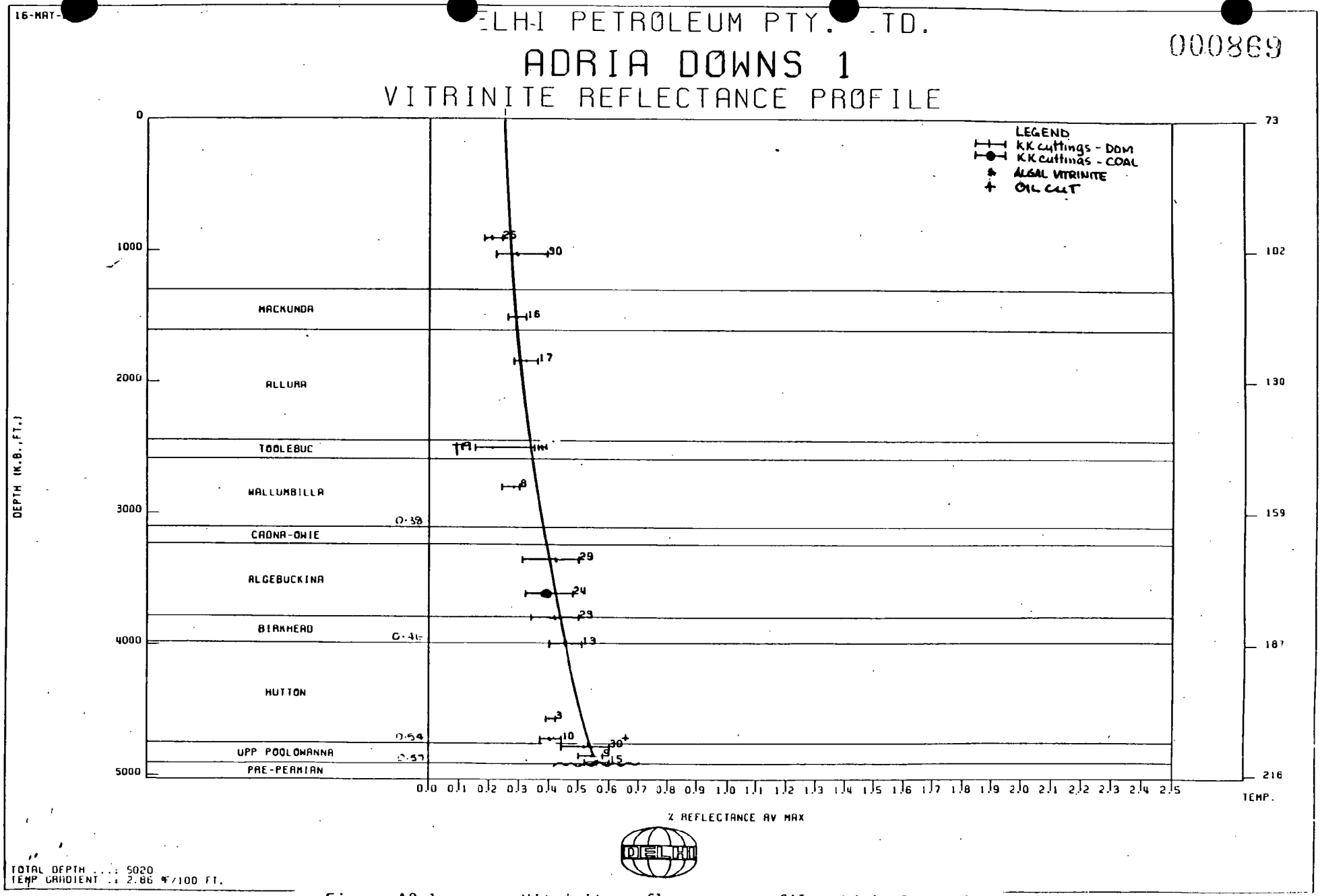

Figure A2.1 Vitrinite reflectance profile, Adria Downs 1.

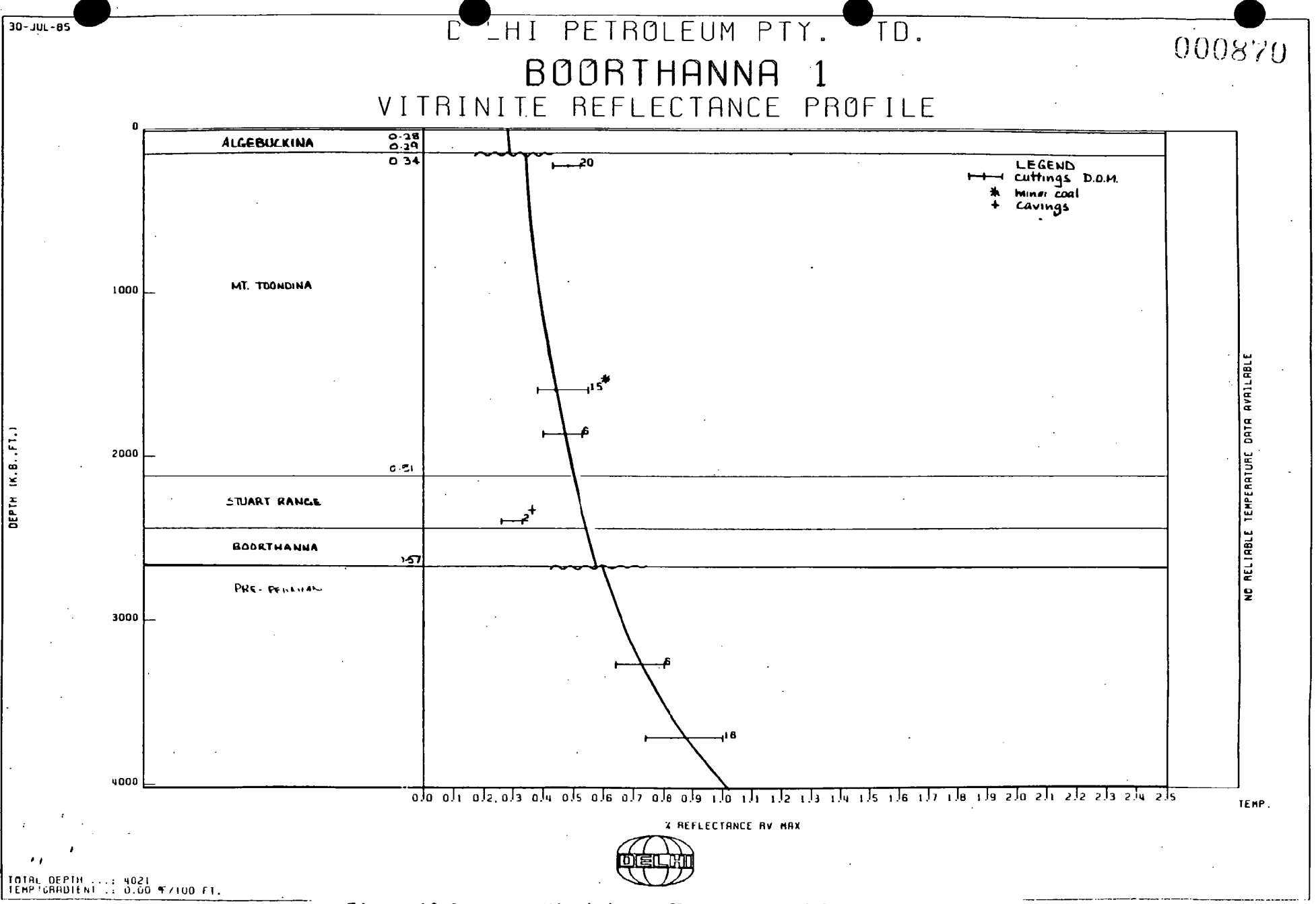

Figure A2.2 Vitrinite reflectance profile, Boorthanna 1.

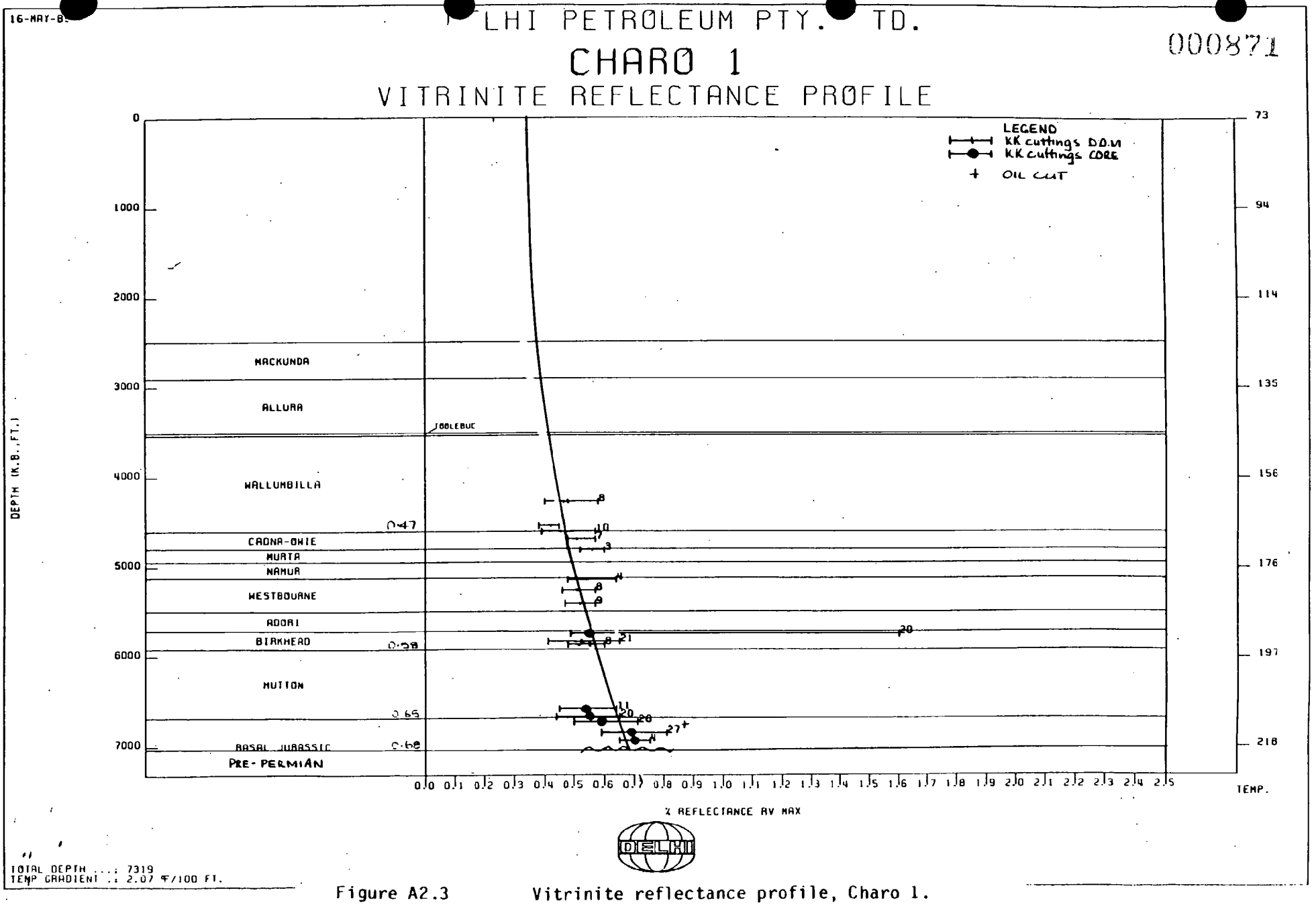

Figure A2.3 Vitrinite reflectance profile, Charo 1.

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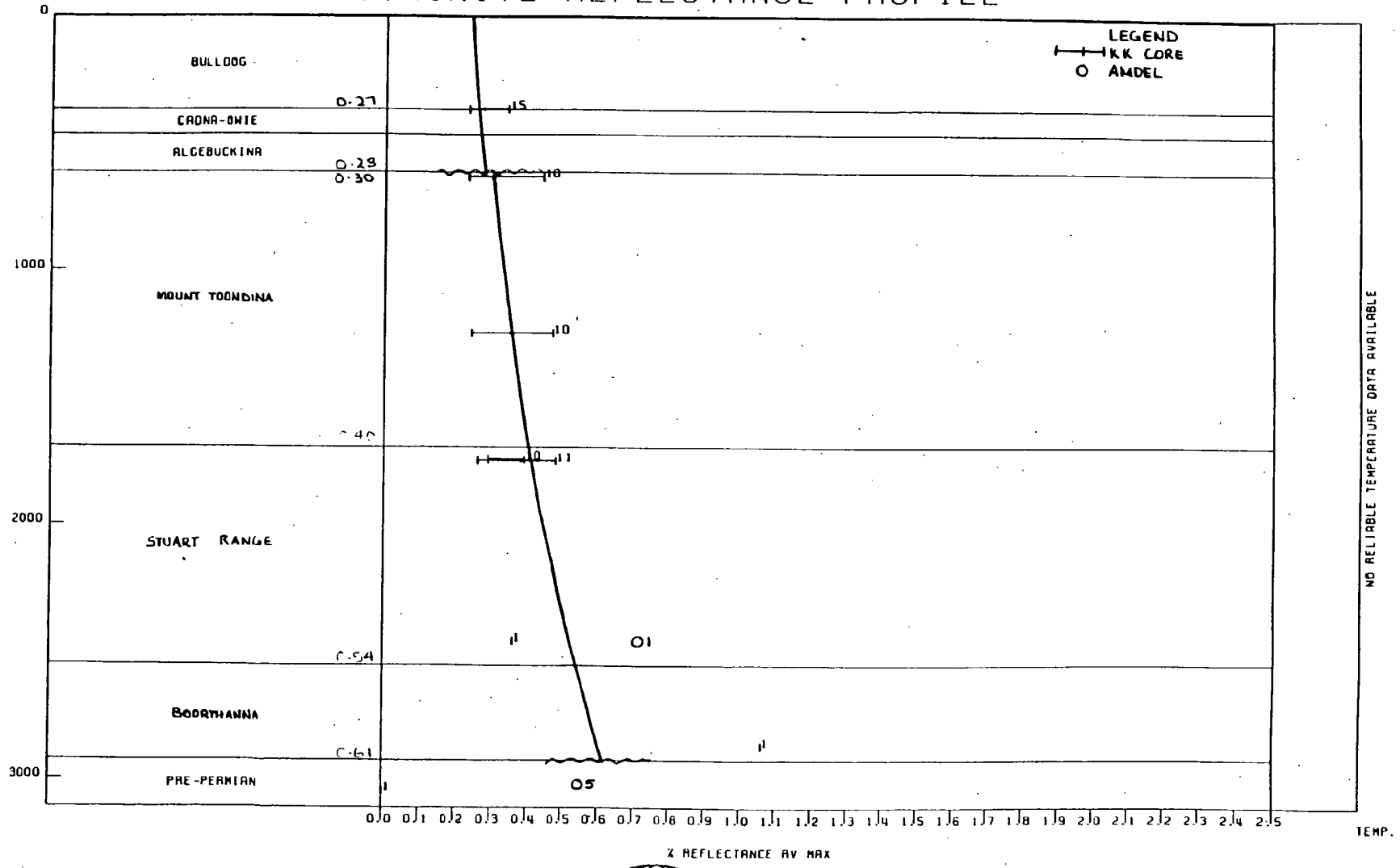
COOTANOORINA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 3111
TEMP GRADIENT ..: 0.00 °F/100 FT.

Figure A2.4 Vitrinite reflectance profile Cootanoorina 1.

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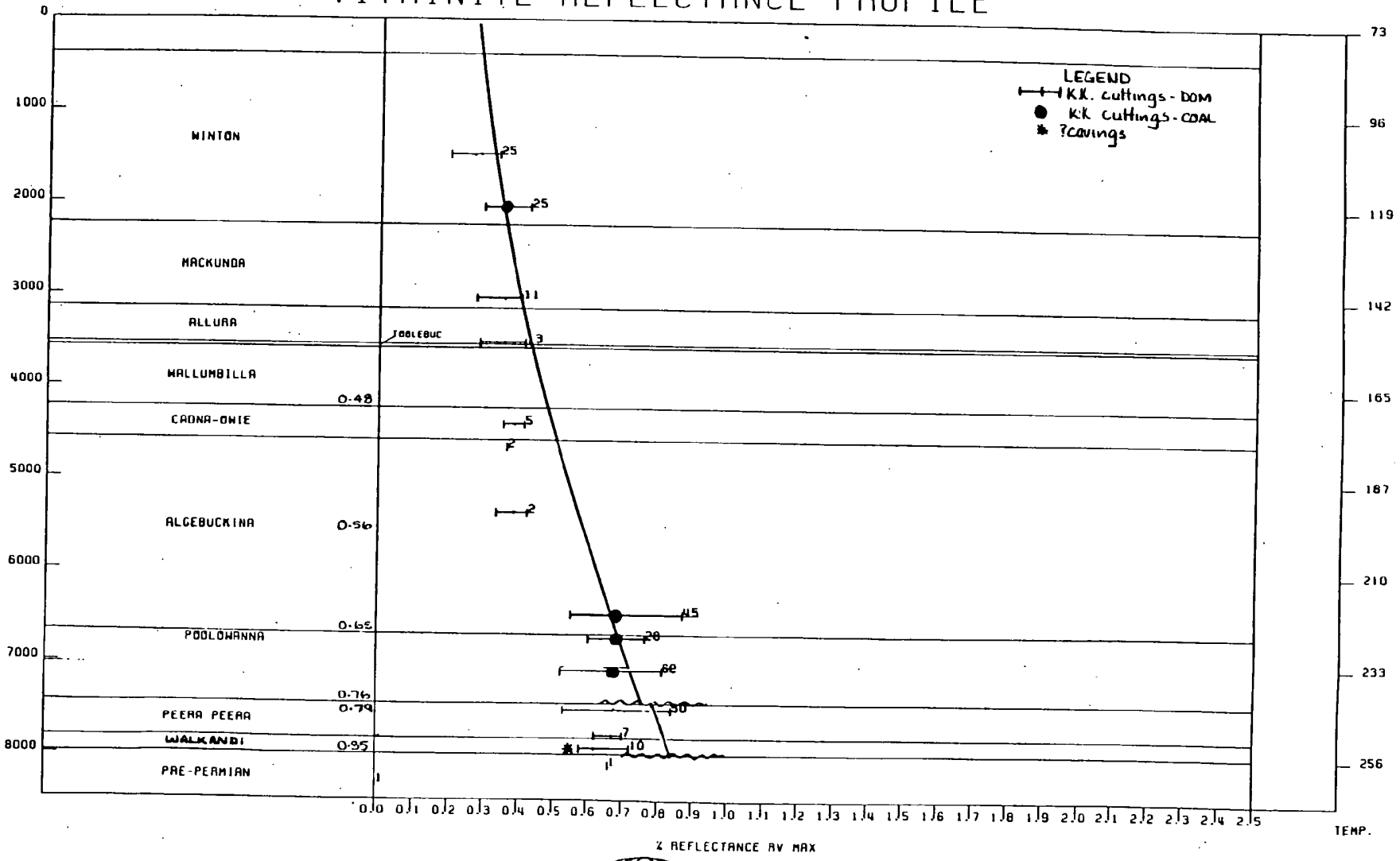
ERABENA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 8480
TEMP GRADIENT ..: 2.29 °F/100 FT.

Figure A2.5 Vitrinite reflectance profile, Koonchera 1.

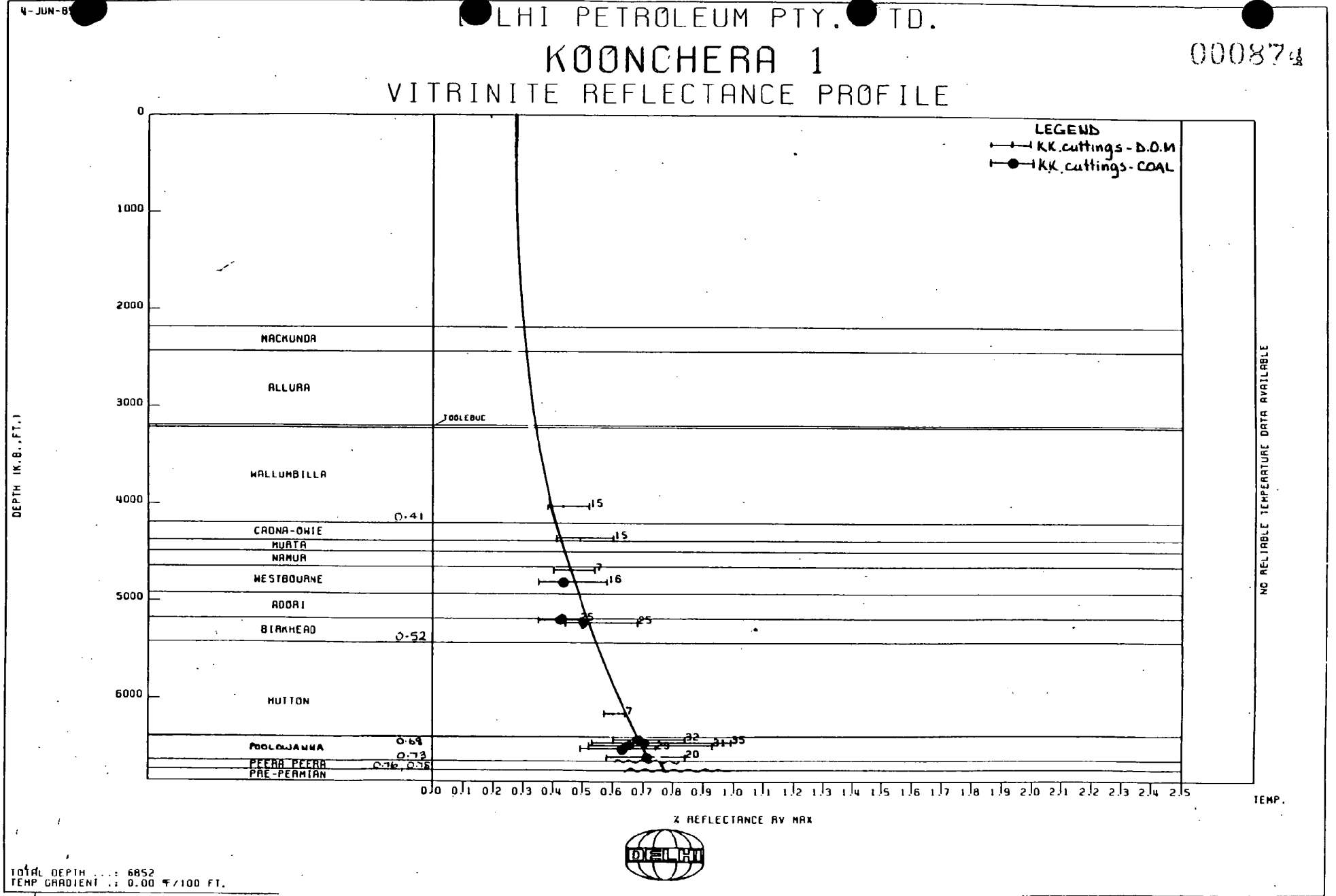


Figure A2.6 Vitrinite reflectance profile, Erabena 1.

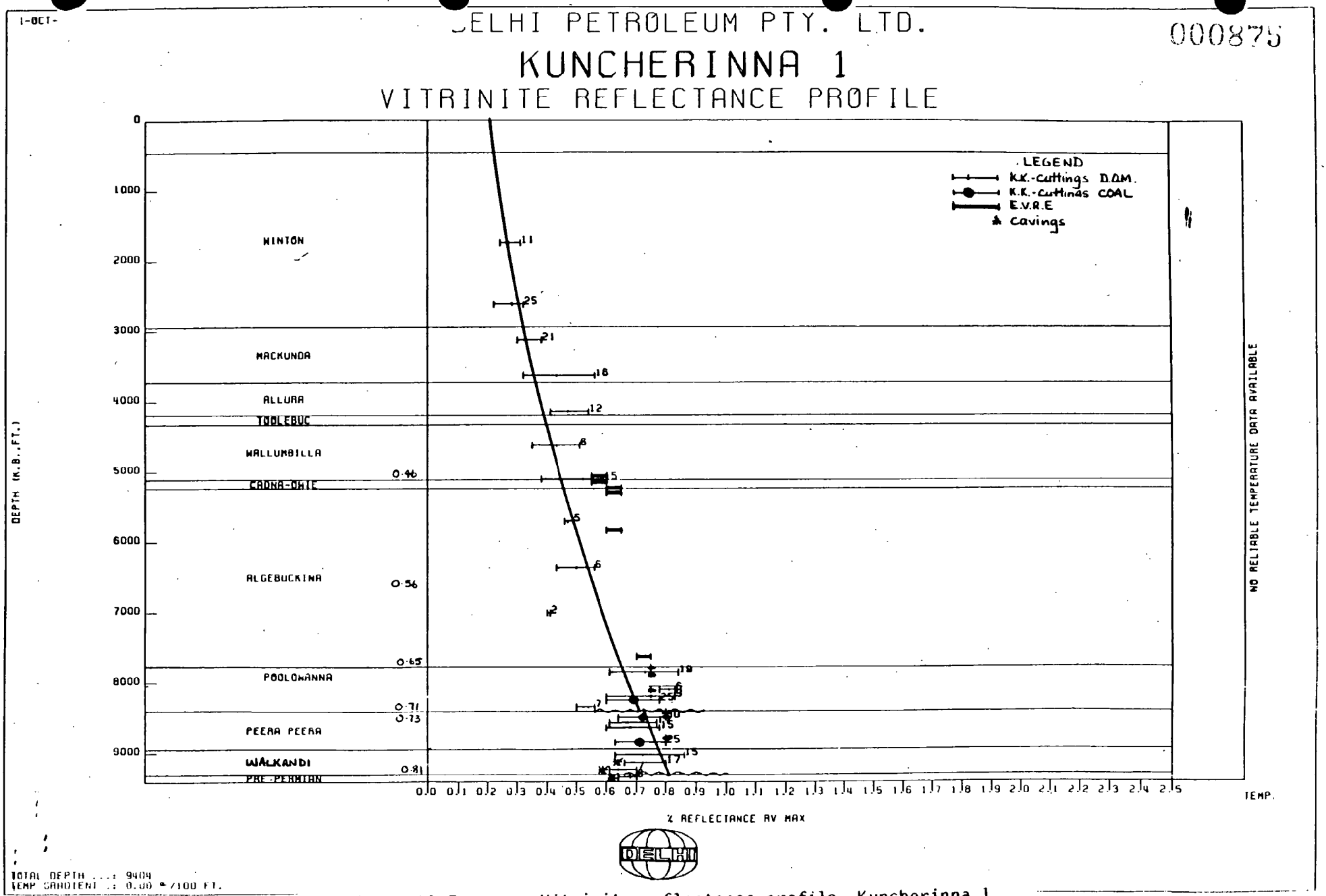


Figure A2.7 Vitrinite reflectance profile, Kuncherinna 1.

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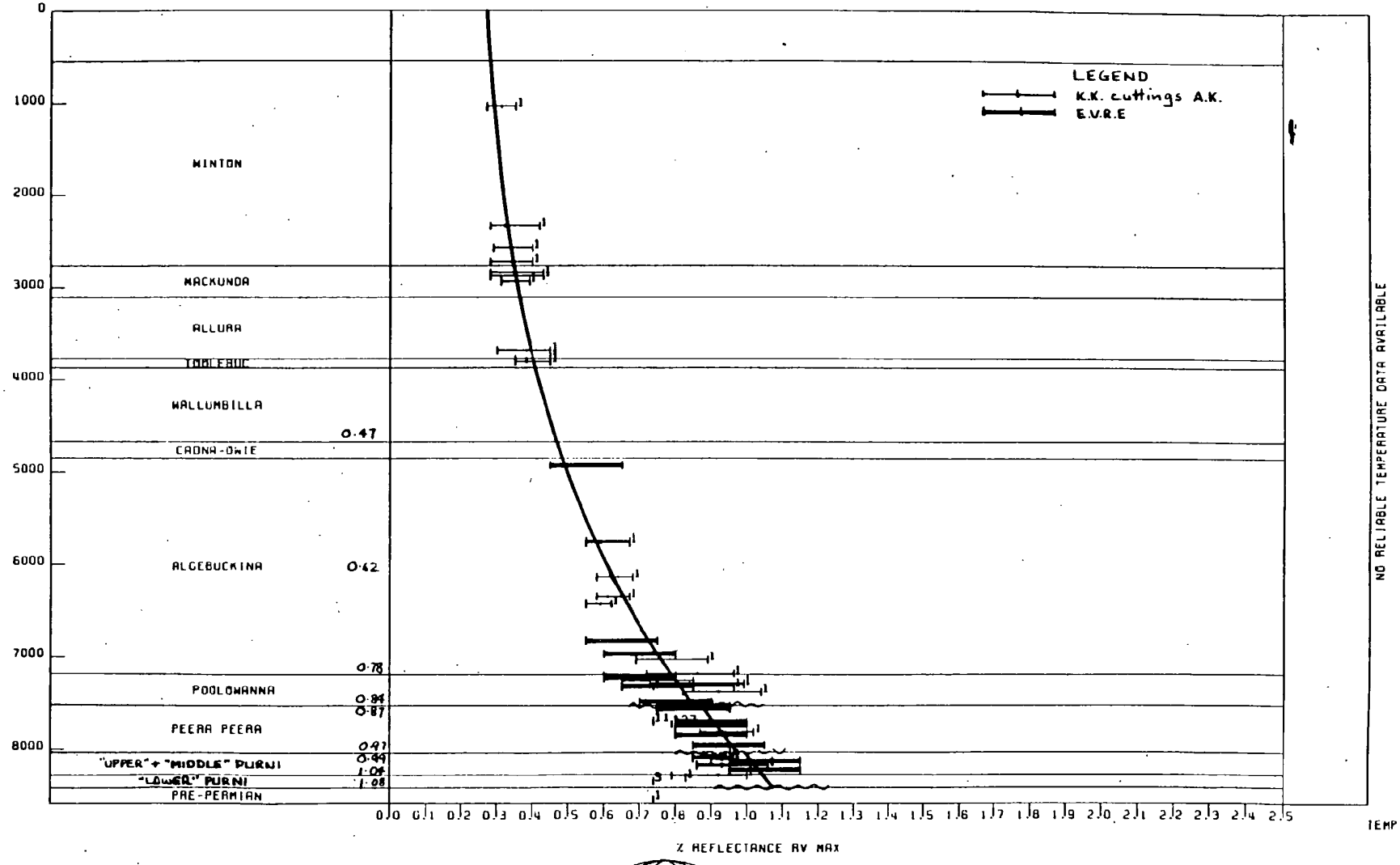
MACUMBA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 8583
TEMP GRADIENT .: 0.00 °F/100 FT.

Figure A2.8 Vitrinite reflectance profile, Macumba 1.

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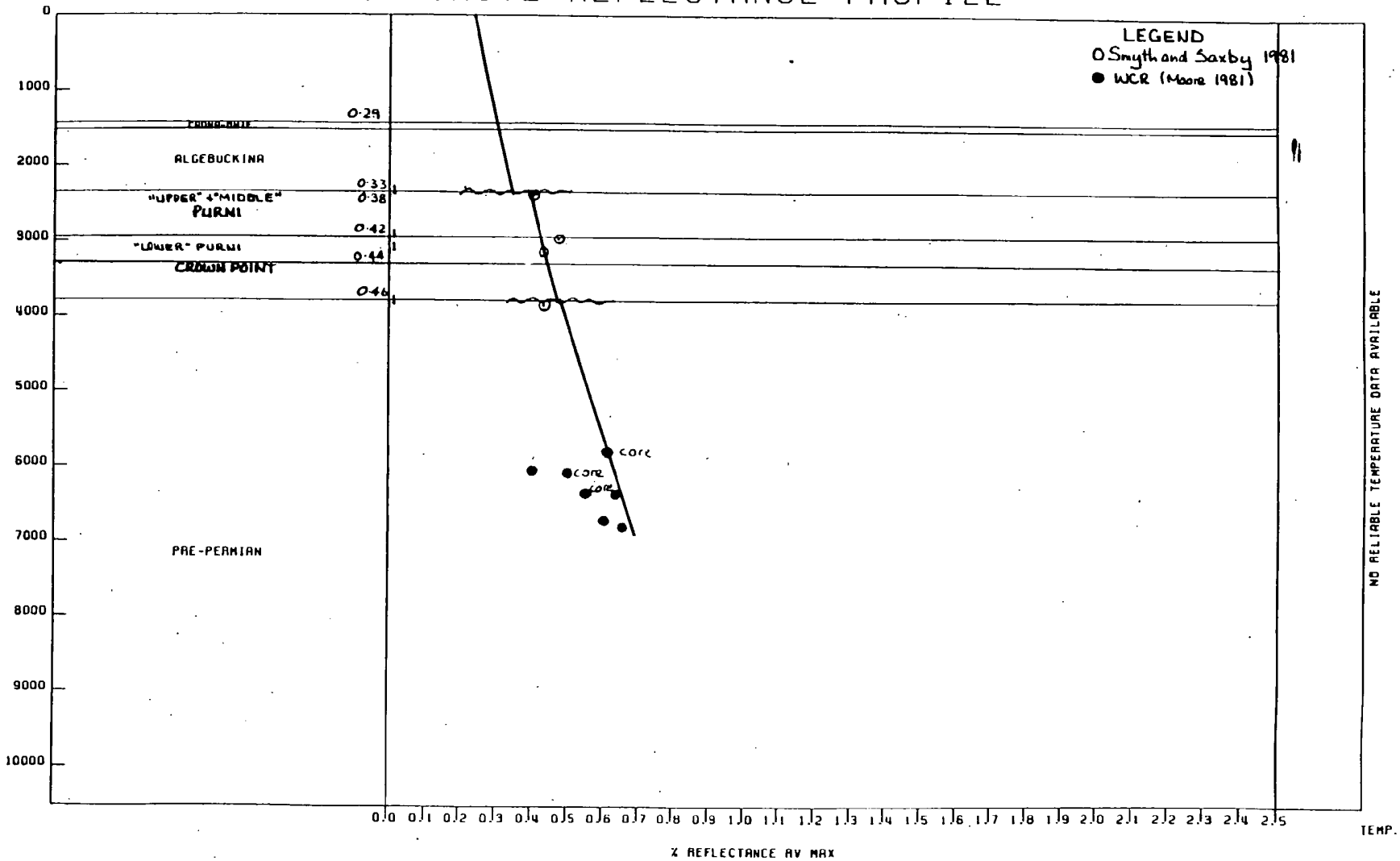
MCDILLS 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 10515
TEMP GRADIENT .: 0.00 °F/100 FT.

Figure A2.9 Vitrinite reflectance profile, McDills 1.

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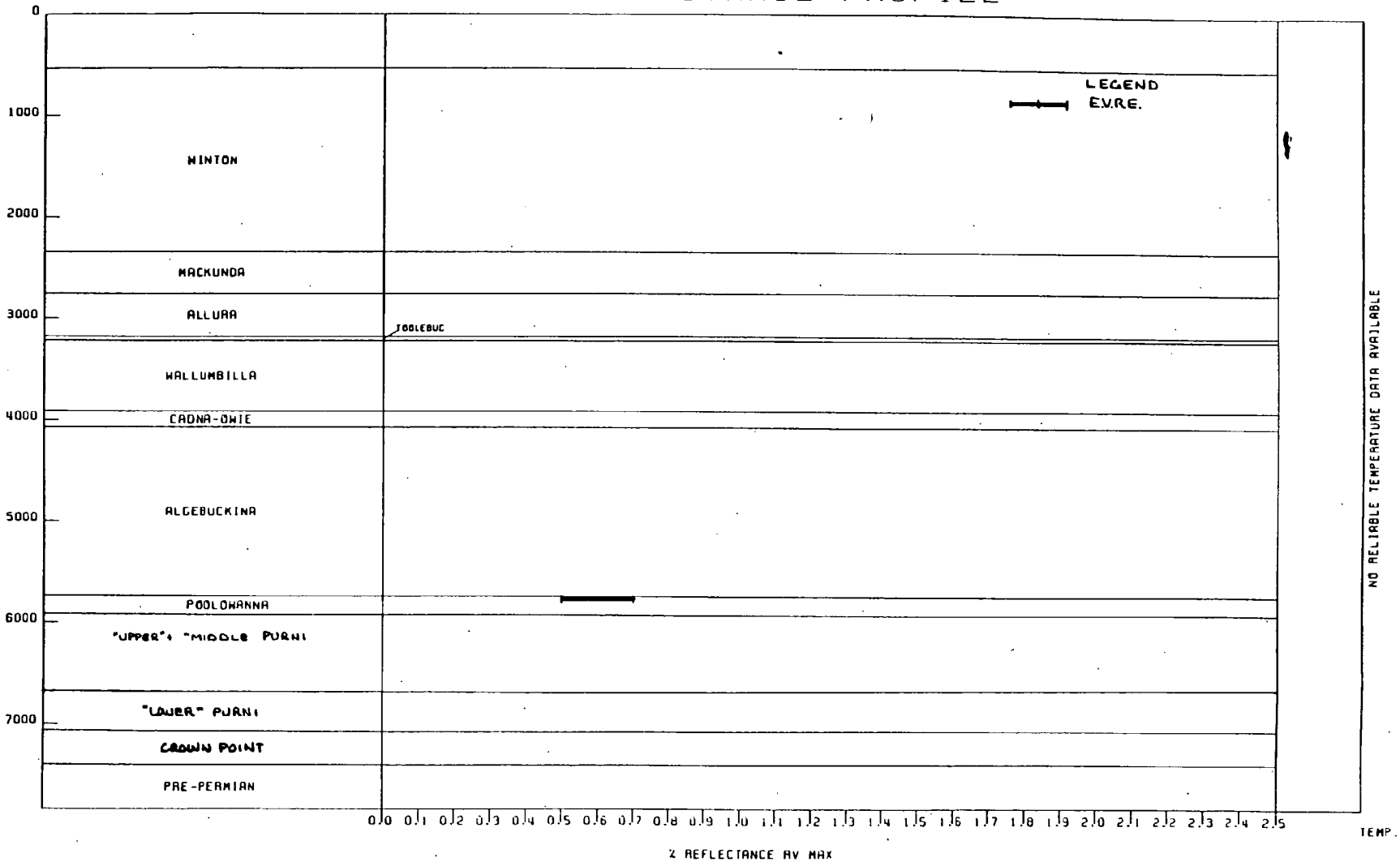
MOKARI 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 7827
TEMP GRADIENT ..: 0.00 °F/100 FT.

Figure A2.10 Vitrinite reflectance profile, Mokari 1.

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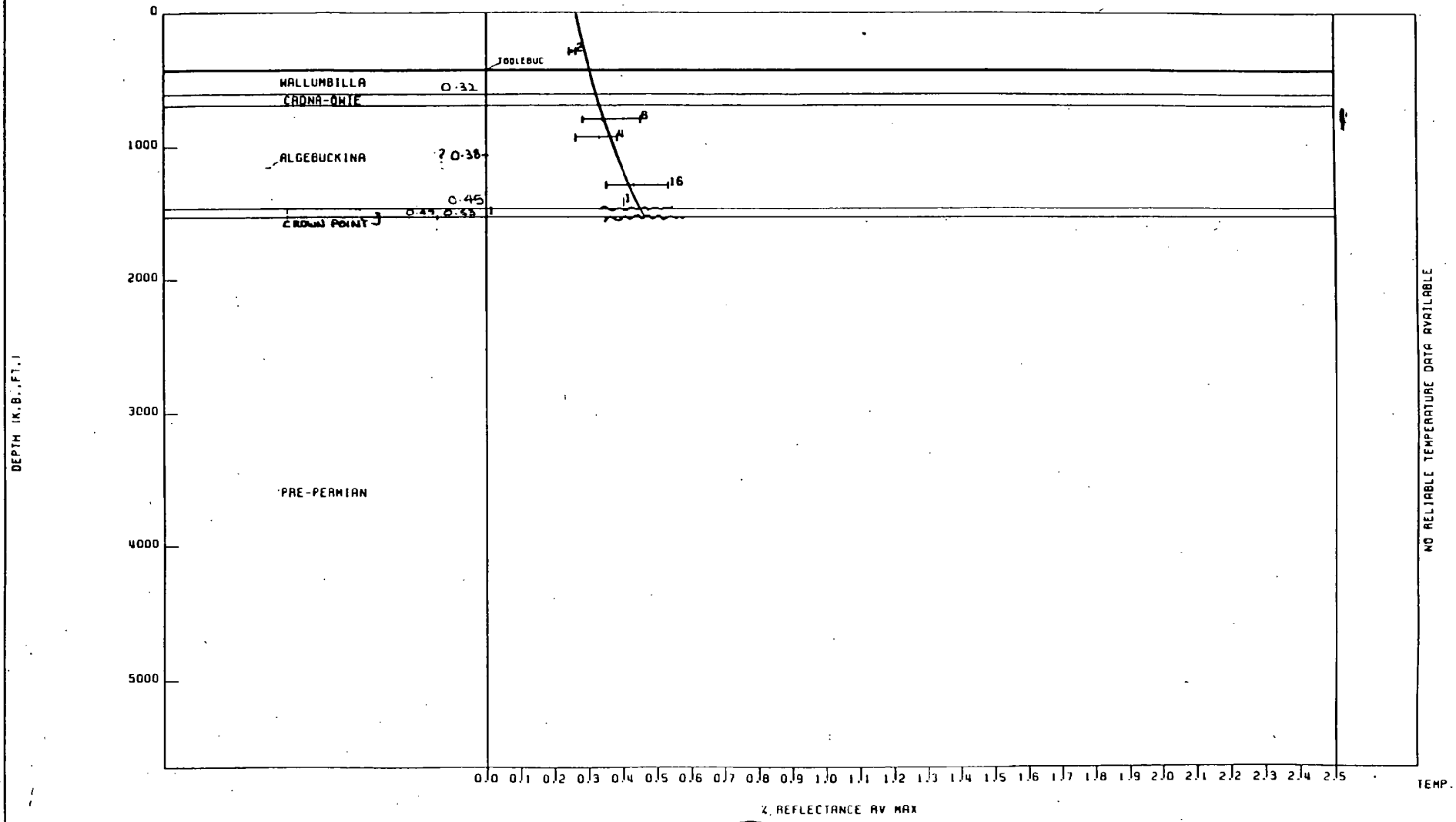
MOUNT CRISPE 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 5647
TEMP GRADIENT .: 0.00 °F/100 FT.

Figure A2.11 Vitrinite reflectance profile, Mount Crispe 1.

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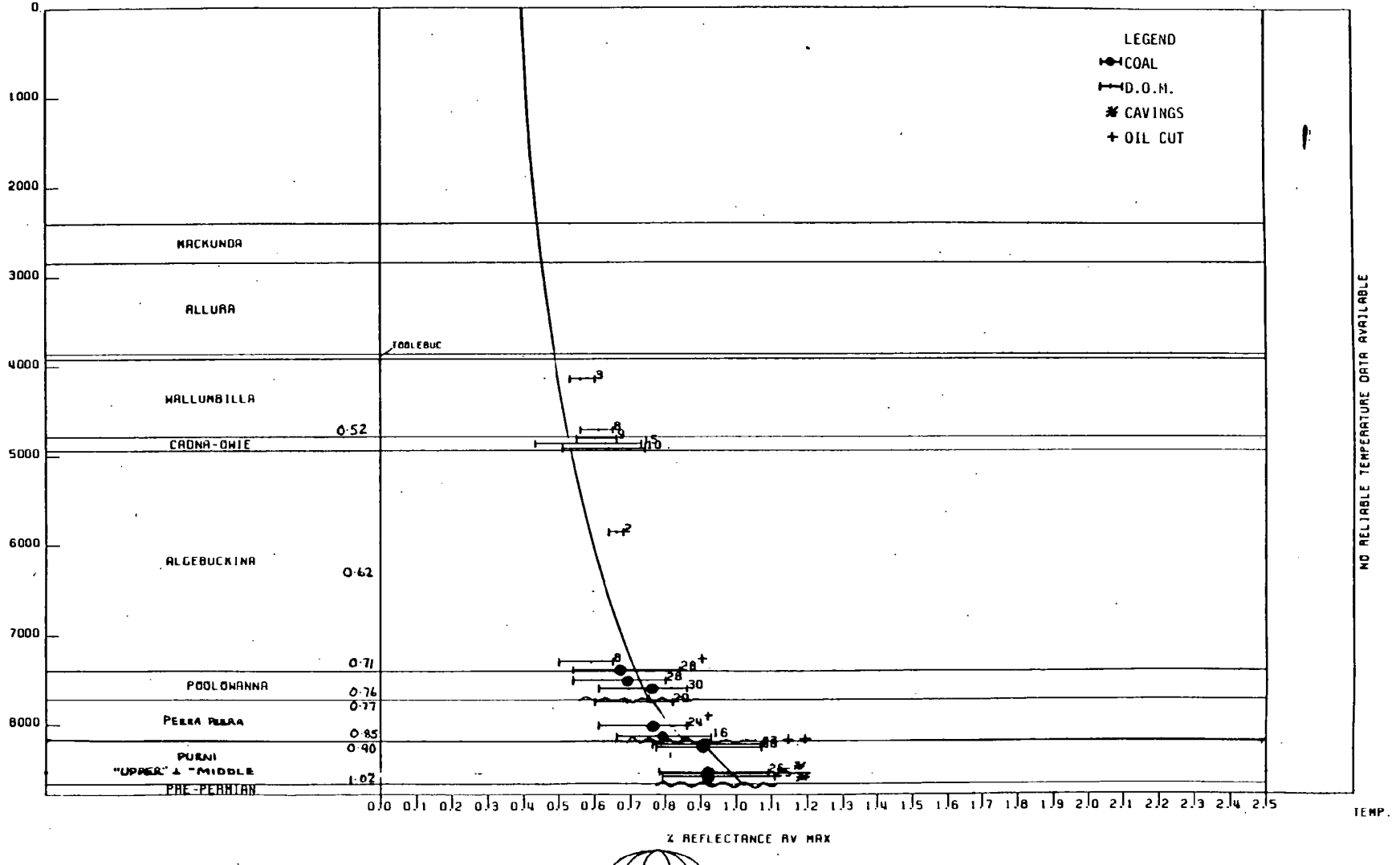
OOLARINNA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 8776
TEMP GRADIENT .: 0.00 °F/100 FT.

Figure A2.12 Vitrinite reflectance profile, Oolarinna 1.

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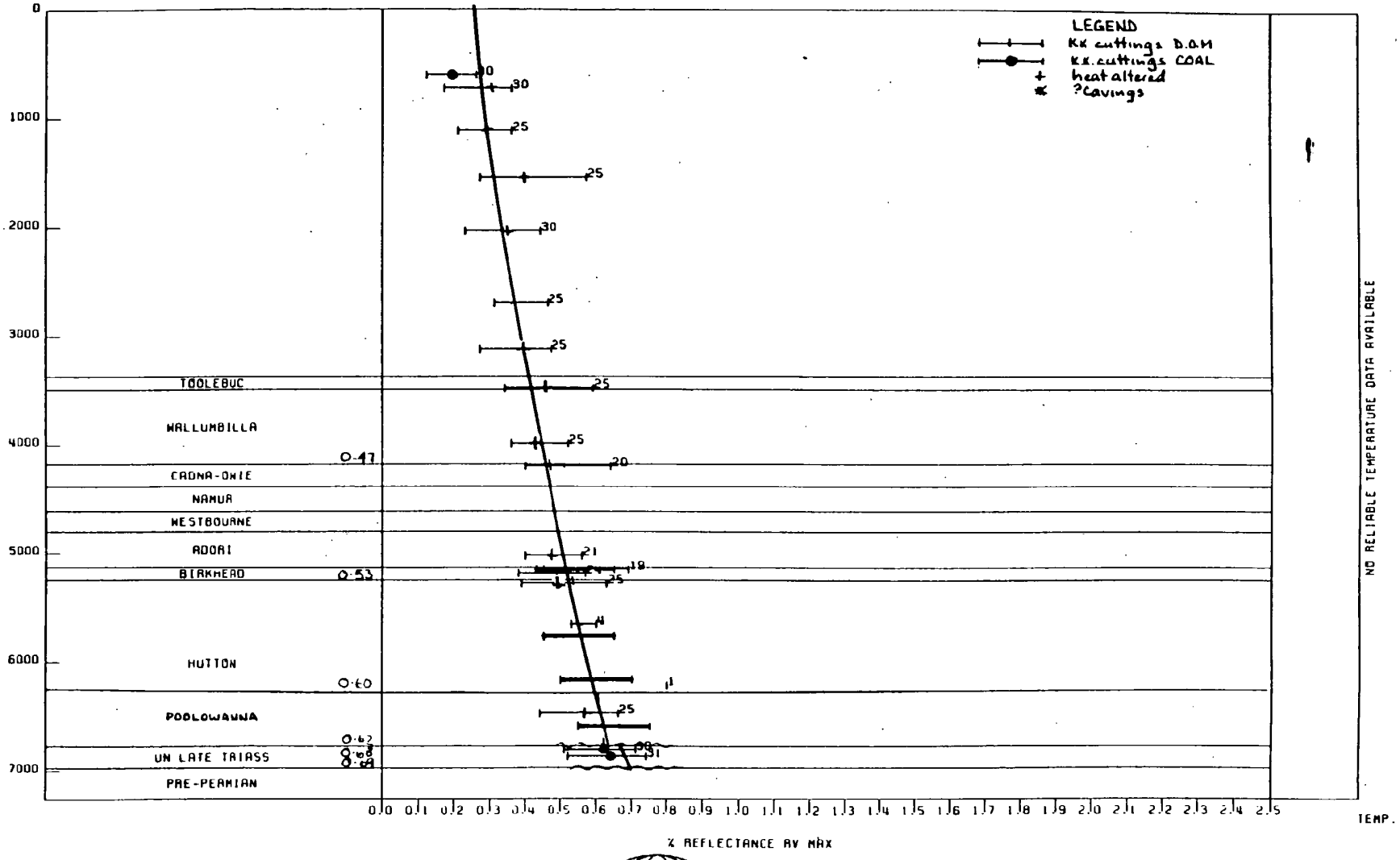
PANDIEBURRA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 7253
TEMP GRADIENT ..: 0.00 °F/100 FT.

Figure A2.13 Vitrinite reflectance profile, Pandieburra 1.

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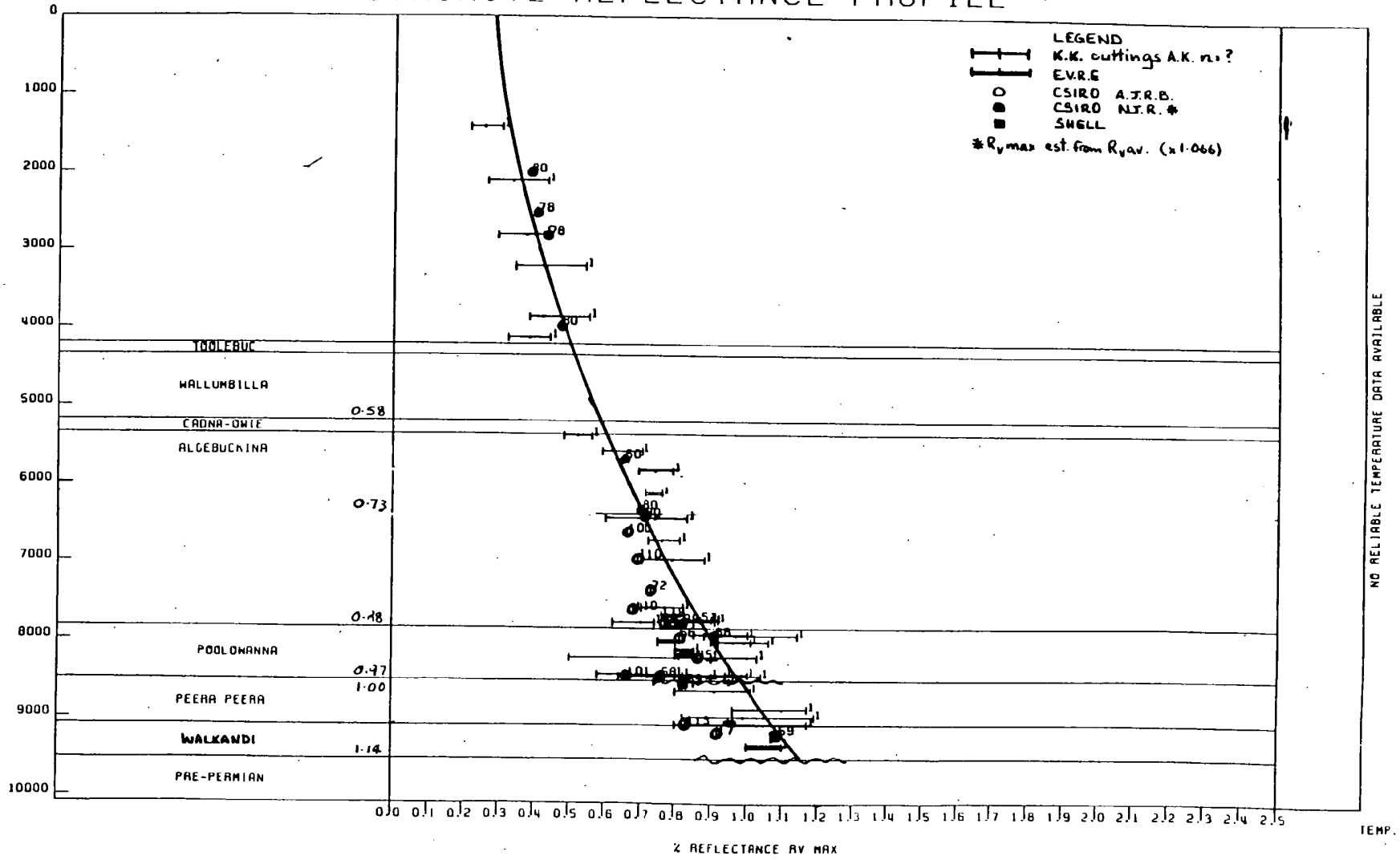
POOLOWANNA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 10086
TEMP GRADIENT ..: 0.00 °F/100 FT.

Figure A2.14 Vitrinite reflectance profile - Poolowanna 1

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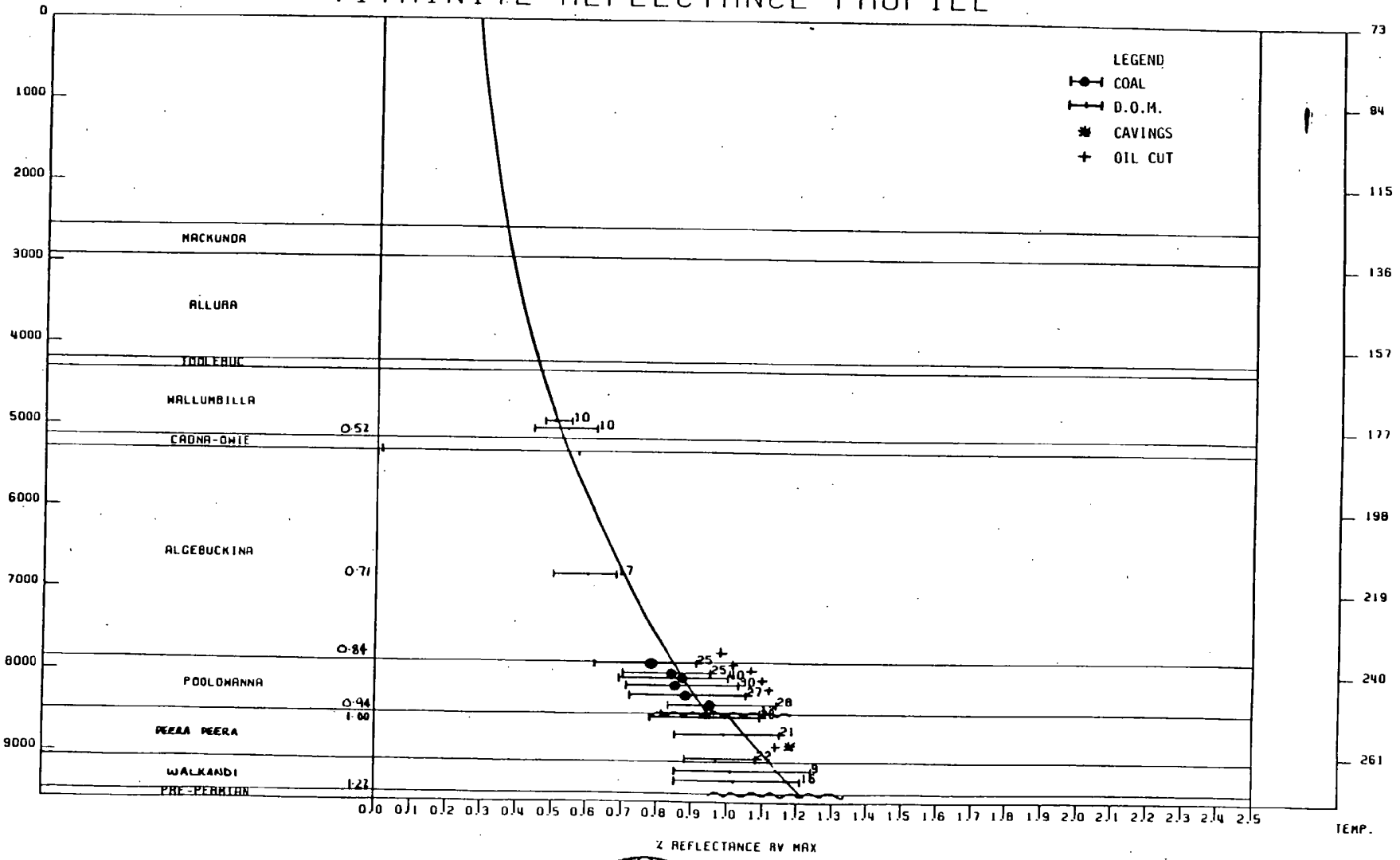
POOLOWANNA 2

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 9568
TEMP GRADIENT .: 2.09 °F/100 FT.

Figure A2.15 Vitrinite reflectance profile

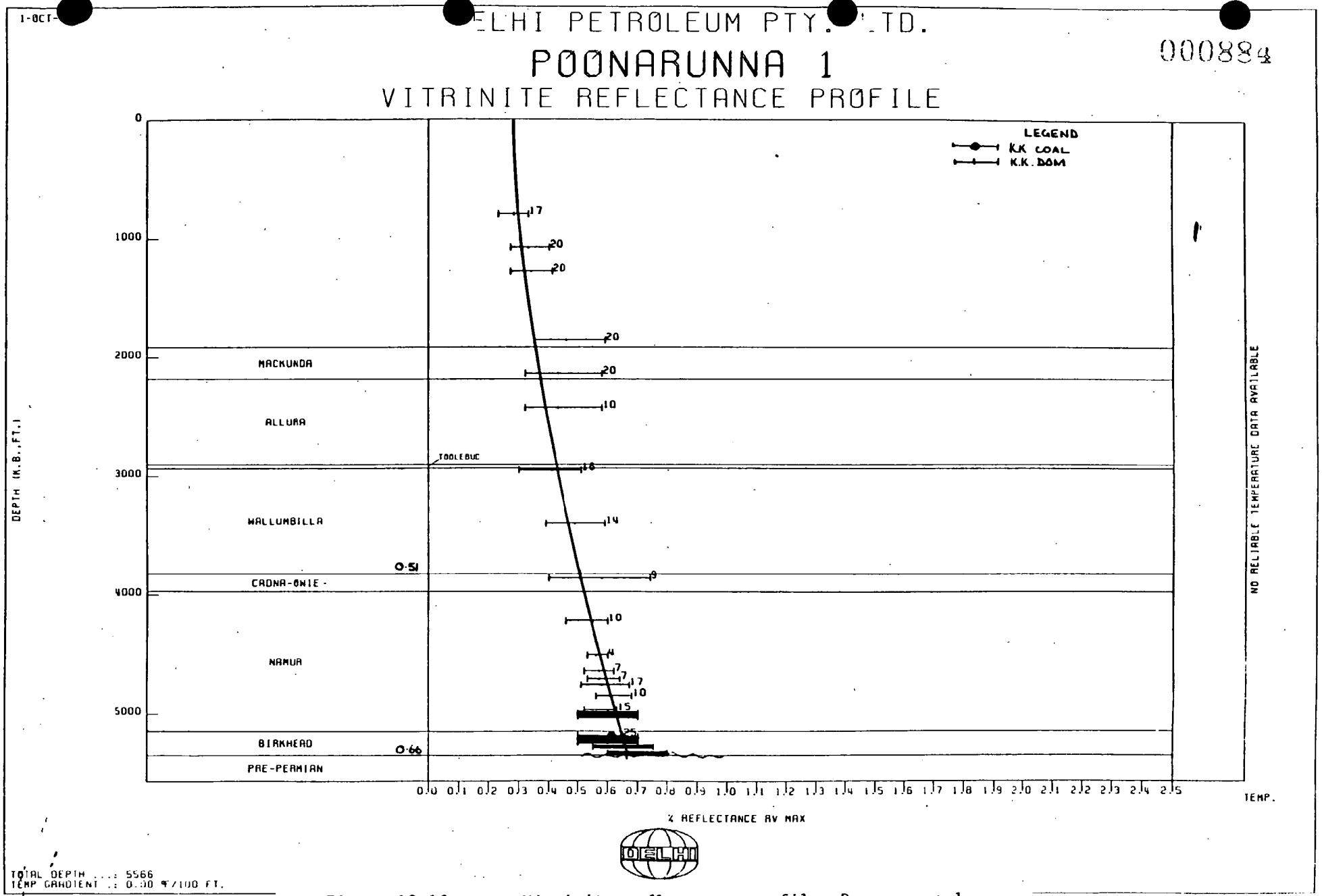


Figure A2.16 Vitrinite reflectance profile, Poonarunna 1.

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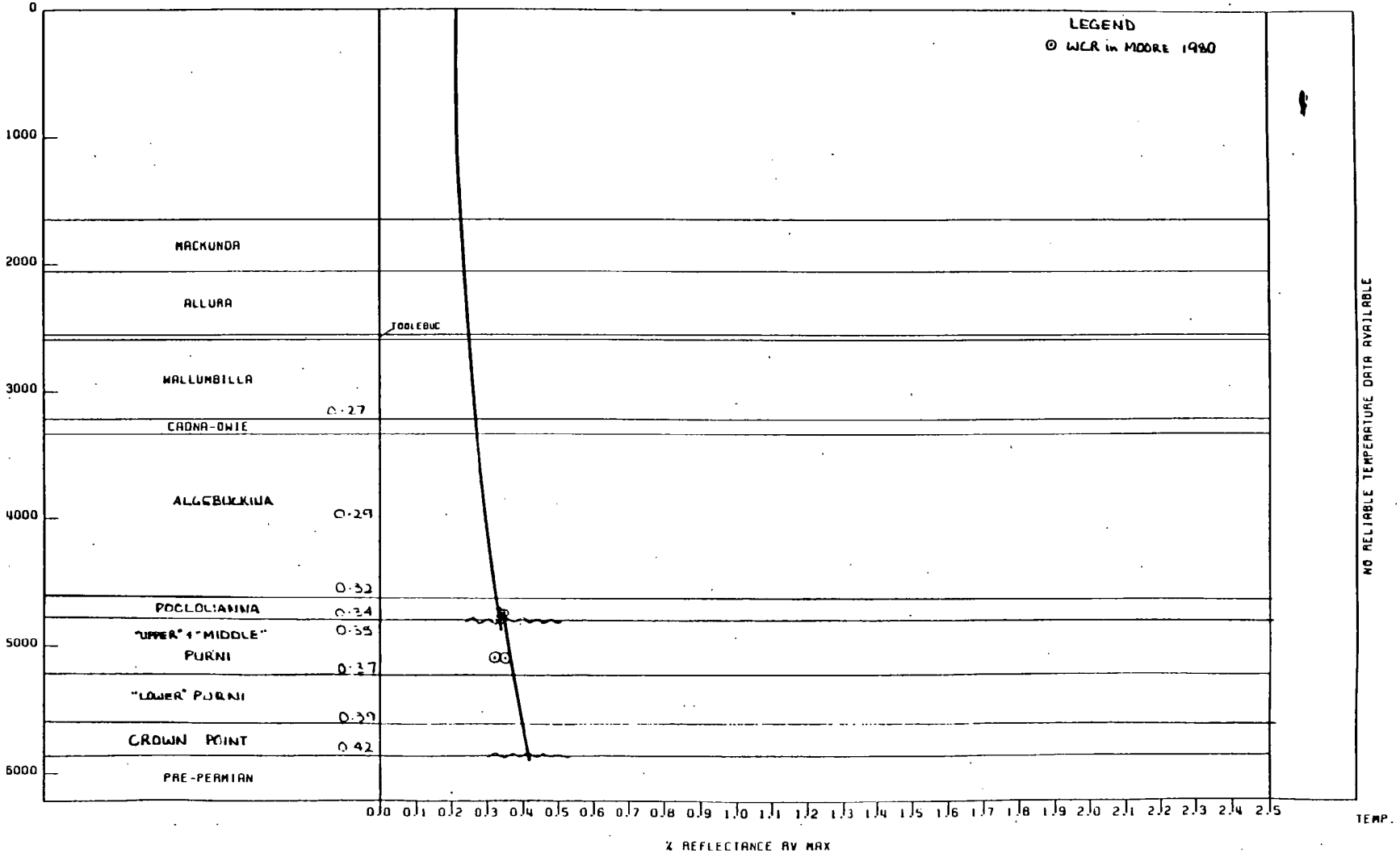
PURNI 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ....: 6213
TEMP GRADIENT ..: 0.00 °/100 FT.

Figure A2.17 Vitrinite reflectance profile Purni 1.

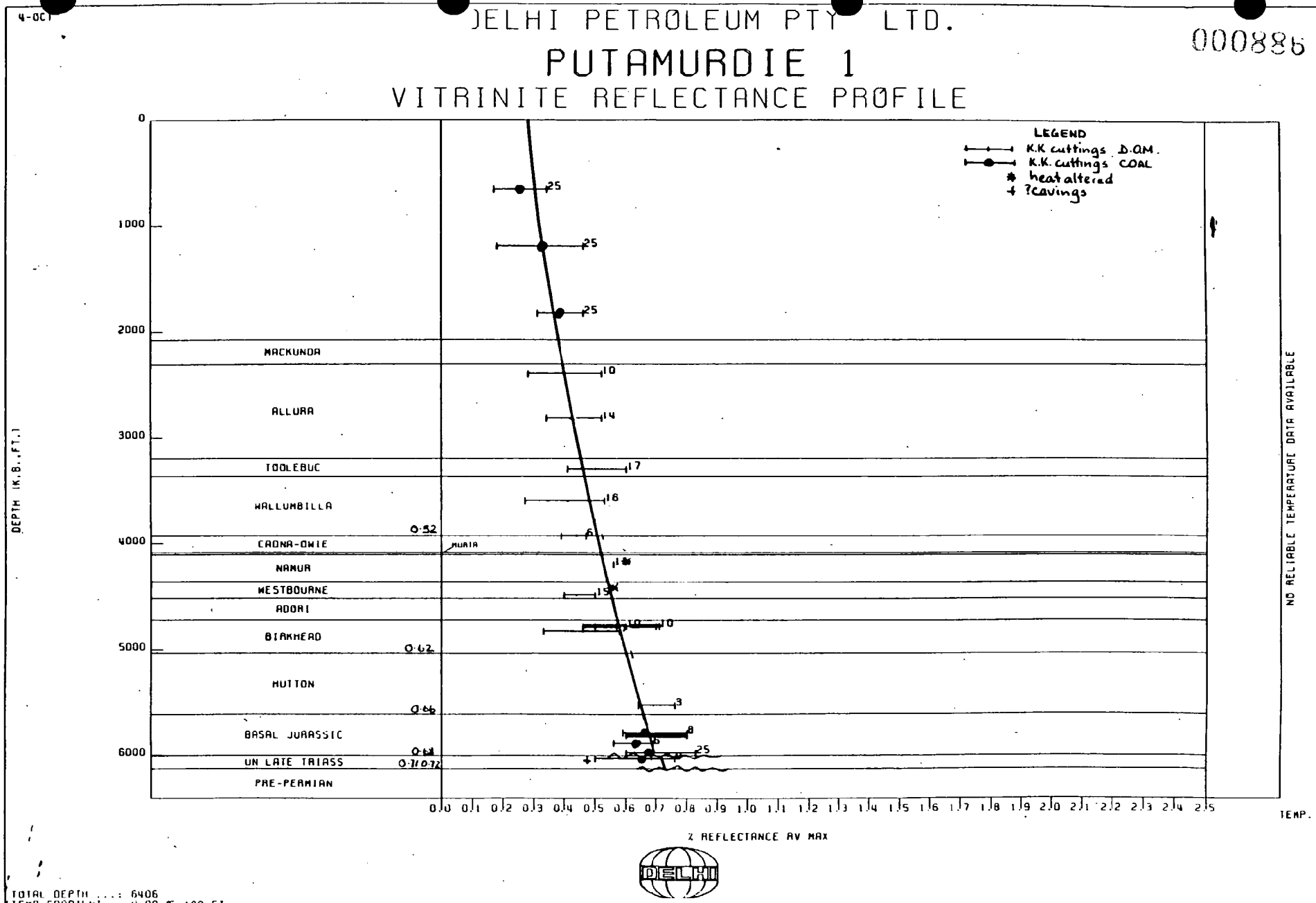


Figure A2.18 Vitrinite reflectance profile, Putamurdie 1.

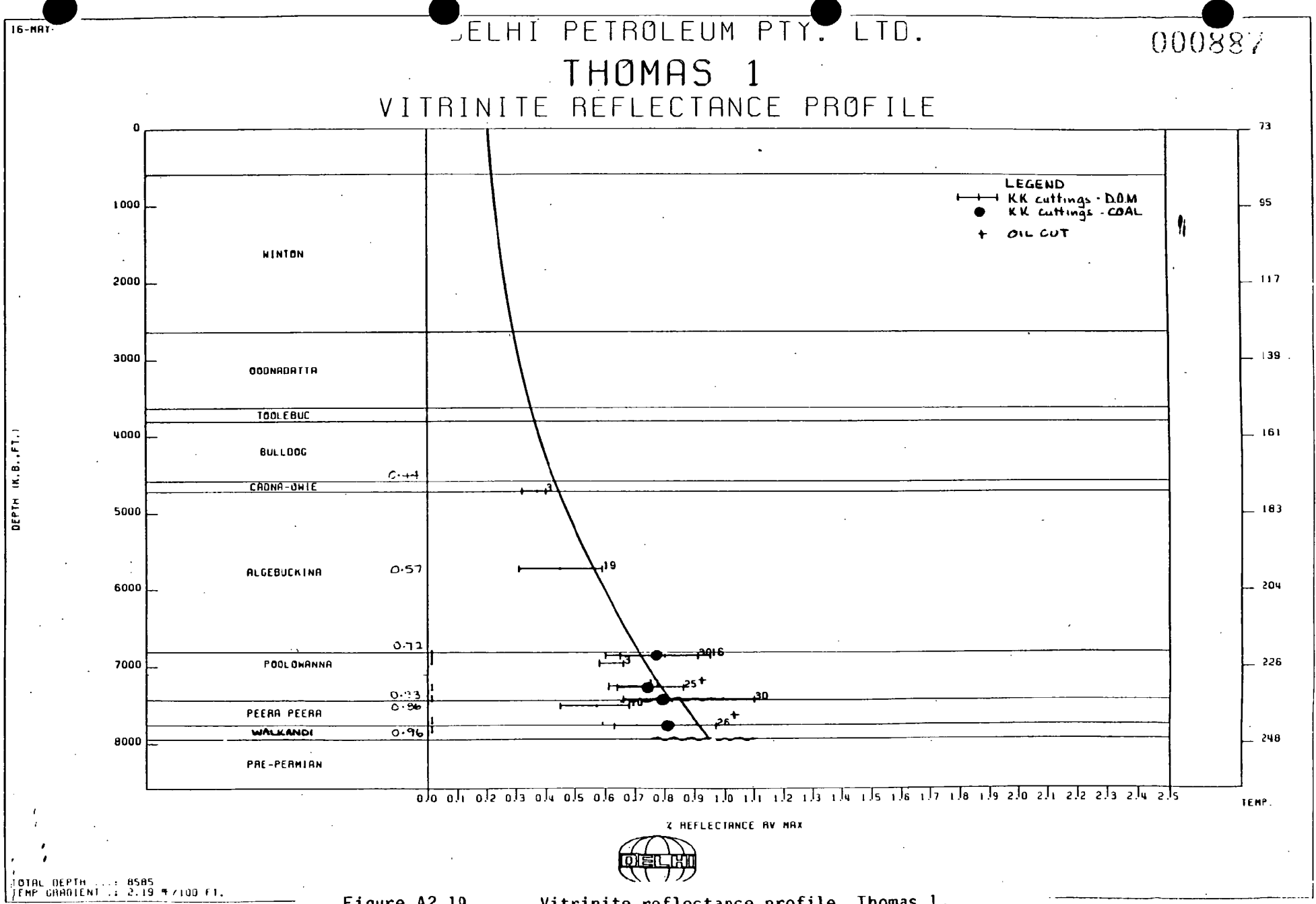


Figure A2.19 Vitrinite reflectance profile, Thomas 1.

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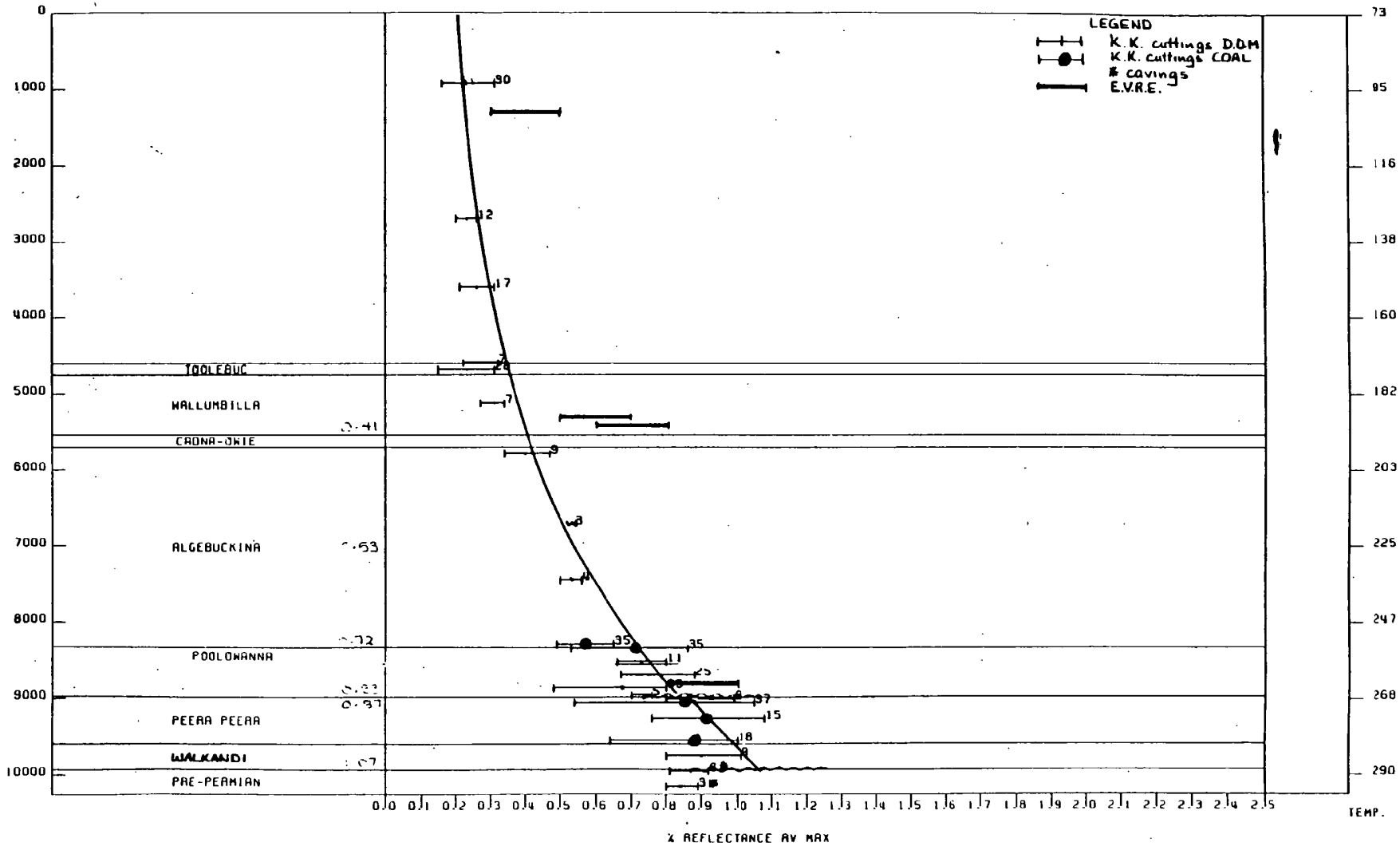
WALKANDI 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 10252
TEMP GRADIENT .: 2.17 °F/100 FT.

Figure A2.20 Vitrinite reflectance profile, Walkandi 1.

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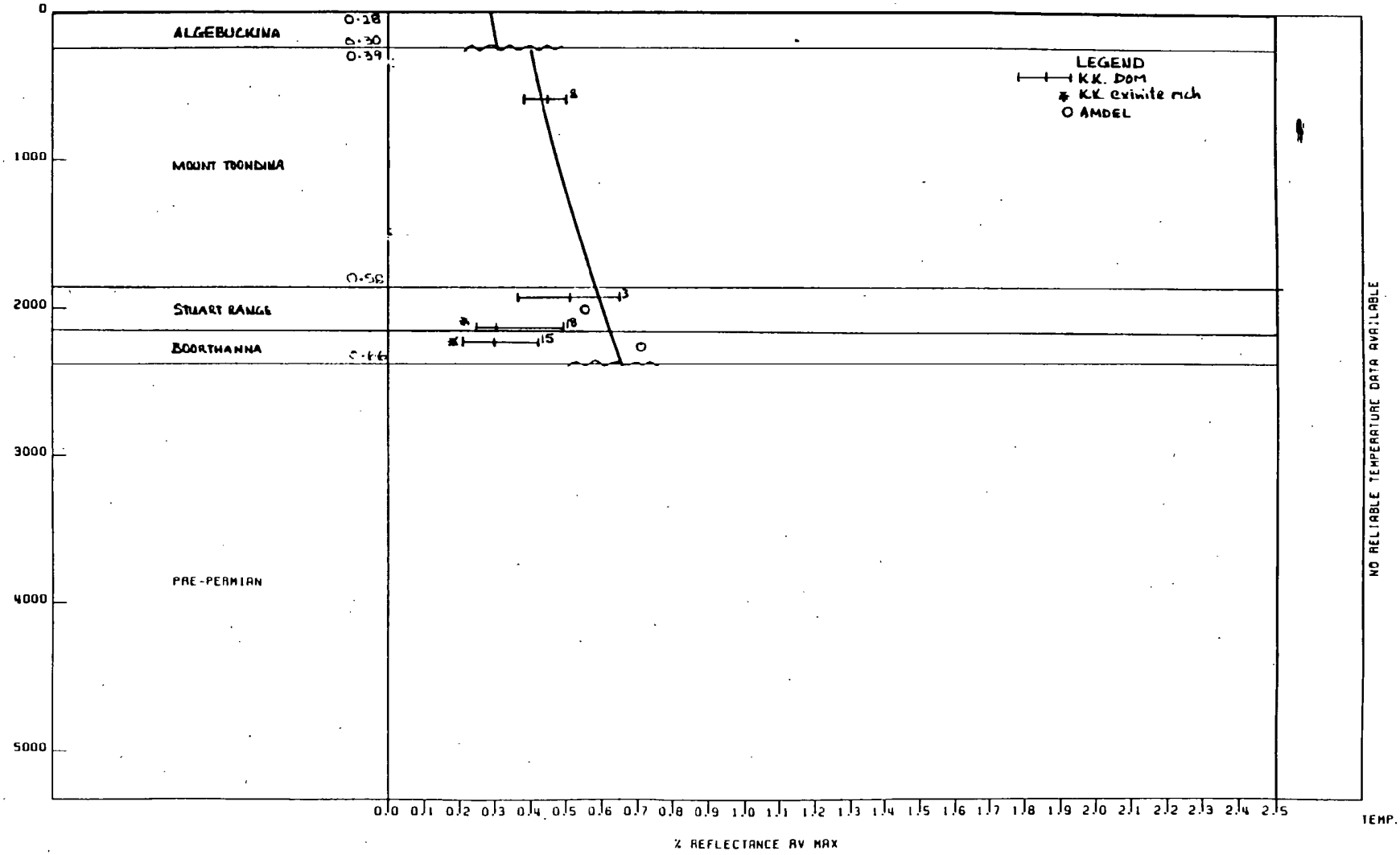
WEEDINA 1

VITRINITE REFLECTANCE PROFILE



TOTAL DEPTH ...: 5328
TEMP GRADIENT ..: 0.00 °F/100 FT.

Figure A2.21 Vitrinite reflectance profile, Weedina 1.

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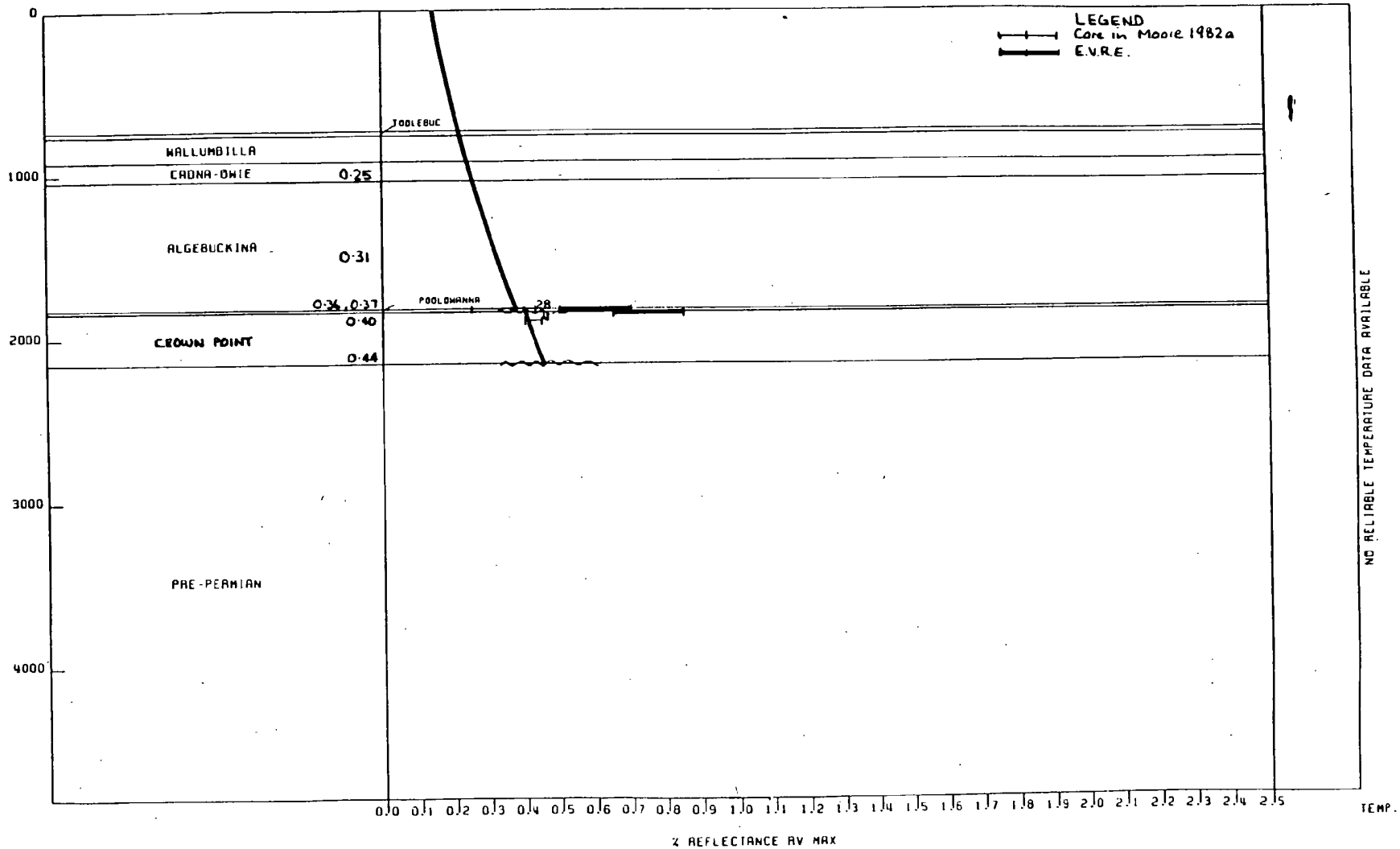
DELHI PETROLEUM PTY. LTD.

000890

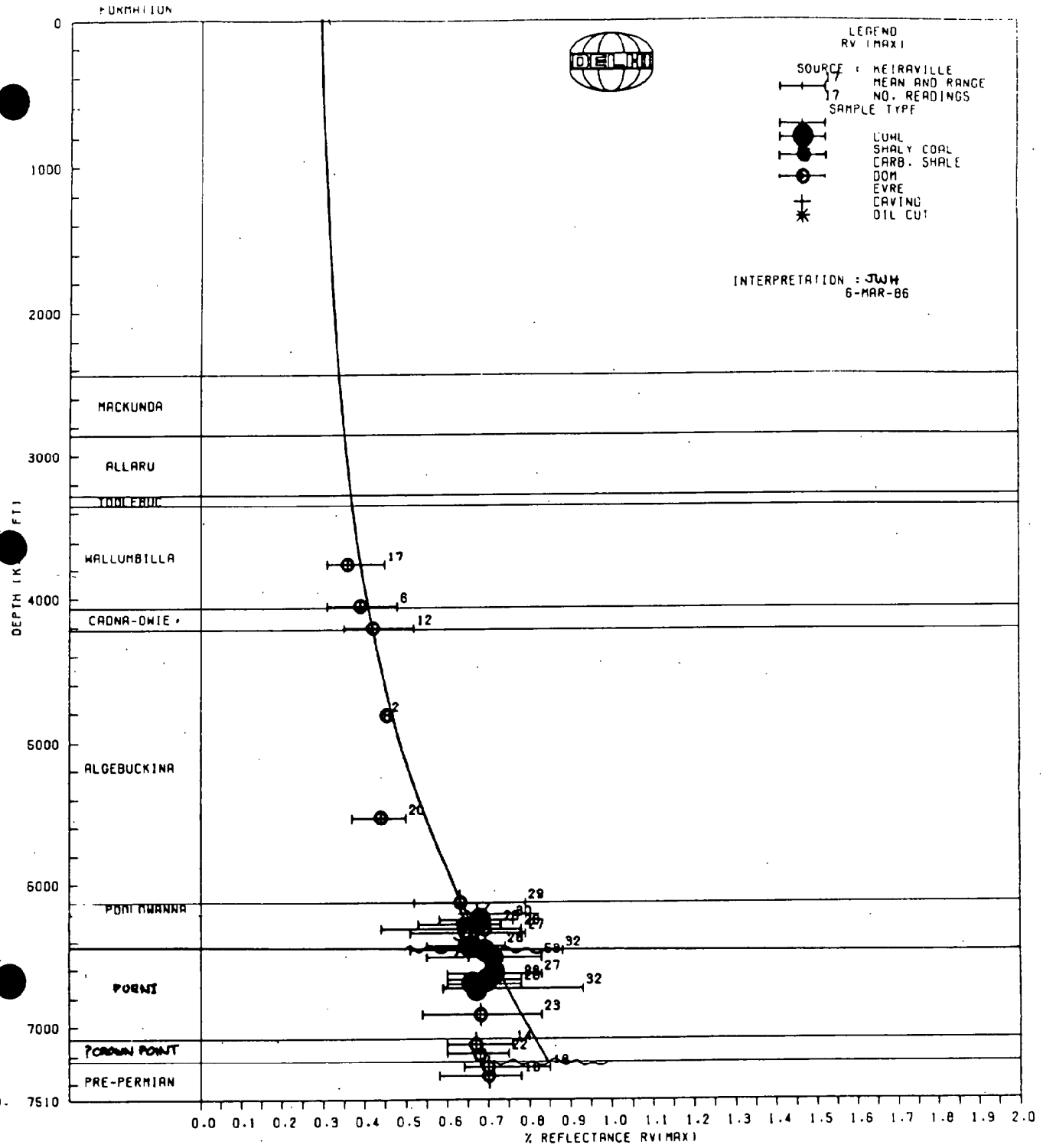
WITCHERRIE 1

VITRINITE REFLECTANCE PROFILE



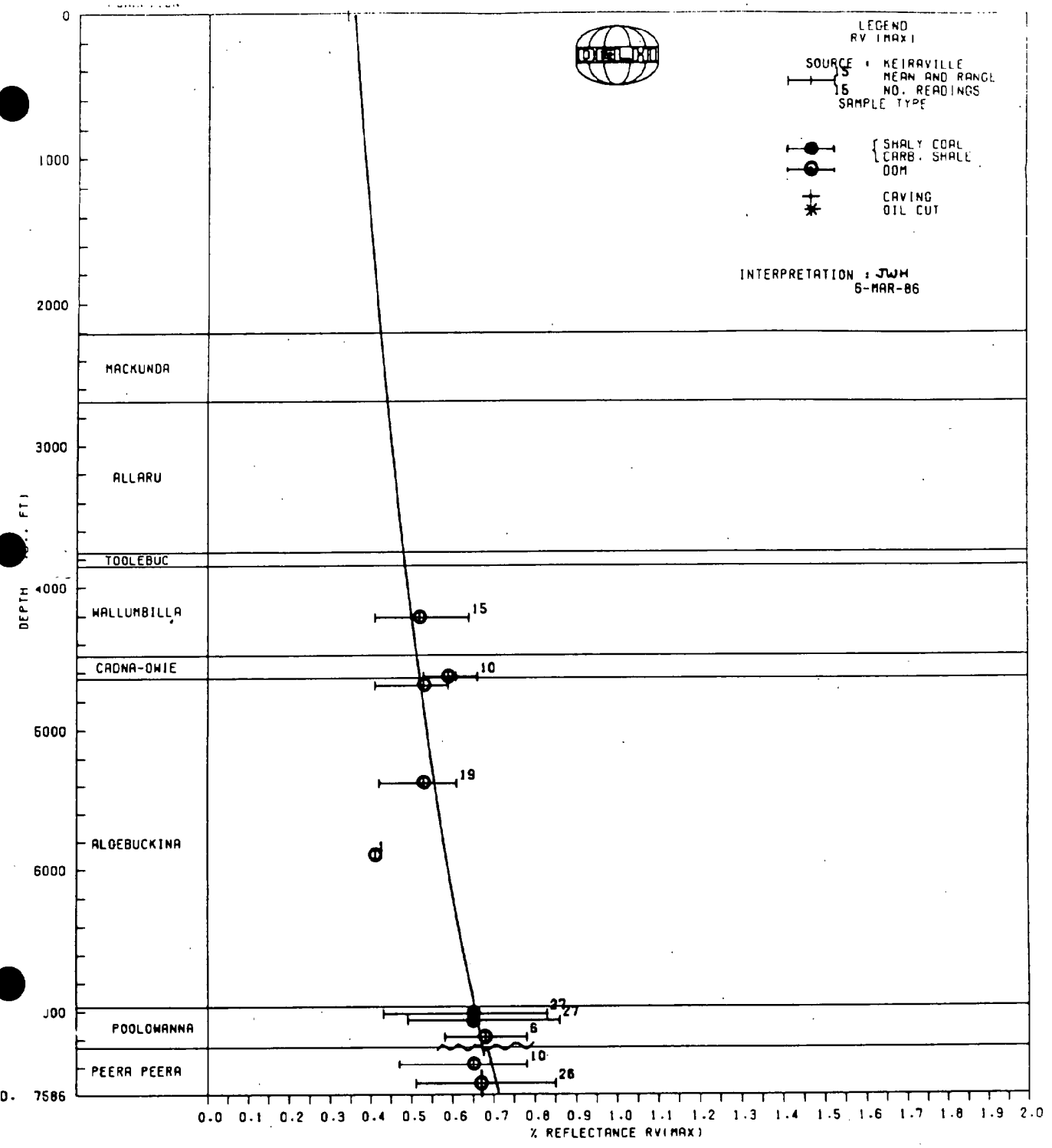
TOTAL DEPTH ... : 4803

Fig. A2.22 Vitrinite reflectance profile, Witcherrie 1



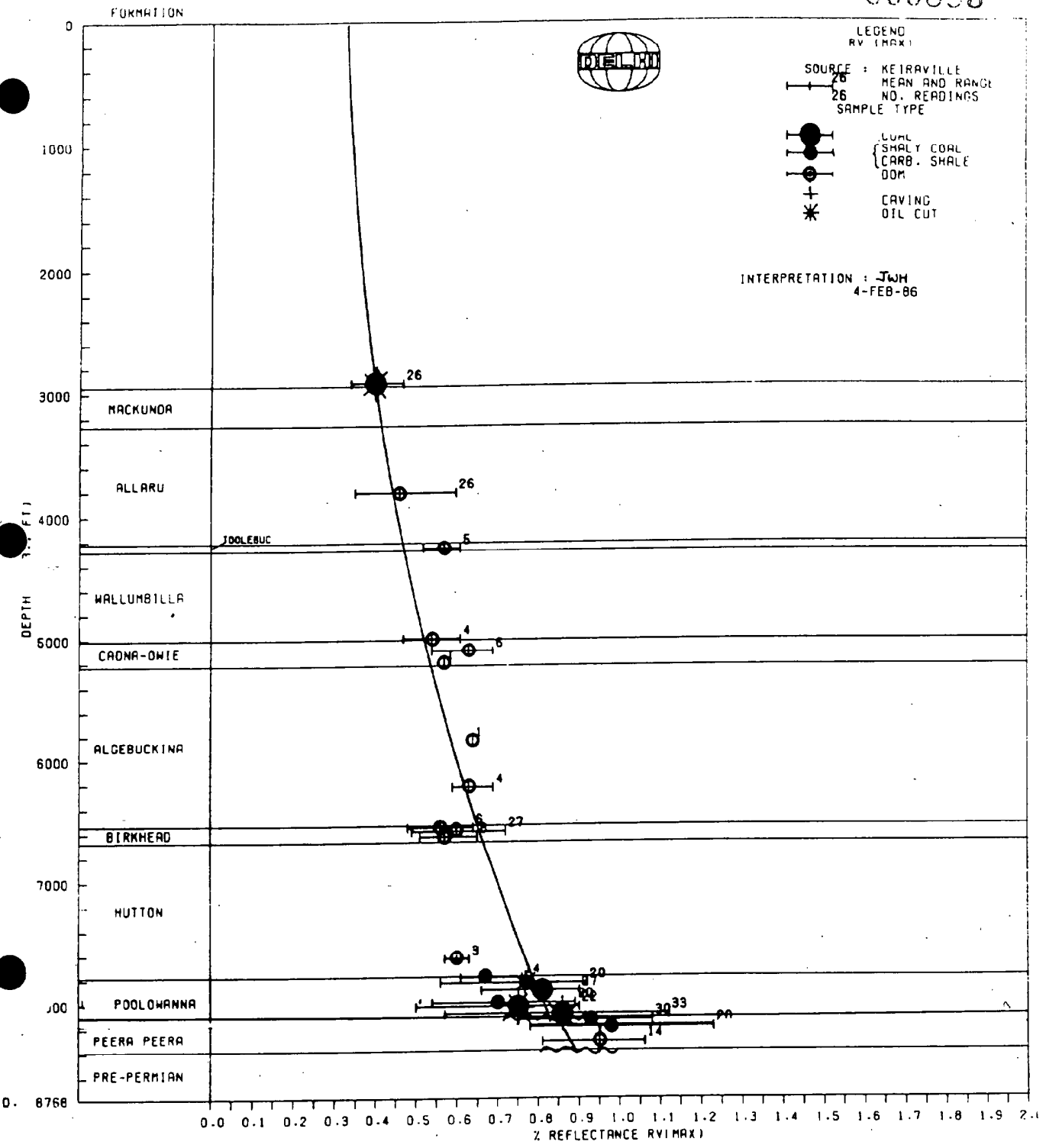
GLEN JOYCE 1 : VITRINITE REFLECTANCE PROFILE

Figure A2.23 Vitrinite reflectance profile, Glen Joyce 1.



KILLUMI 1 : VITRINITE REFLECTANCE PROFILE

Figure A2.24 Vitrinite reflectance profile, Killumi 1.



MIANDANA 1 : VITRINITE REFLECTANCE PROFILE

Figure A2.25 Vitrinite reflectance profile, Miandana 1.

APPENDIX 3

DEPOSITIONAL AND GEOTHERMAL HISTORIES IN PEDIRKA SECTOR WELLS

J.W. Hunt
Regional Studies Group
July 1985

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INTRODUCTION

A3.1 DEPOSITIONAL HISTORY

Sediment accumulation rates (Table A3.1) are calculated from a consideration of formation thickness and palynologically controlled age ranges in Figure A3.1. The absolute age scale is after Harland et al. (1982). Although this does not fit Australian age data particularly well in the Permian the modelling process is not significantly affected by Permian events.

A3.1.1 PURNI FORMATION UNCONFORMITY

The amount of sediment lost from the Permian is estimated from vitrinite reflectance curves and is assumed to be deposited at the rate as in the Purni Formation in each well. Erosion of the estimated thickness is assumed to span from the end of deposition to 244 Ma when Triassic deposition commenced (Table A3.2).

A3.1.2 PEERA PEERA FORMATION UNCONFORMITY

The amount of sediment loss (Table A3.3) is calculated from vitrinite reflectance curves, and is assumed to be deposited at Peera Peera Formation rates. However given the wide range of cessation of deposition (206 to 216 Ma) and the poor quality of reflectance data in the Triassic a cessation date of 209 MA is assumed. Erosion is in all wells then calculated to remove the additional sediment until the beginning of Jurassic deposition at 202 MA.

A3.1.3 WINTON FORMATION UNCONFORMITY

Assuming that sedimentation was proportional in each Post-Triassic interval the amount of erosion at the Winton unconformity (Table A3.4.) is estimated from the ratio of Winton to Cadna-owie and Cadna-owie to Poolowanna Formation thicknesses. This ratio is 2.4 to 2.6 in the Cooper Sector for Beanbush 1 and Burley 2 (Table A3.4) where Winton erosion is considered to be minimal (Pitt, in press). The highest ratio in the Pedirka Sector is 2.0 in Walkandi and Erabena 1. The sediment loss is made up assuming an initial ratio of 2.2 approximated by a cessation of deposition at 87 MA across the Pedirka Sector. Subsequent erosion is assumed to take place at a constant rate until the beginning of Eyre Formation deposition at 60 MA.

A3.2 THERMAL SUBSIDENCE MODEL

The thermal subsidence model of Turcotte and Angevine (1982), predicts that the depth of a sedimentary basin increases with the square root of time, which for many basins (eg Michigan, Appalachian, Atlantic Coast and Gulf Coast Basin) is a good approximation for the first 80 MA of their evolution. The model is based on subsidence following lithospheric thinning due to a temperature perturbation by hot mantle rock.

The relevant equations in Turcotte and Angevine (1982) are 34 and 36:

$$Y_{sb} = [2\rho_{mo}\alpha(T_m-T_o)]/\rho_{mo}-\rho_{so}) \cdot (kt/\pi)^{1/2}$$

and $$Ts = T_o + (T_m-T_o) \cdot y/(\pi kt)^{1/2}$$

Where Ysb = depth to effective basement (i.e. sediment thickness)

t = time after imitation of subsidence

T_m-T_o = temperature anomaly in the lithosphere; and

T_s = temperature in the sediments

Assumed values of constants are:

$\rho_{mo}/\rho_{mo}-\rho_{so}$ = 3.0

K = 25 km^2/Ma

π = 3.14159

α = 0.00003

and T_o = 20°C

From 34 $Y_{sb} = 0.0005\ (T_m-T_o)(t)^{1/2}$ and

from 36 $T_s = T_o + G_y + T_m - T_o/(kt)^{1/2} \cdot y$

where G_y is the gradient before the heating event in basins where subsidence has been re-initiated.

TABLE A3.1 CALCULATION OF SEDIMENT ACCUMULATION RATES BY FORMATION IN PEDIRKA SECTOR WELLS

A = thickness (ft, B = duration (Ma), C = rate (ft/Ma)

		POOLOWANNA 1	WALKANDI 1	ERABENA 1	KUNCHERINNA 1	MACUMBA 1	GLEN JOYCE 1	KILLUMI 1	OOLARINNA 1	MIANDANA 1
EYRE	A	490	616	362	495	532	502	533	580	495
	B	22Ma	22Ma	22Ma	22Ma	22Ma	22Ma	22Ma	22Ma	22Ma
	C	22.3	28.0	16.4	22.5	24.2	22.8	24.2	26.4	22.5
WINTON	A	3695	3965	3159	3675	3226	2753	3196	3259	3701
	B	10Ma	10Ma	10Ma	10Ma	10Ma	10Ma	10Ma	10Ma	10Ma
	C	369.5	396.5	315.9	367.5	322.6	275.3	319.6	325.9	370.1
TOOLE-BUC	A	124	153	31	136	94	74	101	58	61
	B	2Ma	2Ma	2Ma	2Ma	2Ma	2Ma	2Ma	2Ma	2Ma
	C	62.0	76.5	15.5	68.0	47.0	37.0	50.5	29.0	30.5
WALLUM-BILLA	A	862	788	852	786	803	715	629	869	733
	B	17Ma	17Ma	17Ma	17Ma	17Ma	17Ma	17Ma	17Ma	17Ma
	C	50.7	46.4	50.1	46.2	47.2	42.0	37.0	51.1	43.1
CADNA-OWIE	A	164	158	151	123	178	153	163	156	216
	B	15Ma	15Ma	15Ma	15Ma	15Ma	15Ma	15Ma	15Ma	15Ma
	C	11	10.5	10.1	8.2	11.9	10.2	10.9	10.4	14.4
ALGEB-UCKINA	A	2482	2631	2096	2534	2333	1995	2328	2450	2551
	B	53Ma	53Ma	53Ma	53Ma	53Ma	53Ma	53Ma	53Ma	53Ma
	C	46.8	49.6	38.1	46.1	43.2	36.9	43.1	45.3	47.2
POOLO-WANNA	A	674	543	789	635	335	165	284	296	396
	B	15Ma	15Ma	13Ma	13Ma	12.5Ma	12.5Ma	12.5Ma	12.5Ma	12.5Ma
	C	44.9	42.8	60.7	48.8	26.8	13.2	22.7	23.7	31.7
PEERA PEERA	A	577	624	383	542	514	-	480*	439	207
	B	20Ma	25.5	20Ma	20Ma	20Ma	-	20Ma	20Ma	20Ma
	C	28.8	24.5	19.2	27.1	25.7		24.0	22.0	10.3
WALK-ANDI	A	437	404	175	362	-	-	-	-	-
	B	6Ma	6Ma	6Ma	6Ma					
	C	72.8	67.3	29.2	60.3					
PURNI	A		-			246	865	360*	421	-
	B					6.5Ma	13.5Ma	11Ma	9Ma	
	C					37.8	54.1	32.7	46.8	
CROWN POINT	A		-			134	-	340*	112	-
	B					2.5Ma		2.5Ma	2.5Ma	
	C					53.6		136	44.8	

* Prognosed

TABLE A3.2 THICKNESS LOST AND CALCULATION OF EROSION RATES FOR THE PERMIAN UNCONFORMITY

Well	A (Ma)	B (ft/Ma)	C (ft)	D (Ma)	E (Ma)	F (Ma)	G (ft/Ma)
Macumba 1	274	37.8	90	2.4	271.6	27.6	3.3
Glen Joyce 1	266.5	64.1					
Killuni 1	269	32.7					
Oolarinna 1	271	46.8	220	4.6	266.3	22.3	9.9

A) Age of present formation top
B) Rate of deposition of Purni Fm
C) Sediment lost by erosion calculated from reflectance curves
D) Time of extra deposition at rate B from thickness C
E) Time at end of original deposition using rate in B
F) Time of erosion to Triassic deposition at 244 Ma
G) Rate of erosion (ft/Ma) from C and F

TABLE A3.3. THICKNESS LOST AND CALCULATION OF EROSION RATES FOR THE TRIASSIC UNCONFORMITY

Well	A (Ma)	B (ft/Ma)	C (ft)	D (Ma)	E (Ma)	F (Ma)	G (ft/Ma)
Poolowanna 1	218	28.8	150	5.2	212.8	259	37
Walkandi 1	212.5	24.5	150	6.1	206.4	86	12.3
Erabena 1	218	19.2	210	10.9	207.1	173	24.7
Kuncherinna 1	218	27.1	50	1.8	216.2	244	34.9
Macumba 1	214.5	25.7	130	5.1	209.4	141	20.1
Glen Joyce 1	NO DEPOSITION		NO EROSION				
Killuni 1	214.5	24.0				132	18.9
Oolarinna 1	214.5	22.0	170	7.7	206.8	121	17.3
Miandana 1	214.5	10.3				57	8.1
Poolowanna 2	218	?	210				

A) Age of present formation top
B) Rate of deposition of Peera Peera Fm
C) Sediment lost by erosion calculated from reflectance curves
D) Time of extra deposition at rate B from thickness C
E) Time at end of original deposition using rate in B
F) Thickness lost assuming uniform end of deposition at 209 Ma
G) Rate of erosion of G for 209-202 Ma
G) Rate of erosion (ft/Ma) from C and F

TABLE A3.4. THICKNESS LOST AND CALCULATION OF EROSION RATES FOR THE CRETACEOUS UNCONFORMITY

Well	A (Ma)	B (ft/Ma)	C (ft)	D (Ma)	E (Ma)	F (Ma)	G (ft/Ma)
Poolowanna 1	91	369.5	1140	3.1	87.9	1478	54.7
Walkandi 1	91	396.5	1230	3.1	87.9	1586	58.7
Erabena 1	91	315.9	901	2.9	88.1	1264	46.8
Kuncherinna 1	91	367.5	1248	3.4	87.6	1470	54.4
Macumba 1	91	322.6	1401	4.3	86.7	1290	47.8
Glen Joyce 1	91	275.3	1184	4.3	86.3	1101	40.8
Killumi 1	91	319.6	1554	4.9	86.1	1278	47.3
Oolarinna 1	91	325.9	1547	4.7	86.3	13.4	48.3
Miandana 1	91	370.1	1592	4.3	86.7	1480	54.8

A) Age of present formation top
B) Rate of deposition in the Winton Fm
C) Thickness lost assume ratio of 2.2 (see text)
D) Time of extra deposition at rate B for thickness C
E) End time at end of deposition of thickness in D
F) Thickness deposited at rate B from 91 to 87 Ma
G) Rate of erosion of F from 87 Ma to 60 Ma.

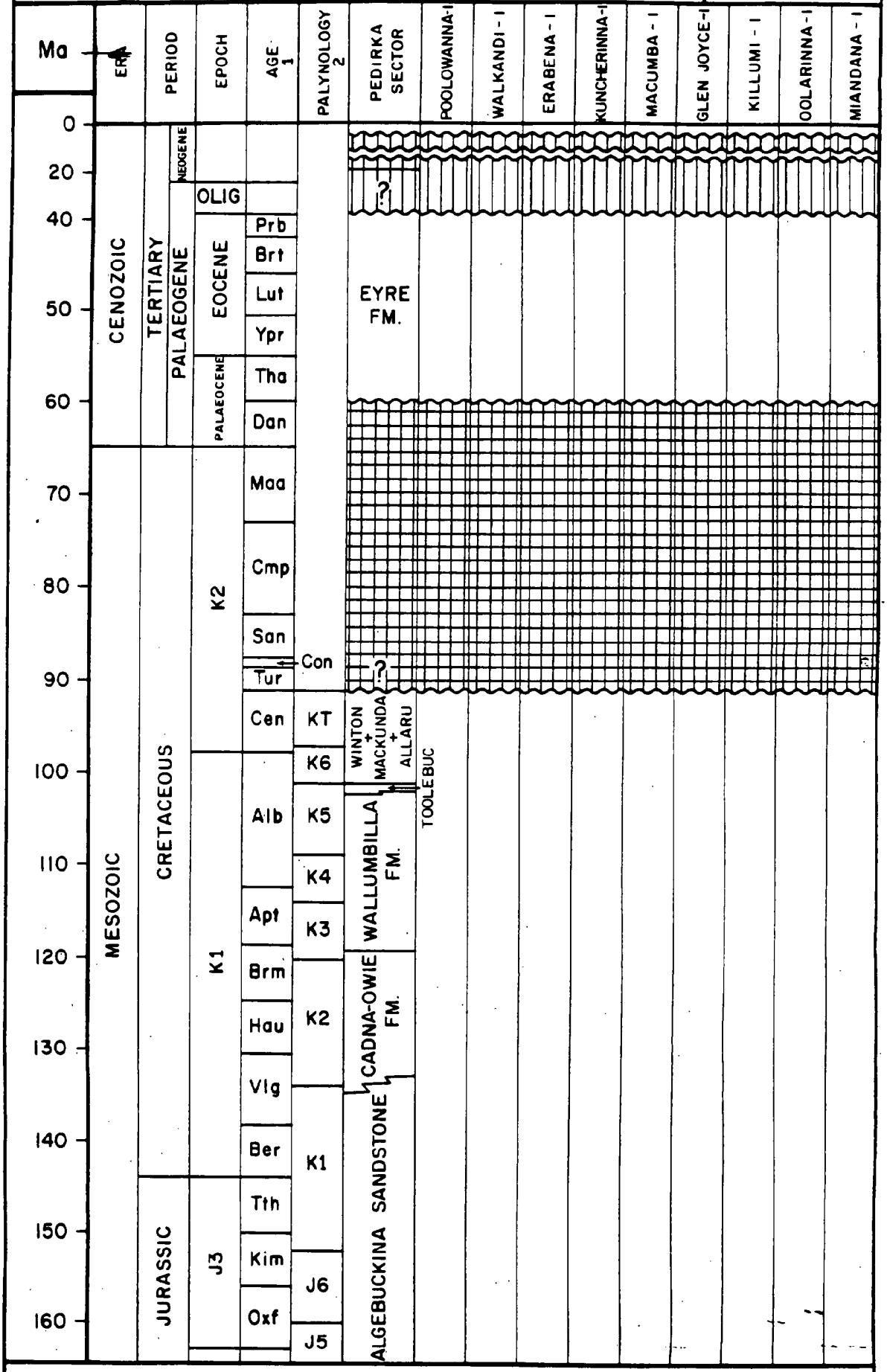
TABLE A3.5. SEDIMENT THICKNESS RATIOS FOR THE EROMANGA AND EYRE BASINS IN THE PEDIRKA SECTOR

WELL	A Eyre Fm.(ft)	B Winton to Cadna-owie	C Cadna-owie to Poolowanna	A:C	B:C	A+B:C	Eroded From B*
Poolowanna 1	490	4681	2646	0.18	1.8	1.9	1140
Walkandi 1	616	4906	2789	0.22	1.8	2.0	1230
Erabena 1	362	4042	2247	0.16	1.8	2.0	901
Kuncherinna 1	495	4597	2657	0.19	1.7	1.9	1248
Macumba 1	532	4123	2511	0.21	1.6	1.8	1401
Glen Joyce 1	502	3542	2148	0.23	1.6	1.9	1184
Killumi 1	533	3926	2491	0.21	1.6	1.8	1554
Oolarinna 1	580	4186	2606	0.22	1.6	1.8	1547
Miandana 1	495	4495	2767	0.18	1.6	1.8	1592
Beabush 1	781	5591	2291	0.34	2.4	2.8	
Burley 2	350	5040	1967	0.18	2.6	2.7	

Note: Sediment lost from B calculated assuming proportional deposition in successive Eromanga Basin units and pre-erosion ratio of 2.2* for B:C in Pedirka Sector. B:C ratios are 2.4 and 2.6 in Cooper Sector wells.

STRATIGRAPHIC RANGES IN SELECTED PEDIRKA SECTOR WELLS

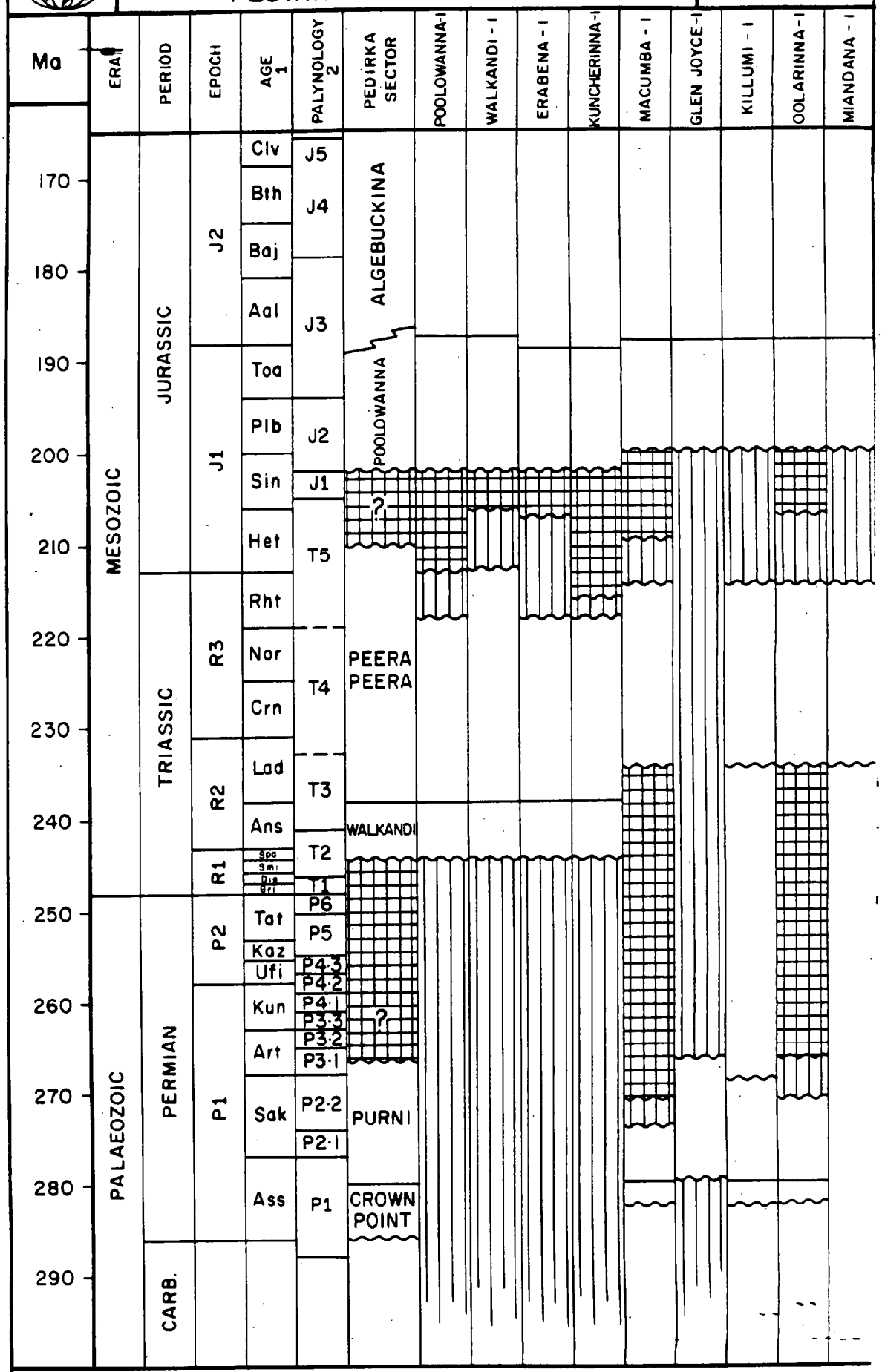
Fig. A3.1.a



Interpretation: J. HUNT | Drawn by: J.S. | Drawing No. 85XG-6281 | File No. RL-41

STRATIGRAPHIC RANGES IN SELECTED PEDIRKA SECTOR WELLS

Fig. A3.1.b



Erosion

Non-deposition

1.- after Harland et al. 1982

2.- after Price et al.

APPENDIX 4

LOPATIN MATURATION PROFILES FOR PEDIRKA BLOCK WELLS

J.W. Hunt,
Regional Studies Group,
Nov., 1985

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Figure: A4.2 Lopatin maturation profile in Erabena 1 modelled using 0.80 of the present geotherm.

Figure: A4.3 Lopatin maturation profile in Glen Joyce 1 modelled using the present geotherm.

Figure: A4.4 Lopatin maturation profile in Glen Joyce 1 modelled using 0.80 of the present geotherm.

Figure: A4.5 Lopatin maturation profile in Killumi 1 modelled using the present geotherm.

Figure: A4.6 Lopatin maturation profile in Killumi 1 modelled using 0.80 of the present geotherm.

Figure: A4.7 Lopatin maturation profile in Kuncherinna 1 modelled using the present geotherm.

Figure: A4.8 Lopatin maturation profile in Kuncherinna 1 modelled using 0.80 of the present geotherm.

Figure: A4.9 Lopatin maturation profile in Macumba 1 modelled using the present geotherm.

Figure: A4.10 Lopatin maturation profile in Macumba 1 modelled using 0.80 of the present geotherm.

Figure: A4.11 Lopatin maturation profile in Macumba 1 modelled using 0.75 of the present geotherm.

Figure: A4.12 Lopatin maturation profile in Macumba 1 modelled using thermal subsidence geotherm.

Figure: A4.13 Lopatin maturation profile in Miandana 1 modelled using the present geotherm.

Figure: A4.14 Lopatin maturation profile in Miandana 1 modelled using 0.80 of the present geotherm.

Figure: A4.15 Lopatin maturation profile in Oolarinna 1 modelled using the present geotherm.

Figure: A4.16 Lopatin maturation profile in Oolarinna 1 modelled using 0.80 of the present geotherm.

Figure: A4.17 Lopatin maturation profile in Poolowanna 1 modelled using the present geotherm.

Figure: A4.18 Lopatin maturation profile in Poolowanna 1 modelled using 0.80 of the present geotherm.

Figure: A4.19 Lopatin maturation profile in Poolowanna 1 modelled using 0.75 of the present geotherm.

Figure: A4.20 Lopatin maturation profile in Poolowanna 1 modelled using thermal subsidence.

Figure: A4.21 Lopatin maturation profile in Walkandi 1 modelled using the present geotherm.

Figure: A4.22 Lopatin maturation profile in Walkandi 1 modelled using 0.80 of the present geotherm.

INTRODUCTION

Maturation was modelled in the recent and several older Pedirka Block wells using the Delhi Pty Ltd Lopatin Modelling Programme. The results are shown in Figures A4.1 to 22. Maturity was modelled for the present geotherm and 0.8 times the present geotherm in all wells. Poolowanna 1 and Macumba 1 were also modelled using a thermal history of 0.7 times the present geotherm and the thermal subsidence model of Turcotte and Angevine (1982).

Burial histories are based essentially on the formation thicknesses shown in Appendix 1, and the time scale of Harland et al (1982). Stratigraphic ranges are based on Price et al. (1985) and some allowance is made for erosion at unconformities based on the ratio of maximum preserved thicknesses of various formations (Appendix 3). This is particularly important in the case of Winton Formation erosion because the deeper burial raises maturity about 0.05% (Rv) at each horizon for the adopted geothermal histories.

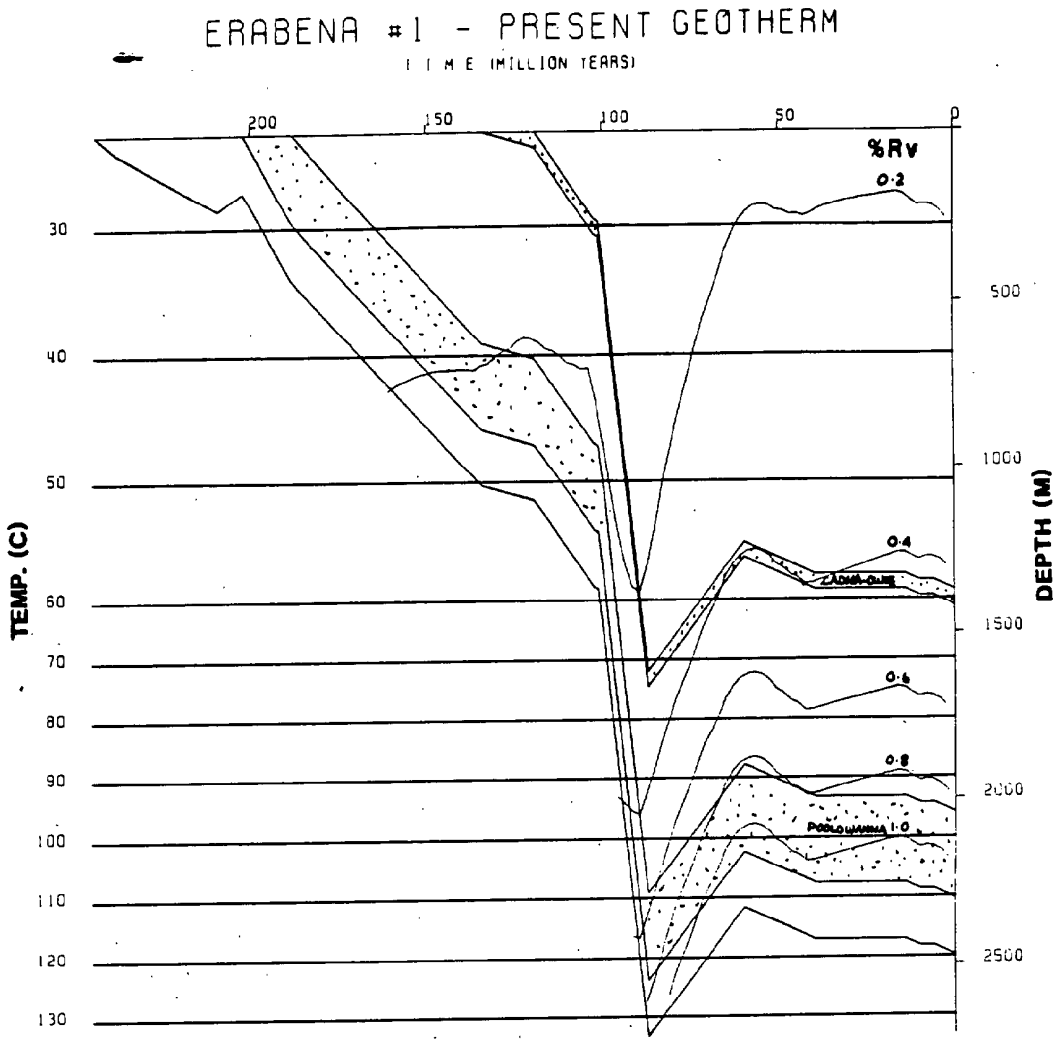

Figure: A4.1 Lopatin maturation profile in Erabena 1 modelled using the present geotherm.

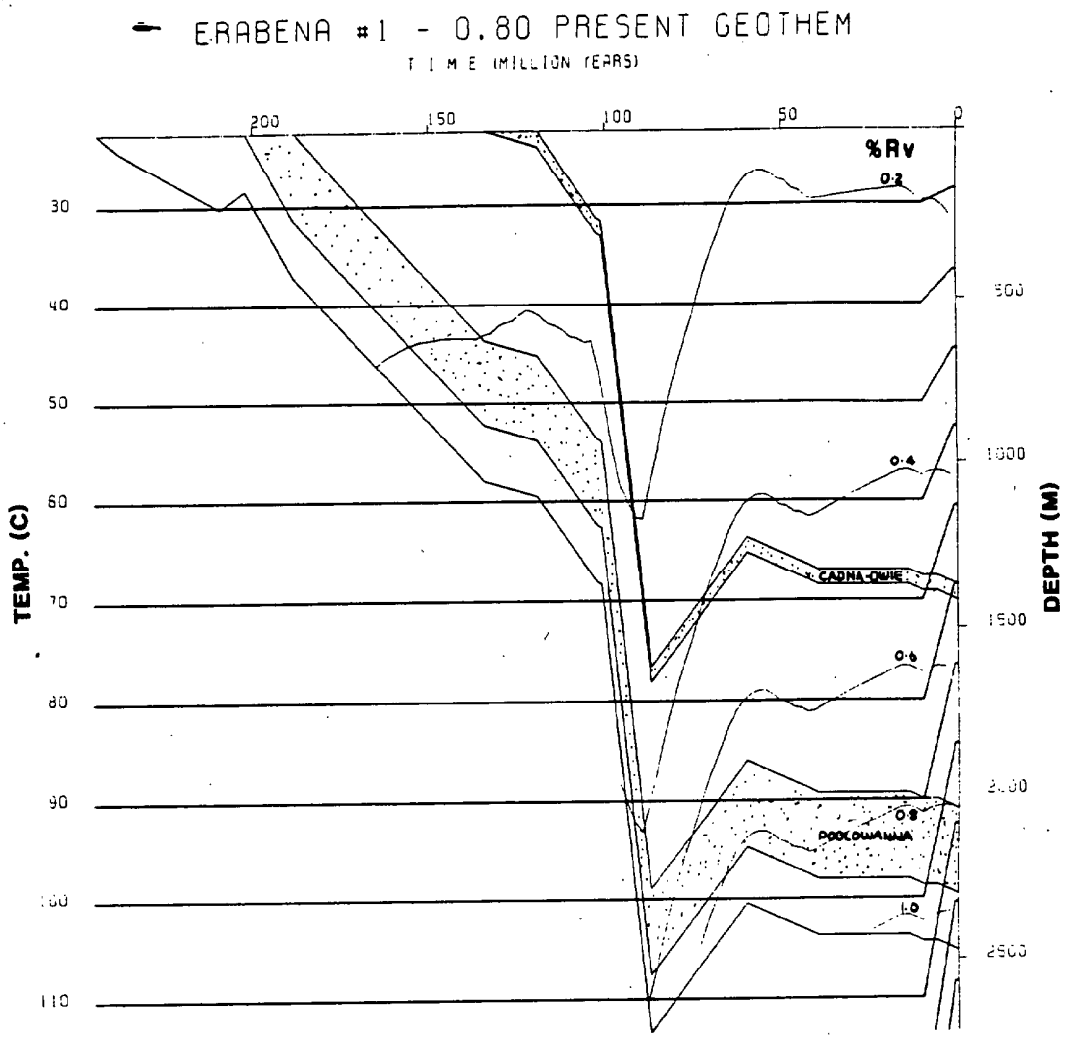

Figure: A4.2 Lopatin maturation profile in Erabena 1 modelled using 0.80 of the present geotherm.

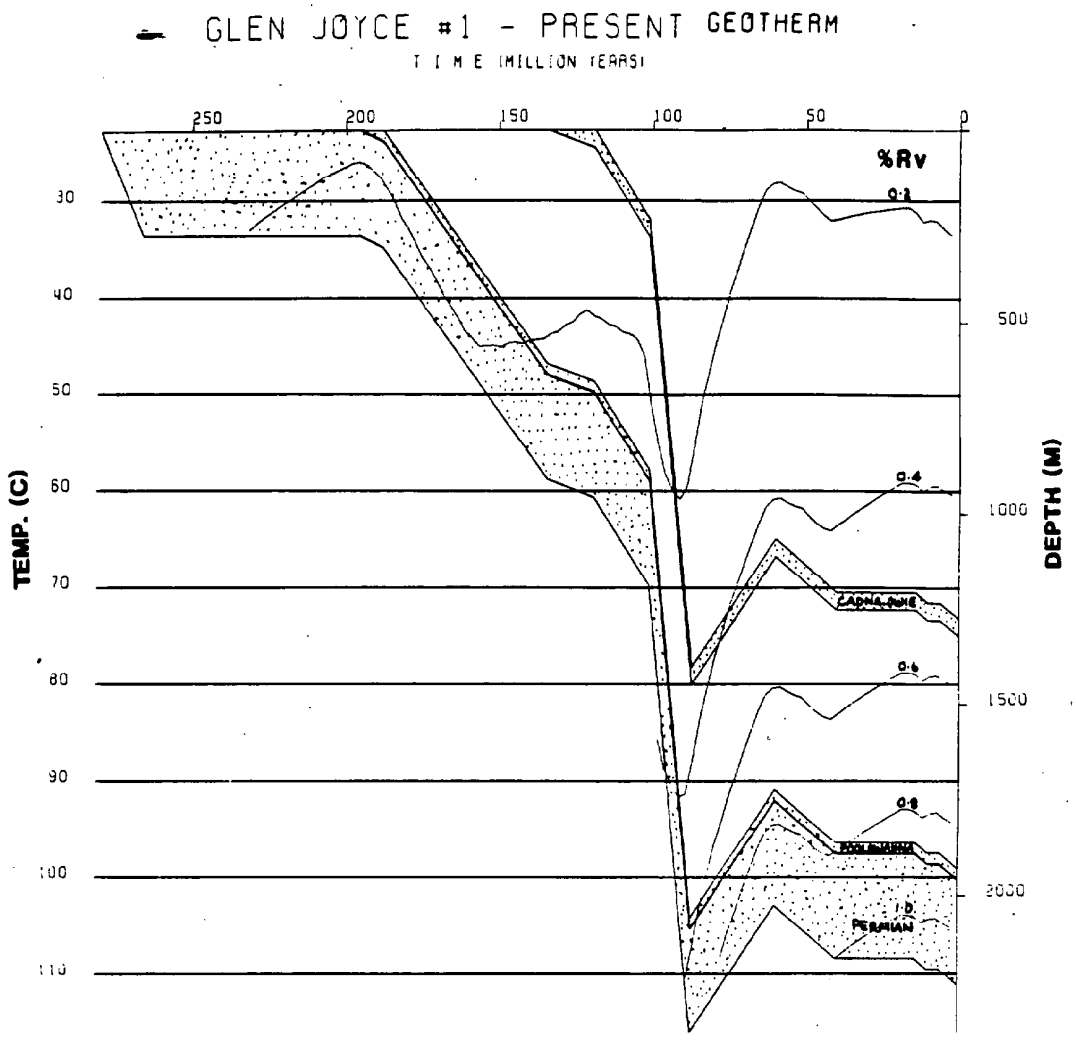

Figure: A4.3 Lopatin maturation profile in Glen Joyce 1 modelled using the present geotherm.

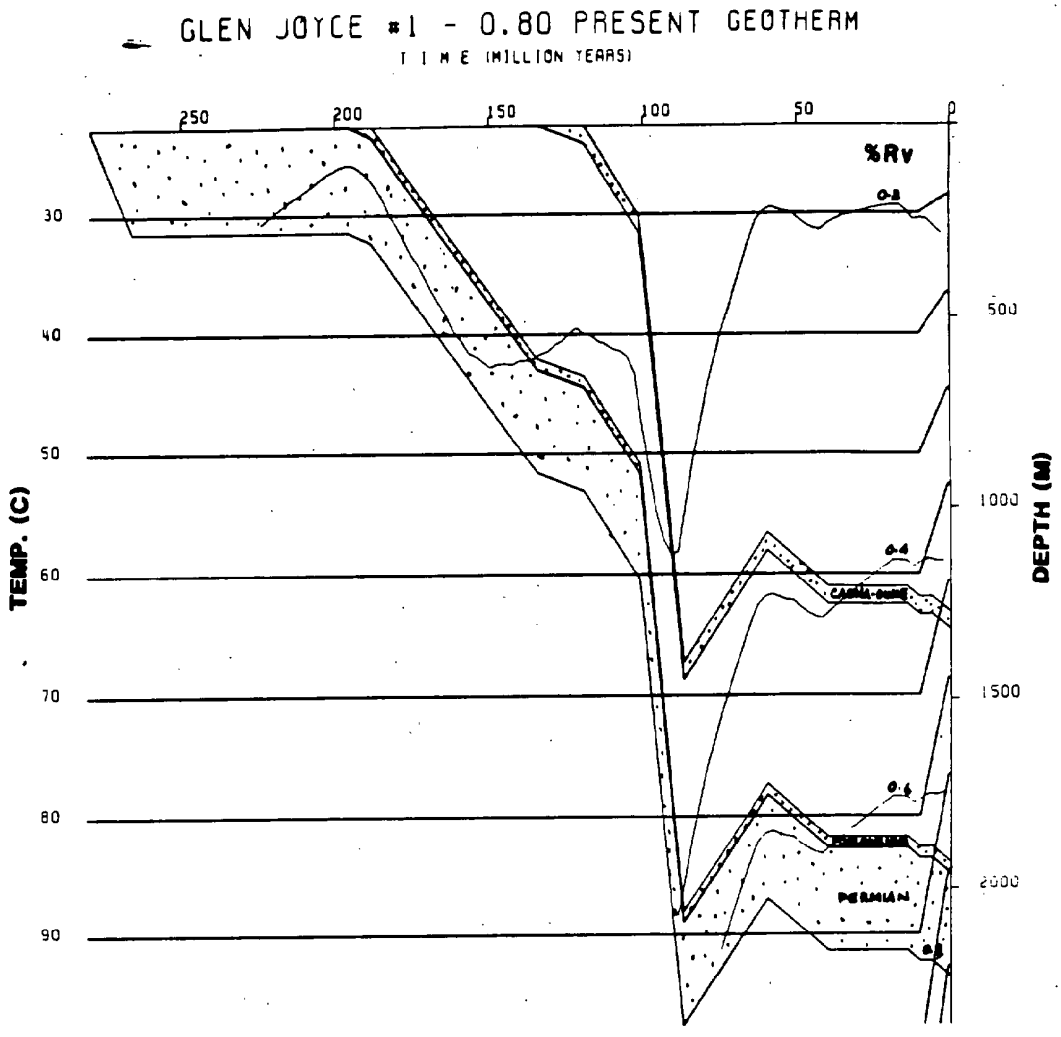

Figure: A4.4 Lopatin maturation profile in Glen Joyce 1 modelled using 0.80 of the present geotherm.

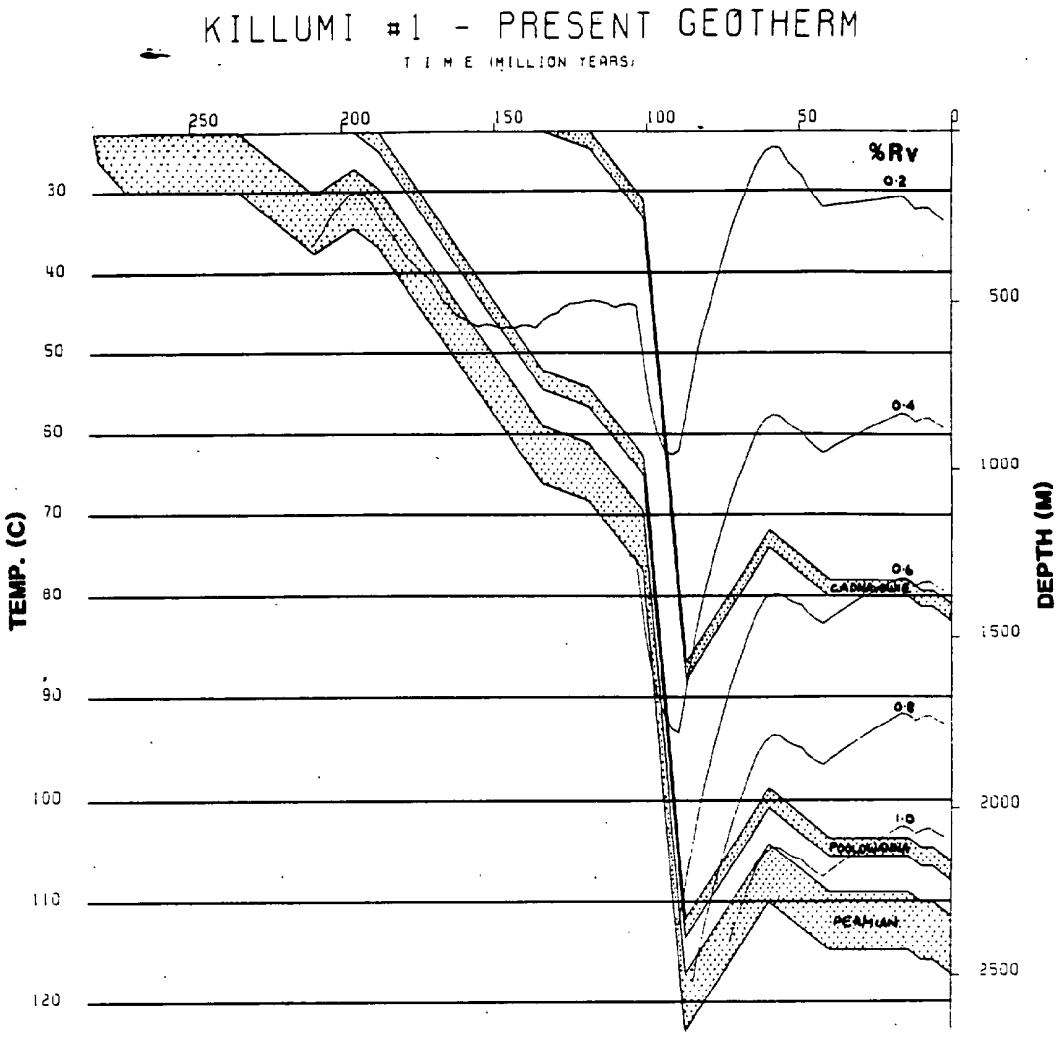

Figure: A4.5 Lopatin maturation profile in Killumi 1 modelled using the present geotherm.

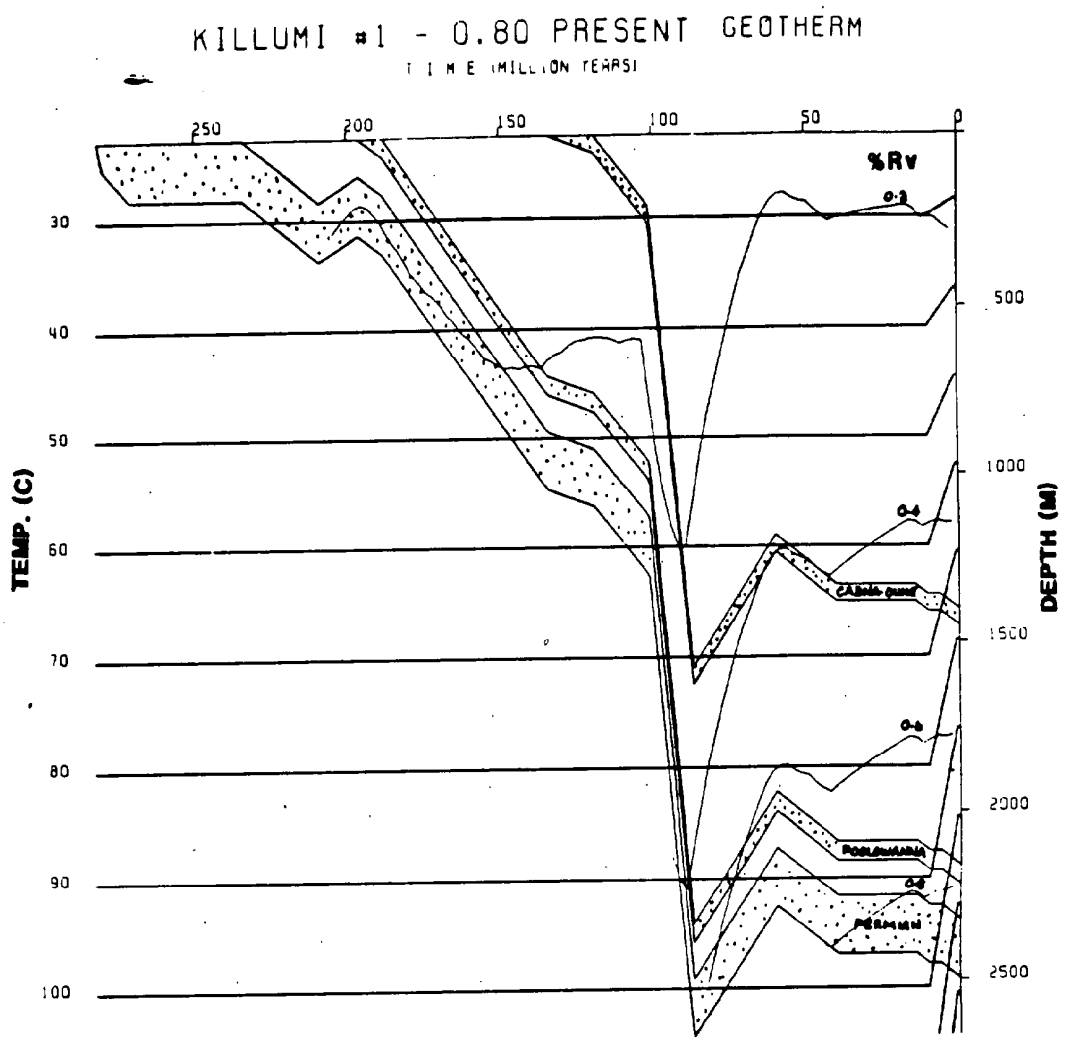

Figure: A4.6 Lopatin maturation profile in Killumi 1 modelled using 0.80 of the present geotherm.

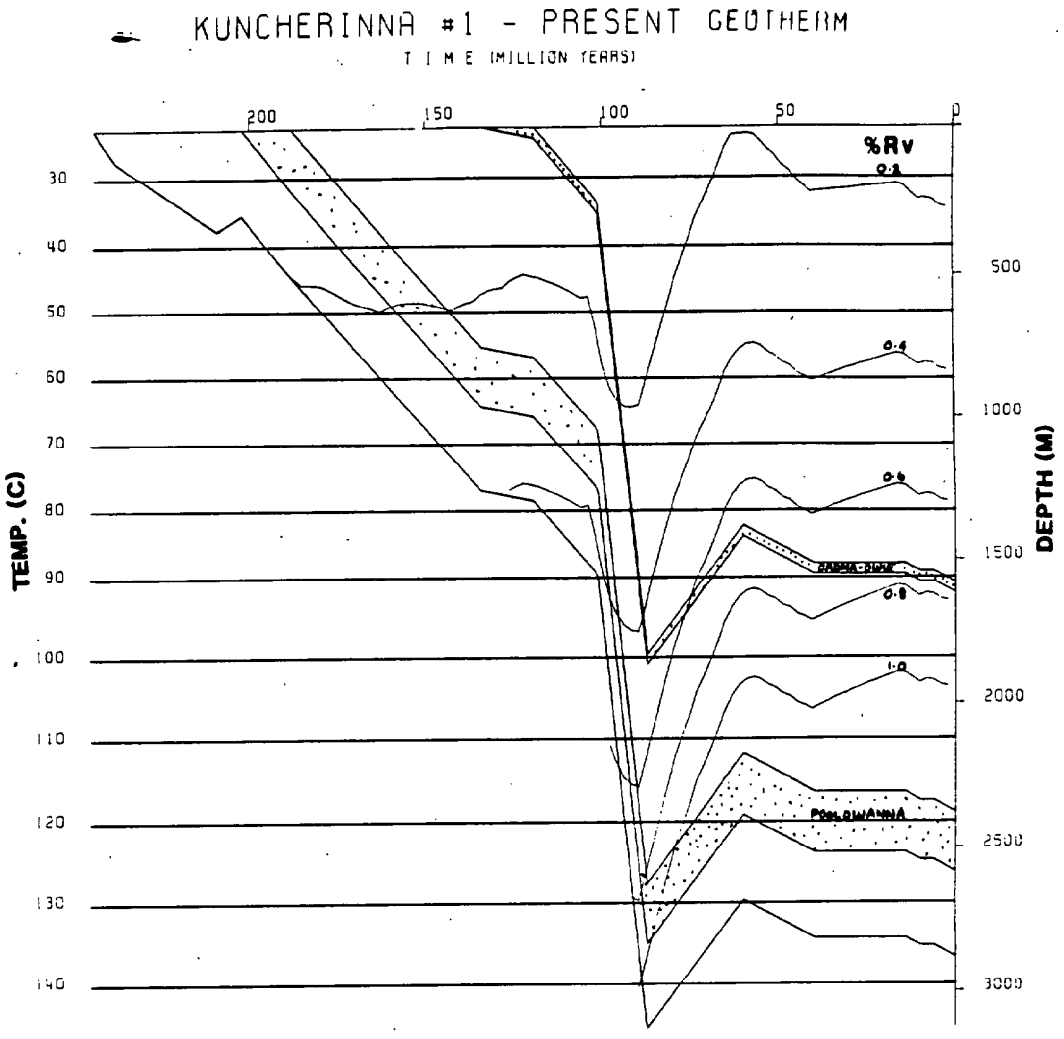

Figure: A4.7 Lopatin maturation profile in Kuncherinna 1 modelled using the present geotherm.

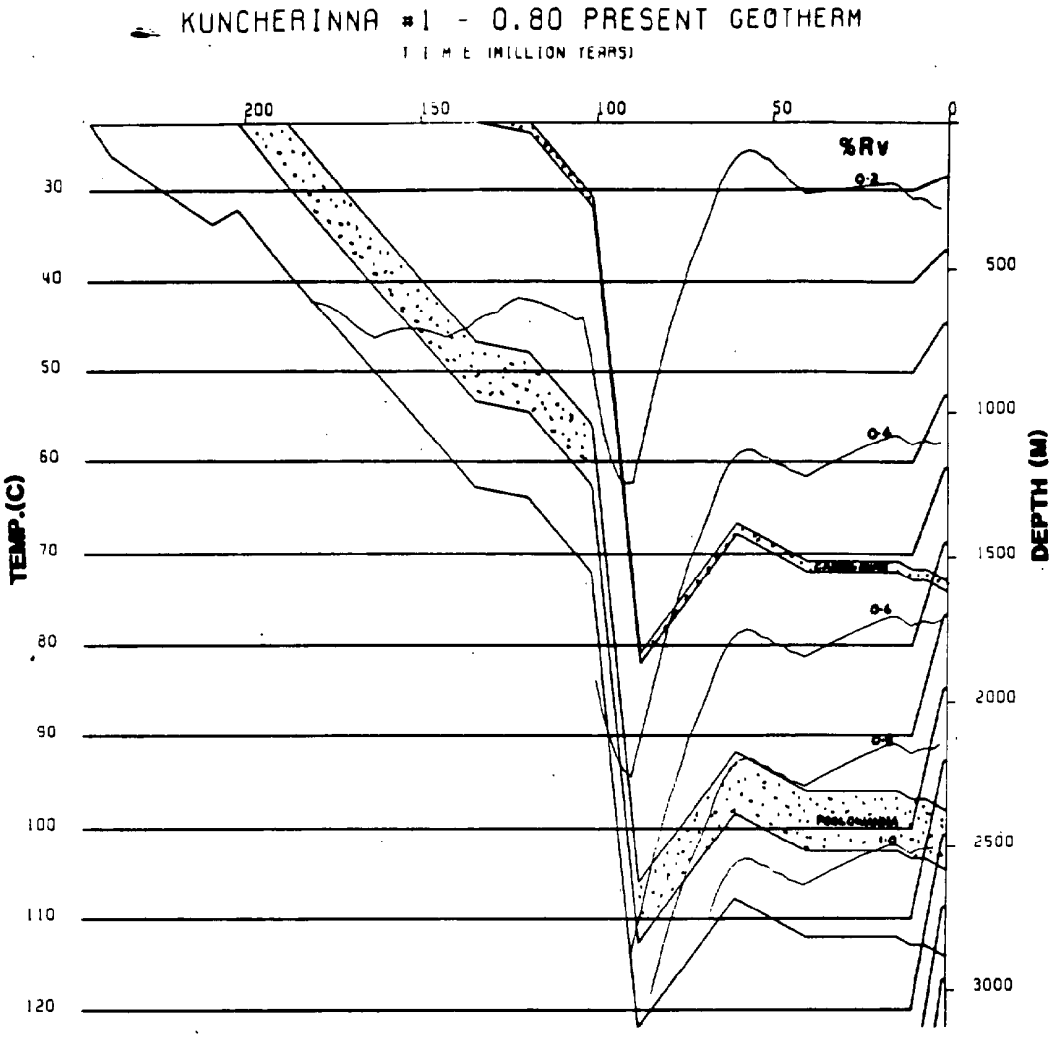

Figure: A4.8 Lopatin maturation profile in Kuncherinna 1 modelled using 0.80 of the present geotherm.

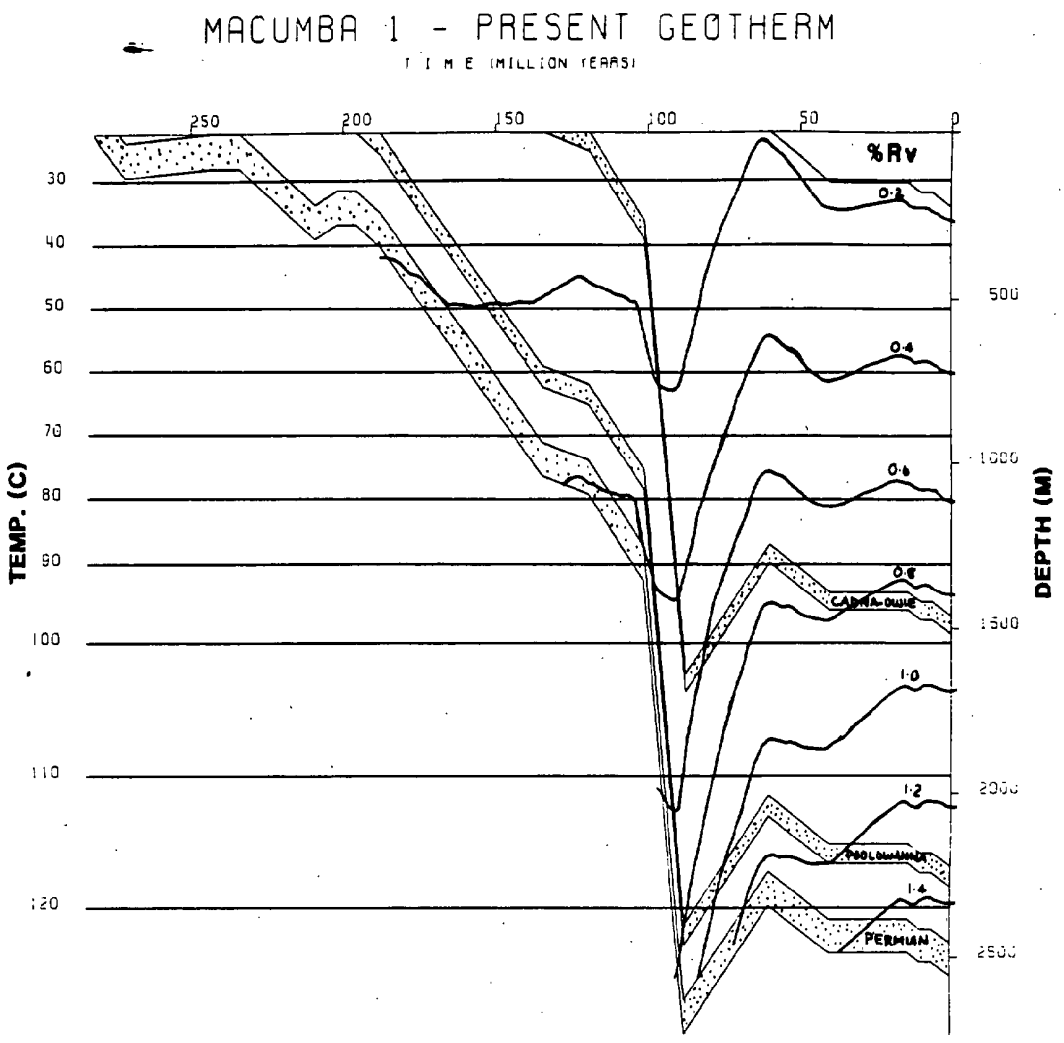

Figure: A4.9 Lopatin maturation profile in Macumba 1 modelled using the present geotherm.

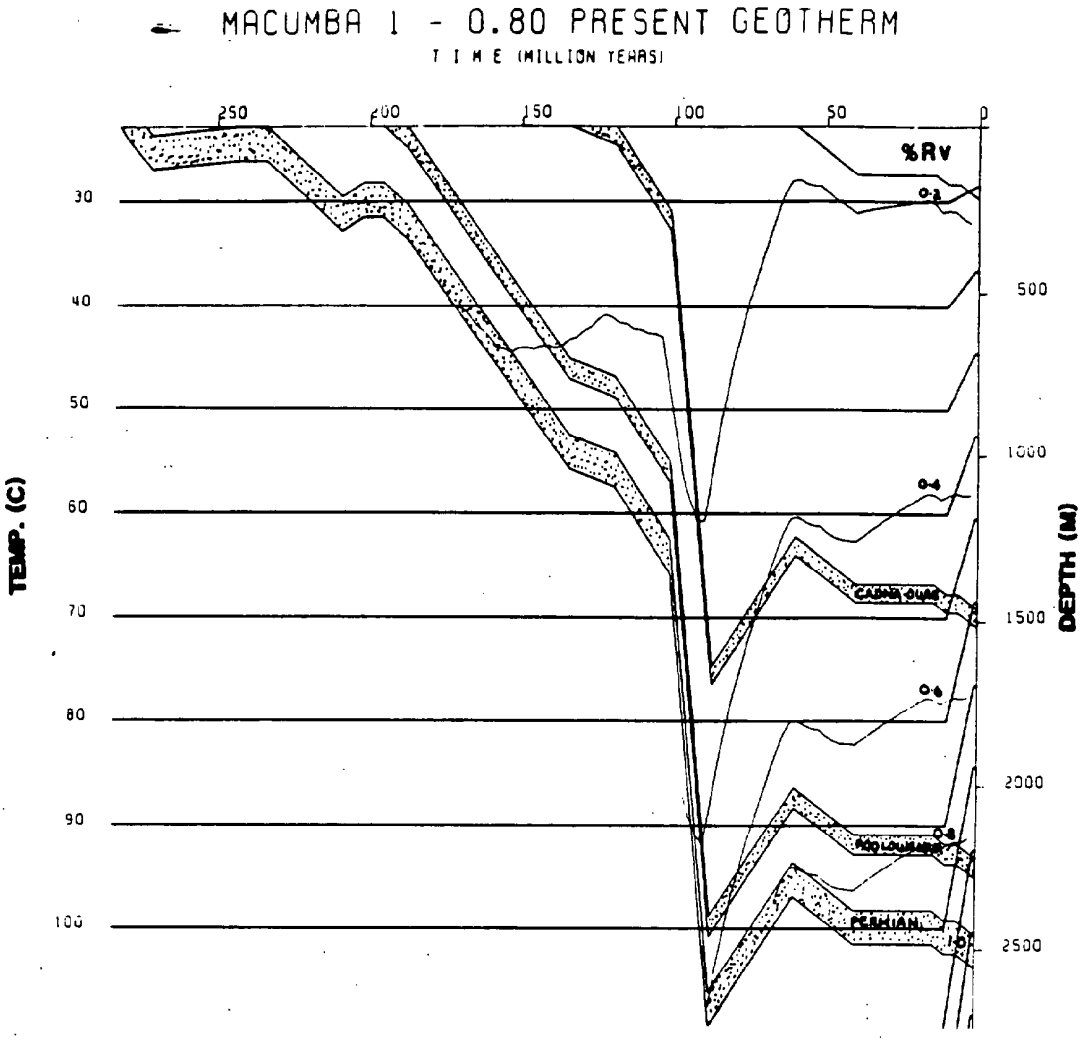

Figure: A4.10 Lopatin maturation profile in Macumba 1 modelled using 0.80 of the present geotherm.

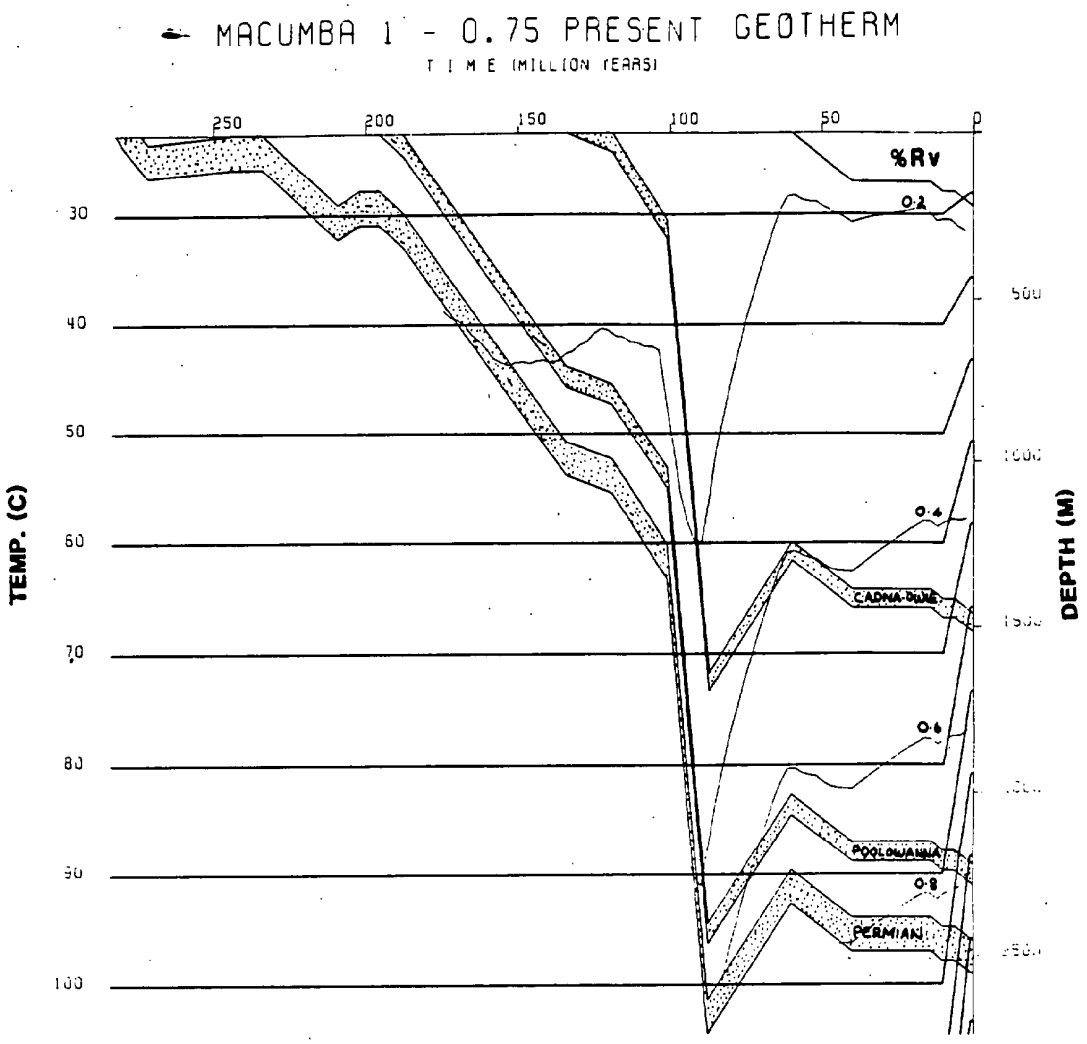

Figure: A4.11 Lopatin maturation profile in Macumba 1 modelled using 0.75 of the present geotherm.

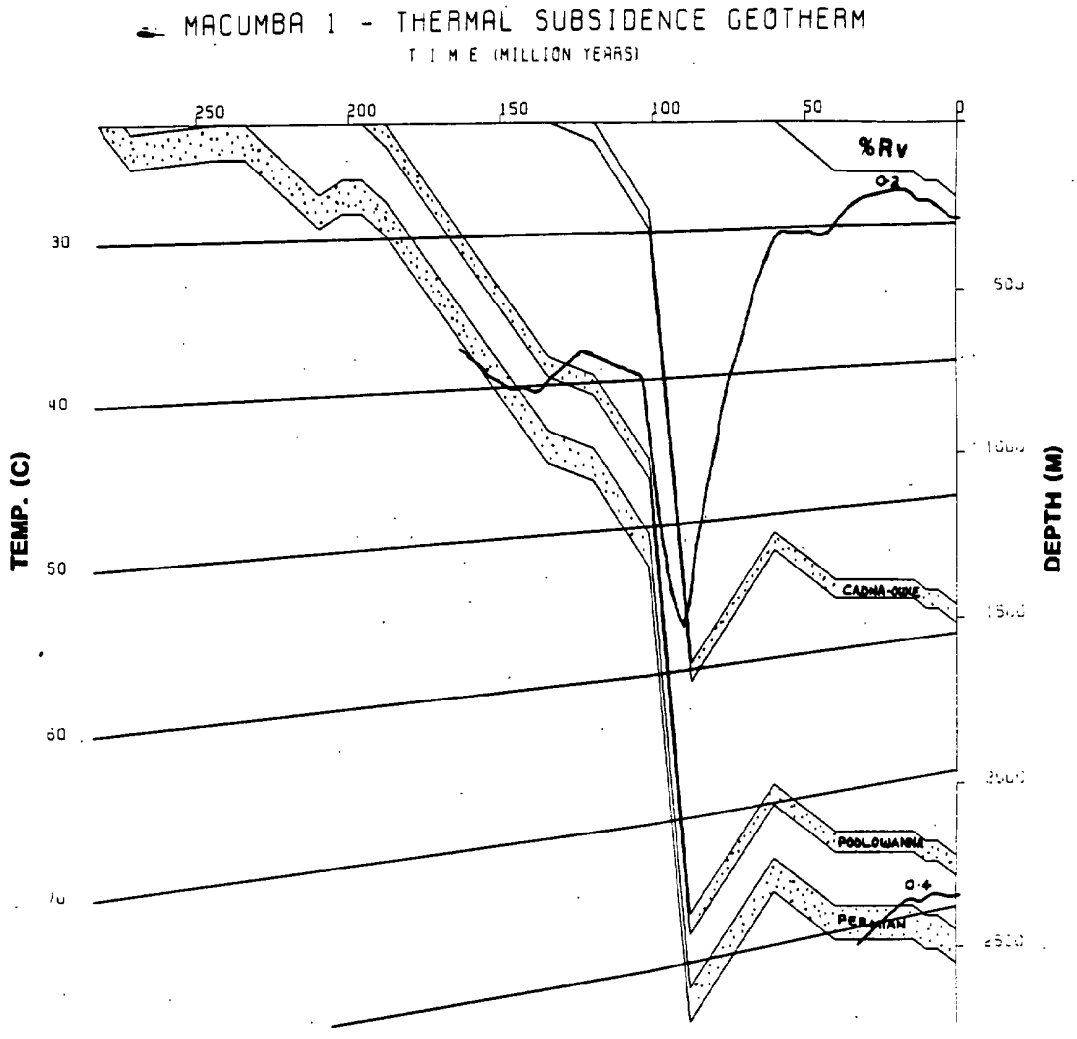

Figure: A4.12 Lopatin maturation profile in Macumba 1 modelled using thermal subsidence geotherm.

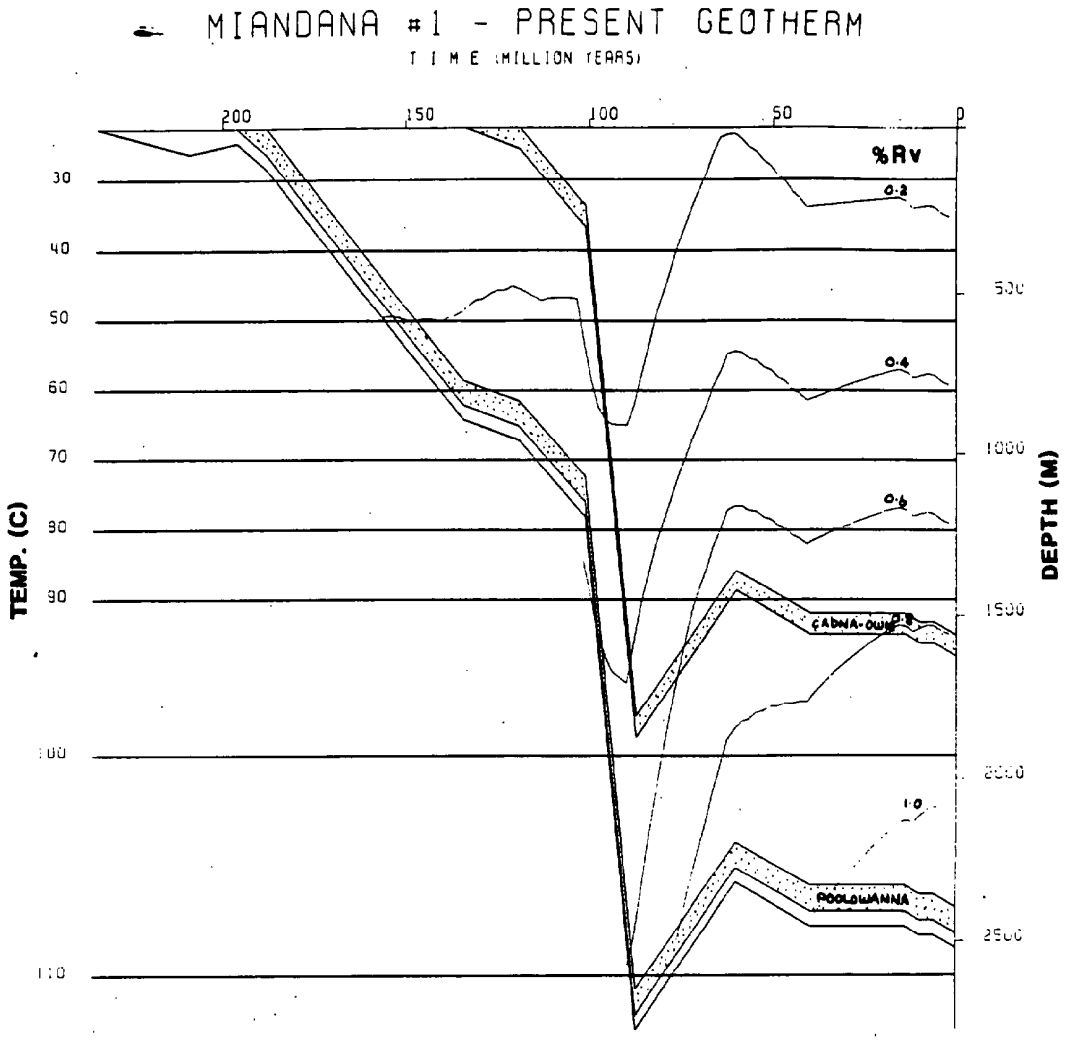

Figure: A4.13 Lopatin maturation profile in Miandana 1 modelled using the present geotherm.

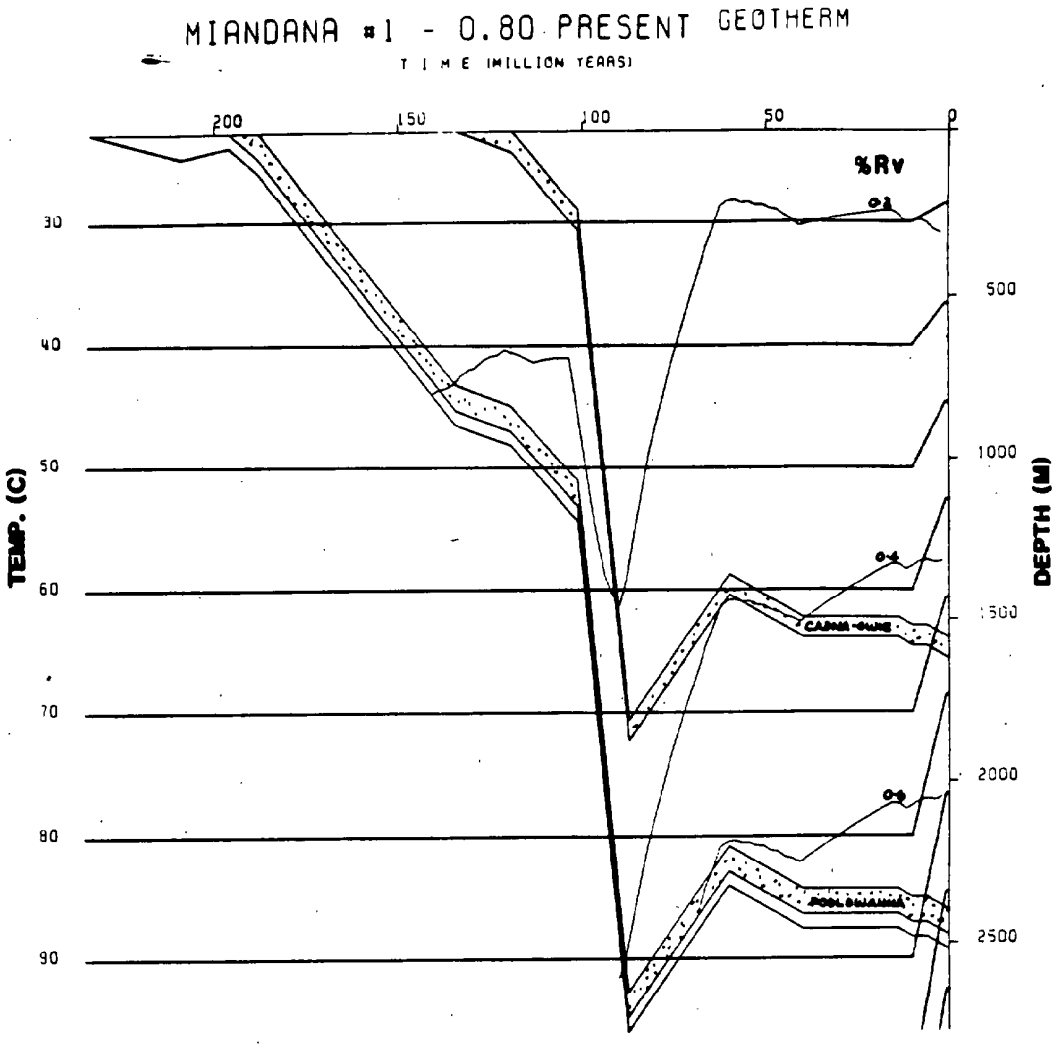

Figure: A4.14 Lopatin maturation profile in Miandana 1 modelled using 0.80 of the present geotherm.

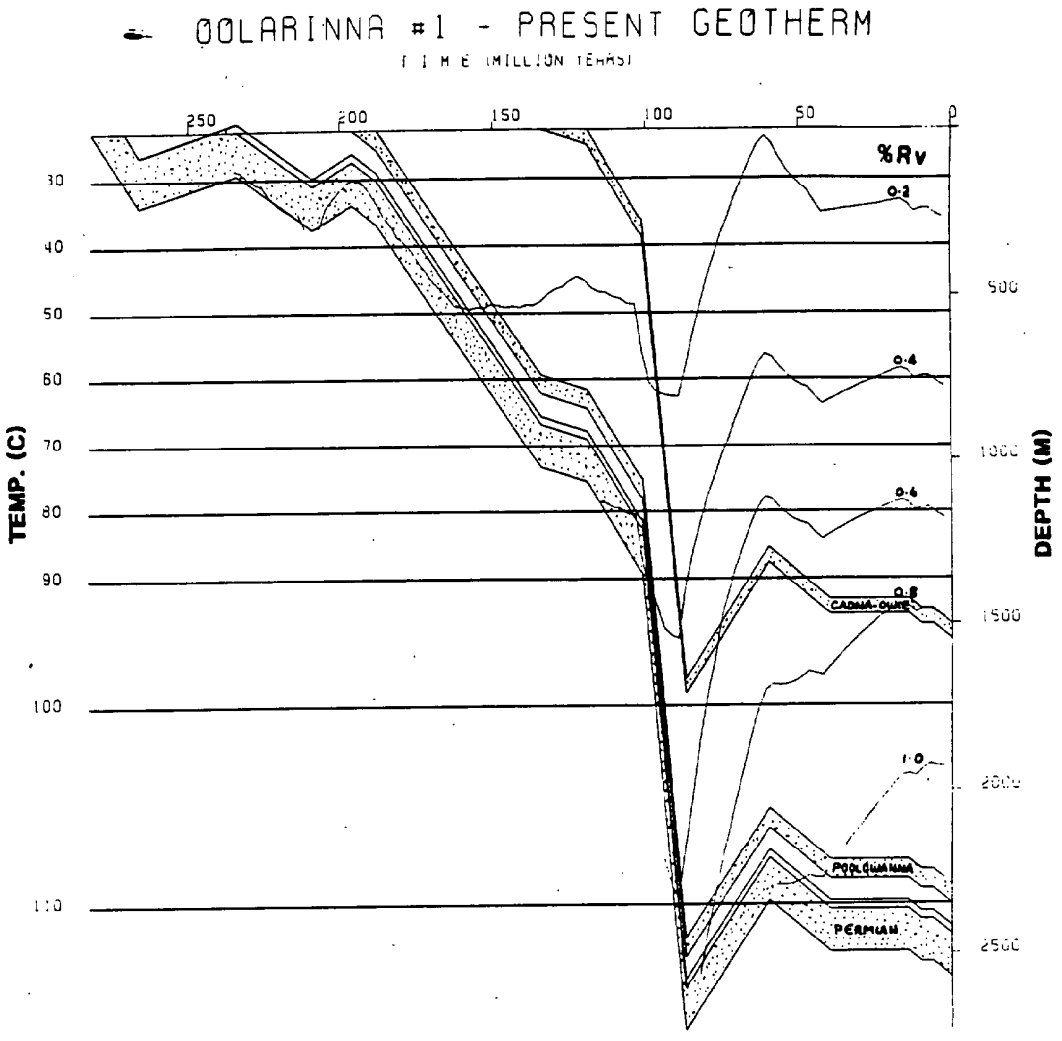

Figure: A4.15 Lopatin maturation profile in Oolarinna 1 modelled using the present geotherm.

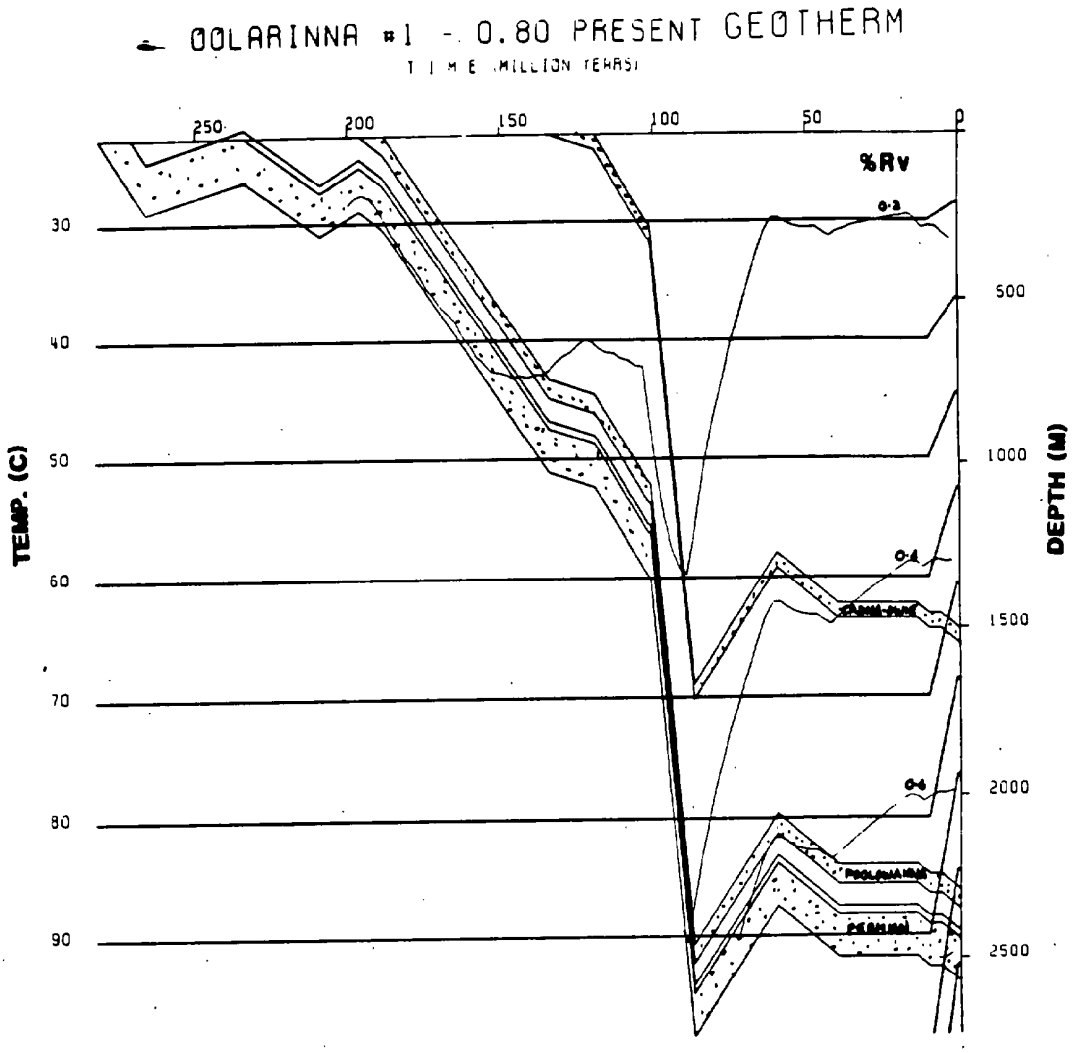

Figure: A4.16 Lopatin maturation profile in Oolarinna 1 modelled using 0.80 of the present geotherm.

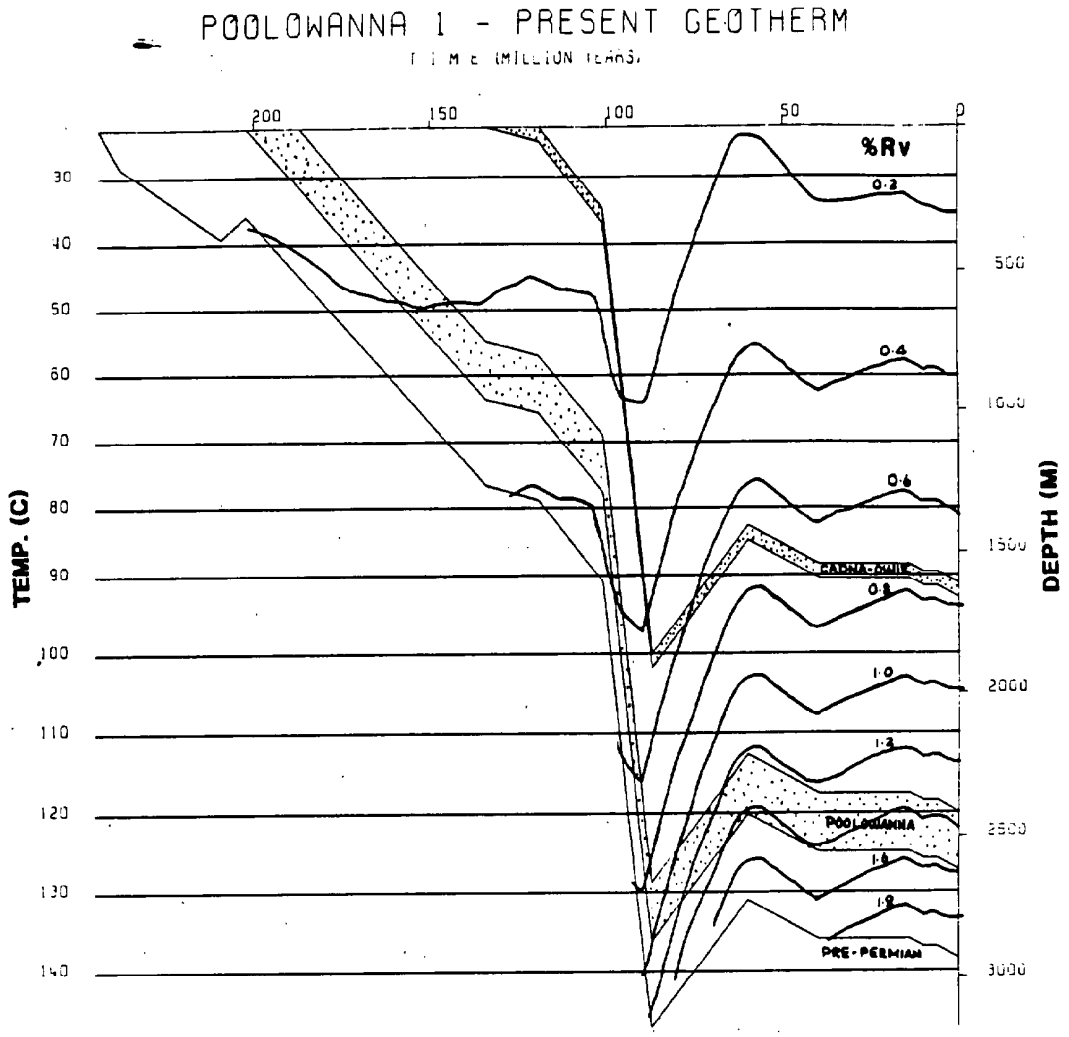

Figure: A4.17 Lopatin maturation profile in Poolowanna 1 modelled using the present geotherm.

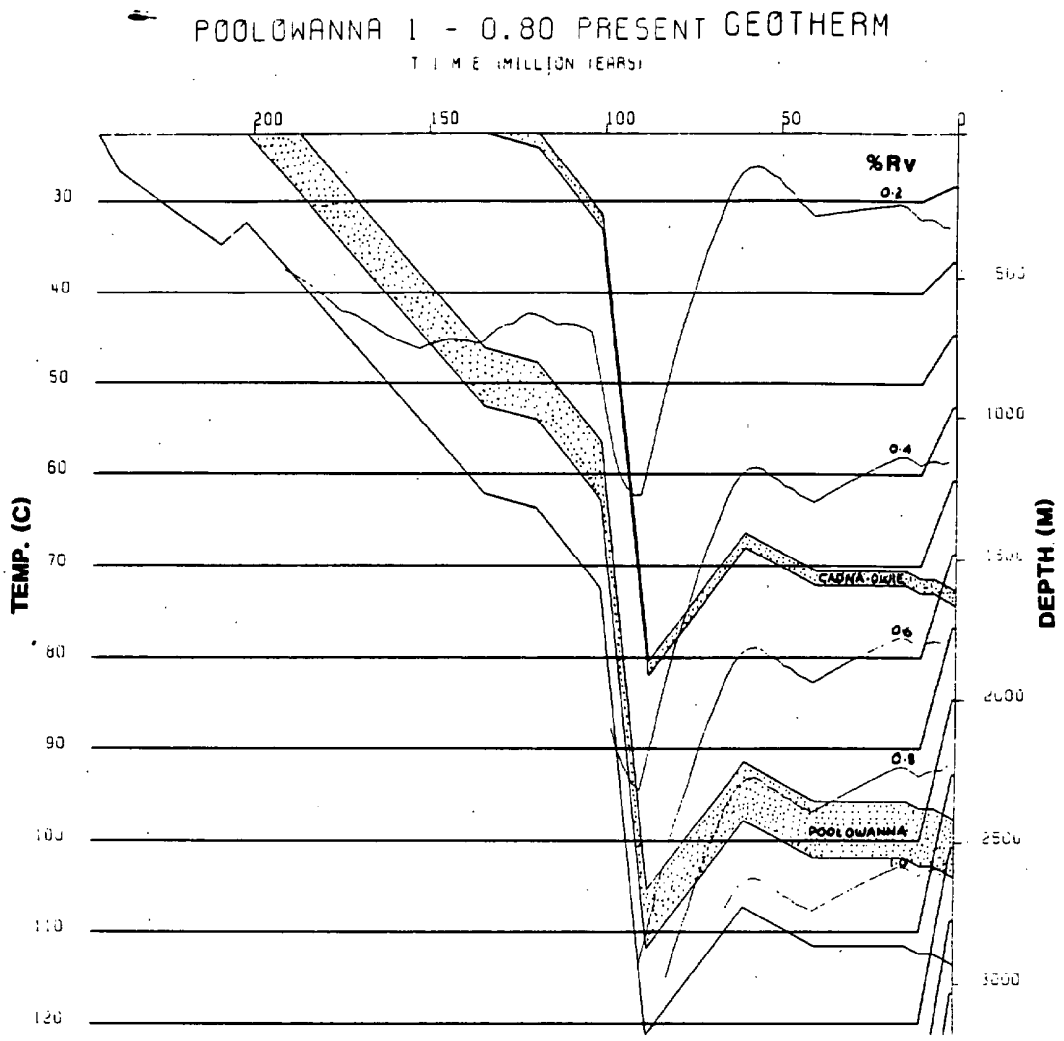

Figure: A4.18 Lopatin maturation profile in Poolowanna 1 modelled using 0.80 of the present geotherm.

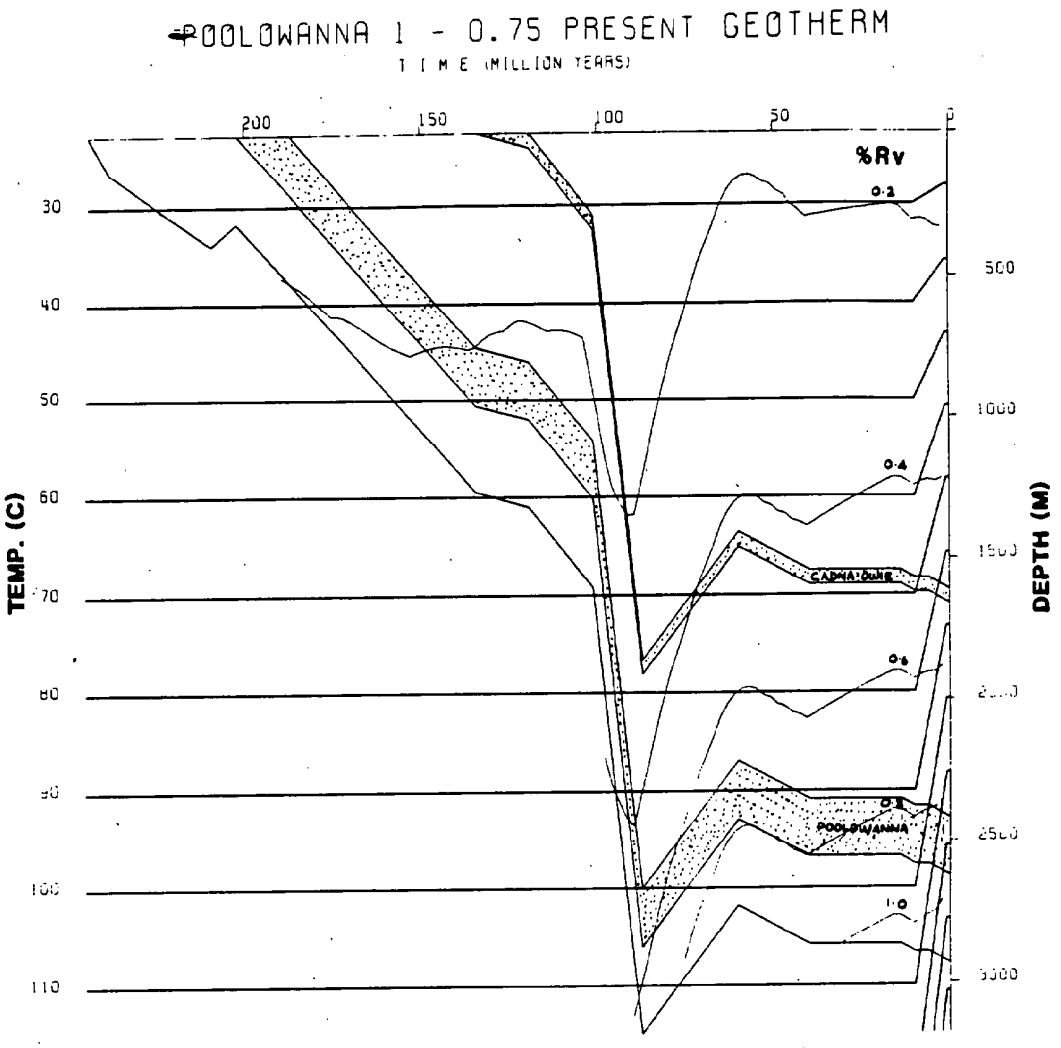

Figure: A4.19 Lopatin maturation profile in Poolowanna 1 modelled using 0.75 of the present geotherm.

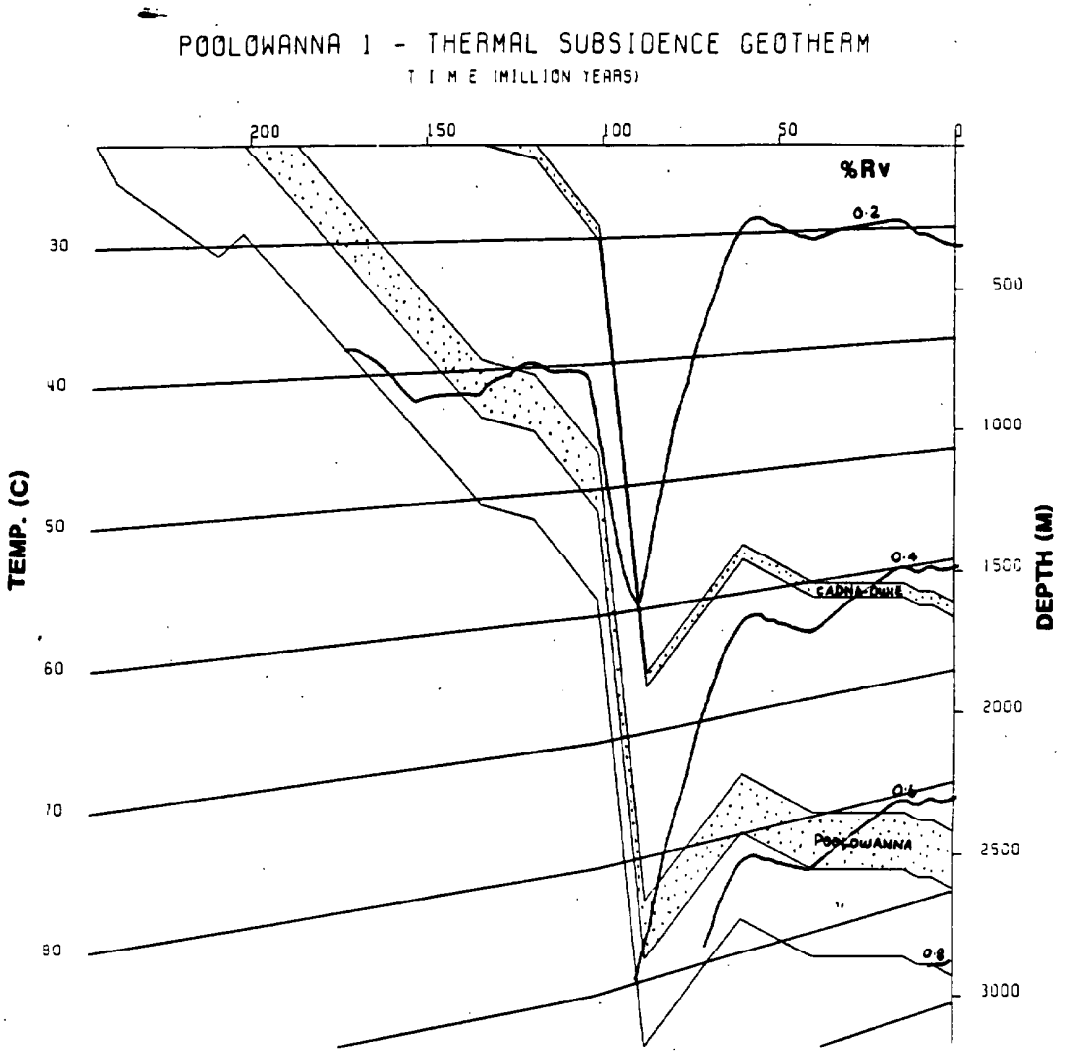

Figure: A4.20 Lopatin maturation profile in poolowanna 1 modelled using thermal subsidence.

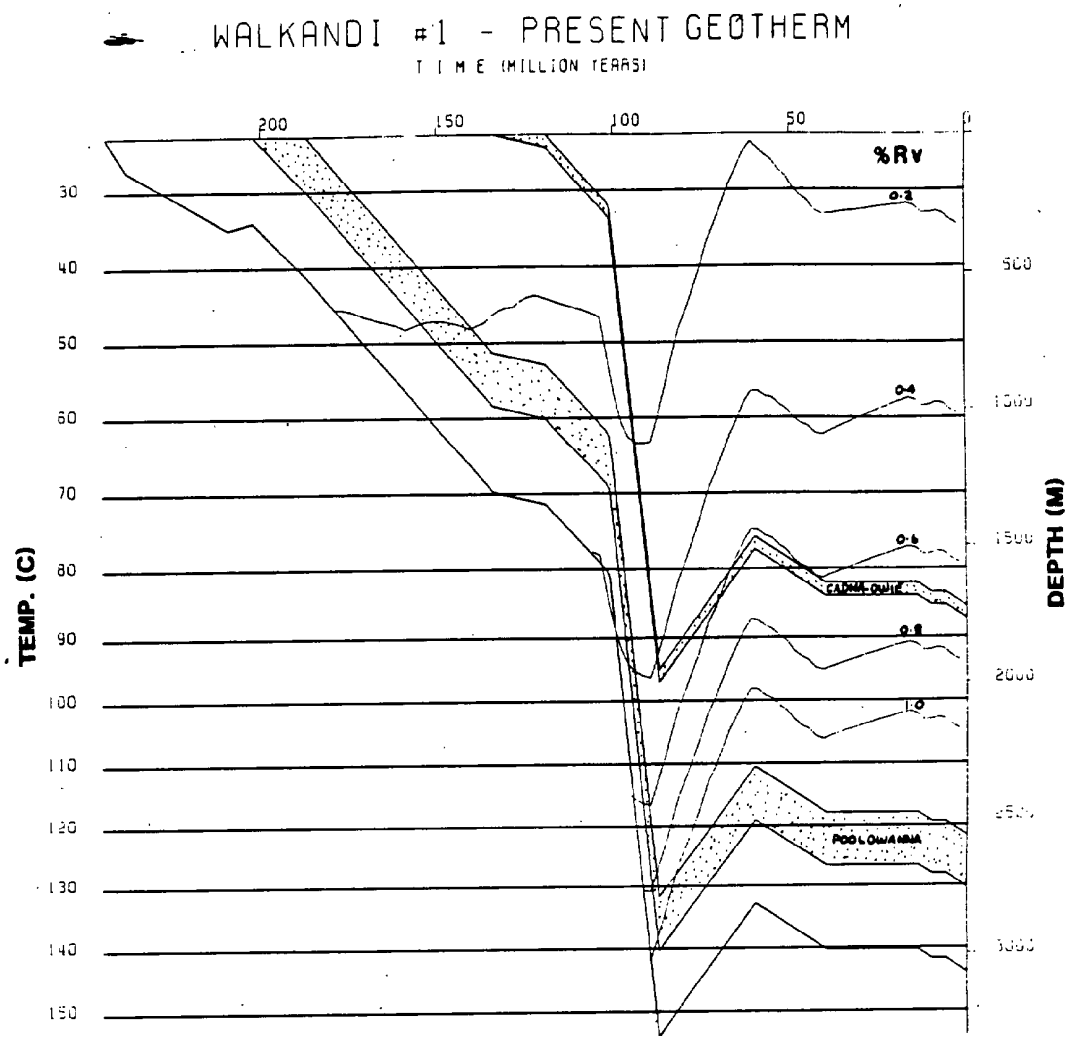

Figure: A4.21 Lopatin maturation profile in Walkandi 1 modelled using the present geotherm.

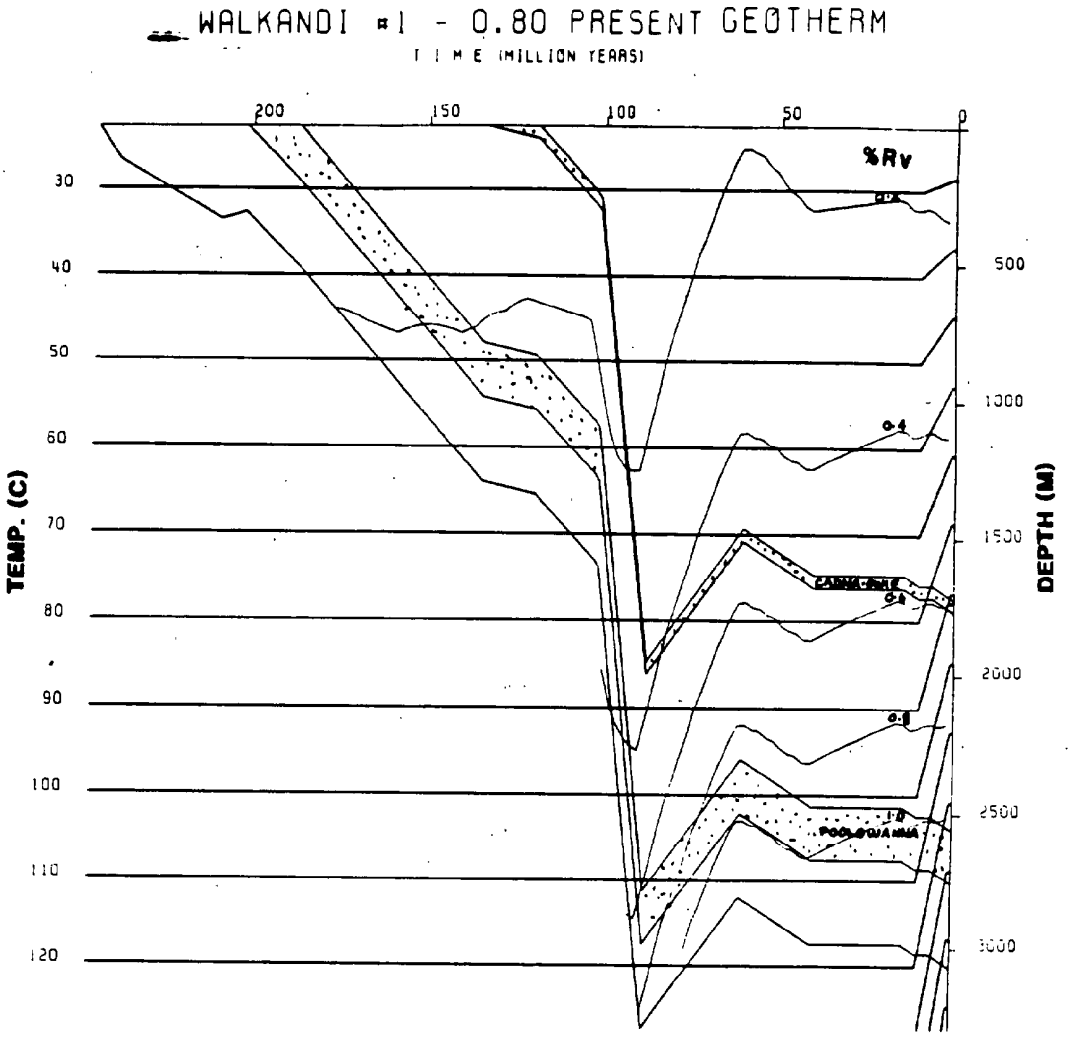

Figure: A4.22 Lopatin maturation profile in Walkandi 1 modelled using 0.80 of the present geotherm.

APPENDIX 5

WESTERN LIMIT OF THE BIRKHEAD FORMATION

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Regional Studies Group
October 1985

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SEISMIC MAPPING

INTRODUCTION

Investigation of seismic data was carried out in an attempt to map the western limit of the Birkhead Formation shaly facies. Beyond this limit, the formation ceases to be an effective seal impeding the vertical migration of hydrocarbons. The Birkhead Formation has been intersected in all wells drilled on or adjacent to the eastern flank of the Birdsville Track Ridge but is found to be absent in wells located to the west of the Ridge (with the exception of Poonarunna 1). Wells in the Pedirka sector do contain shaly intervals at approximately the same stratigraphic position as the Birkhead formation to the east, but are not regarded as being part of the Birkhead and as such may be regarded as having limited sealing capabilities.

SEISMIC MAPPING

It was hoped that limits could be mapped by following the 'E' seismic reflector (top Birkhead Formation) until the character changed significantly, becoming poorly defined. Where the Birkhead Formation is present (based on well data), the interface between it and the Adori Sandstone is represented seismically by a relatively weak peak due to the small contrast in acoustic impedance between carbonated cemented sandstones and carbonaceous shales.

The peak response is a result of a negative reflection coefficient (by convention) which is a function of the product of velocity and density within formations either side of an interface. The sign of the reflection coefficient is determined by the relation:

$$R = \frac{\rho_2 V_2 - \rho_1 V_1}{\rho_2 V_2 + \rho_1 V_1}$$

For this to remain negative, the product of density and velocity within the Birkhead Formation ($\rho_2 V_2$) must remain less than that of the Adori Sandstone ($\rho_1 V_1$).

From well data, the sand content of the Birkhead Formation increases to the west reflecting a change from a low energy lacustrine environment to a higher energy fluvial one. As a result of this, the value of $\rho_2 V_2$ will increase to the west. This has the effect of reducing the amplitude of the peak response and providing that $\rho_1 V_1$ does not increase greatly relative to $\rho_2 V_2$, the reflection coefficient will become positive, producing a change in character from a peak to a trough.

However if $\rho_1 V_1$ does increase greatly (i.e. if the Adori Sandstone becomes more cemented or shaly) then the reflection coefficient will remain negative resulting in a peak response no matter how sandy the Birkhead Formation becomes. Alternatively, if the Adori Sandstone increases its porosity more than the Birkhead Formation (i.e. becomes coarser and less cemented) the Adori interval velocity will decrease as is shown by the equation

$$\frac{1}{V} = \frac{\phi}{V_f} + \frac{1-\phi}{V_m}$$

where V_f = velocity of pore fluids, V_m = velocity of matrix and ϕ = porosity.

This has the same effect on the reflection coefficient (i.e. becomes positive) as the increase in sand content of the Birkhead will have. Hence two different circumstances can result in the same character change thus making it very difficult to determine whether the Birkhead is becoming sandy while the Adori remains lithologically constant or if the Birkhead has remained shaly while the Adori is becoming more porous.

While a character change may not represent a facies change attributable soley to the Birkhead Formation, it was still feasible to try and produce a map showing the limit of the peak response. This is because the Birkhead Formation is known geologically to change facies to the west and even though the Adori Sandstone is also known to increase its porosity in this direction, the change in porosity was not expected to mask the effect caused by the Birkhead Formation facies change.

The production of such a map proved extremely difficult because of the discontinuous nature of the E reflector, even in areas where Birkhead shale facies is known to exist. This discontinuous character may be the result of layers within the basal Adori Sandstone being highly cemented by carbonate, thus producing a reflection. Where the separation between such layers and the top of the Birkhead Formation thins to below a quarter of a wavelength (approximately 50 feet at this depth), the responses from each suffers side-lobe interference resulting in a discontinuous reflection.

In addition, areas which are known not to have any Birkhead facies (i.e. Kuncherinna area) still show a similar discontinuous character due to the existence of thin intermittent shales at approximately the same stratigraphic level. Hence it is not known whether the reflector being followed is one generated by the top of the Birkhead Formation, laterally equivalent thin shales within the Algebuckina Sandstone, or calcareous sandstones within the basal Adori Sandstone.

Seismic coverage across the Birdsville Track Ridge is sparse, with only 2 traverses across the Ridge being possible. As a result, the reflector could only be traced to the end of some Cooper Sector lines without being tied back into a loop. Hence the reliability of mapping the same reflector is greatly reduced. Because of this and the discontinuous nature of the E reflector, it is felt that the task cannot be accomplished until more infill is done in the area with a view to resolve this problem.

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APPENDIX 6

STRUCTURAL DEVELOPMENT OF THE BIRDSVILLE TRACK RIDGE

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Regional Studies Group
September 1985

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INTRODUCTION

A preliminary investigation of the timing of structural phases effecting the Birdsville Track Ridge (BTR) was carried out using seismic sections datumed on several reflectors, to show structural growth with time. Seismic coverage on the ridge is generally sparse, and only two lines link the Poolowanna Trough sequence to that on the BTR. Coverage on the eastern flank is much denser and of superior quality.

EXTENT OF EARLY PERMIAN DEPOSITION

In the vicinity of the BTR, Early Permian strata are confined to the eastern flank within the Patchawarra Trough. This sequence shows only slight thinning from the trough, toward an erosional zero edge on the eastern flank. Thus Early Permian deposition possibly extended further to the west prior to mid-Permian uplift. Hence the BTR was probably a weak positive feature during the Early Permian. Whether the the section encountered in the Patchawarra Trough was originally in communication with the Pedirka Basin sequence to the west, which contains sediments of similar age and affinity, is not known, and correlative sediments are not preserved on the western flank.

MID-PERMIAN UPLIFT

Regional uplift in the mid-Permian resulted in the emergence of the BTR as a positive feature. Trough areas of the Cooper Basin were uplifted to the extent that erosion stripped sediment to the level of the Daralingie beds (in most areas). Erosion continued on the BTR, to the extent that no Early Permian sequence is preserved on the crest or to the immediate west. On the eastern flank, Early Permian strata show an angular relationship to the unconformity with shallow easterly dips, which result in consecutively older units subcropping toward the ridge.

Because the eastern dip of Early Permian strata is shallow, it follows that the positive expression of the BTR was not one of mountainous proportion. It was probably more of a low gradient, broad regional feature.

LATE PERMIAN DEPOSITION

Late Permian deposition represented by the Toolachee Formation is restricted to the east of the BTR. The relationship of this unit with the ridge is probably one of gradual onlap from east to west. Adjacent to the ridge, the westerly extent of the Toolachee Formation is variable over subcropping Early Permian strata. No Toolachee Formation correlative is present on the western side of the BTR. During this time, relief on the ridge probably was not great. Although it was a positive feature, dips on the eastern flank were gentle enough to allow paludal deposition in adjacent areas.

The Toolachee Formation zero edge, although eroded in the south (due to exposure by later uplifts), is probably depositional where the overlying Nappamerri Formation extends further to the west. In these same areas, the Nappamerri Formation edge is also interpreted to be depositional.

EARLY TRIASSIC DEPOSITION

Early Triassic deposition is marked by the widespread development of red beds. During this time, the Nappamerri Formation was deposited in the Cooper Basin region with depocentres in northern Queensland (Windorah Trough) and south of the Jackson-Naccowlah Trend. As deposition continued, the Nappamerri Formation onlapped the ridge which was then a low relief positive feature.

To the west of the BTR, the Walkandi Formation was deposited with its depocentre in the Poolowanna Trough. The unit thins onto the BTR from west to east, due to gradual onlap onto Cambrian carbonates and clastics of the Kalladeina Formation. Gradual thinning from north to south is also apparent. The rate of thinning is reduced east of the Kuncherinna Trend, indicating that growth of the ridge during this time was minimal. In places, local thinning over basement structures on the western flank is evident, superimposed on regional thinning to the east.

Exact time correlation between the Walkandi Formation and the Nappamerri Formation is uncertain due to the lack of age control in the upper units of the Nappamerri Formation and basal units of the Walkandi Formation. However, the formations are regarded as being eqivalent in part (Price et al., 1985).

EXTENT OF LATE TRIASSIC DEPOSITION AND TECTONISM

West of the BTR, subsidence of the Simpson Desert Basin continued and the Peera Peera Formation accumulated conformably on Walkandi Formation red beds. To the east, in the Patchawarra Trough, seismic evidence in the Packsaddle region suggests that a slight angular relationship exists between the Nappamerri Formation and the overlying Upper Triassic strata. This relationship becomes disconformable in the Patchawarra Trough and adjacent to the BTR.

To the west of the ridge structuring of the N seismic horizon (top Walkandi/Nappamerri Formation) is evident during mid-Triassic time with the local development of horst and graben features along the western flank. The Peera Peera Formation thins over highs, thickening off structure into syndepositional grabens and faults. Faults do not intersect the L seismic horizon (top Peera Peera Formation), indicating a period of structural quicsence prior to Late Triassic uplift.

The Peera Peera Formation thins regionally to the east, onlapping the ridge beyond the Walkandi Formation zero edge. Only the uppermost units are deposited in the more crestal areas of the ridge. Where the Peera Peera conformably overlies the Walkandi Formaiton, interval thinning to the east is also present, indicating some uplift of the ridge during this time. This is supported by the existance of structures and faulting at N horizon level.

This phase of uplift was probably confined to the early Late Triassic with tectonic activity being much reduced by late Peera Peera time (basal Bundamba assemblage - PT5). Log correlation of the present day top of the Peera Peera Formation shows similar lithologies on the ridge to those in more basinal areas (i.e. depositional environment on the ridge was similar to that in the Poolowanna Trough at this time except for a slightly higher sand/shale ratio).

Triassic units on both sides and on top of the ridge thin regionally to the south. This thinning is probably the result of a complex interplay between onlap of Triassic units and erosion attributable to two seperate uplifts (pre-Peera Peera and per-Jurassic).

The uppermost unit of the Upper Triassic (the Beanbush beds) is absent on the eastern flank of the ridge (along the Charo Trend). This may possibly indicate that the area was the ridge axis in the Late Triassic, although it is not apparent on the seismic line datum plots. However it is probable that the uppermost Peera Peera Formation and the Beanbush beds were stratigraphic equivalents prior to the Late Triassic/Early Jurassic uplift.

LATE TRIASSIC/EARLY JURASSIC UPLIFT

Uplift in the Late Triassic/Early Jurassic terminated deposition in both the Poolowanna and Patchawarra Troughs and is a regionally documented event. Most intense uplift was in southern areas imposing a regional tilt toward the north which resulted in the Jurassic depocentre shifting to the northwest relative to Triassic depocentres. This effect is seen in the southern Patchawarra Trough where Permian sediments subcrop beneath the Early Jurassic Poolowanna Formation. To the north, progressively greater thicknesses of Triassic sediment are encountered.

In the Poolowanna Trough, the top of the Peera Peera Formation appears to be a correlative unit across the area, indicating that erosion was due to regional emergence rather than local uplift and folding.

EARLY JURASSIC DEPOSITION

Renewed Early Jurassic subsidence resulted in the widespread deposition of the Poolowanna Formation. This unit blankets the ridge in the northern part but onlaps the then northerly plunging high in the southern areas. The formation as a whole thins slightly to the east (from the Poolowanna Trough) and to the south (toward the basin margin).

No L seismic reflector is mapped on the ridge, but the Jl-Z (top Poolowanna Formation to basement) interval as a whole, thins onto the ridge from both sides, reaching its thinnest point northwest of Koonchera 1. This interval shows a relatively large amount of local thinning over basement structures, which may be due largely to onlap of uppermost Triassic units.

Down the axis of the ridge, the Jl-Z time interval is regionally constant (with minor local thinning) in the northern area but thins dramatically toward the Mulka Block. It is in this southern area that the Poolowanna Formation onlaps the ridge. On the eastern flank, the Jl-Z time interval thickens into faults. This and local time thins suggest syndepositional activity during this period, which mainly effects the Triassic strata.

MIDDLE JURASSIC DEPOSITION

The Hutton Sandstone is not recognised as a unit west of the Birdsville Track Ridge due to facies change. Beyond this point, it has a correlative section in the lower part of the Algebuckina Sandstone. However, a time line approximating the top of the Hutton Sandstone, can be traced west of the ridge. Both the Hutton and Algebuckina Sandstones were deposited conformably on the Poolowanna Formation as the environment of deposition changed from moderate to high energy fluvial (meandering or anastomosing -channel), to a braided fluviatile environment.

The Hutton Sandstone and correlatives show minimal thinning in the northern areas, the thinnest point again being close to Koonchera 1. To the south, the interval does thin, eventually onlapping a palaeo-high in the Mulka Block (Mungeranic). Slight local variations in thickness do occur but these may be attributed to lateral facies changes at the Birkhead Formation/Hutton Sandstone interface. However, some growth is apparent with the Hutton Sandstone thickening into and draping over faults which penetrate the Poolowanna Formation. This phase of structuring was probably localized, causing some roll over at J1 level on the BTR and to the west in the Poolowanna Trough.

The restricted distribution of shaly facies (e.g. Birkhead Formation) west of the ridge indicates that the BTR was a major control on sedimentation by late Hutton time.

EARLY CRETACEOUS DEPOSITION

Eary Cretaceous deposition is represented by the Murta Member and Cadna-owie Formation west of the BTR and by the uppermost Algebuckina Sandstone and Cadna-owie Formation west of it.

The C-H time interval (Cadna-owie to top Hutton) is relatively constant in thickness across the ridge, with some thinning apparent in the axial areas. To the west, the interval remains constant out to the Kuncherinna Trend, beyond which it begins to thicken. Local thinning occurs in some areas but in the same region, the C to J1 interval is approximately constant. Thus such apparent thinning may be the result of facies changes at the Birkhead/Hutton interface.

Along the axis of the ridge, the C-H interval is relatively constant except for the southern-most end, which shows a large amount of thinning over the Mungeranie structure due to onlap. Ridge activity is interpreted to be low during this time, allowing Eromanga Basin sediments to onlap and eventually completely cover the ridge.

TERTARY UPLIFT

Uplift due to Tertary movements occured along the entire length of the ridge. This regionally documented event resulted in an unconformity at the top of the Winton Formation. This phase of structuring resulted in the development of prominant C horizon rollovers, giving the ridge a strong, present-day surface expression. Relief on such rollovers is greater in the south where further uplift and folding of Mungeranie occured. The present axis of the ridge coincides with previous apices (based on the thinnest point of each time interval investigated), with localized development of low relief structures superimposed on broad anticlines.

To the west on the flank region, structural relief is increased. Faulting during this time is mainly confined to crestal areas with some faults intersecting the top of the Hutton Sandstone on the flanks.

CONCLUSIONS

This study reveals the following points:

1. The Birdsville Track Ridge was present as a positive feature since the late Early Permian.

2. A phase of activity in the mid Triassic produced some rollovers of the N seismic reflector with associated faulting. A northerly plunge to the north is indicated at this stage. Uplift was responsible for a mid-Triassic disconformity east of the BTR.

3. Major uplift in the Late Triassic/Early Jurassic produced a regional unconformity.

4. Continuation of the waning structural phase into the Early Jurassic resulting in minor roll overs at the J1 horizon, some of which may be due to drape.

5. Low levels of structural activity with slow uplift are indicated throughout the remainder of the Jurassic and Cretaceous. Drape of the H horizon over basal Jurassic faults is noted. Eromanga Basin units onlap the ridge to the south.

6. Uplift and erosion with associated faulting and folding occurred in the Tertary. This was the strongest structural event since the late Early Permian event.

7. Slight subsidence and accumulation of the Eyre Formation concluded the structural history.

APPENDIX 7

APPRAISAL OF 1985 PEDIRKA SECTOR WELLS

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Regional Studies Group
December 1985

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3.3 MIANDANA 1

3.4 OOLARINNA 1

1.0 INTRODUCTION

Pedirka sector wells drilled in 1985 are rated here according to a scheme currently under development to critically assess the causes of success and failure of individual plays in exploration wells. This assessment is carried out in the form of a rating for the geological factors of structure, reservoir, seal, source and maturity. Most factors are divided into two aspects usually relating to quantity and quality.

Only the wells Oolarinna 1, Minadana 1, Glen Joyce 1 and Killumi 1 are rated here, because Poolowanna 2 was drilled down dip to Poolowanna 1.

2.0 FACTORS RATED

2.1 STRUCTURE

The aspects of structure which are rated are closure and growth.

The magnitude of closure is in the case of exploration wells regarded as a measure of seismic reliability. Given a maximum stratigraphic uncertainty of about 80' in the Cooper-Eromanga Basins, closure of > 20ms (=80') is taken as indicative of certain closure in a prospect. Lesser amounts of closure are rated as below:

Closure (ms)	Rating
>20	Good
10-20	Adequate
5-10	Fair
<5	Poor
Absent	Absent

The amount of C to H, C to J1 or C to E growth (or conversely thinning) is here used as a measure of the likelihood of structure existing at the time of generation, given that significant generation took place mainly post-deposition of the Cadna-owie Formation in all areas except for the central Nappamerri Trough. This assumes that significant generation was associated with vitrinite reflectance levels of > 0.6%.

Thus, evidence of thinning on a structure (= growth of the structure) immediately prior to deposition of the Cadna-owie Formation implies a higher probability of favourable timing, compared with a structure which shows no thinning and is merely the result of recent structuring.

Growth as a measure of timing is rated as below:

Growth (ms)	Rating
>30	Good
20-30	Adequate
10-20	Fair
0-10	Poor

2.2 RESERVOIR

The two aspects of reservoir which are rated are presence (or absence) and porosity.

Porosity is rated post-well as a measure of reservoir quality, The ratings and probabilities are set out as below:

Porosity (%)	Rating
>15	Good
10-15	Adequate
6-9	Poor to Fair
<6	Tight (unproducable)

A complication not dealt with here is the possibility of reservoir stimulation in otherwise uproducable formations.

2.3 SEAL

Maximum thickness of intra-sand units is here regarded as a measure of the probability of seal adequacy (ignoring the question of faulting). Based on empirical observations (in the Permian) a seal which contains coal is given a higher rating than one which does not.

Lateral continuity is not rated, and thus for most plays considered equivalent lateral continuity is implied. Lateral continuity is probably better in coaly than non-coaly sequences, and best for the widespread Cretaceous marine shale units and Permian lacustrine shales (Murteree and Roseneath).

Thickness (ft)		Rating
NON-COALY	COALY	
>100	>50	Good
50-100	25-50	Adequate
20-50	10-25	Fair
<20	<10	Poor

It may be necessary to modify the ratings and probabilities in the light of possible faulting, although that aspect is not quantified here.

2.4 SOURCE AND MATURITY

The two aspects of source rated here are thickness and maturity. The aspect of source quality is not rated, but some adjustment may be desirable if there is evidence to differentiate source rock quality.

The thickness of potential source rocks (non-sandy rocks) at the wellsite is taken to be proportional to the source available to the particular prospect. The effective volume may be determined by maturity, depending on the distribution of maturity at and around the wellsite in relationship to the oil and gas generation windows. Coaly and non-coaly sources are not differentiated and the absence of source rock at the wellsite does not neccessarily imply no access to source.

The threshold values for rating and probability are set out below:

Thickness (ft)	Rating
>300	good
300-200	adequate
100-200	fair
0-100	poor

Maturity is measured by vitrinite reflectance separably for oil and gas, at and within 10km of the wellsite (assuming reflectance increased down dip, which does not hold in parts of the Patchawarra Trough). The threshold values chosen are calibrated by reference to Cooper-Eromanga Basin discoveries and reserves (Moore, 1985). The calibration is firm for gas but some uncertainty exists for oil.

The adoption of lower threshold values for oil would create more problems than it would solve in terms of the distribution of oils in the basin and the large number of failures to explain.

Rv (max) %		Rating
GAS	OIL	
	>1.3	Overmature
>1.0	0.8-1.3	Good
0.9-1.0	0.7-0.8	Adequate
0.7-0.9	0.5-0.7,	Marginal
<0.7	<0.5	Immature

The use of a dual rating implies that the oil- or gas-proneness of the source is known.

2.5 MIGRATION

The final factor to be considered is that of communication between source and reservoir. This is difficult to quantify and involves the problem of nominating or identifying the correct source for a particular play or discovery. However here it is likely that compensating errors will be made. For instance if a play involves a distant source because of immaturity at the wellsite, then maturity would receive a higher rating but communication a lower rating. Conversely maturity at or in the vicinity of the wellsite implies a short migration distance and thus a high probbility of communication. Therefore communication is quantified depending on the location of the inferred source as follows:

Migration (km)	Rating
<10	Good
10-40	Adequate
>40	Poor to Fair

3.0 INTERPRETATION OF WELL RESULTS

3.1 GLEN JOYCE 1

SUMMARY

STATUS:	P & A
OBJECTIVES:	Crestal test for Permian and Jurassic oil
INTERPRETATION:	Lack of success in the Permian [1] is attributed to lack of early growth, small closure and marginal maturity, assuming a gas prone source. Lack of success in the Jurassic is attributed to poor maturation, and poor early growth.

FOOTNOTES: (1) The Permian is assumed to be gas prone. If the Permian is assumed to be oil prone, then maturation would be adequate for oil generation.

(2) The play was based in part on migration from the deep Poolowanna Trough which apparently has not taken place.

PRIMARY PLAY 1:	Purni oil/gas
Structure:	Poor (<10ms closure, poor growth C to P)
Reservoir:	Present (water saturated, porosity = 10%)
Seal:	Good (300' of coaly and silty "upper" Purni Formation)
Source:	Good (500' of coaly and silty Purni Formation)
Maturation:	Prog. Adequate (Rv = 0.7% at wellsite, 0.8% within 10 km.)
SECONDARY PLAY 1:	Algebuckina oil
Structure:	Poor (<10ms closure, probably limited early growth)
Reservoir:	Present (water saturated, porosity = 19%)
Seal:	Good (150' of shaly Cadna-owie Formation)
Source:	Poor, see SECONDARY PLAY 2 (Cadna-owie is immature)
Maturation:	Prog. poor, see SECONDARY PLAY 2 (Cadna-owie Formation is immature, Rv = 0.40% wellsite, 0.45% within 10 km)
SECONDARY PLAY 2:	Poolowanna oil
Structure:	Fair (20ms closure, limited early growth C to J1)
Reservoir:	Present water saturated, porosity = 13%
Seal:	Fair (several shaly and coal intervals to 30' thick, probably laterally discontinuous
Source:	Poor (aggregate of 60' of shaly and coaly Poolowanna Formation)
Maturation:	Prog. poor (Rv = 0.6% at wellsite, 0.7% within 10km)

3.2 KILLUMI 1

SUMMARY

STATUS:	P & A
OBJECTIVE:	Crestal test for Triassic gas, Jurassic/Cretaceous oil and Permian gas
INTERPRETATION:	Failure in the Triassic is attributed to a source/-maturation problem. Failure of the Poolowanna and Algebuckina oil play assuming a gas and not oil prone source is attributed primarily to poor source.
FOOTNOTES: (1)	The Triassic and Permian are coaly and assumed to be gas prone.
(2)	The Permian is given a prognosed rating of adequate for gas maturation.
(3)	The prospect was based in part on a concept of longer range migration from the deep Poolowanna Trough which it appears has not taken place.
PRIMARY PLAY 1:	Algebuckina oil
Structure:	Adequate (closure of 20ms, C to J1 thinning of 30ms)
Reservoir:	Present (thick water saturated sands, porosity = 11 to 16%
Seal:	Good (163' of silty Algebuckina overlain by Wallumbilla)
Source:	Poor, see PRIMARY PLAY 2
Maturation:	Prog. adequate, see PRIMARY PLAY 2 (Cadna-owie prognosed immature at RV=0.45%
PRIMARY PLAY 2:	Poolowanna oil
Structure:	Adequate (closure of 40ms, 10ms is fault dependent, C to J1 thinning of 30ms)
Reservoir:	Present (several water saturated sands, porosity = 12%)
Seal:	Poor (several siltstones to 15' thick, probably discontinuous)
Source:	Poor (aggregate of about 100' of siltstone only)
Maturation:	Prog. good (RV = 0.80% at the wellsite 0.85% within 10 km)
PRIMARY PLAY 3:	Triassic gas
Structure:	Adequate (closure of 40ms, 20ms fault dependent, minor Triassic thinning, C to J1 thinning of 30ms)
Reservoir:	Present (several water saturated sands, porosity = 12%)
Seal:	Adequate (several siltstones up to 50' thick)
Source:	Fair (aggregate thickness of 150' of siltstone)
Maturation:	Prog. marginal for gas (0.85% at wellsite, 0.90% within 10 km)
PRIMARY PLAY 4:	Purni gas
Structure:	Adequate (closure of 40ms, 20 is fault dependent. Permian thinning, good C to J1 growth of 30ms)
Reservoir:	Not reached, prognosed adequate
Seal:	Not reached, prognosed adequate
Source:	Not reached, prognosed adequate
Maturation:	Not reached, prognosed adequate (RV = 0.90% at wellsite, 0.95%, within 10 km; N.B. Purni is assumed to be gas prone

3.3 MIANDANA 1

SUMMARY

STATUS:	P & A
OBJECTIVES:	Crestal test for Jurassic and Triassic oil
INTERPRETATION:	Reason for failure is lack of early structural growth, and assuming that the prognosis of adequate maturity is correct, the poor fair source rating.
FOOTNOTES: (1)	Present day closure of 15 to 20 ms at all horizons from Cadna-owie to Triassic does not support good early growth in the prospect.
(2)	The Poolowanna and Birkhead seals are thin, silty and probably laterally discontinuous/meandering fluvial facies.
(3)	The Triassic is coaly and is assumed to be gas prone; the original play was for Triassic oil.
PRIMARY PLAY 1:	Algebuckina oil
Structure:	Fair (20 ms closure; probably limited early growth [1])
Reservoir:	Present (porosity = 18%, sands are water saturated)
Seal:	Good (100' of silty Cadna-owie overlain by shaly Wallumbilla)
Source:	Poor, see PRIMARY PLAY 2
Maturation:	Prog. adequate, see PRIMARY PLAY 2, (Cadna-owie is prog. to be immature RV = 0.50% at wellsite and within 10 km)
PRIMARY PLAY 2:	Poolowanna oil
Structure:	Fair (15 ms closure, prob. limited C to J1 thinning [1])
Reservoir:	Present (several water saturated sands to 30' thick, porosity = 9%)
Seal:	Adequate (several shaly and coaly units up to 60' thick but probably laterally discontinuous[2])
Source:	Prog. Poor (aggregate of 100' of shaly and coaly Poolowanna Formation)
Maturation:	Prog. good (RV = 0.85% at wellsite, 0.90% within 10 km)
PRIMARY PLAY 3:	Triassic gas[3]
Structure:	Fair (20 ms closure; (prob. limited C to J1 thinning [1])
Reservoir:	Tight (several water saturated sands to 30' thick, porosity = 7%)
Seal:	Adequate (several shales to 60' thick)
Source:	Prog. fair (aggregate about 200 feet of shaly and coaly Triassic
Maturation:	Prog. adequate for gas (RV = 0.90% at the wellsite, 0.95% within 10 km)
SECONDARY PLAY 1:	Hutton oil
Structure:	Fair (20 ms closure, prob. limited C to J1 thinning [1])
Reservoir:	Good (thick water-saturated sandy sequence, porosity = 11%)
Seal:	Fair: (severely silty to shaly intervals up to 40' thick are present)
Source:	Prog. fair in the Birkhead (aggregate thickness of 100' of shaly section - see PRIMARY PLAY 2 also)
Maturation:	Prog. good in the Birkhead,(RV = 0.80% at the wellsite, 0.85% within 10 km)

3.4 OOLARINNA 1

SUMMARY

STATUS:	P & A (Pedirka Block)
OBJECTIVE:	Crestal test for Jurassic oil, Triassic gas and Permian oil/gas
INTERPRETATION:	The reason for failure in the Permian is unkown but the aspect of source quality (gas/oil prone) has not been assessed. Assuming that the Triassic is gas prone, then failure in the Triassic and Jurassic is attributed to a source/maturation problem. Structural growth history is assessed to be good [2, 4].
FOOTNOTES: (1)	The Permian and Triassic are coaly and assumed to be gas prone. Both are assumed to be ol plays in the proposal to drill.
(2)	Several hundred feet of carbonate cemented sand is present overlying the Poolowanna Formation, which may mean that the well was not crestal in the Poolowanna Formation depending on the lateral distribution of the carbonate. The associated velocity pull up of 20 ms is capable of accounting for half of the closure (and depending on its distribution, part of the growth) at the Poolowanna, Triassic and Permian levels.
(3)	The highly faulted nature of the Permian trap raises the possibility of failure of the Permian seal.
(4)	The assessment of adequate growth based on 30 ms C to J1 thinning is not supported by only 40 ms closure in the deeper horizon given 30 ms closure at C.
PRIMARY PLAY 1:	Algebuckina oil
Structure:	Adequate (30 ms closure, early growth assumed)
Reservoir:	Present (water saturated, porosity = 18%)
Seal:	Good (150' of silty Cadna-owie overlain by shaly Wallumbilla)
Source:	Prog. Fair (See PRIMARY PLAY 2)
Maturation:	Prog. Marginal (see PRIMARY PLAY 2)
PRIMARY PLAY 2:	Poolawanna oil
Structure:	Good (40 ms at J1, 30 ms C to J1 growth, fault dependent for 10 ms)
Reservoir:	Present, (water saturated, porosity marginal at 9%)
Seal:	Poor (few thin coals and silts up to 15' thick, probably laterally discontinuous)
Source:	Poor (aggregate of 80' of shaly and coaly Poolawanna Formation)
Maturation:	Adequate (Rv = 0.7 at well site, 0.75 within 10km of well site)
PRIMARY PLAY 3:	Triassic gas
Structure:	Good (40ms closure, partly fault controlled, 30ms C to J1 growth - 30 ms)
Reservoir:	Tight, water saturated, porosity = 8%.
Seal:	Fair (several shaly units up to 40' thick, probably laterally discontinuous)
Source:	Fair (210' of probably lean Triassic shale present)
Maturation:	Prog. Marginal for gas (vR = 0.75% at well site, 0.8% within 10 km of well site

PRIMARY PLAY 4:	Purni oil/gas
Structure:	Good (40 ms of closure, partly fault controlled good C to J1 growth - 30 ms)
Reservoir:	Tight,(water saturated, porosity = 4%)
Seal:	Good (300' of silty and coaly Purni Formation)
Source:	Adequate (300' of silty and coaly Purni Formation present)
Maturation:	Prog. Adequate for gas, Good for oil (Rv = 0.9% at well site, Rv = 1.0% within 10km, N.B. Permian is assumed to be gas prone)

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5 & 6 S.A.

LEADS

40 50 kilometres

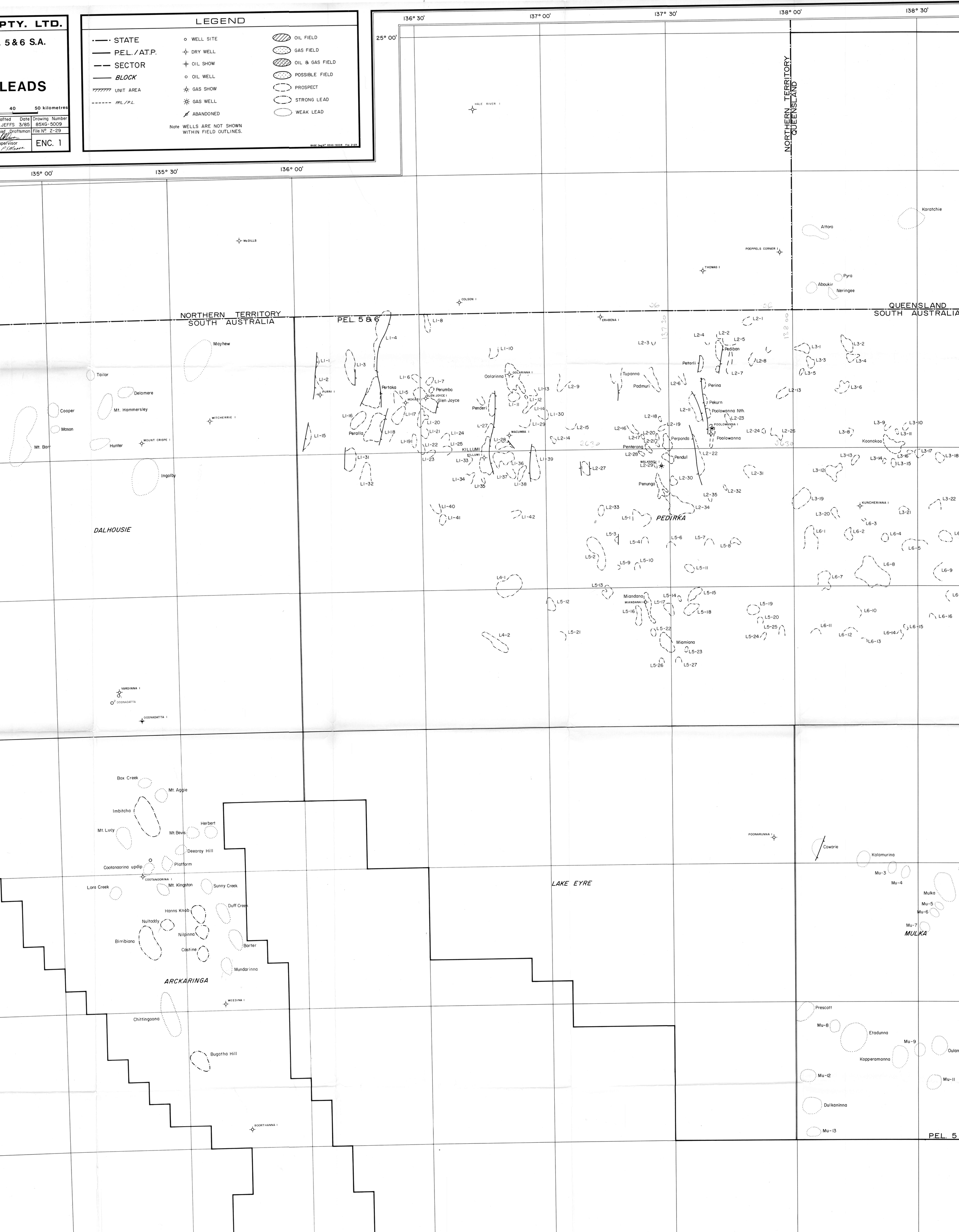
afted	Date	Drawing Number
JEFFS	3/85	85XG-5009
ief Draftsman		File N° Z-29
upervisor P.S.Moore		ENC. 1

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- P.P.L. / P.L.
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

BASE Dwg N° 85XG-5008 File Z-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF THE CADNA-OWIE FM. PLUS THE ALGEBUCKINA SANDSTONE

4891-15

1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

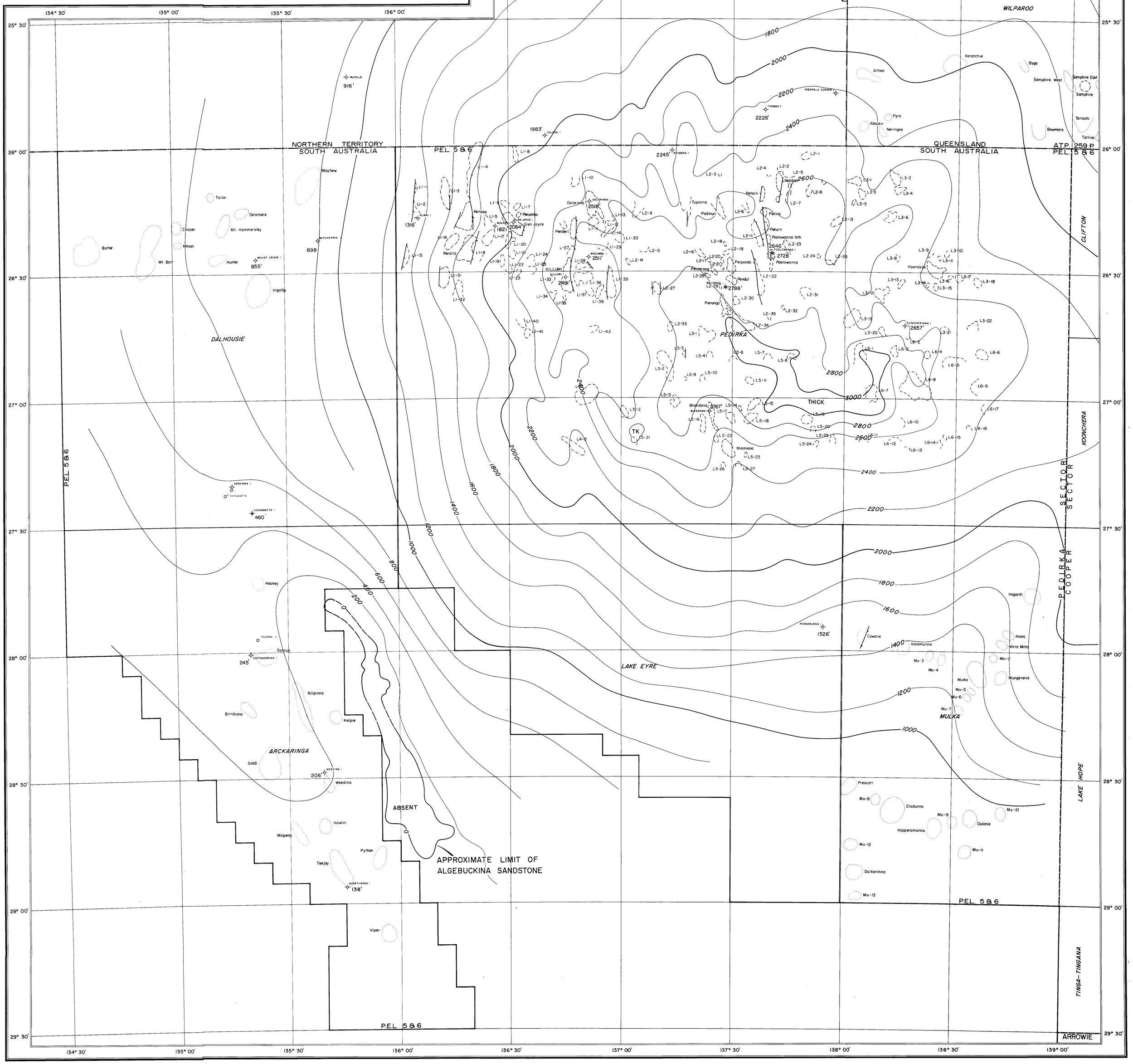
Projection AUSTRALIAN MAP GRID	Drafted M.S.M.	Date 10/85	Drawing Number 85XG-5962
Interpretation J.W. HUNT 8/85, D.C. JOHNSTONE	Chief Draftsman		File N° AA-9
Contour Interval 200 ft.	Supervisor P.Moore		ENC. 2

LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL/PL
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

2728' CONTROL POINT



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF THE CADNA-OWIE FORMATION

4891-16

1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

DELHI	Projection AUSTRALIAN MAP GRID	Drafted M S M 10/85	Date	Drawing Number 85KG-5963
	Interpretation by J. W. HUNT 8/85, D.C. JOHNSTONE	Chief Draftsman		File No. AA-9
	Contour Interval 10' & 50'	Supervisor P.S. Moore		ENC. 3

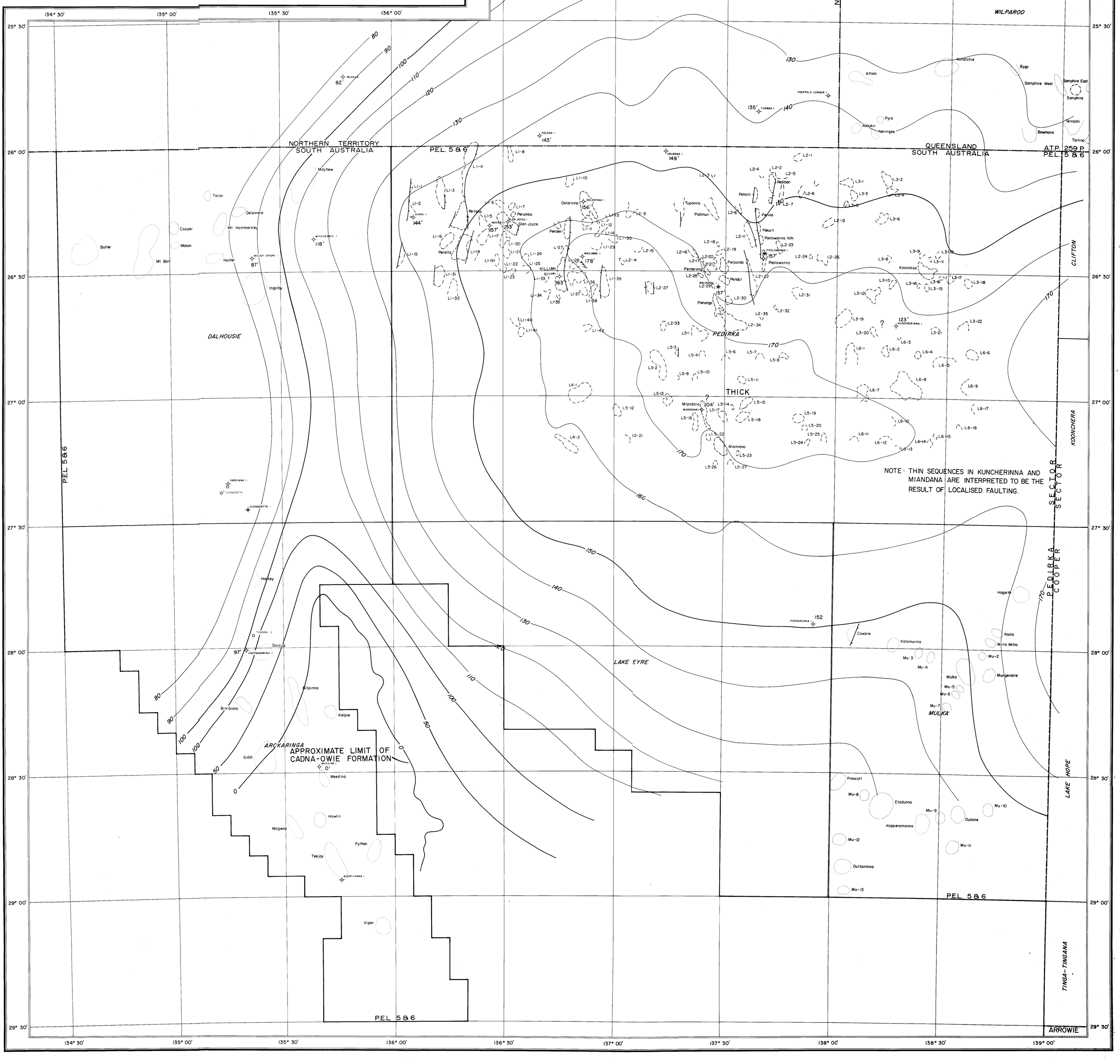
LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

118 CONTROL POINT

BASE Dwg No 85KG-5008 File 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF THE ALGEBUCKINA SANDSTONE

4891-17 1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

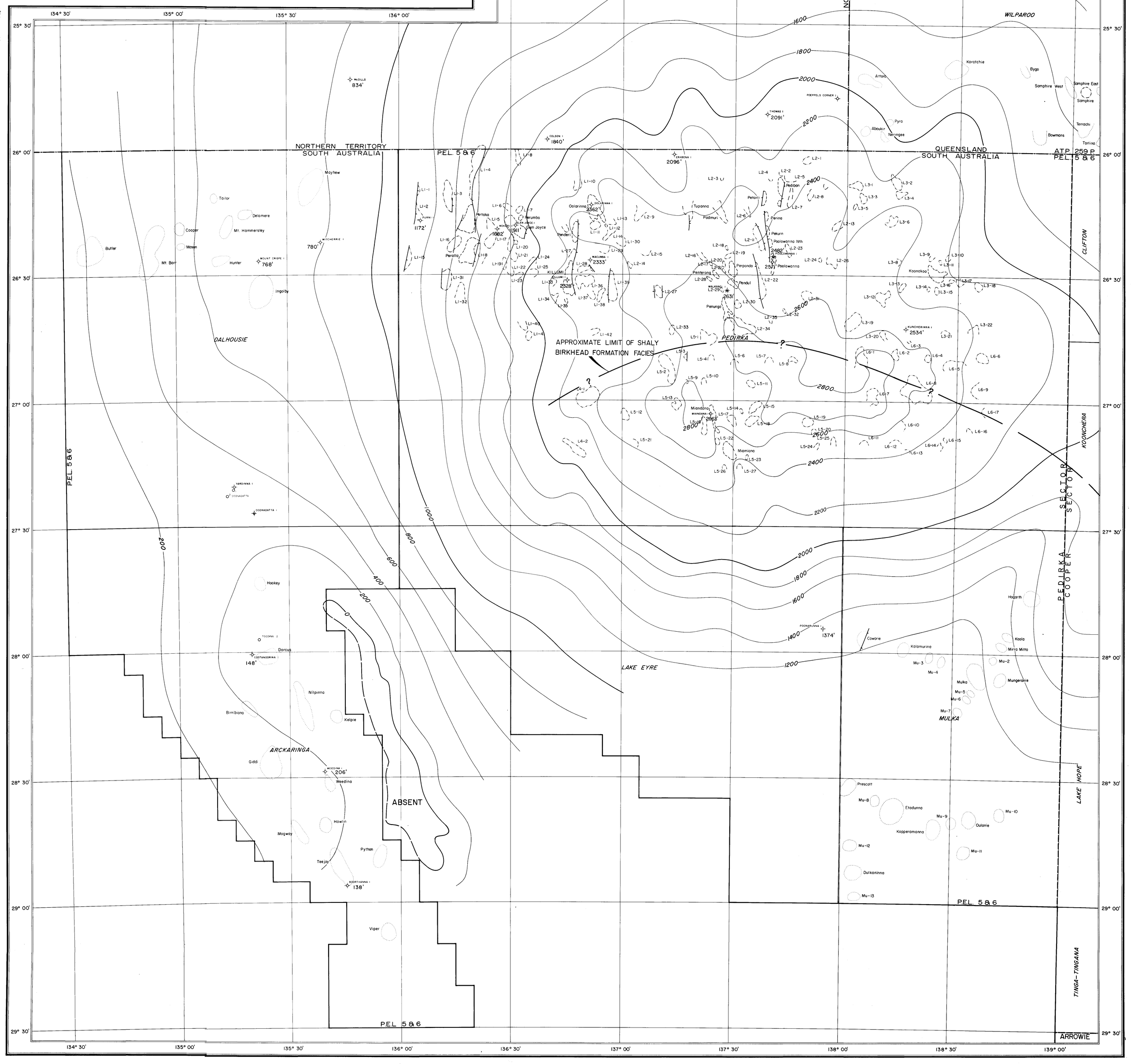
DELHI	Projection AUSTRALIAN MAP GRID	Drafted M S M 10/85	Drawing Number 85XG-5964
	Interpretation by J. W. HUNT 8/85, D. C. JOHNSTONE	Chief Draftsman	File N° AA-9
	Contour Interval 200 ft.	Supervisor P. Moore	ENC. 4

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

148' CONTROL POINT



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF THE POOLOWANNA FORMATION AND LOG EQUIVALENTS

4891-18

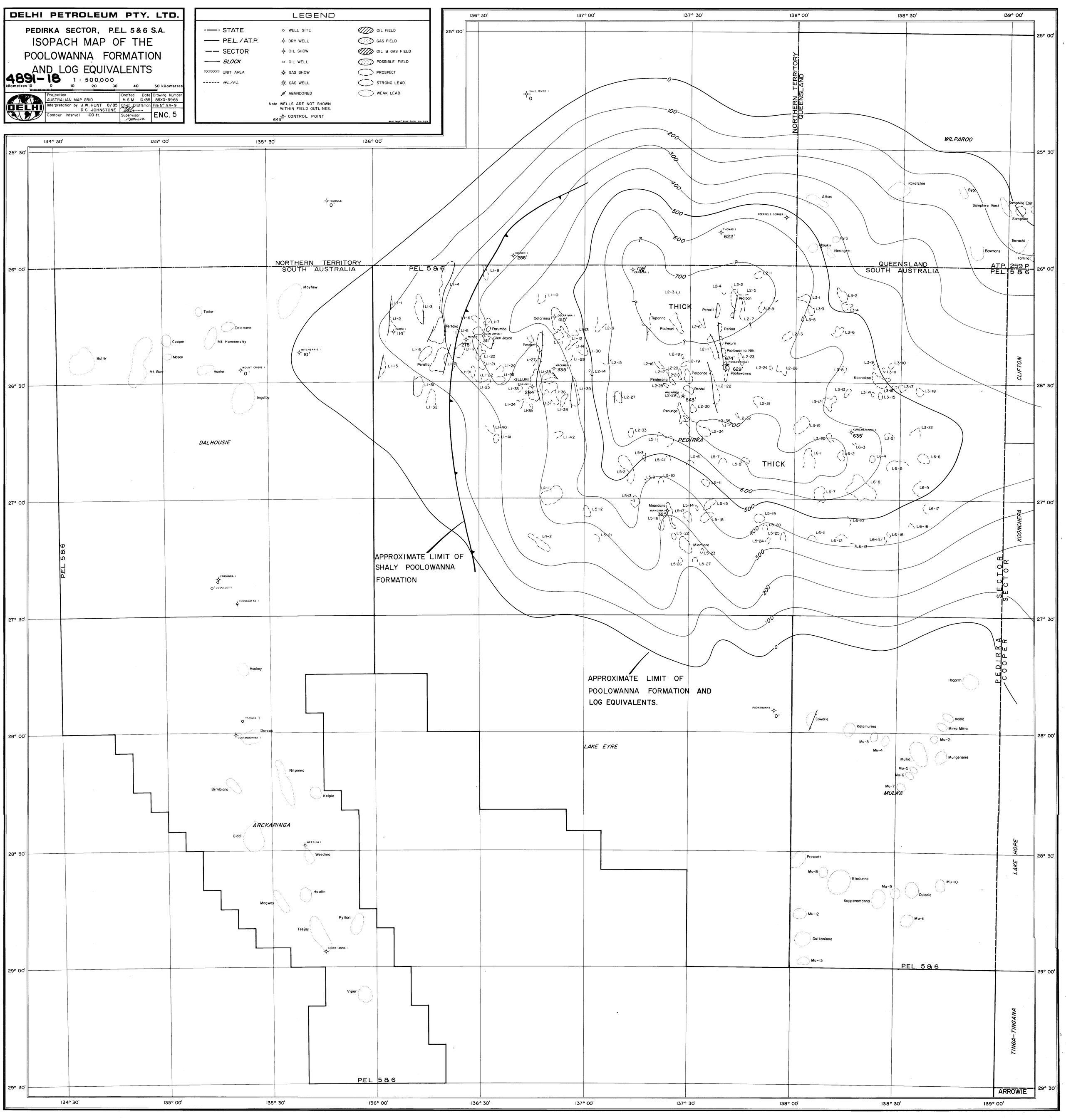
1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M S M	Date 10/85	Drawing Number 85XG-5965
Interpretation by J.W. HUNT 8/85 D.C. JOHNSTONE	Chief Draftsman		File Nº AA-9
Contour Interval 100 ft.	Supervisor P.Moore		ENC. 5

LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL/PL
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 643 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF THE PEERA-PEERA FORMATION AND LOG EQUIVALENTS

4891-19 1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

DELHI	Projection AUSTRALIAN MAP GRID	Drafted M S M Date 10/85	Drawing Number 85XG-5966
	Interpretation by J.W. HUNT 8/85 D.C JOHNSTONE	Chief Draftsman	File N° AA-9
	Contour Interval 100 ft	Supervisor	ENC. 6

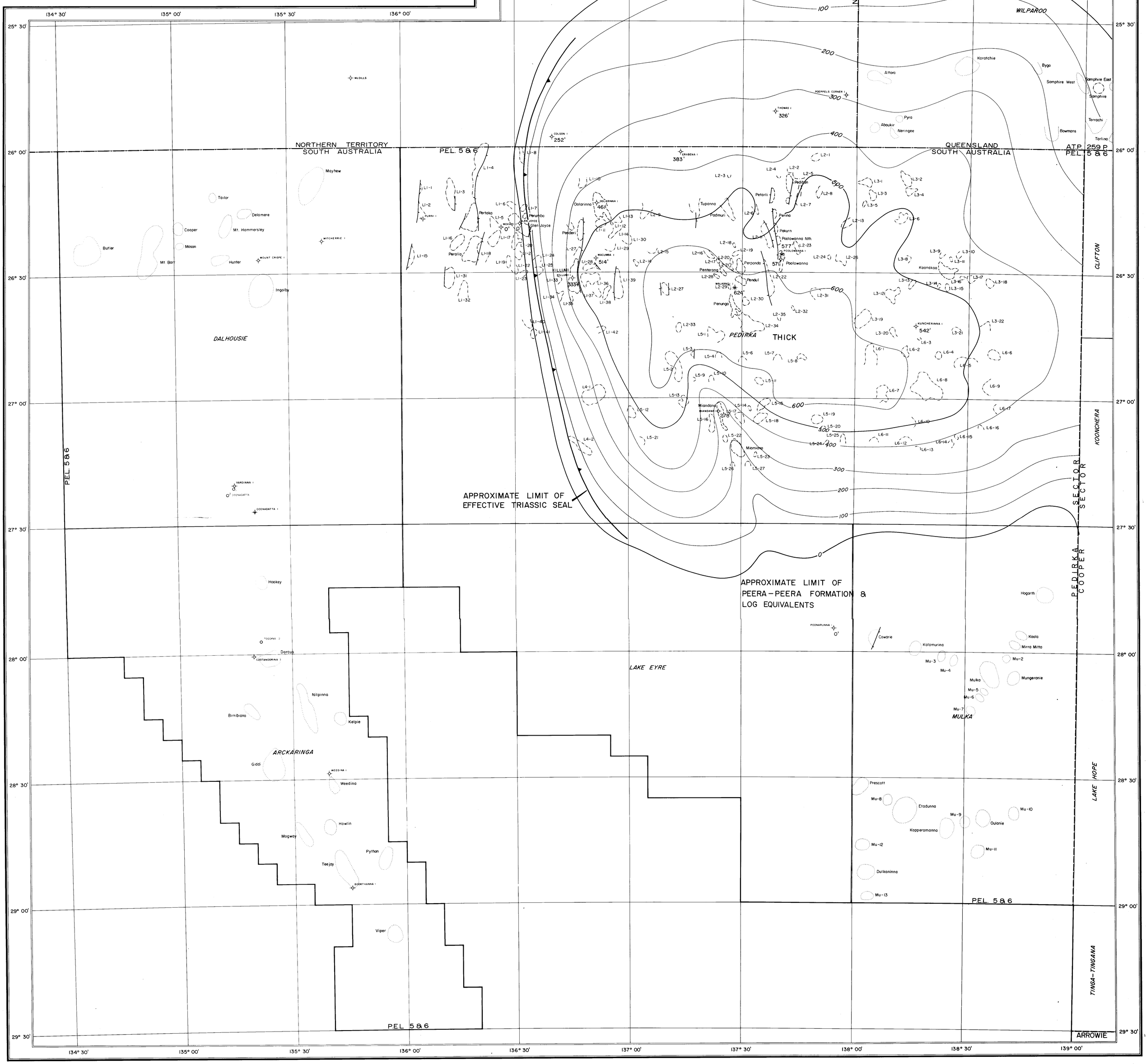
LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL/PL
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

310' CONTROL POINT

BASE Dwg.N° 85XG-5008 Fig 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF THE WALKANDI FORMATION AND LOG EQUIVALENTS

4891-20 1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

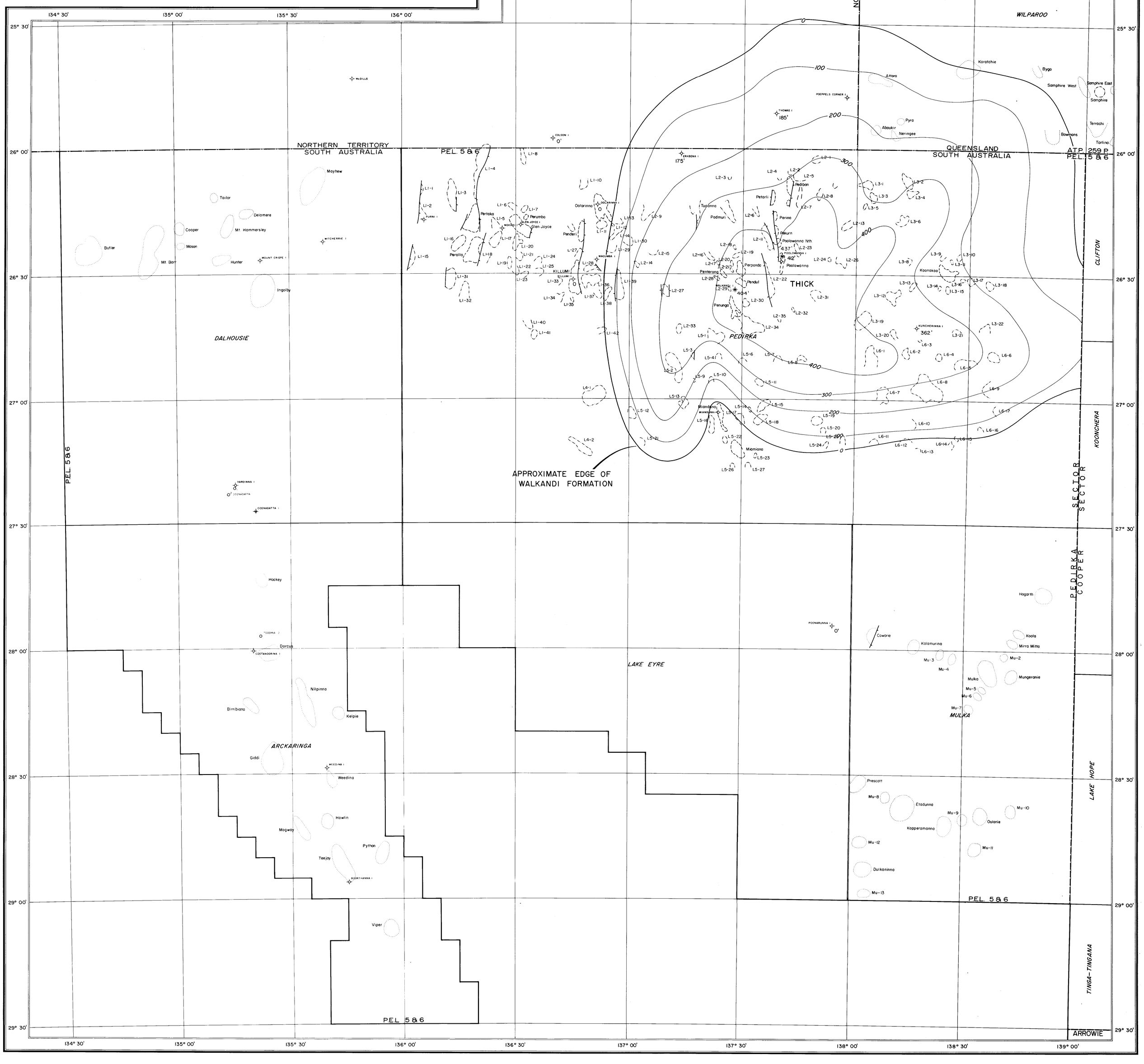
Projection AUSTRALIAN MAP GRID	Drafted M.S.M.	Date 10/85	Drawing Number 85KG-5967
Interpretation by J.W. HUNT 8/85, D.C. JOHNSTONE	Chief Draftsman		File N° AA-9
Contour Interval 100 ft	Supervisor		ENC. 7

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- 404 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

BASE Dwg.No 85KG-5008 Fig 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF TOTAL PERMIAN

4891-21

1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

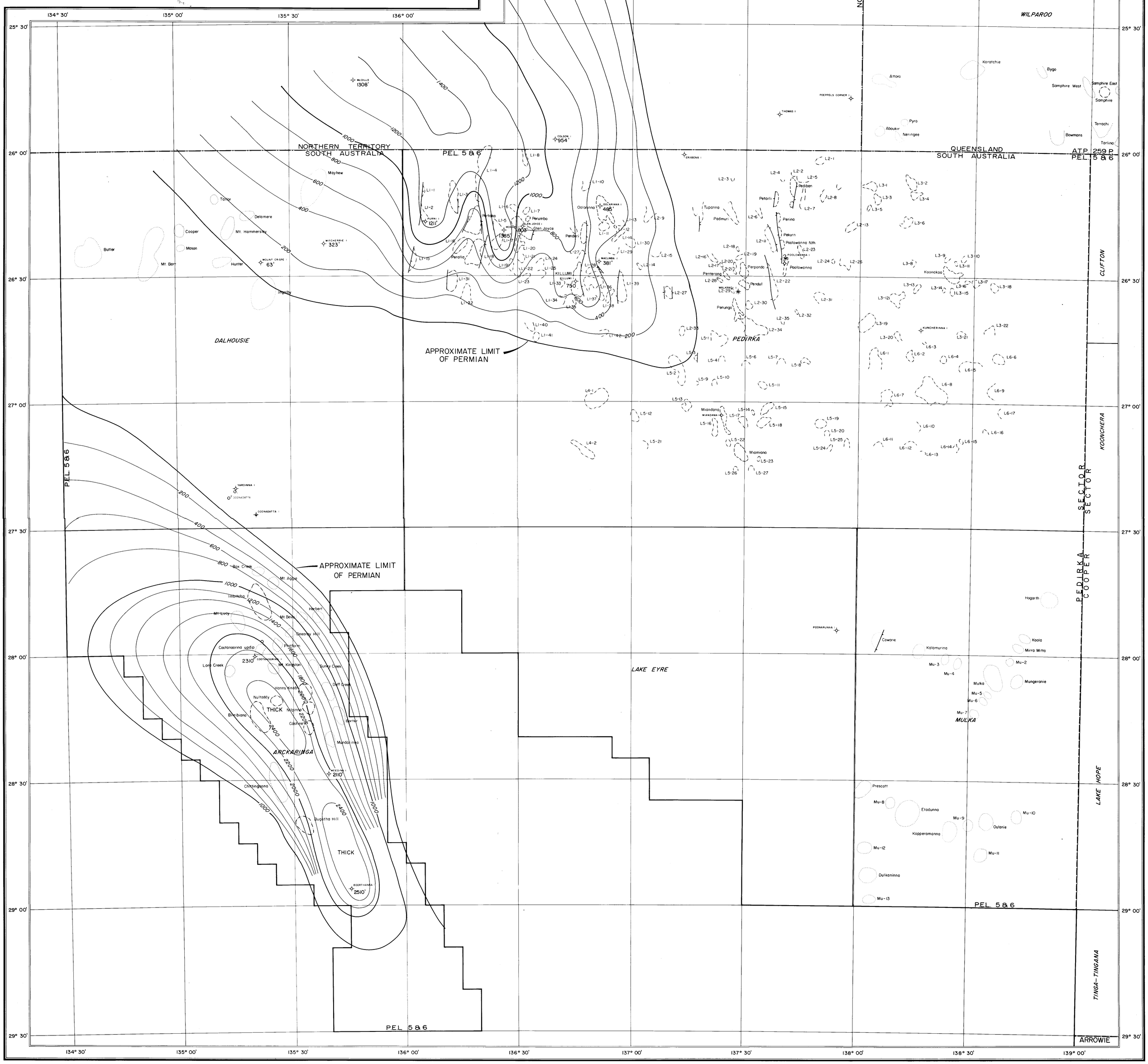
Projection AUSTRALIAN MAP GRID	Drafted S. deL.	Date 11/85	Drawing Number 85XG-6309
Interpretation by J. HUNT NOV. '85	Chief Draftsman		File Nº AB-12
Contour Interval 200 FEET	Supervisor		ENC. 8

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- CONTROL POINT 1308'

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

BASE Dwg.Nº 83XG-5008 File E-29


NORTHERN TERRITORY
SOUTH AUSTRALIA
PEL. 5 & 6
QUEENSLAND
SOUTH AUSTRALIA
ATP 259 P
PEL. 5 & 6
NORTHERN TERRITORY
QUEENSLAND
WILPAROO
DALHOUSIE
PEDIRKA
ARCKARINGA
LAKE EYRE
MULKA
CLIFTON
KOONCHERA
PEDIRKA SECTOR
COOPER SECTOR
LAKE HOPE
TINGA-TINGANA
ARROWIE
APPROXIMATE LIMIT OF PERMIAN
APPROXIMATE LIMIT OF PERMIAN
THICK
THICK
PEL. 5 & 6
PEL. 5 & 6
PEL. 5 & 6
Mayhew
Tarlor
Delamere
Cooper
Mt. Hammersley
Butler
Mason
Mt Barr
Hunter
Ingalby
Mt. Agnes
Box Creek
Imbitcha
Mt. Luey
Mt. Bevis
Herbert
Breadsay Hill
Platform
Cootanoorina updip
Lake Creek
Mt. Kingston
Sunky Creek
Hanns Knob
Nultaddy
Birribiana
Castnia
Mundatinna
Bugetha Hill
Chittinguna
Hogarth
Koola
Mirra Mitta
Mungeranie
Mulka
Prescott
Etadunna
Kopperamanna
Oulanie
Dulkaninna
Karatchie
Bygo
Samphire West
Samphire East
Samphire
Attora
Pyra
Aboukir
Neringee
Terrachi
Bowmans
Tarlina
Tupanna
Padmuri
Petarli
Pediban
Perina
Pekurn
Poolowanna Nth
Poolowanna
Perponda
Penterong
Pendul
Penunga
Koonakoo
Miandana
Miamiana
Cowarie
Kalamurina
Mu-2
Mu-3
Mu-4
Mu-5
Mu-6
Mu-7
Mu-8
Mu-9
Mu-10
Mu-11
Mu-12
Mu-13
Oolanna
Pendera
Perulla
Perumba
Glen Joyce
Killumi
Pertaka
Peralia
Ingalby
Tarlor
Delamere
Cooper
Mt. Hammersley
Butler
Mason
Mt Barr
Hunter
Ingalby
Mayhew

DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

ISOPACH MAP OF 'UPPER' PLUS 'MIDDLE' PURNI AND MT. TOONDINA FORMATIONS

4891-22 1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

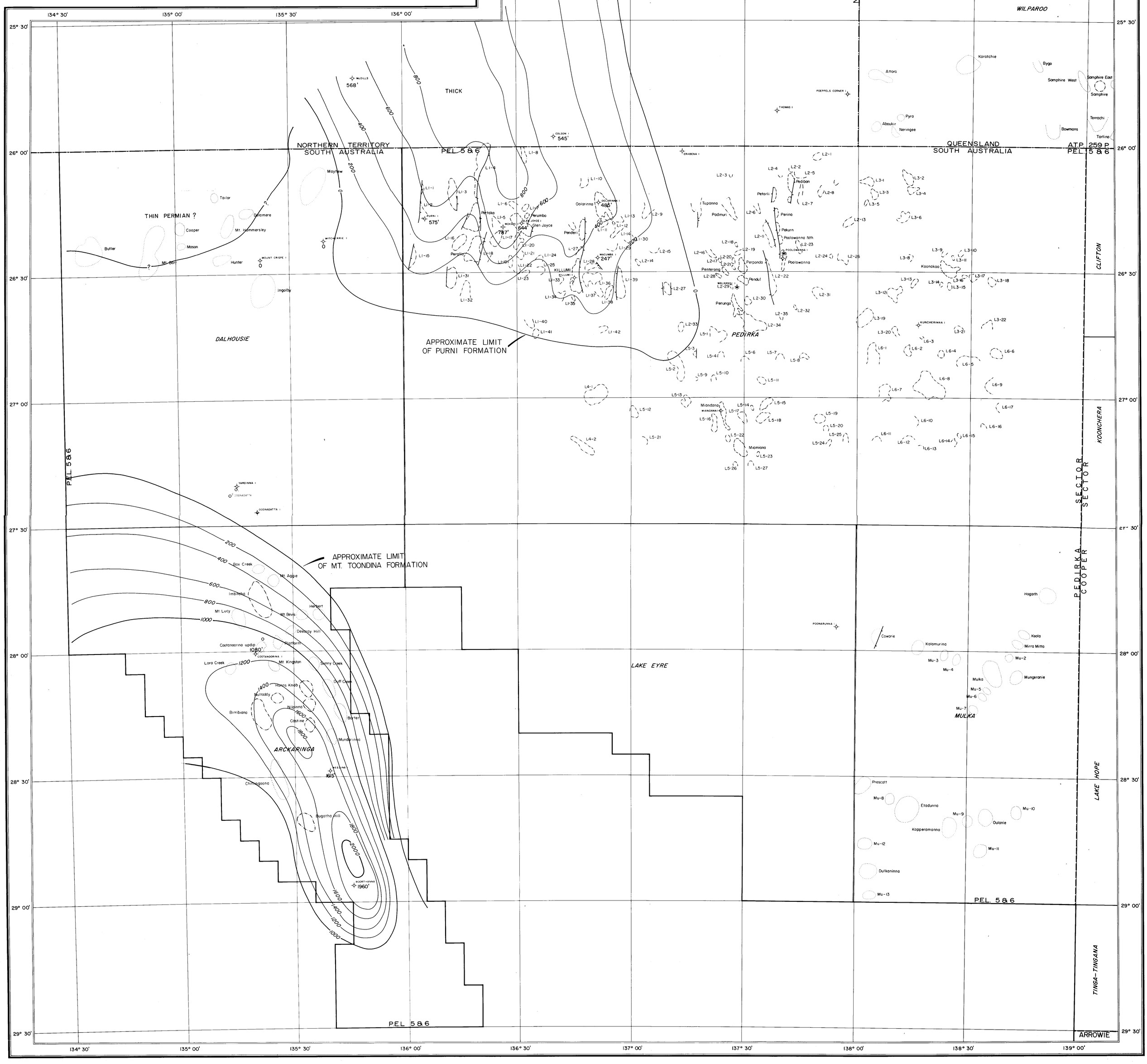
DELHI	Projection AUSTRALIAN MAP GRID	Drafted S deL. Date 11/85	Drawing Number 85XG-6308
	Interpretation by J.W. HUNT W. FAWCETT 11 '85	Chief Draftsman	File N° AB-12
	Contour Interval 200 FEET	Supervisor	ENC. 9

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- CONTROL POINT (568)

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

BASE Dwg.N° 85XG-3008 Fig. 2-23



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.
ISOPACH MAP OF 'LOWER' PURNI PLUS CROWN POINT AND STUART RANGE PLUS BOORTHANNA FORMATIONS

4891-23

1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

DELHI	Projection: AUSTRALIAN MAP GRID	Drafted: MSM	Date: 10/85	Drawing Number: 85XG-6321
	Interpretation by J. W. HUNT	Chief Draftsman		File N° AB-12
	Contour Interval 200 FEET	Supervisor		ENC. 10

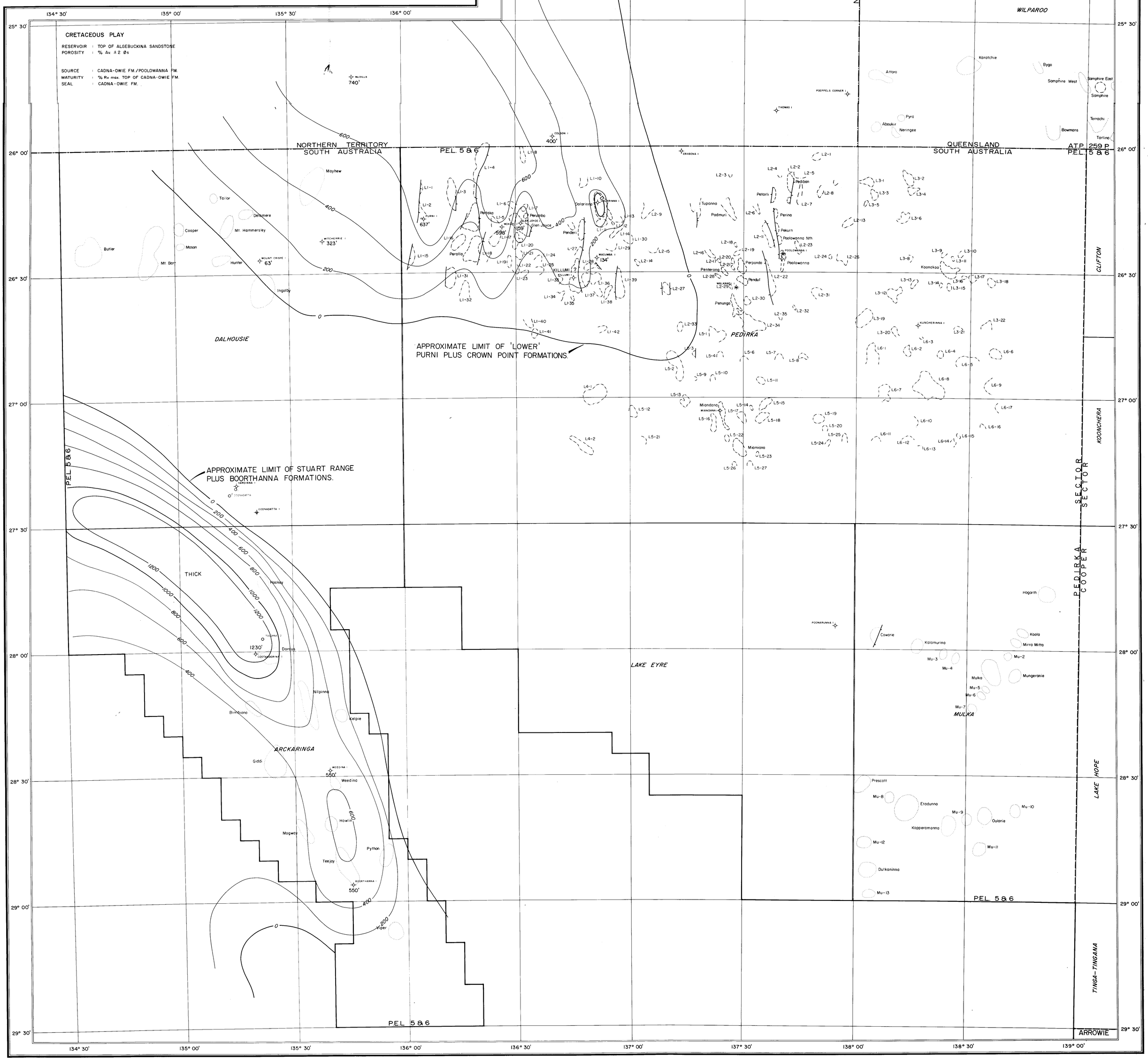
LEGEND

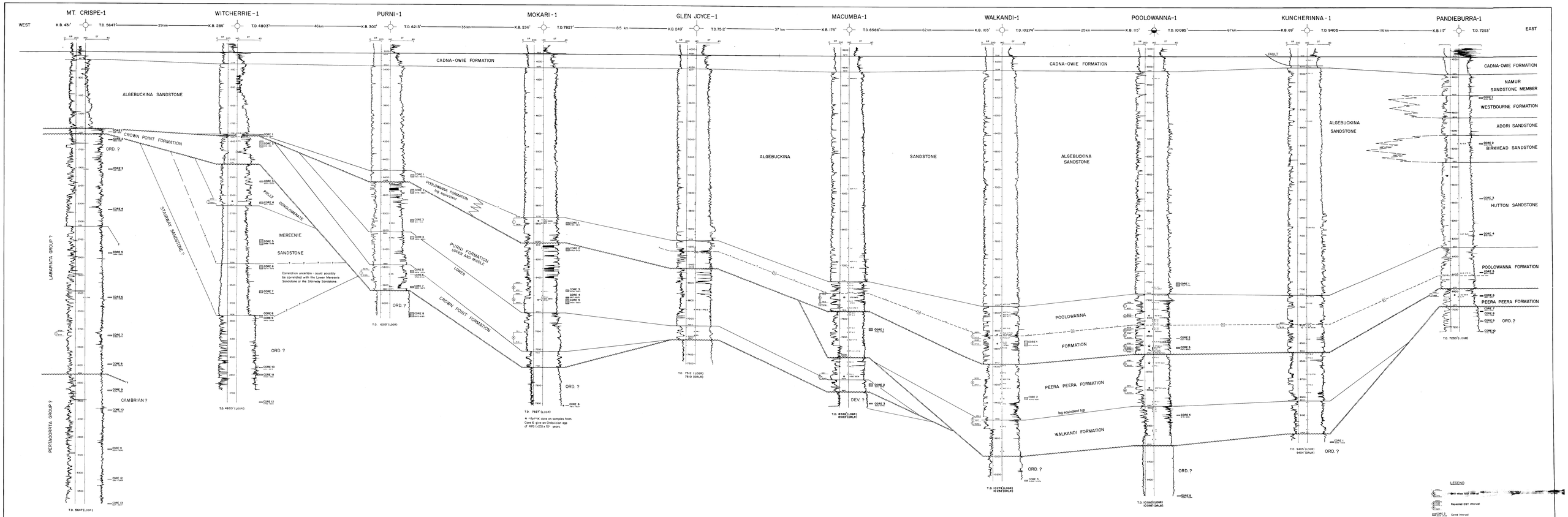
- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- % POROSITY
- % Rv max.
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED

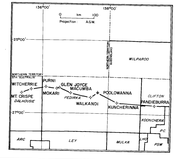
Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- SEAL : CADNA-OWIE FM

BASE Dwg N° 85XG-5008 File 2-29







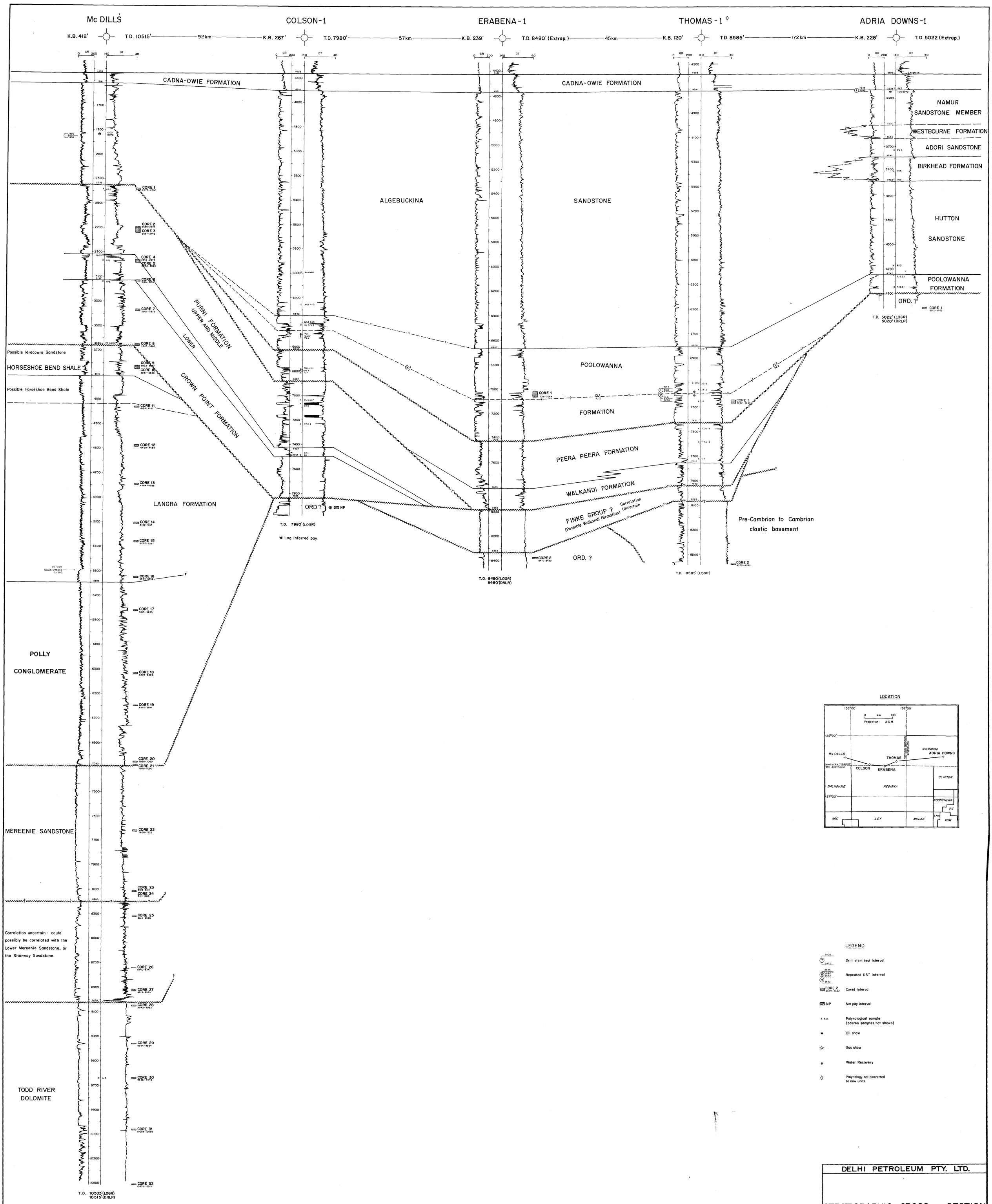
DELHI PETROLEUM PTY. LTD.

SOUTH AUSTRALIA

STRATIGRAPHIC CROSS – SECTION MT. CRISPE TO PANDIEBURRA

4691-24

Vertical Scale 1" = 100'	Drafted	Date	Drawing Number
Horizontal Scale 1:25,000	G.S.	5.75	5745-5224
Datum TOP of CADNA-OWIE FM (SUPPRIM)			FIG NP.24-27
Supervisor J. Gilbert	APPROVED		
Interpretation G.C. Whitaker	Date Dec 1974		ENCL.
Revised Interpretation J.W. Hunt	Date Dec 1984		11

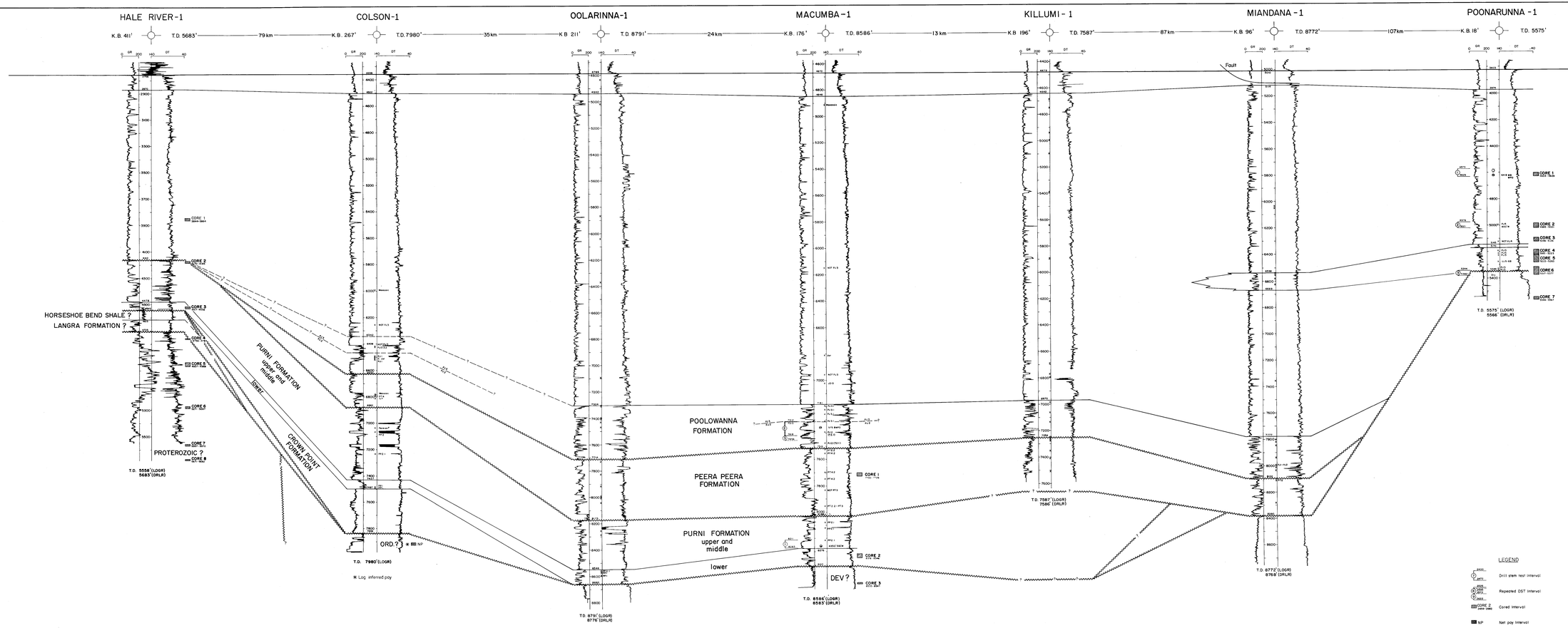


DELHI PETROLEUM PTY. LTD.

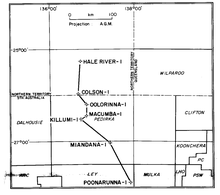
STRATIGRAPHIC CROSS — SECTION
McDILLS TO ADRIA DOWNS

4891-25

Vertical Scale. 1" = 200'	Drafted, Date J.S. 5/85	Drawing Number 85XG-5339A
Horizontal Scale. DIAGRAMMATIC		
Datum. TOP of CADNA-OWIE FM	Chief Draftsman	File Nº Z-7
Supervisor		ENCL. 12
Interpretation. D.C. Johnstone	Date. Dec. 1984	
Revised Interpretation. J.W. Hunt	Date. Dec. 1985	



LOCATION



LEGEND

- Drill stem test interval
- Repeated DST Interval
- Cored Interval
- NP Net pay Interval
- Palynological sample (barren samples not shown)
- Oil
- Gas show
- Water Recovery

DELHI PETROLEUM PTY. LTD.

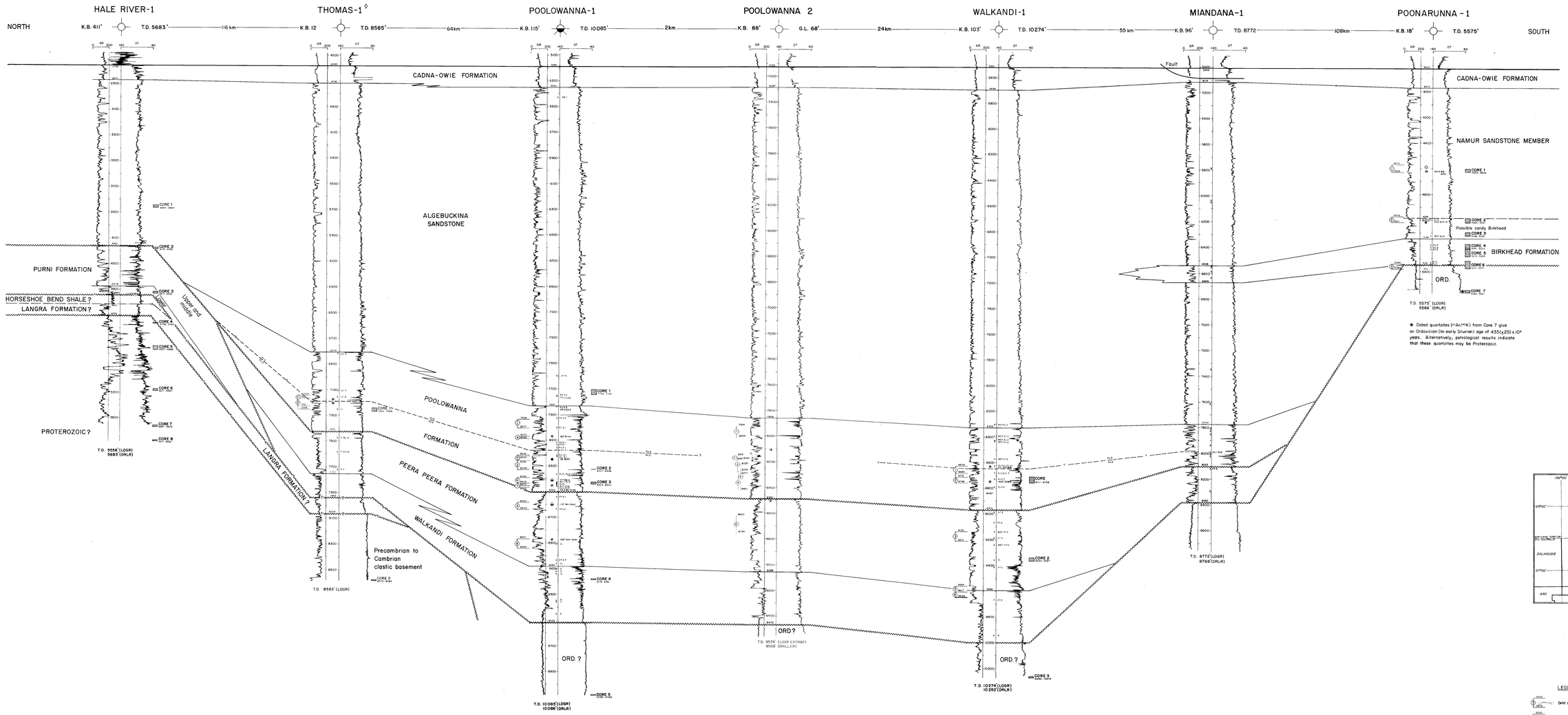
PEDIRKA FARMOUT AREA
SOUTH AUSTRALIA

STRATIGRAPHIC CROSS — SECTION

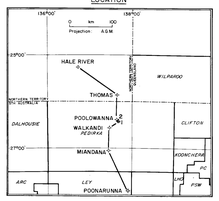
HALE RIVER - COLSON TO POONARUNNA

4891-26

Vertical Scale 1" = 200'		Drafted, Date L.T. 12/85	Drawing Number 85KG-6303
Horizontal Scale DIAGRAMMATIC			
Datum TOP of CADNA-OWIE FM		David Dunham	File № 4A-27
Supervisor			ENCL 13
Interpretation J. Hunt		Date Dec 1985	
Revised Interpretation		Date	



* Dated quartzites ($^{40}Ar/^{39}K$) from Core 7 give an Ordovician (to early Silurian) age of 435(±25) x 10^6 years. Alternatively, petrological results indicate that these quartzites may be Proterozoic.



LEGEND

- Drill stem test interval
- Repeated DST interval
- CORE 2 Cored interval
- Palynological sample (barren samples not shown)
- Oil show
- Gas show
- Water Recovery

DELHI PETROLEUM PTY. LTD.

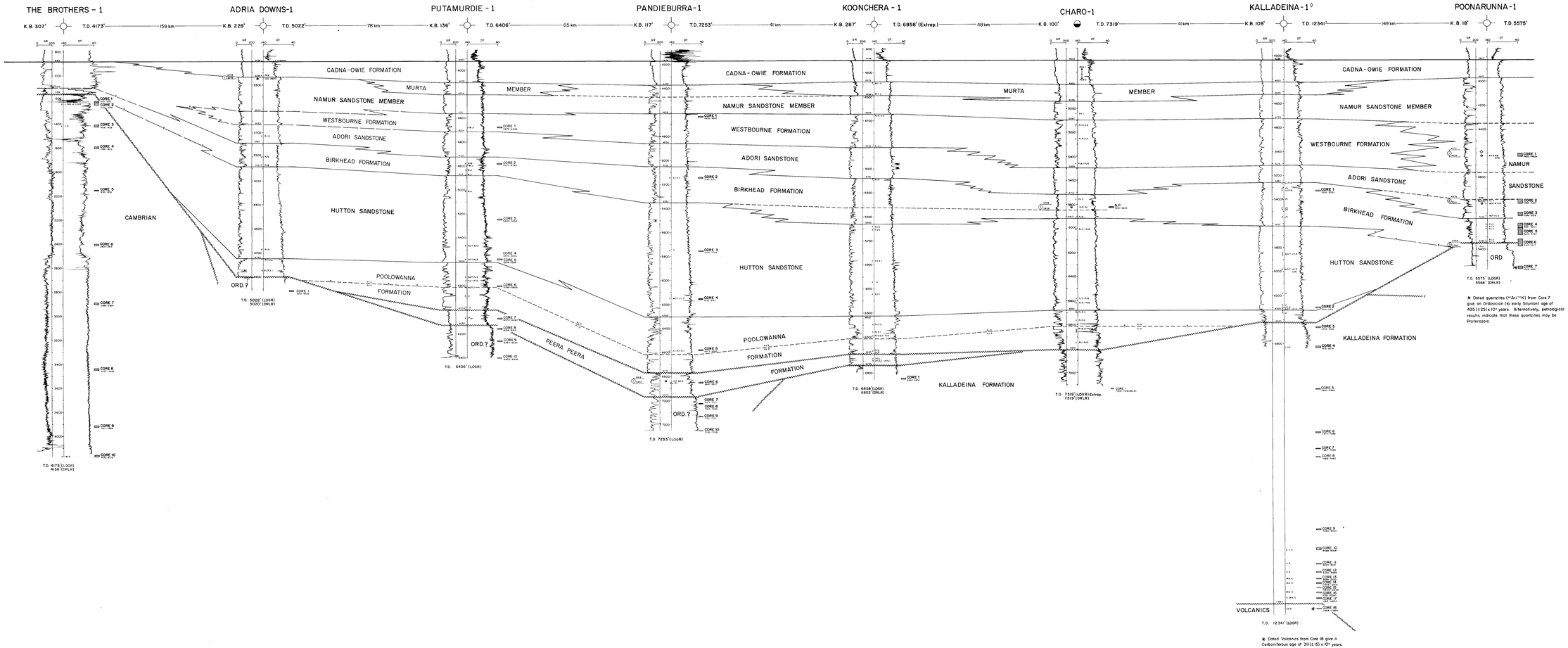
SOUTH AUSTRALIA

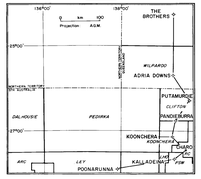
STRATIGRAPHIC CROSS – SECTION

HALE RIVER-THOMAS TO POONARUNNA

4891-27

Vertical Scale 1" = 200'	Drafted, Date 4.6.5.85	Drawing Number 85A6-63G6
Horizontal Scale DIAGRAMMATIC		File № SA-27
Datum TOP of CADNA-OWIE FM	Draftsman	
Supervisor		
Interpretation J. HUNT	Date 0.00.1900	ENCL 14
Revised Interpretation	Date	





LEGEND

- Drill stem test interval
- Repeated DST interval
- Cored interval
- Net Pay Interval
- Palyeological sample (Barren samples not shown)
- Oil show
- Gas show
- Water Recovery
- Palynology not converted to new units

DELHI PETROLEUM PTY. LTD.			
PEDIRKA FARMOUT AREA SOUTH AUSTRALIA			
STRATIGRAPHIC CROSS — SECTION THE BROTHERS TO POONARUNNA			
			4891-28
Vertical Scale 1" = 200'	Drafted J.S.	Date 5/85	Drawing Number 85XS-S340A
Horizontal Scale DIAGRAMMATIC			
Datum TOP of CADNA-OWIE FM	Chgd. Drafted	File No.	2-7
Supervisor			ENCL. 15
Interpretation D.C. Johnstone	Date Dec. 1984		
Revised Interpretation J.W. Hunt	Date Dec. 1985		

DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (% Rv max) AT THE TOP OF THE CADNA-OWIE FORMATION

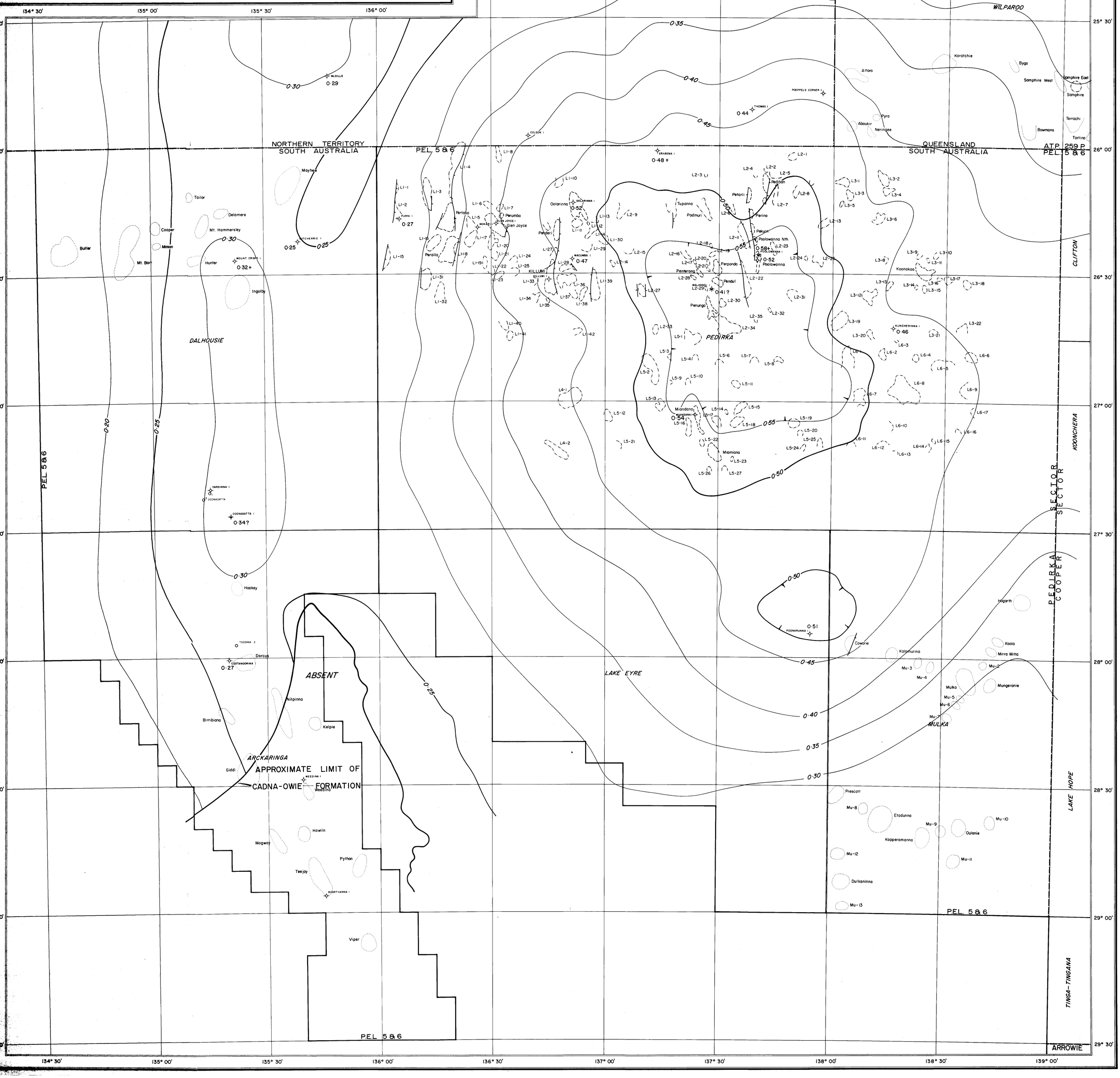
4891-29 1 : 500,000

10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M S M	Date 10/85	Drawing Number 85XG-5970
Interpretation by J.W. HUNT	Chief Draftsman		File No AB-12
Contour Interval 0·05%	Supervisor		ENC. 16

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- VALUE AT BASE OF OVER-LYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- − VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 0·48 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (% Rv max) AT THE TOP OF AN APPROXIMATE HUTTON SST. CORRELATIVE HORIZON

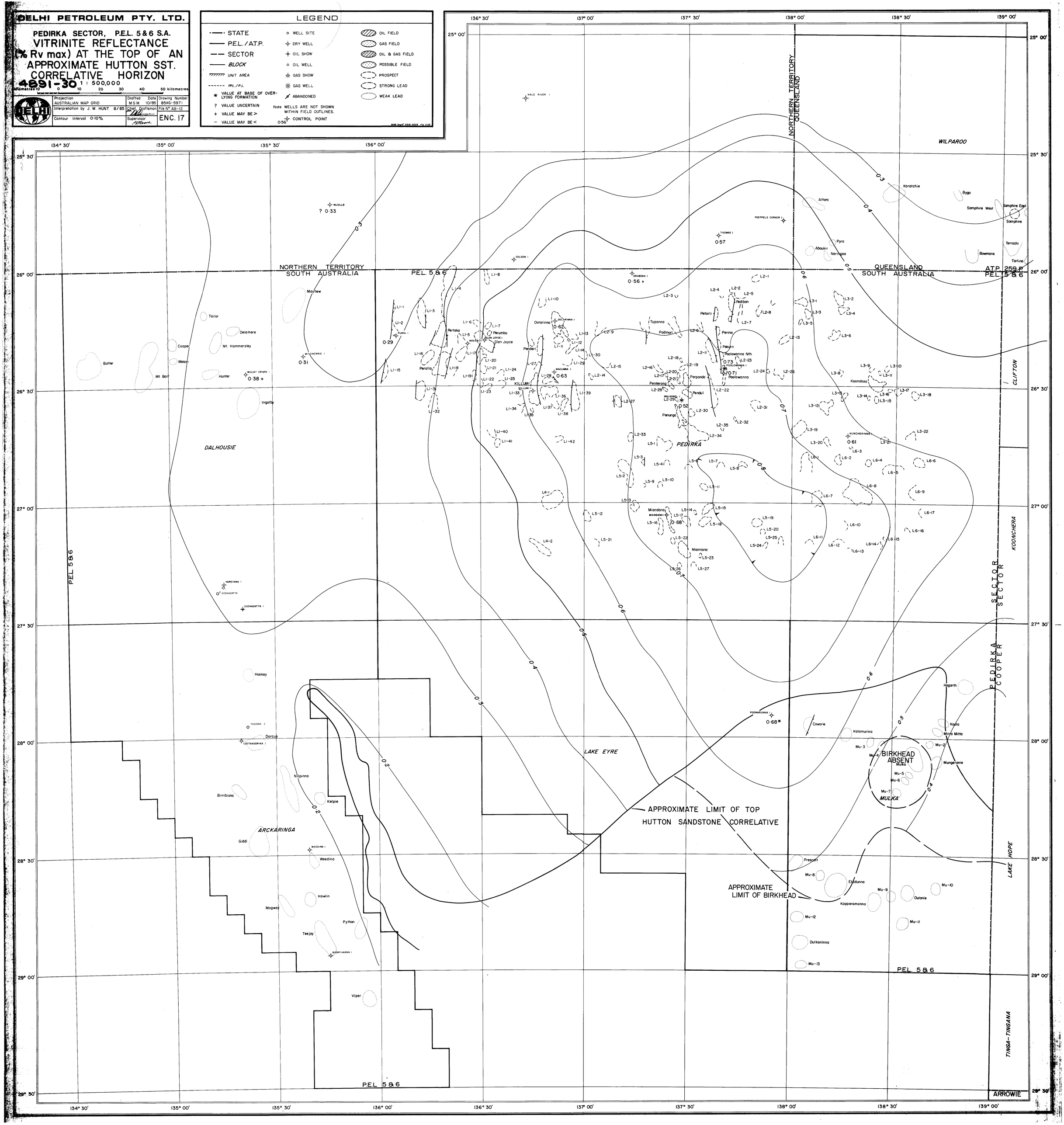
4891-30 1 : 500,000

Kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M.S.M.	Date 10/85	Drawing Number 85XG-5971
Interpretation by J. W. HUNT 8/85	Chief Draftsman		File Nº AB-12
Contour Interval 0·10%	Supervisor		ENC. 17

LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL/PL
- VALUE AT BASE OF OVERLYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- − VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 0·56 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (Rv max %) TOP OF POOLOWANNA FM. AND LOG EQUIVALENTS

4891-31

1 : 500,000

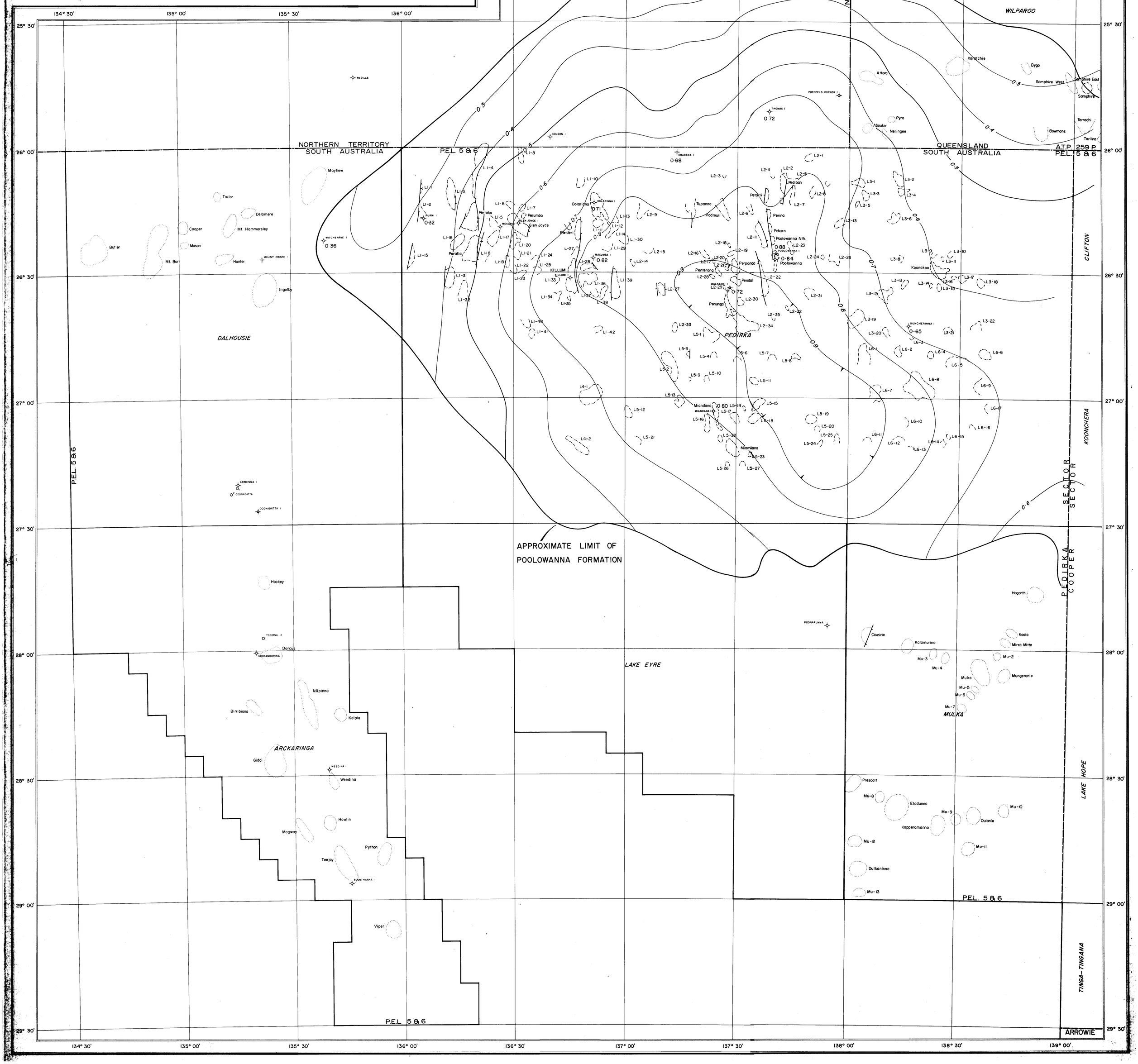
Kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted MSM	Date 10/85	Drawing Number 85XG-5972
Interpretation by J. HUNT 8/85	Chief Draftsman		File Nº AB-12
Contour Interval 0·1 %	Supervisor		ENC. 18

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- VALUE AT BASE OF OVERLYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- − VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- 0·32 CONTROL POINT

BASE Dwg Nº 8316-5006 File 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (Rv max %) AT THE BASE OF THE POOLOWANNA FORMATION

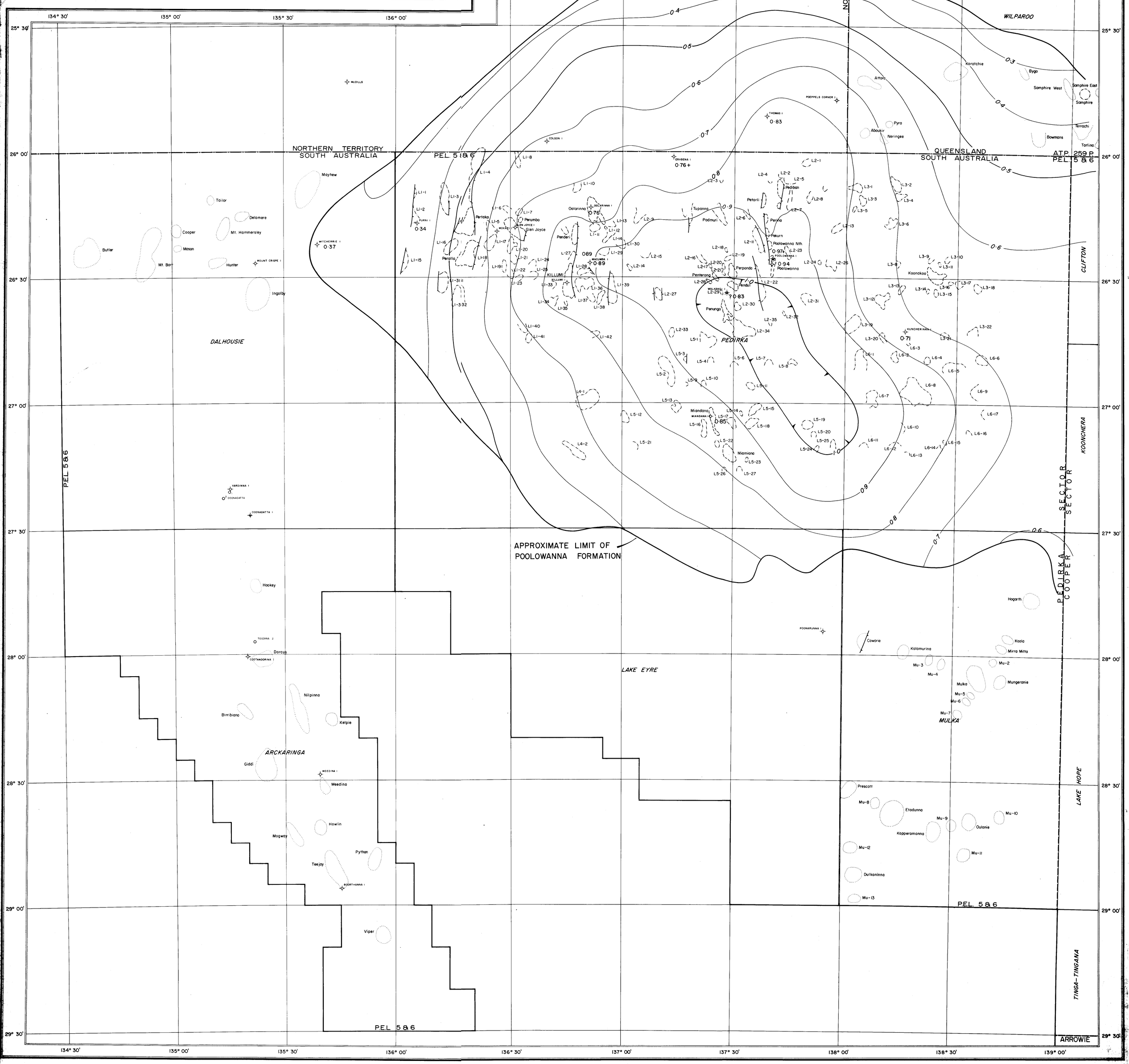
4891-32 1 : 500,000

Kilometres 10 0 10 20 30 40 50 kilometres

Projection: AUSTRALIAN MAP GRID	Drafted: MSM	Date: 10/85	Drawing Number: 85XG-5973
Interpretation by: J. W. HUNT 8/85	Chief Draftsman		File Nº AB-12
Contour Interval: 0·1 %	Supervisor		ENC. 19

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- VALUE AT BASE OF OVERLYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- − VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- 0·89 CONTROL POINT



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (Rv max %) AT THE TOP OF THE PURNI & MT. TOONDINA FMS.

4891-33 1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

DELHI	Projection AUSTRALIAN MAP GRID	Drafted M S M Date 10/85	Drawing Number 85XG-5974
	Interpretation by J.W. HUNT 8/85	Chief Draftsman	File N° AB-12
	Contour Interval 0·1 %	Supervisor	ENC.20

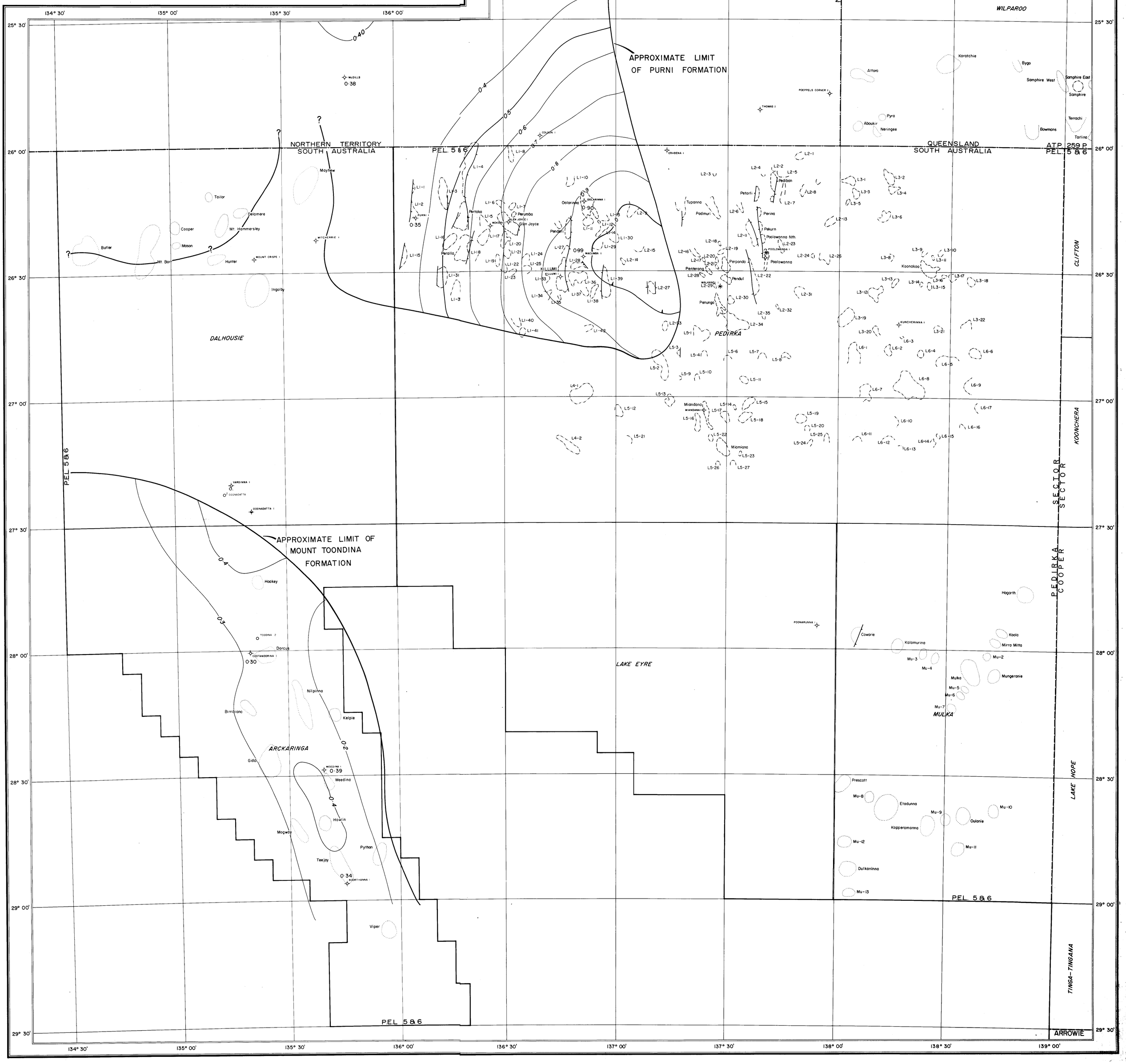
LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL/PL
- * VALUE AT BASE OF OVERLYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- – VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- CONTROL POINT

BASE Dwg N° 85XG-5008 File 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (Rv max %) AT THE TOP OF THE 'LOWER' PURNI & STUART RANGE FMS.

4891-34 1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M S M	Date 10/85	Drawing Number 85XG-5975
Interpretation by J.W. HUNT 8/85	Chief Draftsman		File N°AA-11
Contour Interval 0·1 %	Supervisor		ENC. 21

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- VALUE AT BASE OF OVERLYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- – VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- 0·39 CONTROL POINT

BASE Dwg.No 85XG-5006 File E.29

DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

VITRINITE REFLECTANCE (Rv max %) AT THE BASE OF THE PERMIAN, TRIASSIC OR JURASSIC (Z HORIZON)

4891-35

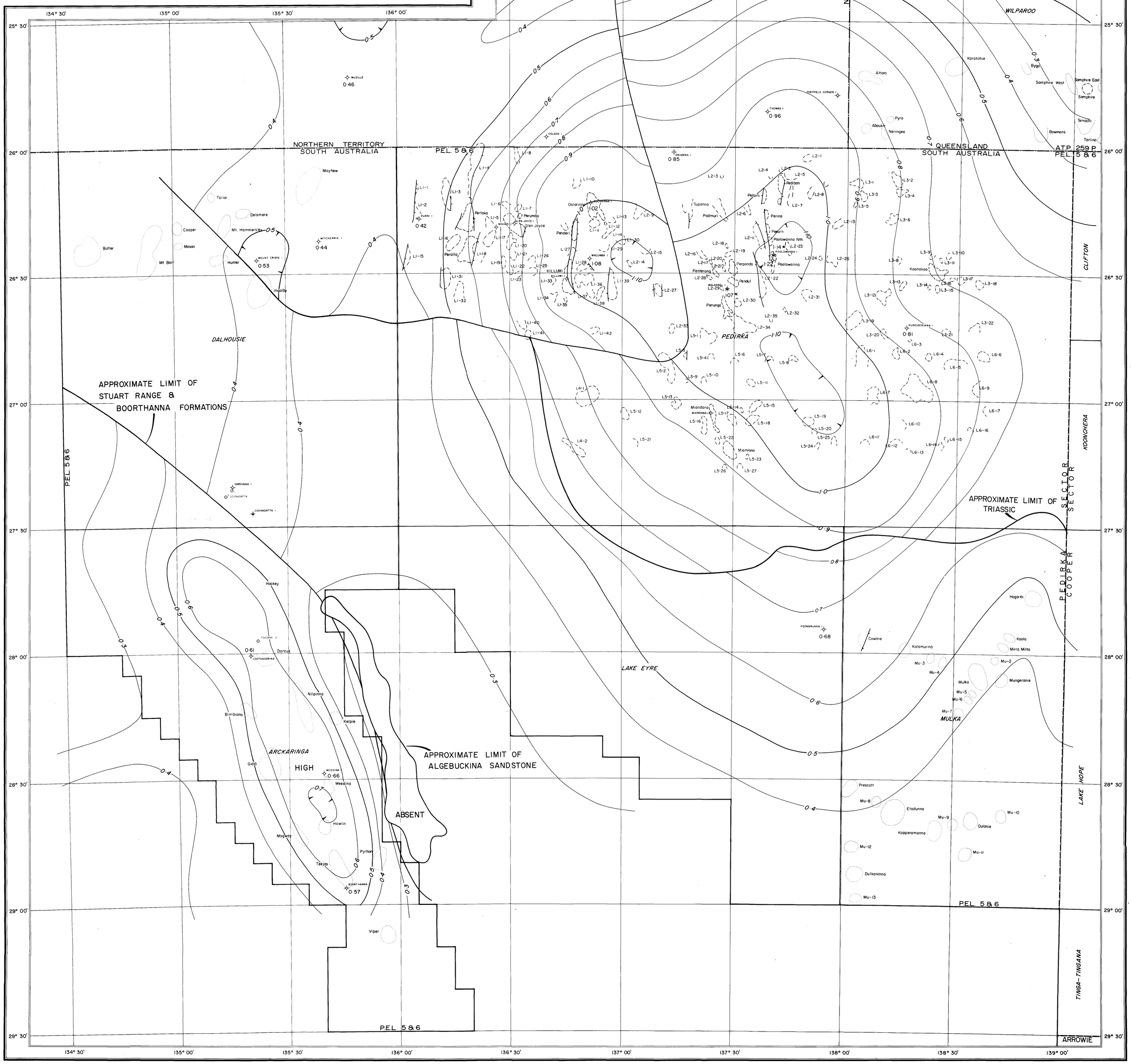
1:500000

kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M.S.M.	Date 10/85	Drawing Number 85XG-5976
Interpretation by J.W. HUNT 8/85	Chief Draftsman		File No. AA-11
Contour Interval 0·1%	Supervisor		ENC.22

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- VALUE AT BASE OF OVERLYING FORMATION
- ? VALUE UNCERTAIN
- + VALUE MAY BE >
- − VALUE MAY BE <
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- 0·44 CONTROL POINT



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2) IN THE TOP OF THE ALGEBUCKINA SANDSTONE

4891-36

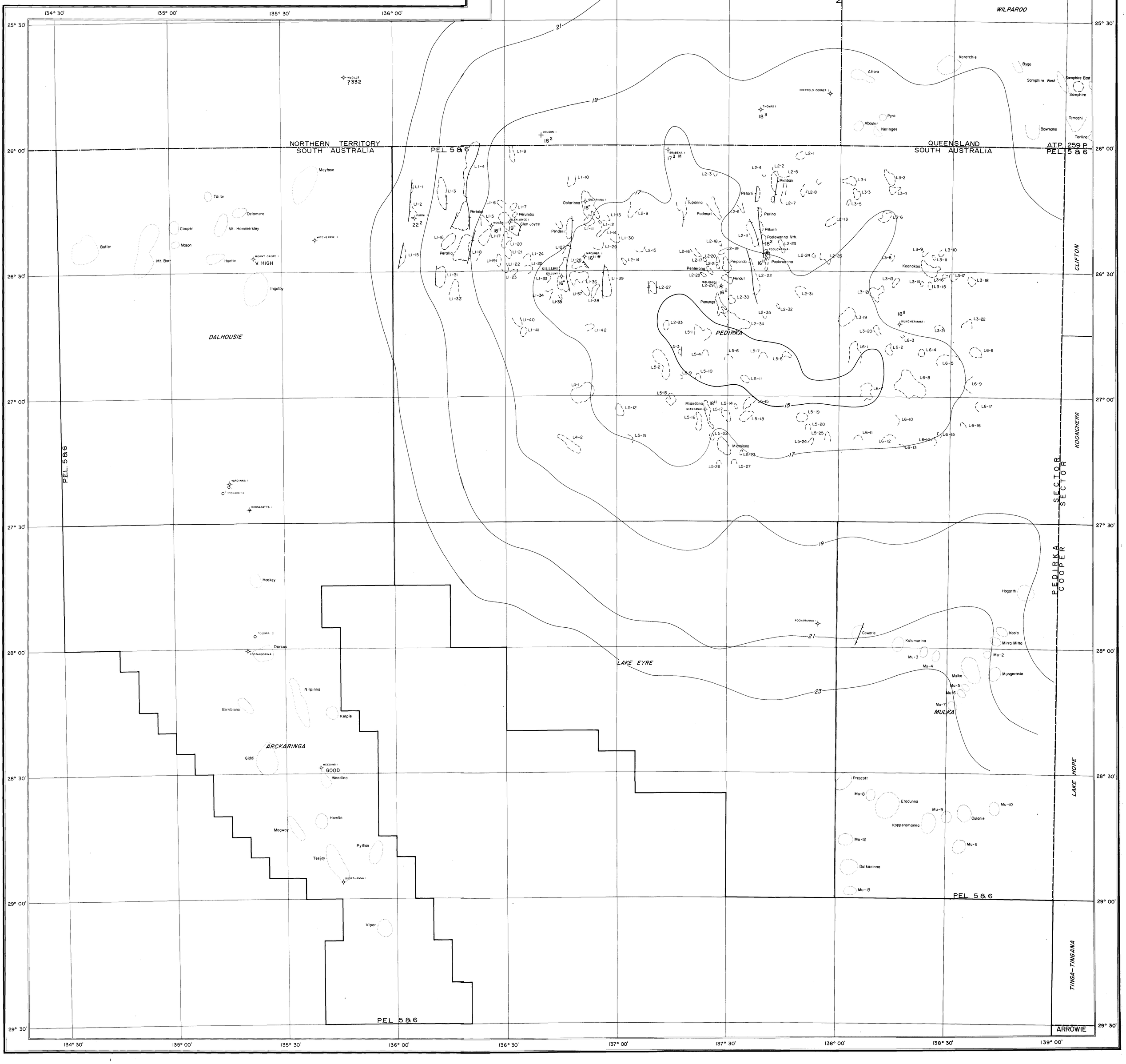
1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M.S.M. 10/85	Date	Drawing Number 85XG-5977
Interpretation by J. W. HUNT 8/85	Chief Draftsman		File N° AA-11
Contour Interval : 2 %	Supervisor		ENC. 23

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- 14^2 = 14 ± 2% average & range of Ø for selected sands (wellcards)
- 14^{11} = 14 ± 2% volumetric average & range of Øs (logcalc.)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note: WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 14 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- * Low in top 50'



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2) IN THE MIDDLE OF THE ALGEBUCKINA SANDSTONE

4891-97

1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

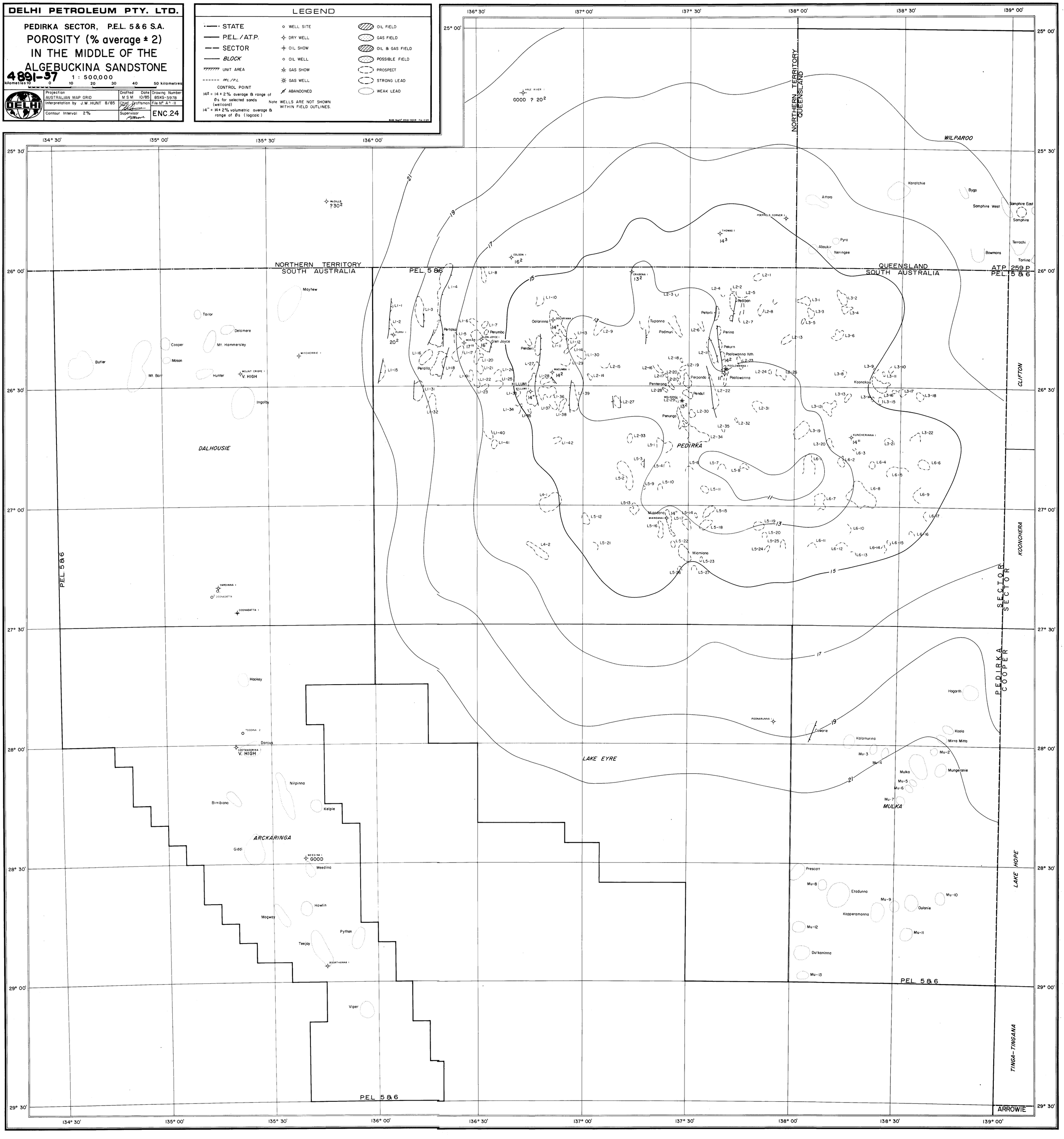
Projection AUSTRALIAN MAP GRID	Drafted M S M	Date 10/85	Drawing Number 85XG-5978
Interpretation by J.W. HUNT 8/85	Chief Draftsman		File N° A^-11
Contour Interval 2%	Supervisor		ENC.24

LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL/PL
- CONTROL POINT
- 14^2 = 14 ± 2% average & range of Øs for selected sands (wellcard)
- 14^{11} = 14 ± 2% volumetric average & range of Øs (logcalc)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD

Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.

BASE Dwg.N° 85XG-5008 File 2-23



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2) IN THE BASE OF THE ALGEBUCKINA SANDSTONE

4891-38 1 : 500,000

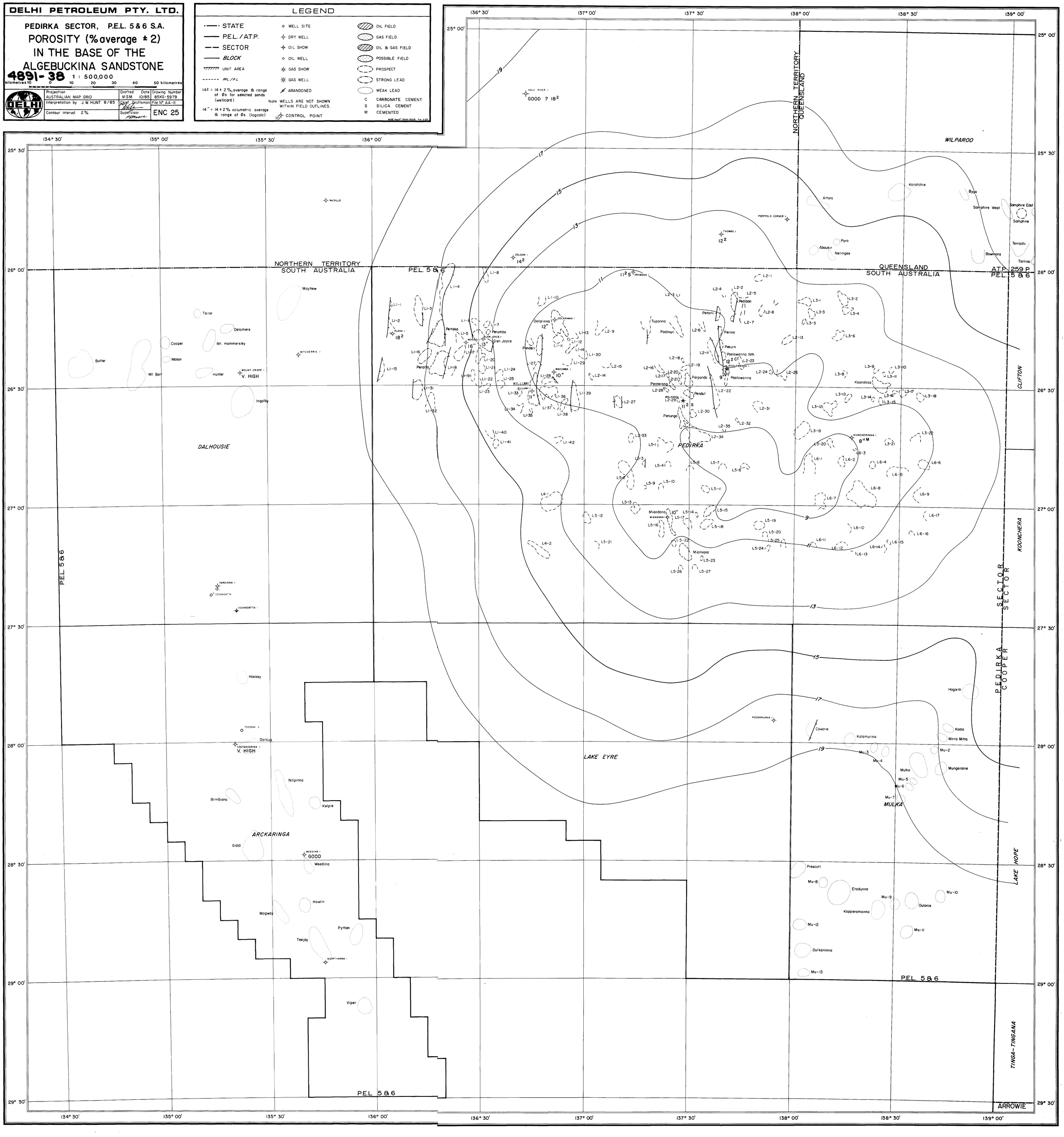
kilometres 10 0 10 20 30 40 50 kilometres

DELHI	Projection: AUSTRALIAN MAP GRID	Drafted: M.S.M. Date: 10/85	Drawing Number: 85XG-5979
	Interpretation by: J.W. HUNT 8/85	Chief Draftsman:	File N° AA-11
	Contour Interval: 2%	Supervisor: R.Moore	ENC 25

LEGEND

- STATE
- P.E.L./A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL./P.L.
- 142 = 14 ± 2%, average & range of Øs for selected sands (wellcard)
- 14" = 14 ± 2% volumetric average & range of Øs (logcalc)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 10 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- C CARBONATE CEMENT
- S SILICA CEMENT
- M CEMENTED

BASE Dwg.N° 8310-5008 File 2.03



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2) IN THE POOLOWANNA FORMATION AND LOG EQUIVALENTS

4891-39 1 : 500,000

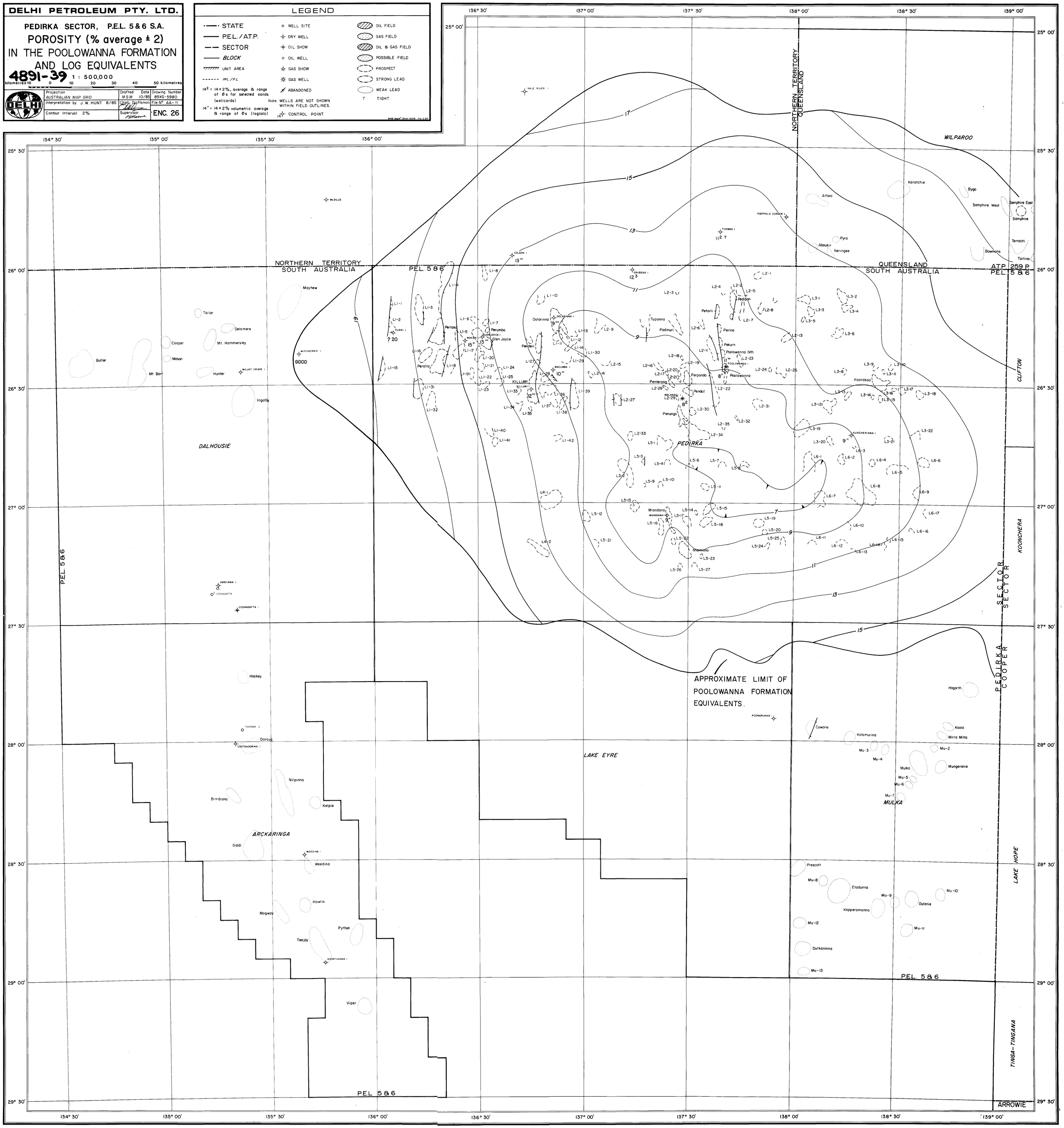
kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted M S M	Date 10/85	Drawing Number 85XG-5980
Interpretation by J. W. HUNT 8/85	Chief Draftsman		File N° AA-11
Contour Interval 2%	Supervisor		ENC. 26

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- 14^2 = 14 ± 2%, average & range of Øs for selected sands (wellcards)
- 14" = 14 ± 2% volumetric average & range of Øs (logcalc)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 14 CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- T TIGHT

BASE Drawn 85XG-5008 Fri 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2)

IN THE PEERA PEERA FORMATIONS AND LOG EQUIVALENTS

4891-40

1 : 500,000

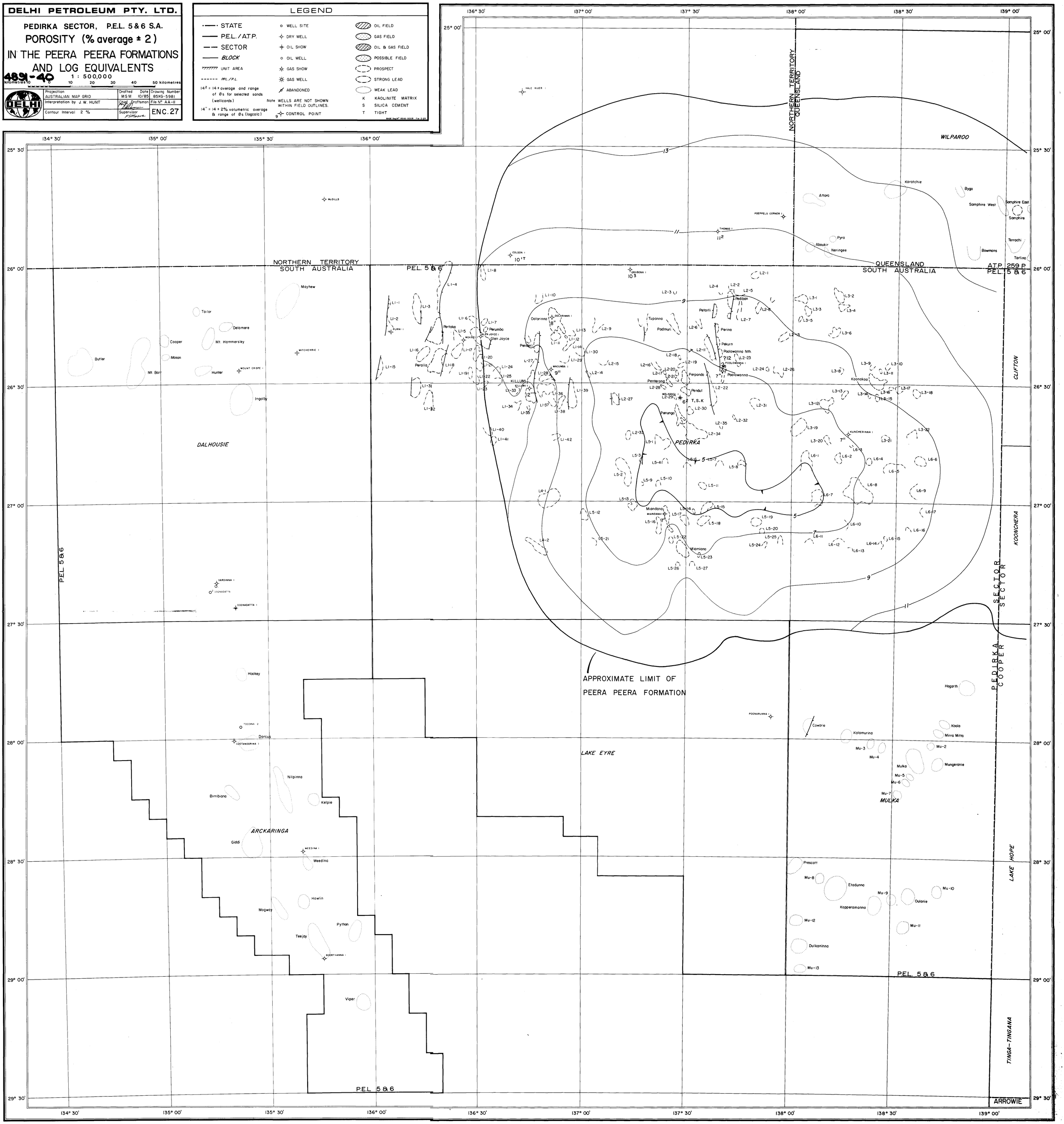
kilometres 10 0 10 20 30 40 50 kilometres

Projection: AUSTRALIAN MAP GRID	Drafted: M S M	Date: 10/85	Drawing Number: 85XG-5981
Interpretation by: J. W. HUNT	Chief Draftsman:		File N° AA-11
Contour Interval: 2 %	Supervisor: P. Moore		ENC. 27

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / PL
- 14^2 = 14 ± average and range of Øs for selected sands (wellcards)
- $14''$ = 14 ± 2% volumetric average & range of Øs (logcalc)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note: WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- K KAOLINITE MATRIX
- S SILICA CEMENT
- T TIGHT

BASE Dwg.N° 8516-5008 File 2-23



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2)

IN THE 'UPPER' AND 'MIDDLE'

PURNI AND MT. TOONDINA FMS.

4891-41

1 : 500,000

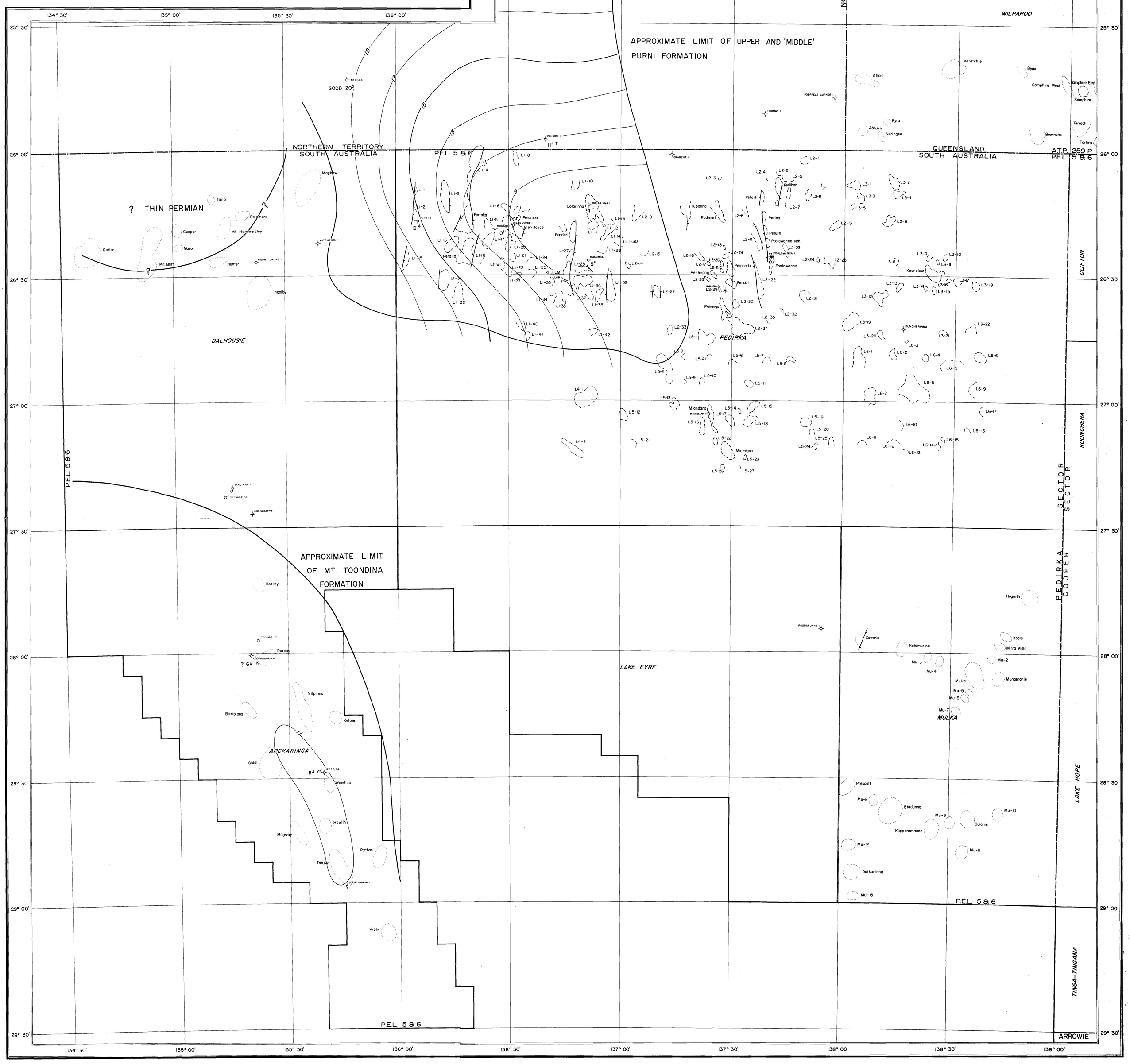
kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID		Drafted MSM 10/85	Drawing Number 85XG-5982
Interpretation by J.W. HUNT 8/85		Chief Draftsman	File No. AA-II
Contour Interval 2%		Supervisor P. Moore	ENC. 28

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PRL / PL
- 14^2 = 14 ± 2%, average & range of Øs for selected sands (wellcards)
- 14^{11} = 14 ± 2% volumetric average & range of Øs (logcalc)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 11^{T} CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- K KAOLINITE MATRIX
- T TIGHT

BASE Dwg No. 85XG-5008 File 2-29



DELHI PETROLEUM PTY. LTD.

PEDIRKA SECTOR, P.E.L. 5 & 6 S.A.

POROSITY (% average ± 2) IN THE 'LOWER' PURNI PLUS CROWN PT. & BOORTHANNA FMS.

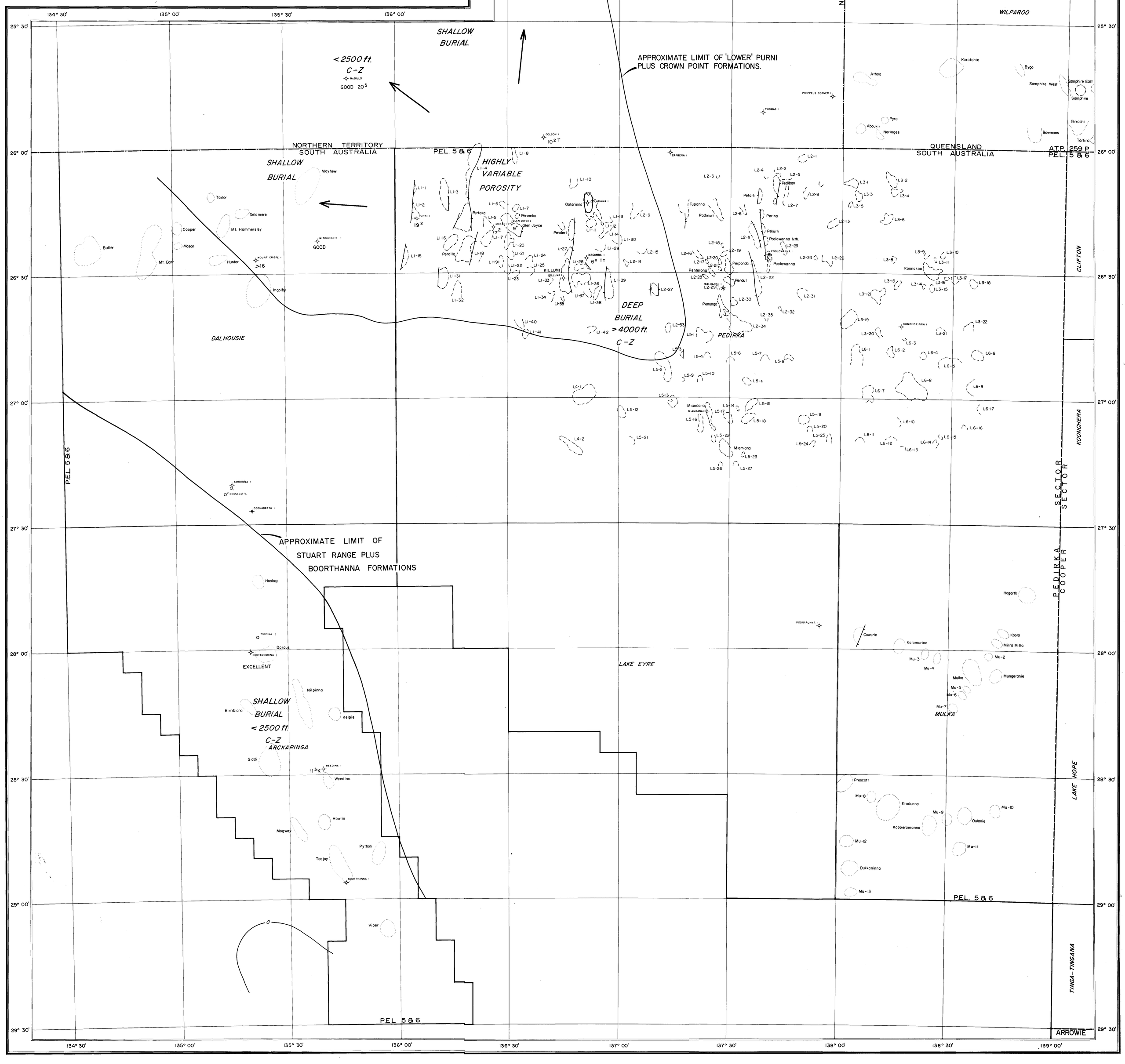
4891-42

1 : 500,000

kilometres 10 0 10 20 30 40 50 kilometres

Projection AUSTRALIAN MAP GRID	Drafted MSM	Date 10/85	Drawing Number 85XG-5983
Interpretation by J. W. HUNT	Chief Draftsman		File N° AA-11
Contour Interval 2%	Supervisor P. Moore		ENC. 29

LEGEND

- STATE
- P.E.L. / A.T.P.
- SECTOR
- BLOCK
- UNIT AREA
- PPL / P.L.
- 14^2 = 14 ± 2%, average & range of Øs for selected sands (wellcards)
- 14^{11} = 14 ± 2% volumetric average & range of Øs (logcalc)
- WELL SITE
- DRY WELL
- OIL SHOW
- OIL WELL
- GAS SHOW
- GAS WELL
- ABANDONED
- Note WELLS ARE NOT SHOWN WITHIN FIELD OUTLINES.
- 18° CONTROL POINT
- OIL FIELD
- GAS FIELD
- OIL & GAS FIELD
- POSSIBLE FIELD
- PROSPECT
- STRONG LEAD
- WEAK LEAD
- Y CLAY MATRIX
- K KAOLINITE MATRIX
- T TIGHT

BASE Dwg N° 85XG-5008 File 2-29