KAROON
Gas Australia

MEGASCOLIDES-1 Re-Entry Side Track1

PEP 162/EL 4537

WELL COMPLETION REPORT

Volume 2: INTERPRETATIVE DATA (GEOLOGY)

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1. CONTRIBUTORS and CONTROLS

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2. PERMIT HISTORY and EXPLORATION

Megascolides 1 was the first deep, modern exploration well to be drilled (Dec., 2004) in the EL4537 and PEP162 permits (Fig.1) targeting lower Strzelecki coal deposits for Coal Bed Methane (CBM) exploration and Crayfish Group equivalent alluvial fan sands for conventional oil and gas accumulations that had been interpreted by previous seismic mapping (Blackburn, 2002). The Megascolides 1 and Re-entry well is located 14 km south of Warragul, Victoria on the Northern Terrace of the Narracan Trough, which forms part of the northwestern edge of onshore Gippsland Basin (Fig. 2).

The Megascolides-1 well was located on the basis of two early seismic surveys – the Yarragon 99A survey shot in 1999 totaling about 36km of 2D data and the Nexus GBA 01A seismic survey totaling about 68km of 2D data. Both these surveys used a vibroseis source and the lines were located along roads.

The primary objective of the Megascolides-1 well was to test the methane producing qualities of the Strzelecki Group Coals and the secondary objective was to evaluate the reservoir potential of the basal Strzelecki (Crayfish Group equivalent) sandstone for conventional oil and gas

Seismic mapping had indicated that the coals should occur at the optimum depth range of 750 to 800m with low structural deformation (analogous to prospective coal seam methane exploration in other CBM basins). From these shallow targets the well was deepened to explore the petroleum potential of the deeper section and the reservoir potential of the basal Strzelecki.

Early mapping had interpreted that basal Strzelecki Group (Crayfish Group equivalent, probably Rintouls Creek Formation) alluvial fan sands were well developed over the northern and eastern portion of the seismic survey area. It was also interpreted that trap seal integrity would be higher to the north and west where there has been less Tertiary structural deformation.

Megascolides is a fault bounded structure geologically located on the Northern Terrace of the Narracan Trough, which forms part of the northwestern edge of onshore Gippsland Basin (Fig. 3). The well was drilled on a saddle, bounded at the south by a fault identified by seismic mapping at the Top Crayfish Group Equivalent surface (Fig. 4).

Megascolides 1 was spudded on 17th Nov. 2004 and was cased and suspended as an exploration well with oil shows on 18th Dec. 2004 having intersected hydrocarbon shows in the Cretaceous Crayfish Group Equivalent Sands near the Total Depth of the well.

The well penetrated 3 to 5 metres of net porous, permeable sands with good bright white-yellow fluorescence and high mud gas readings within the Rintoul Creek Fm (Top Crayfish Group equivalent) over the gross interval 1883 to 1891mRT. Petrophysical analysis of the sands showed up to 60% oil saturation and a porosity range between 10% and 15%. A core was taken at the base of this interval from 1890 to 1897.27mRT. Geochemical analysis of the extracted oil from a piece of the core shows it to be an unbiodegraded waxy oil. The viscosity and pour point of the oil is unknown. MDT pressures and samples were attempted, however due to hole washouts the tool could not be seated and no data could be collected.

For CBM exploration, the results of the well proved the presence of gas bearing black coal across the Narracan Trough within Wonthaggi Coal Measure (Strzelecki Group) sediments. However, only a total thickness of 15m of black coal in beds less than 0.5m was penetrated. In the one core sample analyzed the gas content was 100SCF per tonne with an approximate gas saturation of 30%. It was therefore considered that a CBM project would be non-commercial at this location and is not the purpose of this re-entry and sidetrack drilling. No testing was undertaken due to the unavailability of equipment. The well was subsequently plugged and suspended for later re-entry

The purpose of this drilling was to re enter, sidetrack and cut a core through the Rintoul Creek Formation (Top Crayfish Group equivalent) reservoir zone. Then drill sufficient rat hole, TD the well and run a full suite of wireline logs. This was successfully achieved. If significant hydrocarbon saturations, porosity and permeability are interpreted then the well was to be open hole drillstem tested.

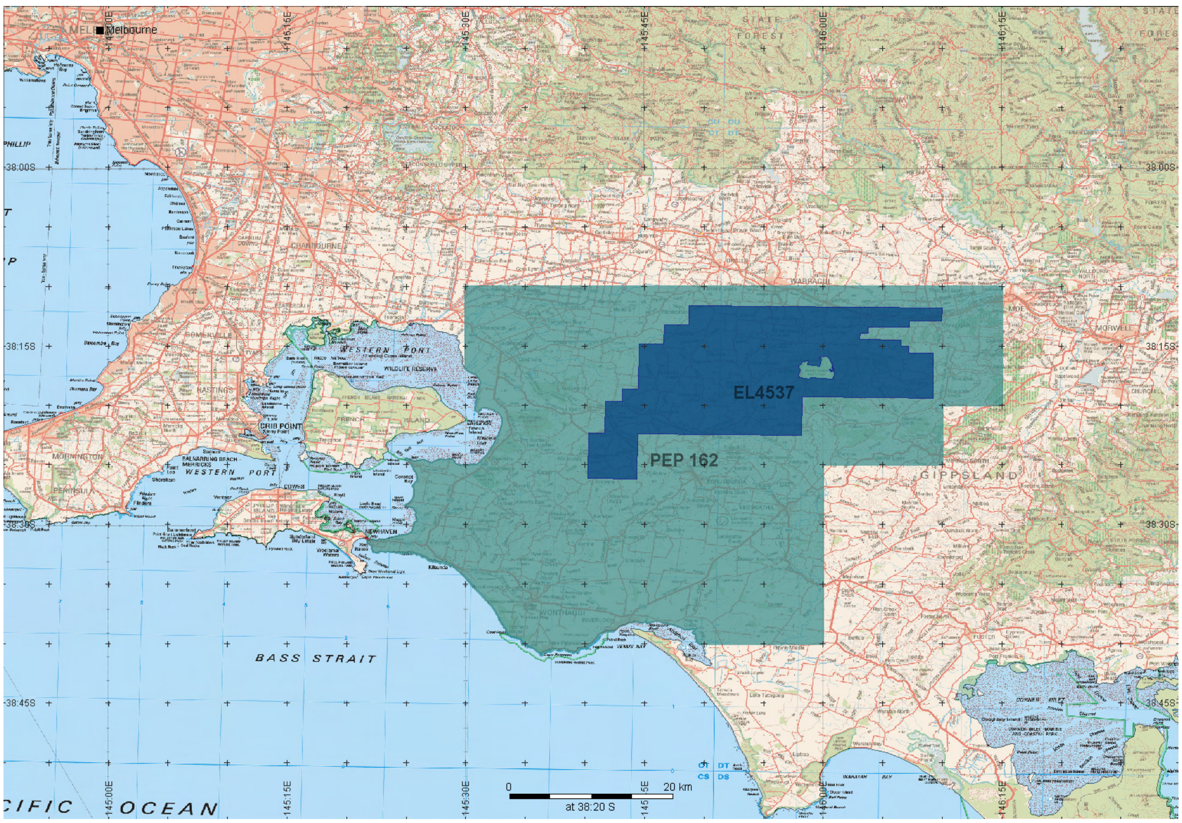


Fig 1 Karoon Gippsland Acreage

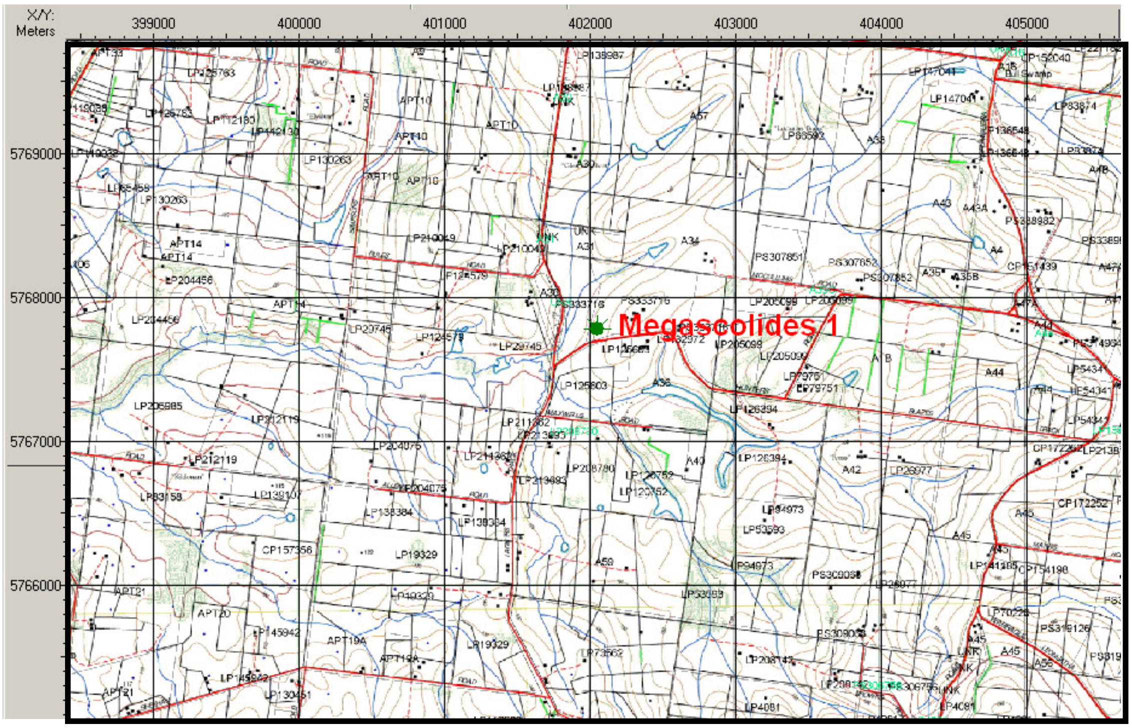


Fig 2 Megascolides-1 Location Map *Megascolides-1 Well Location showing roads (red), streams (blue), farms (bordered in black) and topography (brown).*

3 REGIONAL GEOLOGY

The EL 4537 license covers an area of (820 km^2) and is generally characterized by extensive outcrop of the Early Cretaceous age Strzelecki Group rocks. The larger PEP 162 oil and gas exploration permit area is more extensive extending to the south coast and Western Port Bay. Thin intervals of Tertiary sediments and volcanics overly part of the Strzelecki outcrop. In restricted areas around the margins of the Early Cretaceous grabens Palaeozoic rocks outcrop or lie beneath the thin tertiary sections (Fig.3).

The Strzelecki group comprises the earliest known sediments in the Gippsland Basin, which were deposited in a series of generally northeast to southwest trending grabens and half grabens. The graben system extends to the east and underlies the giant oil and gas fields of Bass Strait. The same graben system extends to the west at least as far as the western end of the Otway Basin in South Australia. Basement outcrops, comprising Palaeozoic granites and metamorphic rocks occur to the north and south of the permit.

The Strzelecki Group. is divisible into two distinct intervals. The lower Strzelecki interval is an early graben fill sequence of mainly continentally derived, quartz rich fluvial sands, lake deposits and minor local coals and volcanics. It is analogous to the Crayfish subgroup, prospective in the Otway Basin.

The upper Strzelecki Gp.is a later stage graben fill interval dominated by volcaniclastic derived sediments from andesitic/dacitic volcanic rocks erupting to the east. The resulting rock section is characterized by stacked fluvial sands, fine-grained overbank deposits and coal rich intervals best developed near the base of the interval (Wonthaggi coals). This depositional pattern is regionally persistent with indications of marine influences only detected far in the west of the Otway Basin (eg. Troas-1 well). The components of cratonic hinterland derived claystones, quartzose sands and metamorphics is generally less than 20%, except in the basal units, compared with over 85% in the lower Strezelecki.

The presence of the large relative volumes of volcanoclastic material in the Upper Strzelecki (coal bearing interval) is very important for CBM production. The volcanoclastic dominated sandstones alter rapidly with burial resulting in very low porosity and permeability rocks that are as such, very unlikely to provide a water source during production related dewatering of the coals.
The Strzelecki coals appear well developed in this license area of the basin, based on seismic evidence and were deposited during a regionally quiescent period of basin development. Seismic indicates up to 400m of gross coal interval in the license area. Equivalent, though less coaly intervals can be seen right across the Gippsland and Otway basins.

The structural history of this graben system is complex and is the result of the interplay of basement geology with tectonic forces associated with at least four tectonic regimes. These regimes were; the Australia/ Antarctica rift and continental break-up tectonics, the Australia/Norfolk rise rift and continental break-up tectonics, the Australia/Antarctica West Tasmania wrench margin development and the Australia/ Indonesian archipelago collision. The net structural effect in the permit area can be characterized by early major graben development then episodic Late Cretaceous and Tertiary inversion and uplift. The timing and magnitude of the later of these events is locally indicated by the deformation seen in the late Tertiary coals of the Latrobe valley which are underlain by similar

Strzelecki Gp. filled grabens. It has been estimated that as much as 1500m of section has been removed over the license area. This is consistent with the regional geologic history of the area.

Local and regional thermal history studies have consistently interpreted a major heating event before the mid Cretaceous and prior to the initial period of deformation/uplift variably expressed along the entire graben system. It is interpreted that prior to the mid Cretaceous, that the rocks within the Strzelecki Group grabens were likely to have matured and generated oil and gas. This is supported by the coal maturity data from the Wonthaggi and Korumburra coal fields which are preserved at maturity levels that can produce oil and gas. These coalfields are sited beside the main depocenter of the Narracan Trough where coal maturity levels are interpreted to be higher.

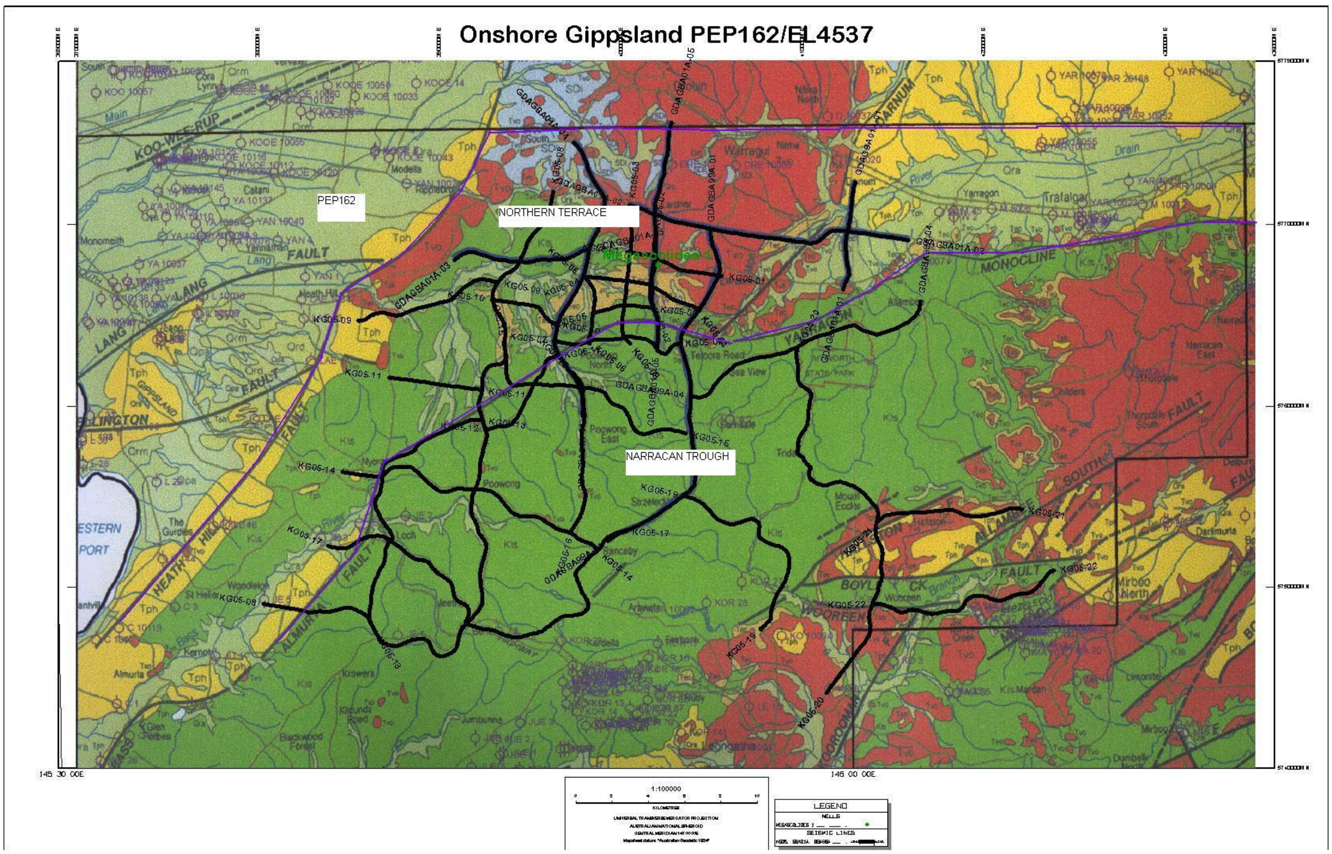


Fig. 3 Regional Geological Map
Seismic = Black Lines
Green = Strzelecki Gp.,
Red = Tertiary Volcs.,
Lt Brown = Childers Fm

4 WELL STRATIGRAPHY

4.1 Thorpdale Volcanics (Oligocene) (5.2 to 38.9mRT)

This Unit was described in Megascolides-1

This unit outcrops at the surface and has a base at 38.9mRT.

It consists of weathered basalt at the top with boulders and very coarse sands to unweathered black basalt at the base.

The lithologies are described as weathered volcanics to claystone at the top, which is red brown, minor light brown grey to white and mottled, soft to firm, sticky with, rare coarse to very coarse angular quartz sand grains, grading with depth to volcanics which are mainly unweathered, hard, black to dark green black angular basalt fragments, intermixed with common red brown mottled with dark brown and light yellow brown to white claystone (weathered basalt).

4.2 Barracouta Formation (formerly known as Childers Formation), Oligocene (?) (38.9 to 61.9 mRT)

This Unit was described in Megascolides-1

The top of the onshore extent of the Barracouta Formation (known locally as the Childers Formation) is based on a lithology change from the overlying Thorpdale Volcanics basalt to paleosol and coal to massive quartz sandstone. There is an associated increase in rate of penetration and shift in gamma ray on wireline logs.

Lithology:
"PALAEOSOL " (38.9 to 39.9 mRT)
Claystone (80%) intermixed with Coal (20%)
CLAYSTONE: light green grey, very soft, sticky.
COAL: black, very argillaceous in part, earthy lustre, soft and amorphous.

CHILDERS (39.9 to 61.9mRT)
Massive Sandstone (90%) with minor interbedded Claystone (10%).
SANDSTONE: light orange, very fine to pebble, dominantly very coarse, angular to sub angular, very poorly sorted, trace off white to red brown argillaceous matrix, very weak silica and weak iron oxide cement, clear to opaque quartz grains with common yellow to dark brown iron oxide staining, trace dark brown iron oxide pellets, unconsolidated to friable, has very good visual porosity, no oil fluorescence at top grading with depth to:
SANDSTONE: very light orange grey, has occasional yellow orange iron oxide staining, as above, is very poorly sorted, trace off white argillaceous matrix, trace pyrite, and
CLAYSTONE: light grey, slightly silty, rarely very finely arenaceous, very soft, sticky. non fissile, unconsolidated. "

4.3 Wonthaggi Formation (Strzelecki Group)

This Unit was described previously in Megascolides-1 and is reproduced here down to the kick off point at 1635m from where new lithological descriptions were made.

Top: 61.9 m RT **Base**: 1942.6 m RT **Age**: Cretaceous (*P.notensis* to *F.wonthaggiensis* zone*)*
(The Palynological zonation has recently been re interpreted and is presented here. For more details go to Appendix-1 Palynological Analyses for Megascolides-1 and 2).

Upper boundary pick: The top of the Group comprises weathered claystone overlying argillaceous green-grey volcanogenic sandstone. It is distinguished from the overlying faster drilling rate of the Barracouta (Childers) Formation by its lower rate of penetration.

Lithology: Overall the Strzelecki Group consists of interbedded claystone and volcanolithic sandstones with thin interbedded coal seams.

The Strzelecki Group can be further sub divided into a number of lithological "Units"

4.3.1 "Upper Unit" Wonthaggi Formation (Strzelecki Group)

Top: 61.9 m RT **Base**: 858.9 m RT **Age**: Cretaceous (*P. Notensis* zone *)*

Upper boundary pick: The top of the formation comprises weathered claystone overlying argillaceous greenish grey volcanogenic sandstone. This upper unit is distinguished by its slower ROP
Lithology: The Upper unit consists of interbedded claystone and fining up volcanolithic sandstones with thin, rare interbedded coal seams.

The Claystone is generally light to medium grey and medium to dark greenish grey, firm to moderately hard, sub fissile, has minor very fine to silty quartz, rare altered feldspar grains, trace black carbonaceous flakes & laminae and trace micro mica

The Sandstone is light brown to medium greenish grey, friable to firm, very fine to fine quartz, angular to subangular, poorly sorted with abundant medium grey argillaceous matrix, rare to common very light grey altered feldspar, common greyish green volcano lithic grains, trace reddish brown lithics and trace black coaly detritus. The sandstone has poor visual porosity.

The coal is black to very dark brown, is very argillaceous, and has an earthy to sub vitreous lustre and an uneven fracture.

4.3.2 "A" Unit, "Intra Strzelecki Progrades", Wonthaggi Formation (Strzelecki Group)
Near Purple Seismic event

Top: 858.9 m RT **Base**: 1078.9 m RT **Age**: Cretaceous (*P. notensis* zone *)*

Upper boundary pick: The top of this unit has a massive Sandstone with a low GR shift to the left on the wireline log.

Lithology: This unit consists of a number of stacked 15-40m blocky sands, interbedded with claystone and minor coal beds up to 0.5m thick. Towards the base of the unit the sandstone beds are up to 50m thick

The Sandstone is light to medium greenish grey, friable to firm, very fine to fine, rarely medium, trace coarse quartz, subangular to sub rounded, poorly sorted with abundant medium grey argillaceous matrix, has minor siliceous or calcareous cement, rare to common very light grey altered feldspar, common greyish green volcano lithic grains, trace reddish brown lithics and trace black coaly detritus. The sandstone has poor visual porosity.

The Claystone is medium to very dark grey and medium to dark greenish grey, firm to hard, sub fissile, has minor very fine to silty quartz, rare altered feldspar grains, and minor black carbonaceous flakes & laminae.

The coal is black to very dark brown, is very argillaceous, and has an earthy to sub vitreous lustre and an uneven fracture

4.3.3 “B”: Unit, Wonthaggi Formation (Strzelecki Group) Near Green Seismic event

Top: 1078.9 m RT **Base**: 1372.9 m RT **Age**: Cretaceous (*P.notensis)*

Upper boundary pick: The top of the unit is a thinly interbedded Sandstone and Claystone package approx 20m thick.
Lithology: This unit consists of inter bedded Sandstones, Claystones and very rare coals.

The Sandstone is medium greenish grey, friable to firm, composed of very fine to fine quartz, is angular to subangular, poorly sorted with common medium grey argillaceous matrix, rare very light grey altered feldspar, common greyish green volcano lithic grains, trace crystalline calcite, trace reddish brown lithics and trace black coaly detritus. The sandstone has poor visual porosity

The Claystone is generally medium to dark grey and medium greenish to olive grey, firm to moderately hard, sub fissile, has minor very fine to silty quartz, rare altered feldspar grains, trace black carbonaceous flakes & laminae and trace micro mica

The rare Coal is black to very dark grey, is hard and brittle, has an earthy to sub vitreous lustre, sub conchoidal fracture and is very argillaceous in part.

4.3.4 “C” Unit Wonthaggi Formation (Strzelecki Group) Near Orange Seismic event

Top: 1372.9 m RT **Base**: 1726.2 m RT **Age**: Cretaceous (*P.notensis)*

Upper boundary pick: The top of the unit is characterised by a 15m thick interbedded claystone / fine sandstone bed and it has a correspondingly higher GR response than the overlying unit.
Lithology: This unit consists of thickly bedded blocky and fining up sandstones and claystones.

The Sandstone is light to medium greenish grey, friable to firm, very fine to fine, dominantly very fine quartz, angular to subangular, moderately sorted with common medium grey argillaceous matrix, rare very light grey altered feldspar, common greyish green volcano lithic grains, trace reddish brown lithics and trace black coaly detritus. The sandstone has nil to poor visual porosity

The Claystone is generally medium to dark grey and medium greenish to olive grey, firm to moderately hard, sub fissile, has minor very fine to silty quartz, rare altered feldspar grains, trace black carbonaceous flakes & laminae and trace micro mica with minor crystalline calcite vein infill.

FLUORESCENCE: The calcite vein infill from 1659 to 1665m (trace of total sample) has trace moderately bright patchy to solid light to medium yellow oil fluorescence giving a dull yellow white crush cut fluorescence with trace residue.

4.3.5 "D" Unit Wonthaggi Formation (Strzelecki Group) near khaki seismic pick

Top: 1726 m RT **Base**: 1883.3 m RT **Age**: Early Cretaceous (*F.wonthaggiensis* zone and *L. belfordii* Subzone)

Upper boundary pick: The top of the unit consists of a 20-25m thick slightly interbedded claystone bed and correspondingly higher GR response than the overlying unit.

Lithology: The "D" Unit is an interbedded claystone, sandstone and trace coal section. In addition to the upper shale there is a major claystone bed from 1867 to 1883.3m. The latter being the top seal to the oil shows in Megascolides-1.

The claystone is medium to dark brown grey to medium green grey to medium to dark grey, slightly to very silty, very finely arenaceous with altered feldspar grains in part, occasionally very carbonaceous, has trace black carbonaceous flecks, trace black coal detritus, trace micromica, trace to common calcite and goethite lined fractures, hard and subfissile.

The sandstone is light to medium green grey, very fine to rarely medium, dominantly fine, subangular to rounded, moderately sorted, has abundant off white argillaceous matrix, strong silica and moderate to strong calcareous cements, common off white altered feldspar grains, minor altered grey green volcanogenic lithic grains, trace quartz, trace red brown lithics, trace black coaly detritus, trace to common crystalline calcite and goethite vein infill, hard, no visual porosity and no intergranular oil fluorescence.

There is minor fluorescence from 1755-1765m in vein infill material (1% of total sample). There is trace bright patchy to solid light to medium yellow oil fluorescence giving a dull yellow white crush cut fluorescence with trace yellow white film residue.
From 1790 to 1800m the vein infill material (trace to 1% of total sample) has 30-40% bright patchy to solid light to medium yellow oil fluorescence giving a dull yellow white crush cut fluorescence with trace yellow white film residue.
From 1855 to 1860m the vein infill material (trace of total sample) has 10% bright patchy to solid light to medium yellow oil fluorescence giving a dull yellow white crush cut fluorescence with trace yellow white ring residue.

4.4 Rintoul Creek Formation Equivalent (Top Crayfish Group Equivalent sand) (Strzelecki Group) Near Dark Green seismic event

Top: 1883.3 m RT **Base**: 1889.9 m RT **Age**: Cretaceous (*F.wonthaggiensis* zone)

Upper boundary pick: The top pick is based on a lithology change from the overlying Wonthaggi Formation laminated claystone and minor coal, to argillaceous quartz sandstone. There is an associated increase in rate of penetration, a shift in gamma ray on the wireline logs and an increase in mud gas readings. Coring was commenced approximately 2 metres above the top Rintoul Creek equivalent in the overlying shale. (see Basic Geological Well Completion Report)

Lithology: The upper part of the Rintoul Creek Formation equivalent consists predominantly of medium to coarse argillaceous sandstone and the lower part is an interbedded argillaceous medium sandstone and shale.

1883.3 to 1887.6m

Sandstone (100%) with rare coaly laminations.

The sandstone is light to medium grey, to light brown grey, very fine to very coarse, dominantly medium to coarse, angular to subrounded, very poorly sorted, strongly silica cemented, weak to moderate calcareous cemented, common white argillaceous matrix, quartzose, has trace dark grey and red brown lithics, trace medium to dark grey clay clasts to 30mm, common black coal detritus, is hard and has poor visual porosity.

The coaly laminations are black, moderately argillaceous, often strongly slickensided, commonly micromicaceous where argillaceous, vitreous, platy to subconchoidal fracture, hard and brittle.

The sandstone has 50% patchy dull to moderately bright medium yellow to orange oil fluorescence, giving a dull to moderately bright light to medium yellow slow streaming to crush cut fluorescence, with a thin film residue.

1887.6 to 1889.9m

Sandstone (90%) with minor thin interbeds of Shale (10%).

The sandstone is light to medium grey to light brown grey, very fine to medium, occasionally coarse to very coarse, dominantly medium to coarse, angular to subrounded, very poorly sorted, strongly silica cemented, weakly calcareous cemented, has common white argillaceous matrix, quartzose, has trace dark grey, red brown and green lithics, trace garnet?, trace medium to dark grey clay clasts to 20mm, has trace to common black coal detritus, hard, poor visual porosity.
The shale is very dark grey to black, slightly silty, has trace to common fine black carbonaceous matter, trace calcite infilled fractures, common micromica, is hard and subfissile.
The sandstone has 50% patchy dull to moderately bright medium yellow to orange oil fluorescence, giving a dull to moderately bright light to medium yellow slow streaming to crush cut fluorescence, with a thin film residue.

4.5 Crayfish Group Equivalent shale

Top: 1889.9 m RT **Base**: 1942.5 m RT **Age**: Cretaceous (*F.wonthaggiensis* zone)

Upper boundary pick: The top of this unit is based on a sharp lithology change from the overlying sandstone to very dark grey shale. There is a corresponding sharp shift in the gamma ray and density curves on the wireline logs.

Lithology: Shale with thin interbedded sandstones.

The shale is dark to very dark grey to dark brown grey, slightly to occasionally very silty, occasionally very finely arenaceous, moderately carbonaceous, has trace to common fine black carbonaceous matter, trace to common white crystalline vein infill, common micromica, is hard and subfissile.

The thinly bedded sandstone is light grey to light brown grey, very fine to very coarse, dominantly very fine, subangular to subrounded, very poorly sorted, strongly silica cemented, moderately calcareous cemented, has trace white argillaceous matrix, quartzose, trace dark grey lithics, trace black coaly material, trace crystalline vein infill, is hard, has no visual porosity and no oil fluorescence.

There is minor vein infill material from 1915 to 1925m which has trace to 5% dull patchy pale yellow fluorescence giving a very weak dull yellowish white crush cut, and a trace residue.

4.6 Duck Bay Volcanics

Top: 1942.5 m RT **Base:** 1980+ mRT (**Total Depth**) **Age:** ?Early Cretaceous (Indeterminate zone*)*

Upper boundary pick: The top of the Duck Bay is based on a lithology change from the overlying shale to weathered volcanics shown by the decrease in gamma ray, sharp change in neutron-porosity and density logs, decrease in resistivity and sonic and increase in mud gas readings.

Lithology: Weathered volcanics and green claystone.

The weathered volcanics have a cryptocrystalline texture with remnant flow banding, and common small vesicular infill. Near the base from 1959m the volcanics become unweathered where it is hard, brittle, bright green in colour, and cryptocrystalline. There is also some calcite veining, and chloritic alteration.

Weathered Volcanics (Basalt?).
The volcanics in the upper section are mainly weathered to off white to light brown to dark grey claystone, have cryptocrystalline texture, remnant flow banding, are brittle in parts and where less weathered is bright green to black, cryptocrystalline, has a trace calcite veining (no oil fluorescence), are hard and brittle.

From 1959m the volcanics, Basalt(?), are only partially weathered and in general become less weathered with depth.
They are medium to dark green to black speckled with very fine spots of white clay, light brown grey and weathered in part, vesicular in part, micro to cryptocrystalline, chloritic?, have common white and clear crystalline veining and is hard.

The calcite vein infill material (1% of sample) has trace to 40% dull to bright solid to patchy yellow fluorescence giving a weak yellow white crush cut and a thin yellow ring residue.

Formation /unit	Seismic Horizon	Age	TWT sec (Seismic)	Megascolides-1 wireline log pick (mRT)	Megascolides-1 wireline log pick (mTVD SS)	Megascolides-1 Re-entry & ST Prognosed Tops (mMDRT)	Actual Depths (mMDRT)	Actual Depths (mTVD SS)
Thorpdale Volcanics	Surface	Early to Late Oligocene		4.3 (Hunt Rig RT)	+120 abmsl	5.2 (Century Rig RT)	5.2	+120 abmsl
Barracouta Formation (Childers Formation)	No Pick	Oligocene (?)		38	+86.3 abmsl	38.9	38.9 (as per Meg-1)	+86.3 abmsl
Wonthaggi Formation (Strzelecki Group)	No Pick	*P. notensis*		61	+63.3 abmsl	61.9	61.9 (as per Meg-1)	+63.3 abmsl
	PURPLE		0.974					
Intra Strz Sands (Progrades?) "A" Unit	NEAR PURPLE	*P. notensis*		858	-733.7	858.9	858.9 (as per Meg-1)	-733.7
	GREEN		1.155					
"B" Unit	NEAR GREEN	*P. notensis*		1078	-953.7	1078.9	1078.9 (as per Meg-1)	-953.7
	ORANGE		1.298					
"C" Unit	NEAR ORANGE	*P. notensis*		1372	-1247.7	1372.9	1372.9 (as per Meg-1)	-1247.7
	KHAKI		1.482					
"D" Unit	NEAR KHAKI	*F.wonthaggiensis* zone and *L. belfordii* Subzone*)*		1725	-1600.7	**1726.5**	**1726 (wireline)**	**-1601**
	DARK GREEN		1.570					
Rintoul Creek Equiv (Reservoir Target)	NEAR DARK GREEN (Rintouls is below or equiv to top Crayfish equivalent)	*F.wonthaggiensis* zone and *L. belfordii* Subzone		1883	-1758.7	**1884.8**	**1883.3 (wireline & core)**	**-1758.1**
Crayfish Group Equiv	No Pick	*F.wonthaggiensis* zone		1890	-1765.7m	**1891.8**	**1889.9 (wireline & core)**	**-1764.7**
Weathered Duck Bay Volcanics	No Pick	*Early Cret*		1942	-1817.7	**1943.8**	**1942.5 (wireline)**	**-1817.4**
Duck Bay Volcanics	No Pick	*Early Cret*		1962	-1837.7	**1963.8**	**1959.0 (wireline-sonic / res)**	**-1833.8**
TOTAL DEPTH							**1980 (Driller) 1974.55 (wireline)**	**-1854.8 -1849.35**

Table 1: Megascolides-1, Re-entry & Sidetrack Predicted versus Actual Stratigraphy

5 BIOSTRATIGRAPHIC DATA

5.1 Palynological Data

No new palynological slides were prepared for Megascolides-1 RE/ST1, however pre existing data from Megascolides-1 was re interpreted and correlated with new data from the nearby well; Megascodes-2. A summary of that report follows and details can be found in Appendix-1

The principal conclusions derived from the review of the palynological data, as displayed on the cross-section, are as follows:

1. The shallowest Cretaceous assemblages in Megascolides-1 are re-interpreted as no younger than the *Pilosisporites notensis* Zone, and these assemblages do not extend into the younger *Crybelosporites striatus* Zone as has been previously suggested.
2. The base of the *Pilosisporites notensis* Zone is identified as deep as 1475m in Megascolides-2 and as deep as 1550m in Megascolides-1, indicating a thickness of >1.5 km for this zone in both wells.
3. Based on re-examination of palynological slides from Megascolides-1 and a review of the assemblages in Megascolides-2 the next older *Foraminisporis wonthaggiensis* Zone is identified between 1780 and 1895m in Megascolides-1, and between 1625 and 1915m in Megascolides-2.
4. Within the *F. wonthaggiensis* Zone the new *Laevigatosporites belfordii* Subzone is established. This new local subzone is based on the incoming of a suite of spore species that have not previously been recorded in the Gippsland Basin. The subzone was first identified in Megascolides-2 between 1720 and 1915m, and has in this report has been found in the cuttings samples at 1780 and 1875m in Megascolides-1.
5. The bottom six cuttings samples in Megascolides-2 and the core sample and two deeper cuttings in Megascolides-1 are all extremely poorly preserved, adversely affecting the confidence in the zone assignments. These assemblages are definitely no older than Early Cretaceous, and are probably not older than the *Foraminisporis wonthaggiensis* Zone.

Combining the palynological zones with the electric logs and cuttings lithologies a "basal shale" unit is identified in both wells which increases in thickness from 52 metres in Megascolides-1 to 160 metres in Megascolides-2. Immediately above this "basal shale" is identified a thin "transition unit" which can be identified in both wells. Based on a larger scale portion of the cross-section the thin "Rintouls Creek" oil reservoir which lie at the base of the "transition unit" in Megascolides-1 is suggested to correlate with the interval 1895 to 1900m in Megascolides-2.

6 RESERVOIR EVALUATION

6.1 Petrophysical Interpretation

(by G. Wormald)

This well is a re-entry of Megascolides-1, drilled in December 2004, which encountered compelling oil and gas shows in the Early Cretaceous Rintouls Creek Equivalent sandstones of the Strzelecki Group, but could not be fully evaluated at the time. The primary objective of drilling this sidetrack was to fully evaluate the commercial oil producing potential of the Rintouls Creek Equivalent sandstone by coring and logging. If significant hydrocarbon saturations, porosity and permeability were interpreted, then an open hole drillstem test was planned.

The well was sidetracked out of Megascolides-1 at 1635m and drilled to a TD of 1974.6m (wireline depth) into Duck Bay Volcanics.

Water Salinity

A formation water salinity of 5,800ppm NaCl eq was used. This was derived from salts extracted from the core (ACS Laboratories, 2007). It is broadly consistent with Rw estimation from the SP and resistivity logs in this well and Megascolides-2. SP deflection in this well of -10mv over apparent water sands suggest formation water salinity is slightly more saline than the mud filtrate (1,400ppm NaCl eq). At Megascolides-2, up to +30mv SP in the upper part of the well indicates formation water salinity is significantly fresher than the 30,000ppm NaCl eq mud filtrate.

The behaviour of the SP response is erratic and difficult to explain over some parts of the three Megascolides wells and therefore can only be used qualitatively to estimate Rw. The SP works best in moderate to low resistivity formation waters and permeable reservoirs, neither of which are present at Megascolides. Similarly for the resistivity logs, the presence of shaly sands and fresh formation waters limits the accuracy of Rw estimation. Until a more accurate formation water salinity can be derived from an actual water sample, Rw from salt extraction is the best estimate available.

INTERPRETATION RESULTS

Quantitative log interpretation was carried out over the interval 1585-1942.6m. 1:200 and 1:500 Result Plots are shown in Appendix 2.

6.1 Net Sand Definition

Using the ambient core porosity vs permeability relationship, a porosity of 12% corresponds to 1mD permeability. This is a reasonable net sand cut off for oil exploration purposes. A porosity of 6.7% corresponds to 0.1mD permeability. This serves as a net sand cut off for gas exploration purposes.

6.2 Reservoir Summary

Reservoir summaries are shown in the following tables for net reservoir cut offs of 12% and 6.7%.

Reservoir Summary using 12% Porosity Net Sand Cutoff

Depth Interval m	Sand	Gross m	Net Sand m	NTG %	Por %	Perm mD	Sw %
1796-1809	'1800 Sand'	13	0.2	2	12.2	1	68
1821-1835	'1830 Sand'	14	0	-	-	-	-
1856-1867	'1860 Sand'	11	0	-	-	-	-
1883-1887	Upper Rintouls Creek	4	0	-	-	-	-
1887-1890	Lower Rintouls Creek	3	0	-	-	-	-

Reservoir Summary using 6.7% Porosity Net Sand Cutoff

Depth Interval m	Sand	Gross m	Net Sand m	NTG %	Por %	Perm mD	Sw %
1796-1809	'1800 Sand'	13	6.4	49	9.5	0.4	79
1821-1835	'1830 Sand'	14	0.6	4	7.6	0.2	100
1856-1867	'1860 Sand'	11	0	-	-	-	-
1883-1887	Upper Rintouls Creek	4	2.4	60	10.1	0.5	96
1887-1890	Lower Rintouls Creek	3	0	-	-	-	-

Discussion of Results

The presence of oil and gas shows, the best of which are seen in the coarse grained sandstones of the Rintouls Creek formation, are interpreted to be immobile due to their low computed hydrocarbon saturation together with low porosity and permeability, now confirmed by core measurements. Using a net sand cutoff of 0.1mD permeability, 2.4m of net sand is present in the Rintouls Creek formation with porosity, permeability and water saturation of 10.1%, 0.5mD and 96% respectively. Using a net sand cut off of 1mD, no net sand is present.

While the '1800' and '1830' sands are of less interest due to their lack of hydrocarbon shows while drilling, 6.4m of net sand is present in the '1800' sand (using 0.1mD net sand cut off). The ‘1830’ sand is tight. These two poor to fair porous water sands exist above the main target sand (Rintouls Creek Formation Equivalent), had no fluorescence or mud gas observed across these sands when drilled and consequently they have been used to calibrate Rw/Fm water salinity. Computed salinity is very fresh, approx.1,800ppm

The SP deflection over these water sands is similar to the SP over the target sand, therefore it is deduced that fm water salinity over the target is the same as the water sands.
Conducting the log interpretation with this salinity and the Indonesia equation indicates the target sand has approx. 12% porosity and approx.80% Sw., ie it is most likely water bearing. The fluorescence noted however and particularly the cut fluorescence indicates some oil saturation is present. However, the lack of a significant mud gas shows would suggest the oil shows are residual.

6.2 Core Analysis

The primary target Rintouls Creek sandstone was cored over the interval 1881 to 1892.6m. The core was hot shotted to ACS Laboratories in Brisbane for quick turnaround analysis to aid decision making on whether to test the well.

Routine core analysis using quicklook methods (Soxhlet Clean (17hr) and Oven Dry (15 hr)) were compared to the longer time taking, comprehensive Soxhlet clean and “humidity dry” method and only very minor differences were observed. Consequently all analyses were incorporated in the averaging and interpretation of the reservoir.

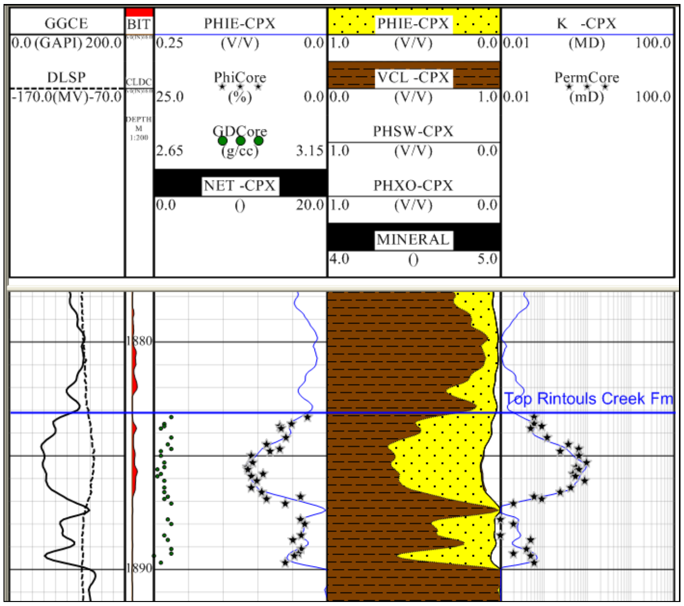
Core Analysis Summary

			Quick Look Soxhlet Clean (17hr) Oven Dry (15hr)			Soxhlet Clean & Humidity Dry			Fluid Saturation		
Sample Number	Depth (m)	Dir	Porosity Helium (percent)	Grain Density (g/cm^3)	Permeability to Air (mD)	Porosity Helium (percent)	Grain Density (g/cm^3)	Permeability to Air (mD)	So (percent)	Sw (percent)	Remarks
1	1883.55	H	2.8	2.70	0.06						
2	1883.78	H	5.1	2.68	0.06						
1V	1883.95	H				6.8	2.68	0.09	0.7	97.1	
7V	1884.05	H				6.6	2.67	0.05	10.5	86.4	
3	1884.40	H	5.9	2.70	0.12						
4	1884.67	H	8.7	2.69	0.37						
5	1884.92	H	6.8	2.70	0.64						
2V	1885.05	H				8.2	2.67	0.24	0.7	92.7	
6	1885.20	H	10.9	2.67	0.65						
7	1885.50	H	10.7	2.68	0.97	10.4	2.67	0.77			
S1	1885.69	H				11.5	2.68	0.56			
8	1885.84	H	11.4	2.66	0.65						
3V	1885.98	H				9.2	2.67	0.47	10.1	89.1	
9	1886.07	H	10.9	2.66	0.54						
10	1886.29	H	10.1	2.68	0.88	10.2	2.69	0.77			
11	1886.60	H	10.9	2.68	0.42						
4V	1886.80	H				9.4	2.68	0.24	0.7	96.5	
5V	1887.05	H				3.8	2.69	0.06	2.8	76.7	
12	1887.10	H	8.7	2.68	0.09						
13	1887.35	H	6.0	2.70	0.02						
14	1887.96	H	3.8	2.69	0.01	4.3	2.70	0.01			
15	1888.25	H	3.2	2.70	0.02	3.4	2.70	0.02			
16	1888.66	H	3.7	2.68	0.01						
17	1888.89	H	4.9	2.69							Irregular
18	1889.30	H	3.7	2.70	0.04						
6V	1889.52	H				4.1	2.70	0.02	24.9	72.5	
19	1889.64	H	4.7	2.65	0.05	4.9	2.65	0.05			
20	1889.95	H				6.0	2.67	0.06	37.1	55.6	

More than 33 plugs were analysed from the interval 1883.55 to 1889.95m. Core porosities range from 2.8 to 11.5% and average 7.02%. Core permeabilities range from 0.01 to 0.97md and average 0.27md.

The results of the core analyses clearly demonstrates the poor reservoir quality of the Rintoul Creek Equivalent Formation and this is supported by the log and petrographic interpretation.

Core vs Log Porosity & Permeability



6.3 Reservoir Petrography

A report on the petrology and petrography of selected core plugs can be found in Appendix 3 of Volume 1 Basic Well Completion Report. The findings of the petrographic analyses are summarised below.

“Two core samples from 1885.50m and 1889.64m were analysed. Techniques used were thin section analysis, quantitave bulk rock/fine fraction X ray diffraction analysis and scanning electron microscopy.

The samples are poorly sorted, very coarse grained feldspathic litharenite (1885.50m) and an argillaceous, moderately sorted, coarse grained lithic arkose (1889.64m) in which the framework grains are mainly quartz, plagioclase and a variety of rock fragments.

Detrital clay is concentrated along thin laminae at 1889.64m. Authigenic kaolin forms scattered patches and patchy psuedomatrix where labile grains, particularly plagioclase has altered. Authigenis clay also includes mixed layer illite/smectite that is associated with some altered labile rock fragments. Clay minerals detected by XRD are kaolin and subordinate illite/mica, mixed layer illite/smectite (60-65% illite interlayers) and chlorite

Other diagenetic effects include quartz overgrowth and calcite cementation, physical compaction, grain contact dissolution/microstylolitisation and feldspar/garnet dissolution.

The samples contain little or no primary intergranular porosity due to the negative effects of advanced diagenisis. Porosity reduction at 1889.64m also results from detrital clay pore filling along argillaceous laminae.

With virtually all intergranular spaces being filled by cement, clay and compacted ductile grains, effective porosity is absent and permeabilities are consequently very low (0.77md, 0.05 mD).

7 CONTRIBUTIONS TO THE EVALUATION OF HYDROCARBONS

1. The well was successfully re entered, conditioned, sidetracked, cored and drilled to a depth of 1980mRT.
2. After sidetracking, two cores were successfully cut and recovered. They were described and analysed in a timely manner
3. There was minor fluorescence in the sandstone of the core which also had estimated poor visual porosity
4. There was very quick turn around (via special cargo flights) to receive core analysis results.
5. Core Analyses indicated the sandstone had very low porosities, very poor permeabilities and very low oil saturations
6. Reached a Total Depth of 1980mRT in Duck Bay Volcanics
7. Good quality electric logs were obtained.
8. No successful formation pressure tests could be obtained (after multiple attempts) in the Rintoul Creek Equivalent sandstone due to the impermeable nature of the sandstone.
9. At the completion of wireline logging a petrophysical interpretation confirmed the Rintoul Creek equivalent sandstone to have very low porosities and high water saturations.
10. The fluorescence observed in the core is interpreted as residual oil saturation and is immobile.
11. Estimating a 12.7% porosity cut off for oil production results in no net pay sand over the Rintouls Creek equivalent interval.
12 Petrographic study of selected samples from the cored interval also demonstrated the sandstone pore spaces were filled with kaolin and also heavily cemented with quartz overgrowths and carbonate. The conclusions were that the sandstone has very poor reservoir quality with no effective porosity or permeability.
13. **In conclusion**; the interpretation of core analysis, wireline logging, pressure testing and petrography all indicate the reservoir has nil to poor effective porosity and permeability with insignificant residual hydrocarbon saturations. These results led to the conclusion there was no justification for drill stem testing and the well was plugged and abandoned

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APPENDIX-1

PALYNOLOGICAL REPORT for MEGASCOLIDES-1 (revised) and 2

APPENDIX-2

PETROPHYSICAL INTERPRETATION

ENCLOSURE-1

CD containing Digital Data