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MEGASCOLIDES-2

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 PREVIOUS EXPLORATION

Megascolides-2 is located in permits EL4537 and PEP162, approximately 160km east of Melbourne and 14km south of Warragul in eastern Victoria (Fig.1). The well was drilled 1.1 km east of Megascolides-1 (Fig.2).

The well was located to be an appraisal of Megascolides-1 which had significant oil shows when drilled in December, 2004. Megascolides-2 was the second well of a proposed three well programme. The re entry of Megascolides-1 was the first well of this programme.

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

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 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 Formation 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 showed it to be an unbiodegraded waxy oil. MDT pressures and samples were attempted, however due to hole washouts the tool could not be seated and no data could be collected.

On the basis of these results, it was decided to test the well later and potentially follow up this well with another further up dip, since Megascolides 1 was actually located in a syncline on the deeper beds because it was primarily targeting the relatively undeformed shallower coals.

In order to define and map the Megascolides structure a more extensive seismic survey, including some additional regional lines further to the east, were conducted.

The Korrumburra GK05 2D survey was shot during October and November 2005. The survey was a high effort factor survey using three 42,000lb peak force truck mounted vibrators online with 12m vibratorpoint intervals. Five seconds of data were recorded at 2ms. This high effort was targeting both the shallow coals for CBM potential at 500m to 800m depth as well as trying to clearly identify the deeper Strzelecki interval at 1,500 to 2,000m depth.

The bulk of this 290 km 2D survey was shot over the Western and northern shelf edges of the Narracan trough, on the northwestern edge of onshore Gippsland Basin (Fig. 3) concentrating coverage in the area of the Megascolides 1 well.
Seismic lines were still located on roads and only very minor incursions were taken cross country. Rain and muddy conditions resulted in these traverses providing poor quality data with many gaps where vehicles could not be brought into the treacherous conditions to provide adequate coverage.

It was considered unlikely a continuous sand sheet was deposited over the entire approximately 14 sq km area that is up dip of Megascolides-1 within the fault bounded block. Consequently the key risk with the Megascolides-2 location was whether or not the reservoir rock intersected in Megascolides-1 was present at this new location and, if it is, if it is sealed to trap hydrocarbons intersected in the Megascolides-1 position. On the upside, there may have been more sands in the new up dip location and perhaps all the faults seal allowing a substantial trap to exist (**see section 8**).

Overall, the result of the last seismic survey confirmed that Megascolides-1 had been drilled in a syncline at the level of the Crayfish Group Equivalent level and there was up dip potential in an easterly direction (**see section 8,** Fig. 4). Therefore, Megascolides-2 was drilled approximately 1.1 km east of Megascolides-1; approximately 240m up dip, at the top Crayfish Group equivalent level on the edge of the easterly fault bounded closure (Fig. 5).

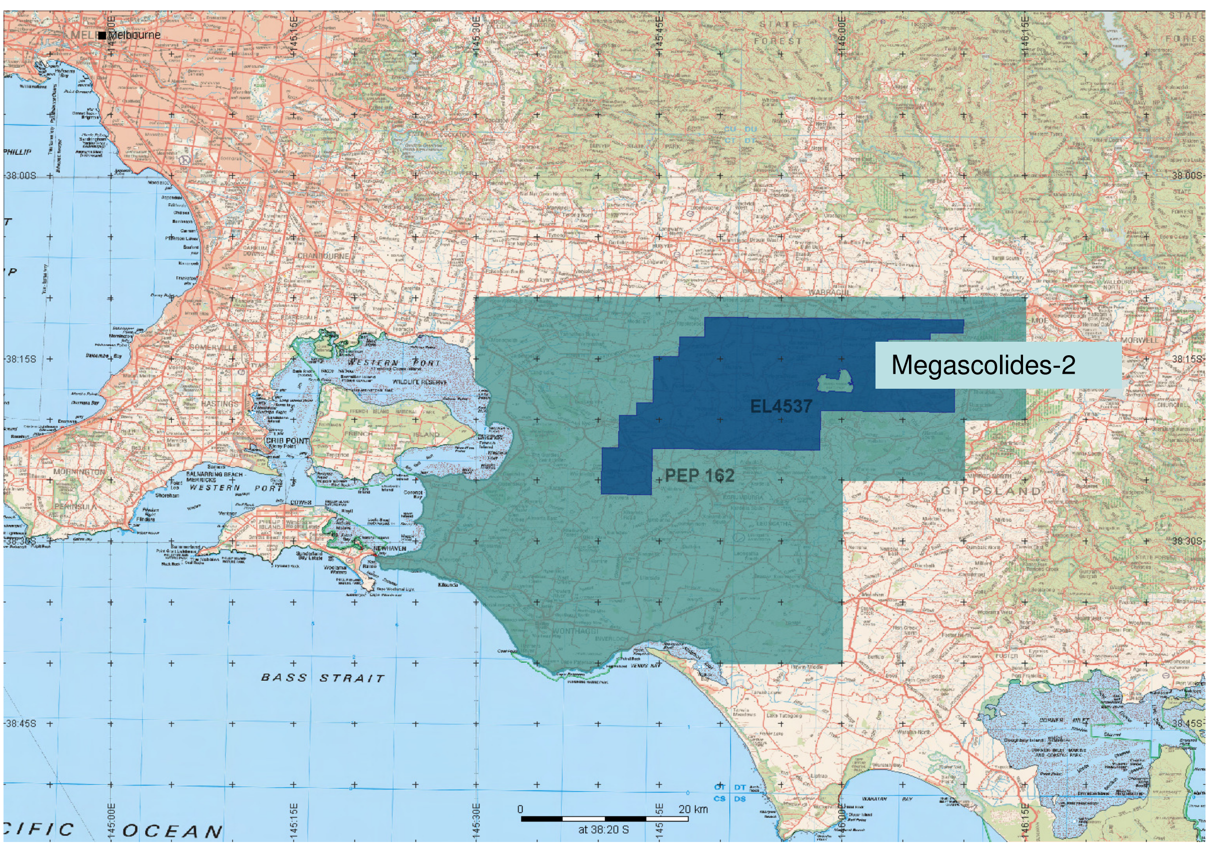

Fig 1 Karoon Gippsland Acreage

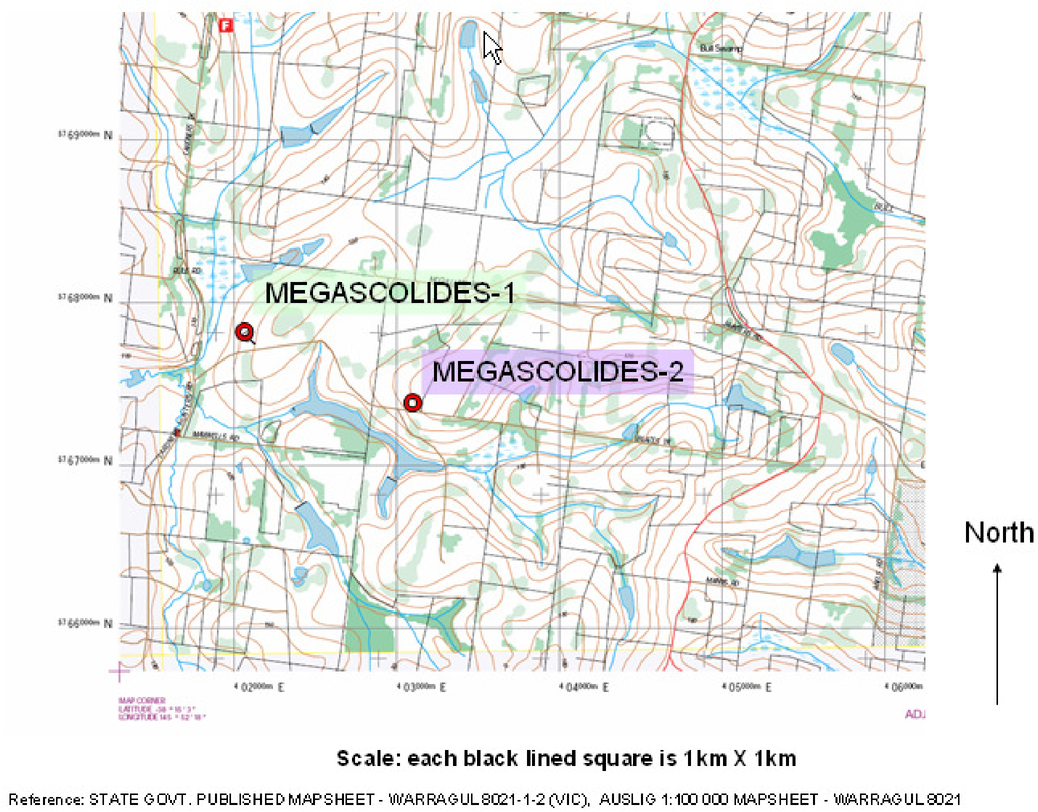

Fig 2 Megascolides-2 Location Map *Megascolides-2 Well Location showing roads (brown), streams (blue), farms (bordered in black) and topography (light brown).*

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 Group. is a later stage graben filling 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 Strzelecki.

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 depocentre of the Narracan Trough where coal maturity levels are interpreted to be higher.

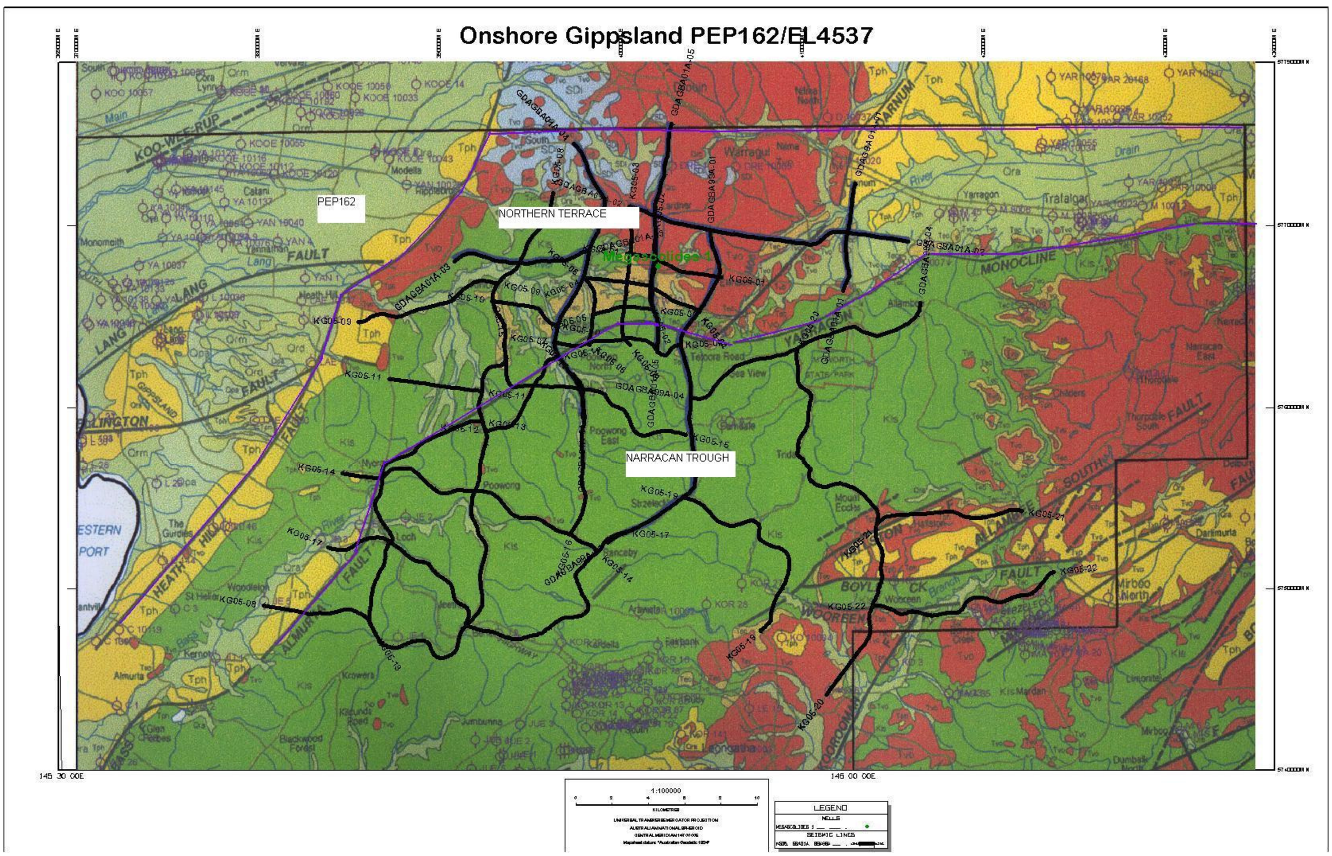

Fig. 3 Regional Geological Map
Seismic = Black Lines
Green = Strzelecki Gp.,
Red = Tertiary Volcs.,
Lt Brown = Childers Fm

4 WELL STRATIGRAPHY

The objectives of the Megascolides-2 well were to

1) Investigate the significance of the shows observed and interpreted in Megascolides-1 by drilling in an up dip location.
2) Determine the lateral extent and vertical thickness of the sandstone reservoir at top Crayfish Formation equivalent level.
3) To investigate any other potential sandstone reservoirs in the well.
4) Obtain high quality logs in a stable well bore and possibly core the sandstone to fully evaluate for porosity, permeability and oil saturation
5) Test the well in the most appropriate way for its productive capacity if all data collected indicates the well is potentially commercial
6) To integrate all acquired information to aid in the overall management and future relinquishment of the permits

The well was intended to be drilled to a total depth of approximately 1850mMDRT, approximately 50m into the unweathered portion of the Duck Bay Volcanics.

The well has been sub divided into a number of interpreted stratigraphic intervals and formations. These intervals correlate closely to a number of seismic horizons however the seismic and the Stratigraphic tops are not the same and the stratigraphic tops has been adjusted from the seismic to correspond to a lithological unit. The formation tops are based on seismic interpretation as well as wireline logs, wellsite lithological descriptions, palynological interpretations, correlations to the nearby well Megascolides-1 and a literature review of the stratigraphy in nearby sedimentary basins. The formation tops and differences with the predicted tops can be found in Table-1.

4.1 Thorpdale Volcanics (Oligocene)
(5.2 to 32mRT)

This unit outcrops at the surface and has a base at 32mRT.

It consists of weathered basalt?

Lithology:

The lithologies are described as weathered volcanics, which are dark yellowish orange to greyish orange, occasionally light reddish brown to dark brown, rare pale yellowish orange, weathered to Claystone, very dispersive, very soft, very sticky, trace silt and contain rare carbonaceous matter.

4.2 Barracouta Formation (formerly known as Childers Formation), Oligocene (?)
(32 to 68.5 mRT)

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 massive quartz sandstone. There is an associated increase in rate of penetration and shift in gamma ray on wireline logs.

Lithology:

Interbedded Claystone and Sandstones (2 types)

CLAYSTONE: light greenish grey to brownish grey, amorphous to sub blocky, slightly silty, very soft, sticky, non fissile, non calcareous

SANDSTONE (1): quartzose, greyish orange to pale yellowish brown, light greyish yellow to off white, coarse to very coarse, sub angular to sub rounded, mainly sub angular, moderately sorted, trace off white to red brown argillaceous matrix, clear to opaque quartz grains with common yellow to dark brown iron oxide staining, trace black to dark grey carbonaceous matter, unconsolidated to friable, very good inferred porosity, grading with depth to:

SANDSTONE (2): quartzose, with minor volcanic/lithic grains, light grey to light yellowish grey, light olive grey, medium to very coarse, mainly very coarse, poorly to moderately sorted, non calcareous, rare light grey volcanic matter, trace off white argillaceous matrix, and trace pyrite.

4.3 Wonthaggi Formation (Strzelecki Group)

Top: 68.5 m RT **Base**: 1895 m RT **Age**: Cretaceous (*P.notensis to F.Wonthaggiensis* zone*)*

(The Interpretation of the Well Palynology is detailed in Appendix-1, Palynological Analyses for Megascolides-1 and 2).

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

Lithology: Overall the Strzelecki Group consists of interbedded claystone and volcanolithic sandstones grading to minor quartzose Sandstone with thin interbedded coal seams.

The Strzelecki Group can be further sub divided into a number of lithological "Units" which have been associated with corresponding Seismic Horizons.

4.3.1 "Upper Unit" Wonthaggi Formation (Strzelecki Group)

Top: 68.5 m RT **Base**: 807 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 and interlaminated coal seams.

SANDSTONE: light to medium green grey, very fine to occasionally medium, dominantly fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix, moderate silica and calcareous cement, abundant off white altered feldspar grains, common quartz and grey green volcanogenic lithics, trace red brown lithics, common black coal detritus, trace to common calcite and occasionally red geothite lined fractures, moderately hard, very poor visual porosity, no intergranular oil fluorescence.

CLAYSTONE: medium to dark grey to medium brown grey to medium green grey, often very silty, often very finely arenaceous with altered feldspar grains, very carbonaceous in part - grades to coal, common black carbonaceous flecks and coaly detritus, trace micromica, nil to occasionally common calcite and occasionally red geothite lined fractures, moderately hard, subfissile.

COAL: black to very dark brown, often very argillaceous, earthy lustre with blocky fracture where argillaceous, subvitreous lustre with subconchoidal fracture where clean, hard, brittle.

FLUORESCENCE: (670-685m), there is calcite fracture infill material which has 5-10% moderately bright patchy light yellow fluorescence giving a weak dull yellow white crush cut & trace residue. Visual assessment indicates these fractures are oil saturated but have insufficient open volume for significant oil recovery.

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

Top: 807 m RT **Base**: 1064 m RT **Age**: Cretaceous (*P. notensis* zone *)*

Upper boundary pick: The top of this unit is capped with Claystone and lower down comprises massive Sandstone.

Lithology: This unit consists of a number of stacked 15-40m blocky sands, interbedded with claystone and minor coal beds up to 0.2m thick. Towards the base of the unit the sandstone beds are up to 50m thick

SANDSTONE: off white to medium green grey, very fine to occasionally medium, dominantly fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, moderate to strong silica and calcareous cements, abundant off white altered feldspar grains, common grey green volcanogenic lithics, trace red brown lithics and quartz grains, common black coal detritus, nil to common calcite lined fractures, hard, no visual porosity, no intergranular oil fluorescence.

CLAYSTONE: light to dark brown grey to medium grey, often very silty, often very finely arenaceous with altered feldspar grains, moderately carbonaceous in part, trace to common black carbonaceous flecks and coaly detritus, common micromica, nil to common calcite lined fractures, hard, subfissile.

COAL: very dark brown to black, often very argillaceous, earthy lustre and blocky to platy fracture where argillaceous, subvitreous lustre with subconchoidal fracture where clean, hard.

FLUORESCENCE: (from approx 935m) the calcite fracture infill material has trace moderately bright patchy light yellow fluorescence giving a weak dull yellow white crush cut, trace residue.

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

Top: 1064 m RT **Base**: 1238 m RT **Age**: Cretaceous (*P. notensis zone)*

Upper boundary pick: The unit is characterised by thinly interbedded Sandstone and Claystone with a "saw tooth "GR log response.

Lithology: This unit consists of inter bedded Claystones, Sandstones and very rare coals.

CLAYSTONE: medium to dark grey to medium brown grey, often very silty, often very finely arenaceous with altered feldspar grains, slightly to moderately carbonaceous, common black carbonaceous flecks and coaly detritus, common micromica, trace to common calcite lined fractures, hard, subfissile.

SANDSTONE: off white to medium green grey, very fine to fine, dominantly fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, strong silica and calcareous cements, abundant off white altered feldspar grains, common grey green volcanogenic lithics, trace red brown lithics and quartz grains, trace black coal detritus, trace to common calcite lined fractures, hard, no visual porosity, no intergranular oil fluorescence.

COAL (trace): black, very argillaceous in part - grades to claystone, blocky to subconchoidal fracture, earthy to subvitreous lustre, hard, brittle.

FLUORESCENCE: The calcite fracture infill (from 1160-1180m) has trace moderately bright to bright patchy yellow-white fluorescence giving a weak dull milky white crush cut & trace residue.

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

Top: 1238 m RT **Base**: 1608 m RT **Age**: Cretaceous (*P. notensis zone)*

Upper boundary pick: The top of the unit is characterised by a 30m thick interbedded sandstone bed and it has a correspondingly lower GR response than the overlying unit.

Lithology: This unit consists of thickly bedded blocky and fining up sandstones and claystones.

SANDSTONE: off white to medium green grey, very fine to occasionally medium, dominantly fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, minor to abundant strong silica and calcareous cements, abundant off white altered feldspar grains, common grey green volcanogenic lithics, trace red brown lithics and quartz grains, trace black coal detritus, trace to common calcite and occasionally goethite lined fractures, hard, no visual porosity, no intergranular oil fluorescence.

CLAYSTONE: medium grey to medium green grey to medium to dark brown grey, often very silty, very finely arenaceous with altered feldspar grains in part, slightly to moderately carbonaceous, common black carbonaceous flecks and coaly detritus, common micromica, trace to common calcite veins and occasionally goethite lined fractures, hard, subfissile.

FLUORESCENCE: There is calcite fracture infill from 1240-1270m, 1300-1305m, 1310-1320, and 1335-1340m, which has trace to 10% moderately bright to bright patchy pale yellow fluorescence giving a weak dull yellow white crush cut, trace residue.
The calcite fracture infill from 1320-1330m has 20% moderately bright to bright patchy pale yellow fluorescence giving a weak dull yellow white crush cut, thin ring residue, trace medium dark brown oil staining on some calcite crystal surfaces.
The calcite fracture infill from 1370-1375m has 5% moderately bright to bright patchy pale yellow fluorescence giving a weak dull yellow white crush cut, trace residue.
The calcite fracture infill from 1470-1485m & 1490-1505m has trace to 5% moderately bright to bright patchy pale yellow fluorescence giving a weak dull yellow white crush cut & trace residue.

4.3.5 "D" Unit, Wonthaggi Formation (Strzelecki Group)
Near khaki seismic event

Top: 1608 m RT **Base**: 1895 m RT **Age**: Early Cretaceous (*F.wonthaggiensis* zone, and *L. belfordii* Subzone from 1720m*)*

Upper boundary pick: The top of the unit consists of 15m thick interbedded claystone and minor sandstone and correspondingly higher GR response than the overlying unit.

Lithology: The "D" Unit is an interbedded claystone, sandstone and trace coal section.

CLAYSTONE: medium to dark grey to occasionally medium brown grey to medium green grey, very silty in part, very finely arenaceous with altered feldspar grains in part, slightly to moderately carbonaceous, common black carbonaceous flecks and coaly detritus, common micromica, trace calcite lined fractures, hard, subfissile to fissile.

SANDSTONE: off white to medium green grey, very fine to occasionally medium, dominantly fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, moderate to strong silica and moderate calcareous cements, abundant off white altered feldspar grains, common grey green volcanogenic lithics, trace red brown lithics and quartz grains, trace to common black coal detritus, trace calcite lined fractures, hard, nil to poor visual porosity, no intra granular oil fluorescence.

COAL (trace): black, very argillaceous in part - grades to claystone, blocky to subconchoidal fracture, earthy to subvitreous lustre, hard, brittle.

FLUORESCENCE: The calcite lined fracture at 1624m, (5% of total sample), has 80% bright patchy very pale yellowish white fluorescence giving a weak instant followed by strong bright milky white crush cut and a thick very pale yellowish white ring residue.

From 1720-1895m lower"D" UNIT (*L.Belfordii* sub zone)

SANDSTONE: off white to medium green grey, very fine to fine, dominantly very fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, very strong silica and weak to moderate calcareous cement, abundant off white altered feldspar grains, common grey green volcanogenic lithics, trace red brown lithics and quartz grains, trace to common black coal detritus, trace calcite and rare goethite lined fractures, very hard, nil to poor visual porosity, no oil fluorescence. From 1772m the sandstone appears to have a more siliceous (welded) texture of possible hydrothermal alteration(?) according to Wellsite descriptions.

CLAYSTONE: as above.

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

Top: 1895m RT **Base**: 1900 m RT **Age**: Cretaceous (*F. wonthaggiensis* zone / *L. Belfordii Sub zone)*

Upper boundary pick: The reservoir section encountered in the down dip well Megascolides-1 was not encountered here. The stratigraphic equivalent unit was found deeper than predicted and consists mainly of Claystone. The formation top is based on palynological interpretation, however there is a minor lithology change from the overlying Wonthaggi Fm to interbedded claystone and rare interlaminated very fine sandstone, with a corresponding minor shift in gamma ray on the wireline logs.

Lithology: The Rintoul Creek Formation equivalent at Megascolides-2 consists predominantly of Claystone (90%) inter laminated with very fine Sandstone (10%)

CLAYSTONE: medium to dark grey, occasionally moderately silty, rarely very finely arenaceous with altered feldspar grains, moderately to very carbonaceous, trace black carbonaceous flecks and coaly detritus, common micromica, trace calcite lined fractures, hard, subfissile.

With minor interlaminated SANDSTONE: off white to medium brown grey, very fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, very strong silica and calcareous cements, abundant off white altered feldspar grains - matrix supported, common grey green red & brown lithics, trace quartz grains, trace black coal detritus, trace calcite lined fractures, very hard, no visual porosity, **no oil fluorescence.**

4.5 Crayfish Group Equivalent Shale

Top: 1900 m RT **Base**: 1997 m RT **Age**: Cretaceous (*F. wonthaggiensis* zone*)*

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

Lithology: Shale (100%) laminated with minor Sandstone (trace - decreasing to nil with depth).

SHALE: dark to very dark grey, minor light to medium brown, occasionally moderately silty, rarely very finely arenaceous with altered feldspar grains, moderately to dominantly very carbonaceous, trace black carbonaceous flecks and coaly detritus, common micromica, trace calcite lined fractures, hard, subfissile to fissile,

With depth gradually becoming less indurated with fewer calcite lined fractures and grading to

SHALE: dark to very dark grey to greyish black, trace light to medium brown, occasionally moderately silty, moderately to dominantly very carbonaceous, trace black carbonaceous flecks and coaly detritus, common micromica, rare calcite lined fractures, moderately hard, subfissile.

Trace interlaminated **SANDSTONE**: off white to medium brown grey, very fine, subangular to rounded, moderately sorted, abundant off white argillaceous matrix - matrix supported, very strong silica and calcareous cements, abundant off white altered feldspar grains - matrix supported, common grey green red & brown lithics, trace black coal detritus, trace calcite lined fractures, very hard, no visual porosity, no oil fluorescence.

4.6 " Basal" Shale Unit ("Megascolides Shale")

Top: 1997 m RT **Base**: 2066 m RT **Age**: Cretaceous (*F.wonthaggiensis* zone)

Upper boundary pick: The top of this unit is based on a lithology change from the overlying Shale to very dark grey, carbonaceous Shale. There is a corresponding shift in the gamma ray and density curves on the wireline logs. The Shale has a high Total Organic Carbon content, up to 15%, (see section 7).

Lithology: Shale (70-100%) grading to and has thin interbedded Coal (0-30%).

SHALE: dark to very dark brown to black, slightly silty in part, very carbonaceous - grades to coal in part, trace micromica, hard, subfissile to fissile.

COAL: black, very dark brown and very argillaceous in part, subvitreous to slightly earthy lustre, platy to blocky fracture, common slickensided surfaces, hard, brittle. The coal has no direct fluorescence but gives a weak dull yellow crush cut with trace residue.

The Duck Bay Volcanics were absent in this well

4.7 " Undifferentiated "Basement

Top: 2066 m RT **Base**: 2130 m RT (Total Depth) **Age**: Unknown (Devonian?)

Upper boundary pick: The top of this unit is based on a sharp lithology change from the overlying very dark grey Shale to mixed meta-sedimentary lithologies comprising altered limestones, sandstones, clays and shales. There is a corresponding sharp shift in the gamma ray and density curves on the wireline logs.

Lithology: low grade metamorphosed limestones, sandstones, clays, shales, minor Anhydrite(?) and unidentified lithologies. Marble? (90%) interbedded with Anhydrite? (10%) in the upper part of the Unit. Note: very poor quality samples due to weathering and pulverising by PDC drill bit.

MARBLE(?): off white to light grey, rarely green, microcrystalline where cuttings intact - bulk of sample soft/mushy, slightly to very argillaceous, hard.

Minor ANHYDRITE(?): light grey, bulk of sample soft/mushy, cryptocrystalline, firm.

FLUORESCENCE: the marble(?) has trace dull to rarely moderately bright patchy pale yellow white fluorescence giving a very weak milky white crush cut, trace residue.

Deeper in the section the lithologies became Unidentifiable

UNIDENTIFIED METAMORPHIC LITHOLOGY: (weathered Rhyolite?) light grey, homogeneous to speckled, mottled in part, cryptocrystalline to microcrystalline, trace flow or stress banding in part, trace vesicles(?) infilled with brown yellow or green minerals, common micro to macrocrystalline calcite infilled fractures and patches, common yellow orange and brown crypto to macrocrystalline mineral infilled veins and patches, trace bright green serpentine(?) patches, non to occasionally very calcareous, hard at top becoming soft to firm with depth
with minor interbedded:

SPOTTED ARGILLITE: speckled light brown to brown black, cryptocrystalline textured, argillaceous and carbonaceous, hard.

Near TOTAL DEPTH the lithologies become intermixed with the following end members

SANDSTONE: (60%) (lightly metamorphosed) off white spotted with black, abundant white matrix with common black grains, fine grained, trace hard black carbonaceous material, very strong siliceous and calcareous cements, trace to common coarsely crystalline calcite veining, trace to common yellow brown coarsely crystalline veining, hard, no visual porosity, no oil fluorescence.

UNIDENTIFIED: (20%) light grey to off white, homogeneous to spotted with fine black grains, common micro to macrocrystalline calcite infilled fractures, trace orange and brown crypto to macrocrystalline mineral infilled veins, non to occasionally very calcareous, hard.

CARBONACEOUS SHALE: (20%) (lightly metamorphosed) medium brown to brown black, rarely speckled, siliceous texture, moderately to very carbonaceous, trace pyrite, hard.

Table 1: Megascolides-2 Predicted v Actual Stratigraphy

Formation /unit	Seismic Horizon	Age	TWT sec Seismic	Megascolides-2 Prognosed Tops (mMDRT)	Megascolides-2 Prognosed (mTVD SS)	Megascolides-2 Actual (mMDRT) (wireline logs)	Megascolides-2 Actual (mTVD SS)	Diff
Thorpdale Volcanics	Surface	Early to Late Oligocene		5.2 (Century Rig RT)	+151 abmsl	5.2	+151 abmsl	-
Barracouta Formation (Childers Formation)	No Pick	Oligocene (?)		39	+117.2 abmsl	32	+124.2 abmsl	+ 7
Wonthaggi Formation (Strzelecki Group)	No Pick	Cretaceous		61	+95.2 abmsl	68.5	+87.7 abmsl	- 7.5
	PURPLE		0.943	726.6	-570.4			
Intra Strz Sands (Progrades ?) A Unit	Near PURPLE	*P. notensis*		817.9	-661.7	807	-650.8	- 10.9
	GREEN		1.123	1048.7	-892.5			
"B" Unit	Near GREEN	*P. notensis*		1056	-899.8	1064	-907.8	+ 8
	ORANGE		1.215	1211.2	-1055			
"C" Unit	Near ORANGE	*P. notensis*		1244.3	-1088.1	1238	-1081.8	- 6.3
	KHAKI		1.383	1545.1	-1388.9			
"D" Unit	Near KHAKI	*F.wonthaggiensis* zone and *L. belfordii* Subzone from 1720m*)*		1552.6	-1396.4	1608	-1451.8	+ 55.4
Rintoul Creek (Reservoir Target)	Near DARK GREEN (Rintoul is below or equiv to top Crayfish)	*F.wonthaggiensis* zone and *L. belfordii* Subzone*)*		1672.2	-1516	1895 No Sand present Shale equivalent from 1895-1900m based on palynology	-1738.8	+ 222.8
	DARK GREEN		1.457	1696.2	-1540			
Crayfish Group	No Pick	*F.wonthaggiensis* zone		1679.2	-1523	1900	-1743.8	+ 227.8
Weather ed Duck Bay Volcanics	Near Violet			1765.8	-1609.6	Not present		
Duck Bay Volcanics	No Pick			1785.8	-1629.6	Not present		
	VIOLET		1.499	1787.8	-1631.6			
Crayfish Group?	Not Prognos ed	*F.wonthaggiensis* zone				1900	-1743.8	
"Basal Shale Unit"	Not Prognos ed	*F.wonthaggiensis* zone				1997		
"Metasedi ment" - Basement	Not Prognos ed					2066	-1909.8	
Total Depth				1850	-1694	2130 (Driller) 2132.85 (logger)	-1973.8 -1976.7	

5 BIOSTRATIGRAPHIC DATA

5.1 Palynological Data

New palynological slides were prepared for Megascolides-2 and were correlated with re interpreted data from Megascolides-1 RE/ST1. 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 PETROPHYSICAL EVALUATION

6.1 Petrophysical Interpretation

(by G. Wormald)

Log Interpretation for Megascolides 2

Log Run: DLL-MLL-GR-SONIC-DENSITY-NEUTRON (2132-507m)
Date Logged: 1 February, 2007
Logger: Precision Energy Services (ex Reeves Logging)
Mud type: KCl polymer, ~30k ppm NaCleq salinity
Mud density: 1.13g/cc, Max Recorded Temp: 87degC
Bitsize: 8.5 “
Rintouls Creek SS not encountered.

Hole Condition: very good condition with density pad giving good responses except over intervals 1810-1905m and 2040-2070m.

Interpretation
All permeable sands are interpreted to be water bearing given lack of good hydrocarbon shows while drilling and high computed water saturation
Effective SS porosity up to 10% (perm ~1mD) exists at the top of the well (500-800m). Below this porosity is consistently less than 10%.
Porosity was not computed in the basement lithology because bad hole condition has caused both density and sonic responses to be unreliable

Water Salinity

A formation water salinity of 5,800ppm NaCl eq was used. This was derived from salts extracted from core taken in Megascolides-1 RE (ACS Laboratories, 2007). It is broadly consistent with Rw estimation from the SP and resistivity logs in this well. SP deflection in Megascolides-1 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 is 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.

Discussion of Results

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.
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 any oil shows are residual.

7 GEOCHEMISTRY

Formation	Depth Range	TOC range and Av	HI range and Av.	OI range and Av
Upper Stz	68.5-1608	0.34-2.13 Av. 1.02	64-148 Av. 113	9-80 Av. 43
Lower Stz	1608-1900	0.32-0.66 Av. 0.52	66-102 Av. 77	33-71 Av.49
Crayfish Gp Equiv	1900-1997	0.86-0.97 Av. 0.91	66-71 Av. 68	79-101 Av. 90
“Basal Shale Unit”	1997-2062	**1.09-14.56** **Av. 7.46**	59-104 Av.89	18-61 Av. 32
Metasediment (Basement)	2062-2130	0.15-0.48 Av. 0.32	108	269

Table 2 Rock Eval Pyrolysis and Geochemical Summary of Meagascolides-2

A number of conclusions can be made from the acquired data. There is very limited potential source rock in the well. The most significant is in the restricted (lacustrine?) shales of the “basal shale unit “interpreted as a Casterton Fm Equivalent. The TOCs over this interval range from 1.09 to 14.56% and average 7.46%. However the relatively low HI and OI indicate the Shale does not have good source rock potential

8 GEOLOGY and GEOPHYSICS DISCUSSION

Pre Drill structure and objectives

Interpretation of the seismic showed that Megascolides-1 was drilled within a fault block bounded on all sides by faults. The position within this fault bounded block was almost at its lowest point for the deeper horizons. The general geometry of this Megascolides fault bounded block, can be described as roughly rhomboidal in shape elongated in a north north-easterly direction, with an approximately N-S fault bounding it to the east and west, and roughly E-W trending faults bounding it to the north and south (fig 4).

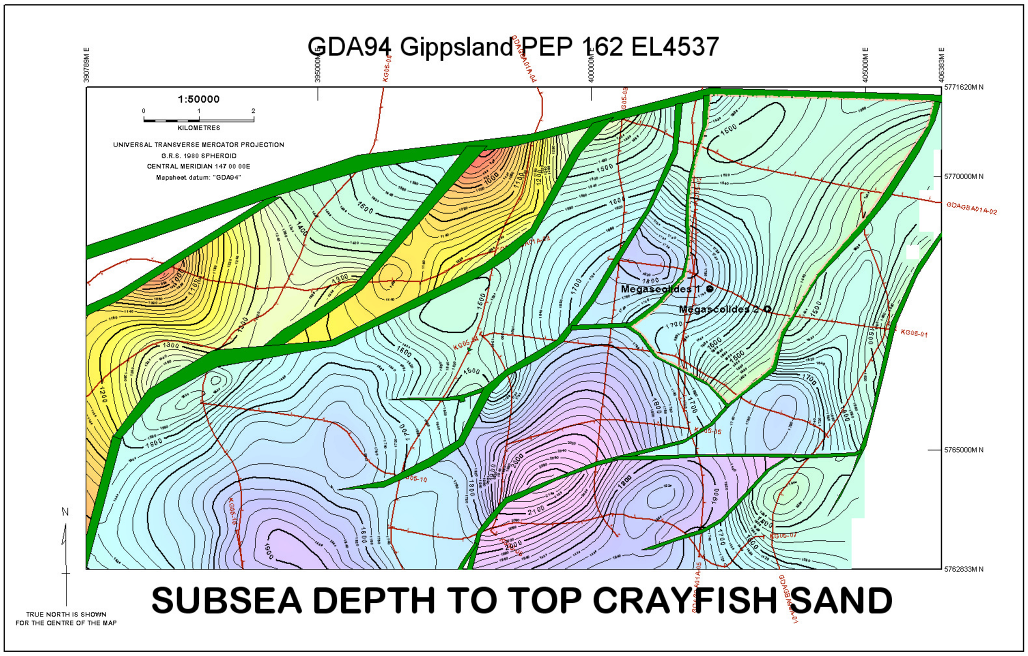

Fig.4 Top Crayfish Equivalent Sandstone (Depth map)

There was observed to be up dip potential from Megascolides-1 to the north, the east and south, with the best control being along seismic line KG05-01 to the east. In this direction, the beds appear to dip uninterrupted down to the west from Megascolides-1 location to Megascolides-2 and where the N-S fault intersects, the dip reverses to the east in the downthrown block. (Fig 5).

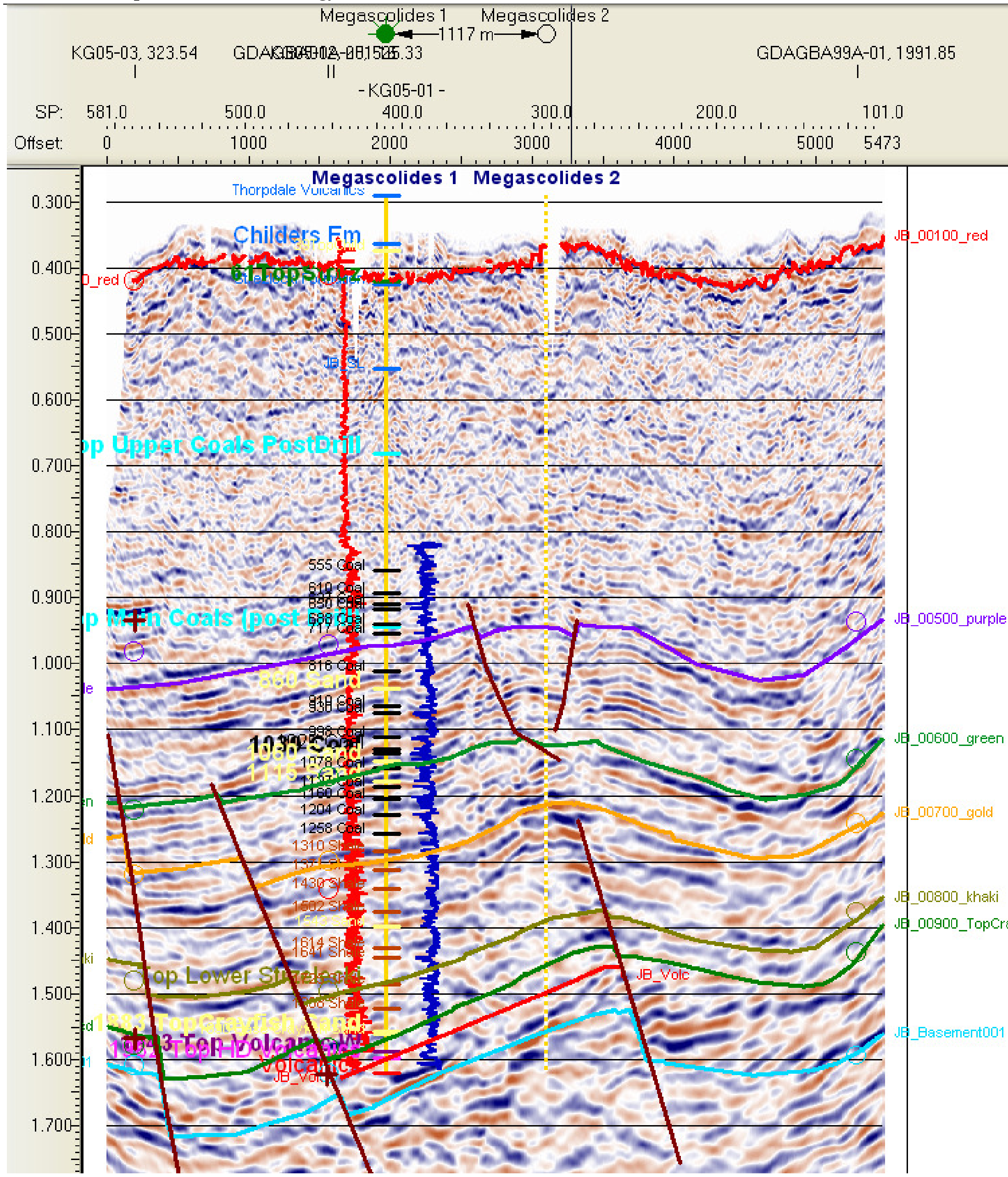

Fig 5. Time seismic section from Megascolides 1 to Proposed Megascolides 2.

Regional and local prospect interpretation of the structure indicated that Megascolides 2 would penetrate all predicted horizons at a shallower depth than was equivalent horizons penetrated in Megascolides 1.

This was predicted on the basis that the seismic interpretation of Line GKG05-01 is correctly indicating dip down to the west between the proposed Megascolides 2 and Megascolides 1, and that the depth conversions, using the time-depth relationship for Megascolides 1 over the area of the prospect is a valid assumption.

The TWT picture as presented before by Line GKG05-01 shows clear TWT dip down to the west from the proposed Megascolides 2 to Megascolides 1(Fig 5). The interval velocities of the formations penetrated by Megascolides 1 were generally fast, and the well did not penetrate any unusual lithologies with extreme interval velocities. No unusual stratigraphic relations were interpreted to exist over the prospect so it seemed reasonable that using a single time depth curve over the area would not introduce excessive errors.

When the well was drilled, indeed the horizons referred to as 'Near Purple', 'Near Green', and 'Near Gold, all came in fairly close to prediction (see Table1 in Section 4). However, the 'Near Khaki' *(F. Wonthagiensis* zone) and the 'Near dark Green' , Rintouls Creek Formation, or near top of Crayfish equivalent was penetrated very deep to prognosis as a result of significant thickening of the green to khaki interval (discussed later). Additionally, the predicted sandstone reservoir at this horizon was not encountered. The Crayfish Shale section has thickened considerably and no Duck Bay Volcanics were present.

In order to check the variation of the time-depth relationship between the Megascolides 1 and 2 wells, the two surveys were compared (Fig 6).

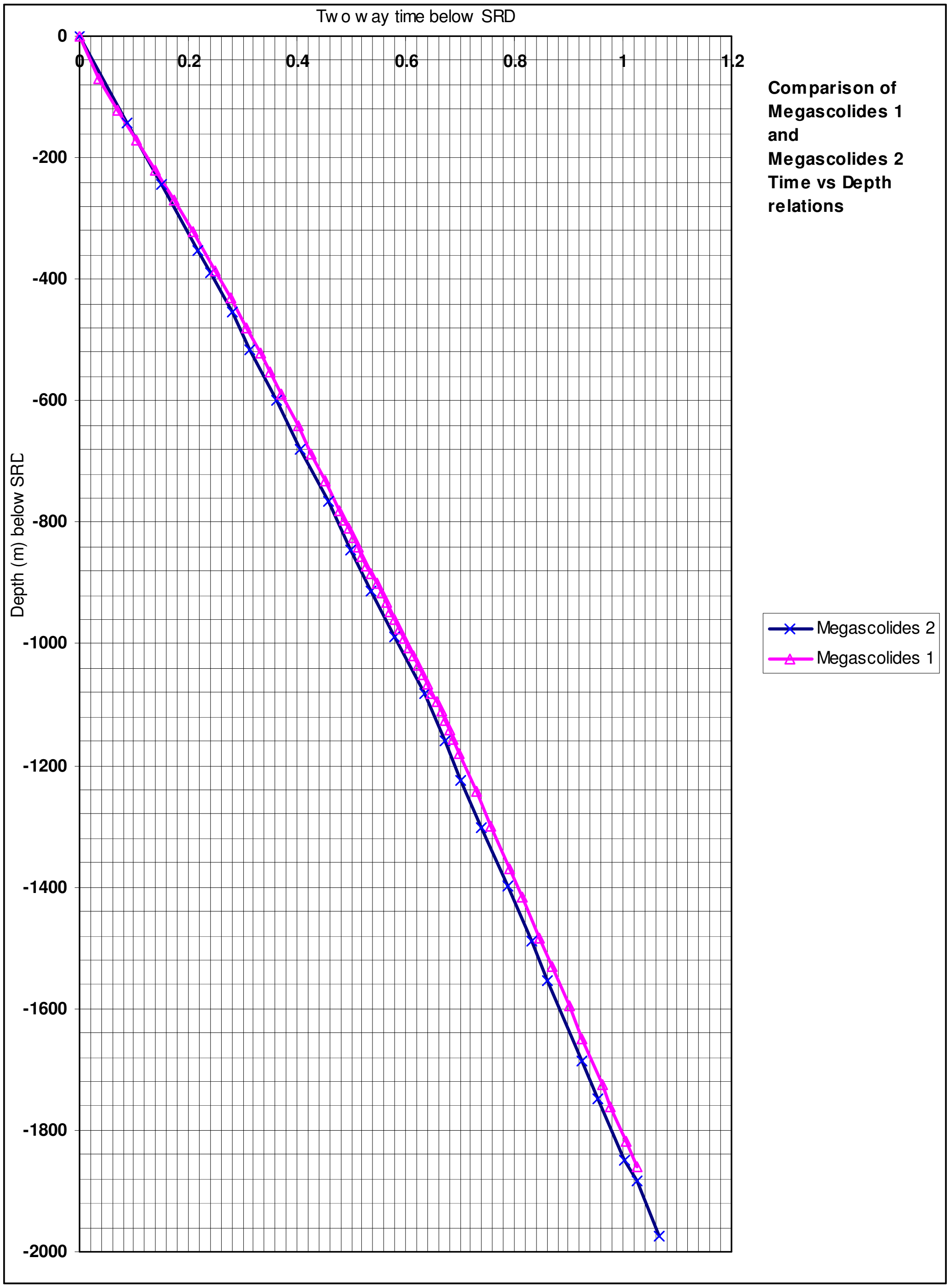

Figure 6 Megascolides 1 and Megascolides 2 Time Depth Curve Comparison.

As can be seen the variations between the two well curves varies from15m to 20m depth for the same TWT from about 600mSS to TD with Megascolides 2 having faster interval velocities than Megascolides 1. This may be the result of inversion (the rocks were buried deeply and then uplifted to shallower depths but retained their high level of compaction.

The similarity of the two curves shows that the original assumption about the use of Megascolides -1 for depth conversion was justified.

The seismic interpretation package did not have the capability of generating or displaying synthetic curves so synthetics were generated in another package and manually tied to the seismic. The ties were scanned and are illustrated in Figures 7 and 8.

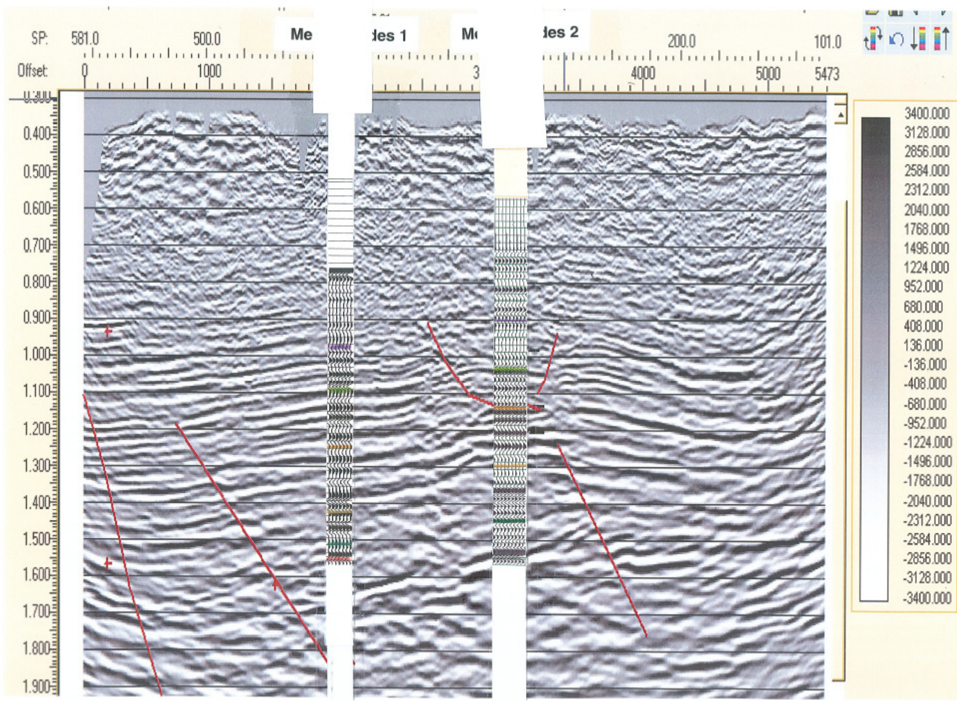

Figure 7. Synthetic seismic traces for Megascolides 1 & 2 tied to seismic line GKG05-01. Note the good match using a 30Hz zero phase Ricker wavelet .

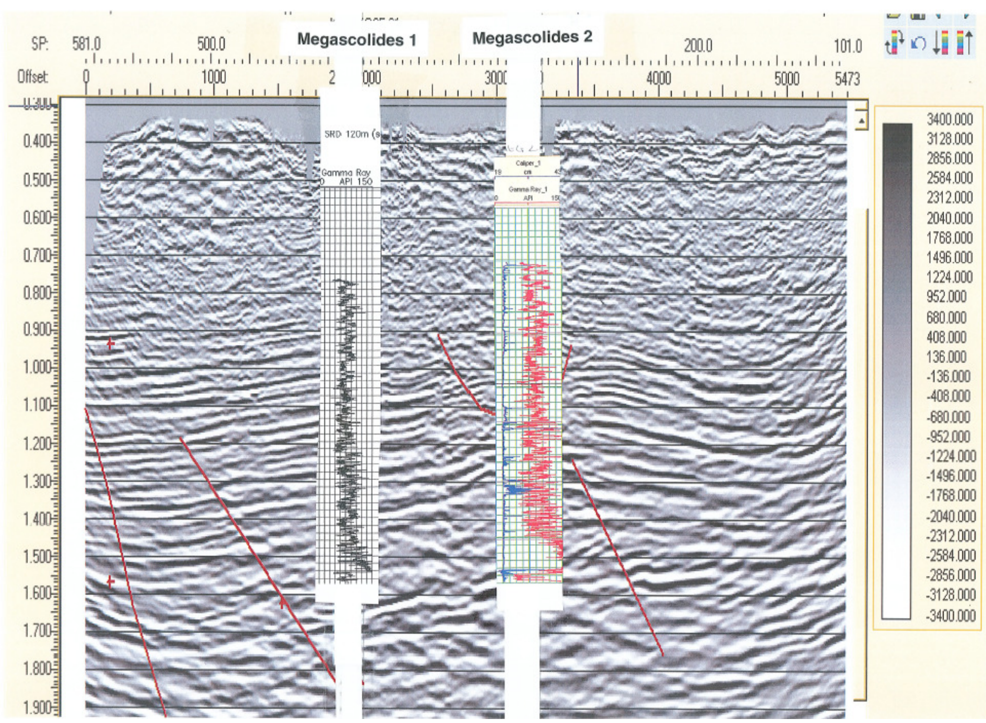

Figure 8. Overlay of GR logs tied at the same level as the synthetic traces.

When the wells are tied to the seismic and the tops annotated, it is clear that the original interpretation was vindicated in terms of dip except for the 'Near Dark Green' horizon (near top Crayfish group equivalent).

It should be noted that while the seismic interpretation carried horizons that were at what appeared to be levels that could be carried regionally, the formation boundaries or lithological units picked in the well were adjusted to these seismic picks and hence the names 'Near dark green' for the lithology pick rather than 'Dark Green' which is the seismic pick.

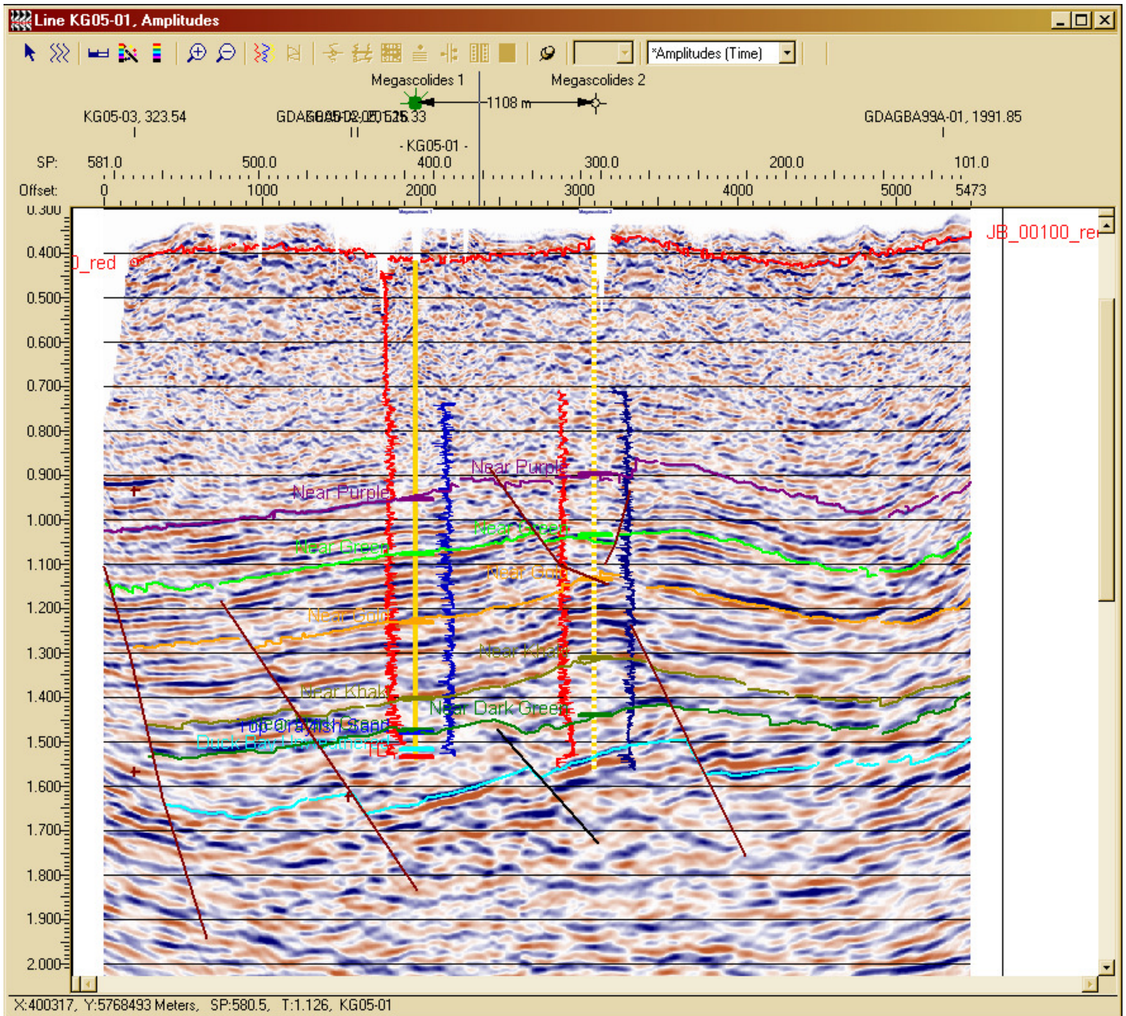

Fig 9. Interpreted seismic line GKG05-01 showing picked geological horizons and their mapped extensions.

It can be seen from Figure 9 and 10 on the post drill interpretation of line GKG05-01 that the geological picks mirror the geophysical picks very closely except for an absence of sand at the predicted level of the 'Near Dark Green' and that that dark green was much deeper.

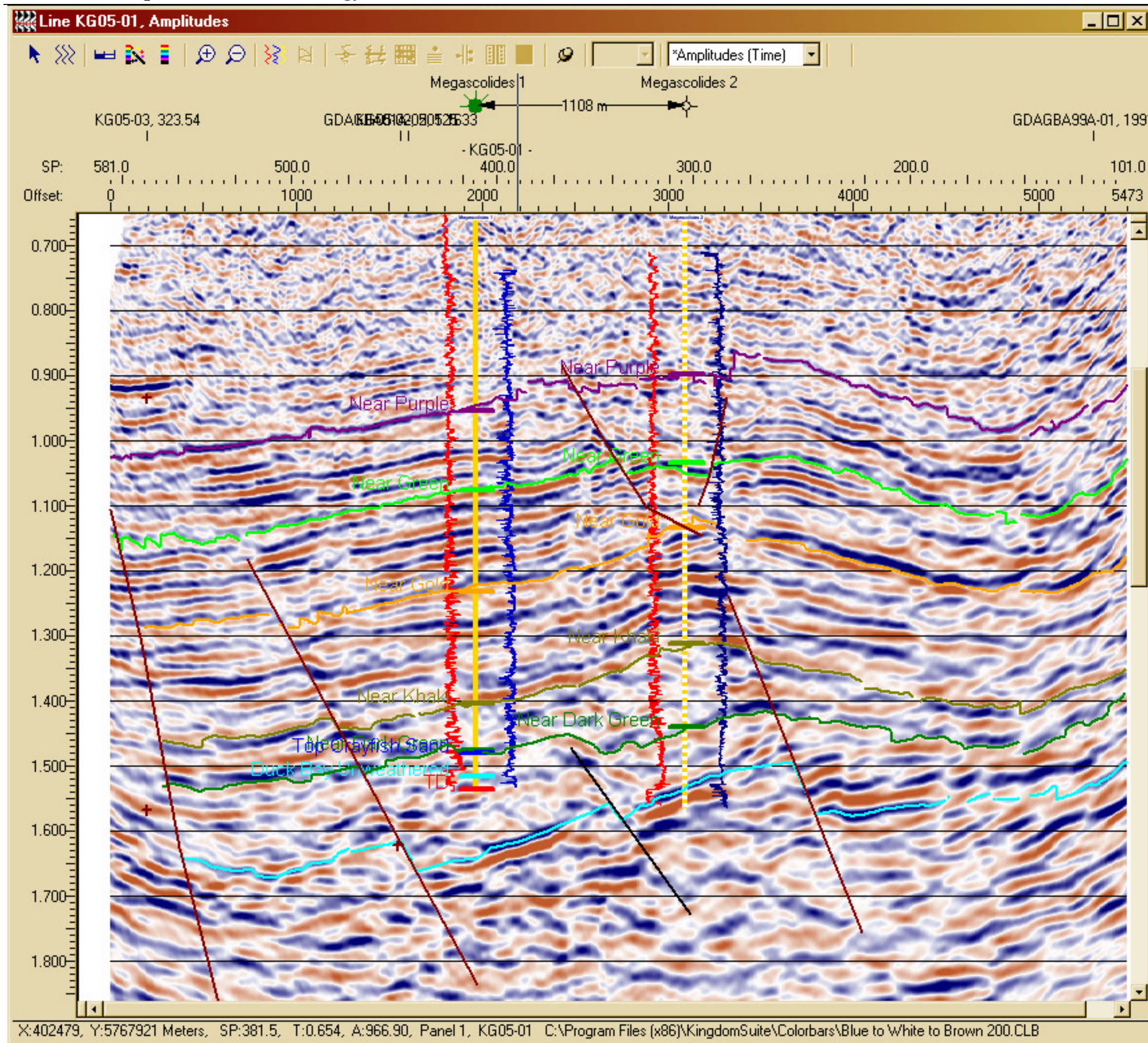

Fig 10. Interpreted seismic line GKG05-01 from 700ms showing picked geophysical horizons and their mapped extensions.

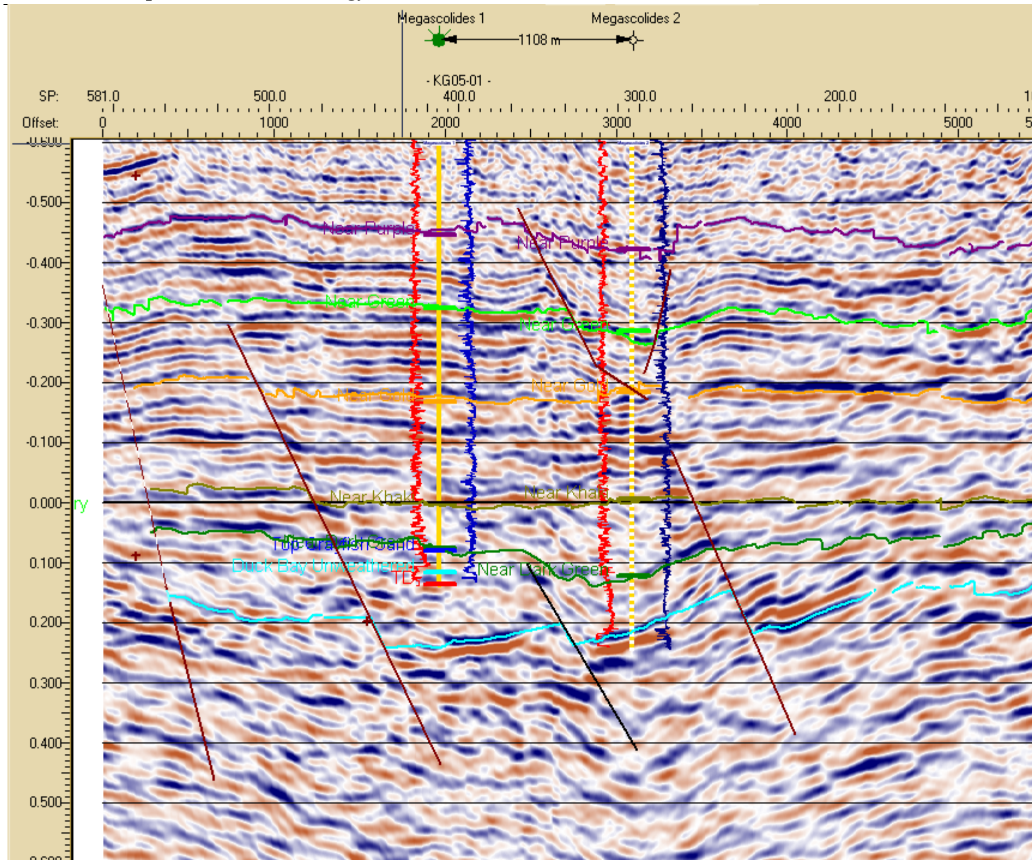

Figure 11. Seismic Line GKG05-01 datumed near the 'Near Khaki' event.

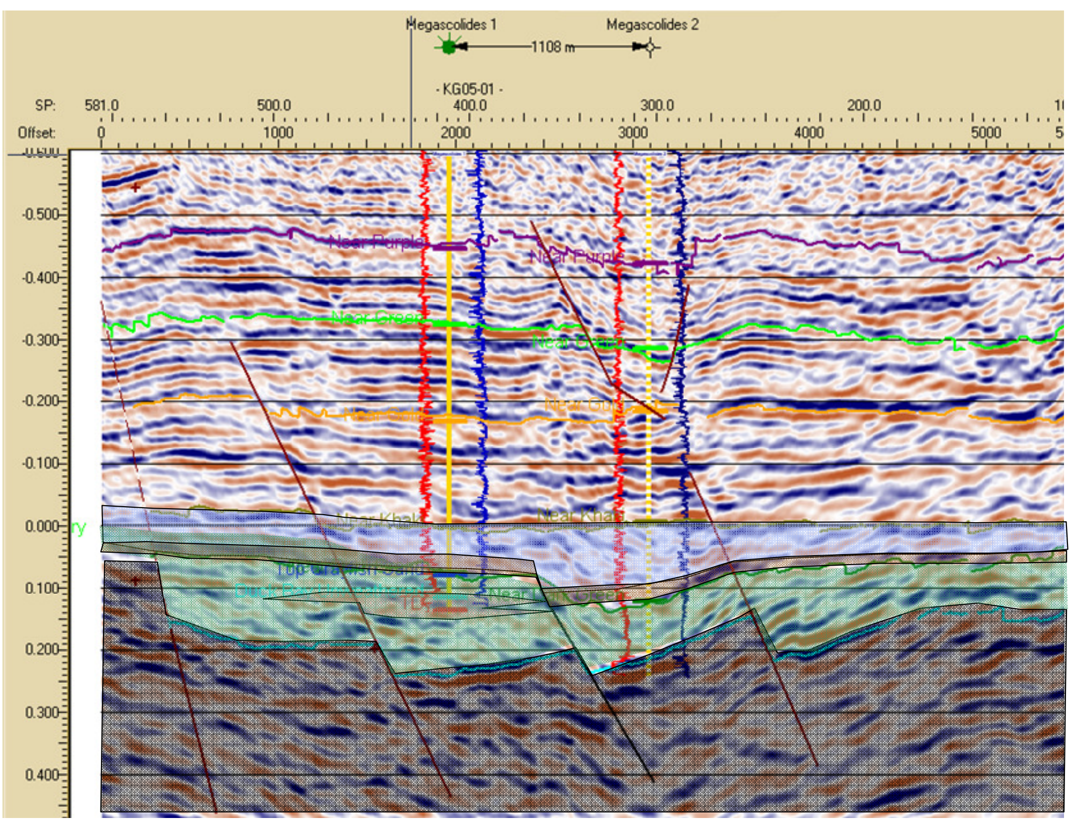

Figure 12. Seismic Line GKG05-01 datumed near the 'Near Khaki' event showing fill of half graben

Major thickening of the Khaki to Dark Green seismic interval ("D" lithostratigraphic Unit in this well) is shown in light blue (Figure 11 and 12). This is interpreted to be late stage infilling of a westerly dipping half graben during the Hauterivian to Barremian *(F. Wonthagiensis/L Belfordii*). This half graben development and depositional timing correlates to similar structuring in the Otway Basin of Western Victoria.

The thicker shale pile (Crayfish Equivalent and Basal Shale Unit, Green) drilled in this well from 1900m to 2066mMDRT is interpreted as the stratigraphic equivalent of the Duck Bay Volcanics and overlying Crayfish shale in nearby Megascolides-1. This restricted lacustrine development and associated volcanism is correlated with the initial phases of rifting occurring in the Casterton Formation of the Otway Basin (Krassey et al 2004).

9 CONTRIBUTIONS TO THE EVALUATION OF HYDROCARBONS IN THE AREA

a) The objectives of the Megascolides-2 well were to

1) Investigate the significance of the shows observed and interpreted in Megascolides-1 by drilling in an up dip location.
2) Determine the lateral extent and vertical thickness of the sandstone reservoir at top Crayfish Formation equivalent level.
3) To investigate any other potential sandstone reservoirs in the well.
4) Obtain high quality logs in a stable well bore
5) To integrate all acquired information to aid in the overall management and future relinquishment of the permits

b) Overall, Wireline log correlation, seismic and velocity survey interpretation and palynological interpretation show that Megascolides-2 was drilled in an up dip location to Megascolides-1. The single event (near Top Crayfish Equivalent) which was encountered significantly structurally deeper, (approximately 260m), than seismically predicted was due to stratigraphic thickening (infilling of a half graben) during the *F Wonthaggiensis* zone and in particular the *L.belfordii* sub zone (new to the Gippsland Basin, A. Partridge, pers com).

c) The sandstone reservoir interval of the Rintoul Creek Formation Equivalent was not encountered as predicted. The stratigraphic equivalent shale (by palynological correlation) was encountered from 1895m to 1900mMDRT in this well

d) Mudlogging, Wellsite lithological descriptions and wireline log interpretations did not find any significant hydrocarbons or any sandstones with significant porosity in the well

e). No Duck Bay Volcanics were encountered as predicted. A stratigraphic equivalent restricted lacustrine shale was found and this is interpreted as an equivalent of the Casterton Fm (Otway Basin).

f) Potential source rocks were found in this basal shale unit from 2097 to 2066m containing Total Organic Carbon up to 15%, however Hydrogen Index and Oxygen Index Rock Eval were low.

g) Seismic Interpretation of a grid of lines that is based on the arrangement of roads and limited access is not ideal.

h) Metasediments of an unknown age were encountered at 2066mMDRT. Total depth of the well was 2130 mMDRT

i) **In conclusion**; No significant hydrocarbons or reservoir sands were found in Megascolides-2 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

Composite Well Log

ENCLOSURE-2

Dipmeter Interpretation Log

ENCLOSURE-3

CD containing Digital Data