Summary

CBM93001 was drilled to examine the coal bed methane potential of the Purni Formation the Permian sequence of the Pedirka Basin in the southern Northern Territory. In addition the sandstone reservoirs were also examined. All depths referred to are measured depth below the rotary table unless otherwise specified.

Data Quality

Data quality on all runs was good, with only a few coal sections adversely affecting the data due to borehole enlargement. Only the Purni Formation was logged with a full suite of logs as the 7" casing shoe was set at the top of the Purni, and only Gamma, Neutron and Acoustic data were recorded though casing to the surface.

Formation Evaluation methodology.

Originally a simple single mineral petrophysical (Sand-shale and porosity) model was constructed for to evaluate the sands encountered in the well. However, for the sands within the Purni Formation, a multi-mineral model was required and constructed as the sands were difficult to distinguish from claystone using the gamma ray and density-neutron data as shale indicators. The multi-mineral components were Illite, Kaolinite, Potassium Feldspar, Quartz and porosity, using the following log data; Gamma ray, Potassium, Thorium, Uranium, Density, Photoelectric Factor, Neutron Porosity, Compressional Slowness, Shear Slowness, NMR Total Porosity and NMR Effective Porosity.

Purni Formation

The Purni Formation consisted of interbedded coals and sands. The coals were easily identified on the density log and from 697m to base if full log coverage (1230 m) (533 m) there was 141.7m of coal indentified, see Table 1.

Table 1 Coal Intervals

CBM93001		
Top	Base	Thickness
m	m	m
718.5588	722.1588	3.6
726.7588	727.2588	0.5
757.8588	759.8588	2
762.3588	763.7588	1.4
774.6588	774.9588	0.3
779.7588	781.3588	1.6
798.3588	805.7588	7.4
833.6588	852.2588	18.6
871.4588	885.8588	14.4
889.4588	891.3588	1.9
906.1588	906.7588	0.6
909.1588	916.2588	7.1
922.2588	923.9588	1.7
937.9588	939.3588	1.4
939.5588	941.3588	1.8
941.8588	943.1588	1.3
976.2588	1010.7588	34.5
1024.2588	1031.8588	7.6
1036.6588	1037.0588	0.3999
1048.7588	1056.3588	7.6
1068.0588	1068.6588	0.6001
1071.1588	1071.9587	0.7999
1093.7588	1098.3588	4.6
1106.8588	1108.9587	2.1
1109.3588	1109.8588	0.5
1116.6588	1117.8588	1.2
1121.5588	1121.9587	0.4
1123.5588	1123.7588	0.2001
1125.8588	1130.1588	4.3
1132.4587	1134.0588	1.6
1137.2588	1138.5588	1.2999
1172.0588	1178.1588	6.1001
1189.1588	1191.0588	1.8999
1199.2588	1199.6588	0.4
Gross	m	355
Net Coal	m	141.7

As noted above the sands were not easily differentiated from claystone due to high gamma values (both elevated Potassium and Thorium levels), and a high neutron porosity. It was possible to differentiate sand from claystone using the NMR data due to the difference in bound water volume. The sands were thought to be mineralogically immature form a granitic or granulitic source, containing feldspars, kaolin and probably heavy minerals including garnets. It was not possible to include any of the likely heavy minerals in the model due to their low concentrations and unknown mineralogy. The model was not optimised for coal, which was zoned out using a density cut-off. The model was run using the Statlith module of the Terrastation package from Terrasciences Inc, and is an error minimisation algorithm.

The multi-mineral model is given in Table 2.

Table 2 CBM93001 Multimineral parameters

CBM 93001 Multimineral Model												
Component	Conduct.	CNC	DTC	DTS	GR	KC	MPHE	MPHS	PE	THC	UC	ZDNC
	Yes/No	frac	us/f	us/f	GAPI	%	frac	frac	brne	ppm	ppm	g/cc
Lower limit		-0.15	40	40	0	0	0	0	0	0	0	1.95
Upper limit		0.45	180	500	250	20	0.5	0.5	20	20	20	2.95
Kaolinite (KAOL)	No	0.2	150	325	90	0.4	0.03	0.08	1.49	65	2	2.61
K-feldspar (KFLD)	No	-0.01	65	90	190	8	0.02	0.06	2.86	7	1.5	2.57
Illite (ILL)	No	0.65	120	150	210	2.5	0.03	0.14	3.45	25	13	2.63
Quartz (QTZ)	No	-0.02	55.5	74	30	0.1	0	0	1.81	0.2	0.4	2.65
Porosity (POR)		1	190	500	30	0	1	1	0.36	0	0	1

Key		
	CNC	Corrected Thermal Neutron Porosity
	DTC	Compressional Slowness
	DTS	Shear Slowness
	GRC	Corrected Total Gamma Ray
	KC	Corrected Potassium
	MPHE	NMR Effective Porosity
	MPHS	NMR Total Porosity
	PE	Photoelectric factor
	THC	Corrected Thorium
	UC	Corrected Uranium
	ZDNC	Corrected Density

The Purni Formation from the top to the bottom of full log coverage 1230m, consisted of 533 m of gross rock with 267m of porous reservoir with net/gross ratio of 50%. It exhibited an average porosity of 17.6% using a 10% porosity cut-off, and a geometric average permeability of 90 mD using a porosity transform, and 82mD form the NMR permeability transform. All sands in the Purni are interpreted to be water filled. The porosity versus thickness plot given in Figure 3 shows the just over half the porosity in the Purni to be less than 18%. The water salinity of the Purni was calculated to be 0.13 Ω-m at 60 °C, or about 20,000 ppm NaCl equivalent, which is consistent with the SP deflections of about 35 mV at 1175m corrected for drift.

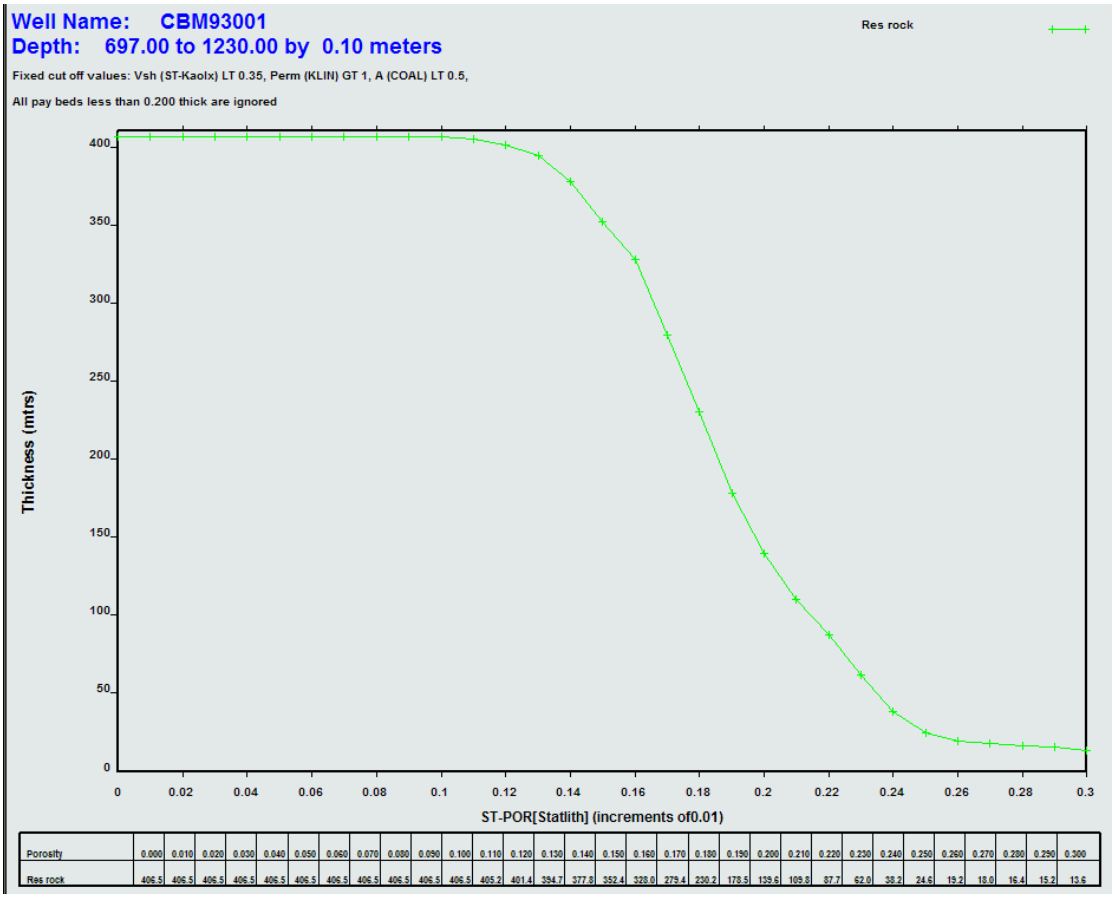

Figure 1 Porosity versus Thickness – Purni

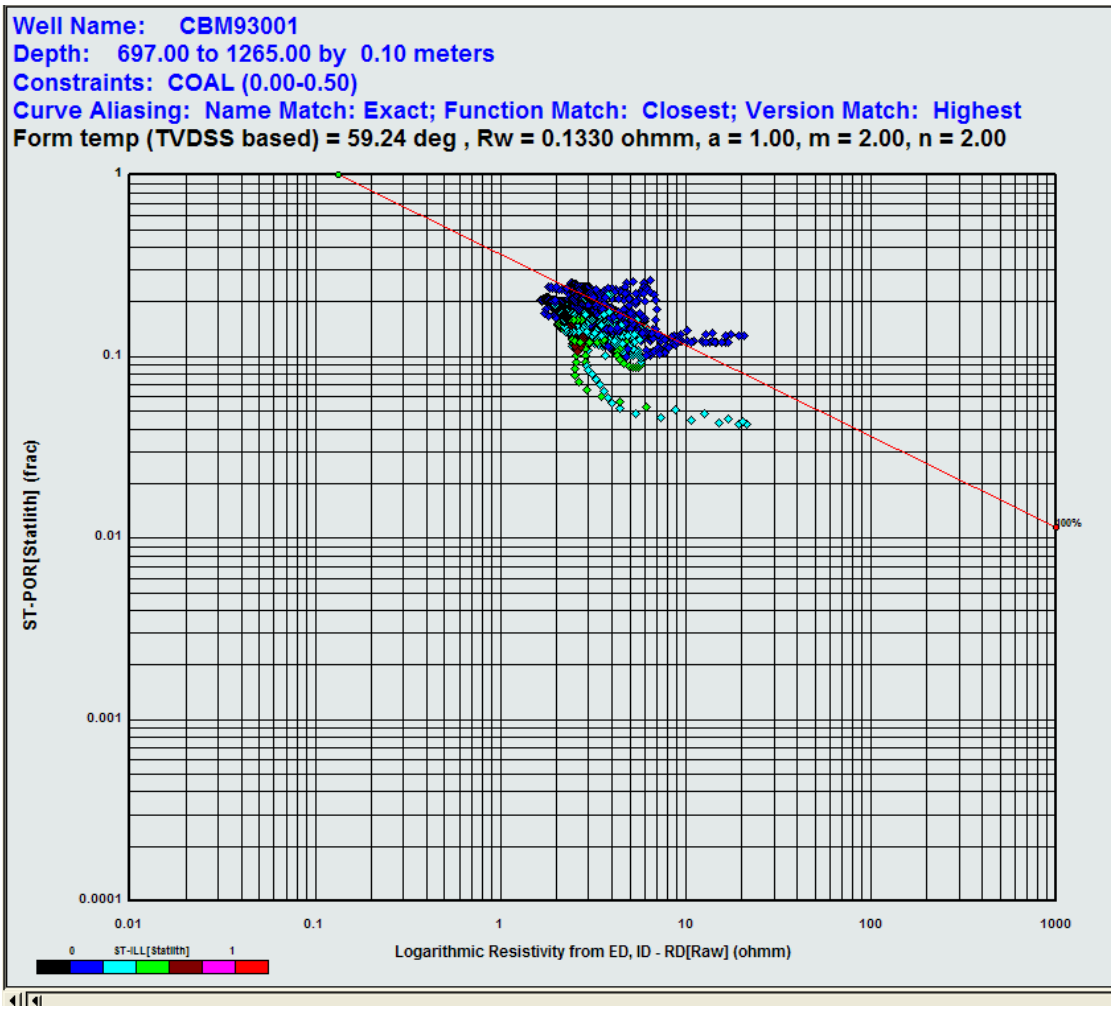

Figure 2 Pickett Plot - Purni