Karoon Gas Pty Ltd
VOBE_KAR_0001_01_05 **February 2005**
Attention: Mark Smith

Megascolides-1

OPEN-HOLE LOG ANALYSIS

Executive Summary

This analysis provides a Petrophysical Interpretation of the open-hole logs for Megascolides-1 using the Hi Resolution Data acquired across the interval 1850-1950mKB.

Two thin sandstone units (1883-1886mKB and 1888.5-1890.3mKB) within the main zone of interest exhibited hydrocarbon fluorescence in the cuttings samples and associated increase in ditch gas was recorded across the zone during drilling operations.

Table 1 summarises the results of this interpretation logs.

Interval	PHIE cut-off %	Gross m	Net m	PHIE av %	Vcl av %	Swe av %
1883-1886	12.0	3.00	0.66	13.39	16.75	63.96
1888-1891	12.0	2.00	0.10	12.29	25.12	49.25

Cut-off used: Vcl <50%, PHIE >12.0%.

Table 1. Megascolides-1 Reservoir Summary

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1. General Information

All depths quoted in this report are m MDKB.

Well Name	**Megascolides-1**				
Country	Australia				
Company	Karoon Gas Pty Ltd				
Location	PEP 162/EL4537				
State	Victoria				
Permanent Dat.	MSL				
Elevation of DF (M)	105.27				
Elevation of GL (M)	101.00				
Logging Co.	SCHLUMBERGER				
Logging Date	20 Dec 2005				
Logs Recorded	SP-HALS-PEX (CNL-TLD)-BHC				
Bottom depth (M)	1850				
Top depth (M)	1950				
Casing shoe (M)					
Bit size (inch)	8.5				
Fluid Type	Native Clay/Polymer				
RM (Ohmm) @ TEMP (DegC)	4.3 @ 20.4				
Recorded by	R. Clark/I.Thomas				

2. Log Quality Control

Digital data received was of good quality, no processing undertaken. Caliper indicates some bore-hole rugosity across zone of interest and positive correction to density. All curves were recorded in the same run, there were no cycle skips observed on the sonic log, there were no tension overpulls recorded resulting in good quality logs and no depth mismatch

3. Log Compositing and Editing

The methodology applied is summarised as follows:

1. Load data into PETROLOG
2. Check for depth match. For this interpretation no depth shift required.
3. Check hole conditions. Caliper log indicates some rugosity across zones of interest resulting in positive Density log corrections.

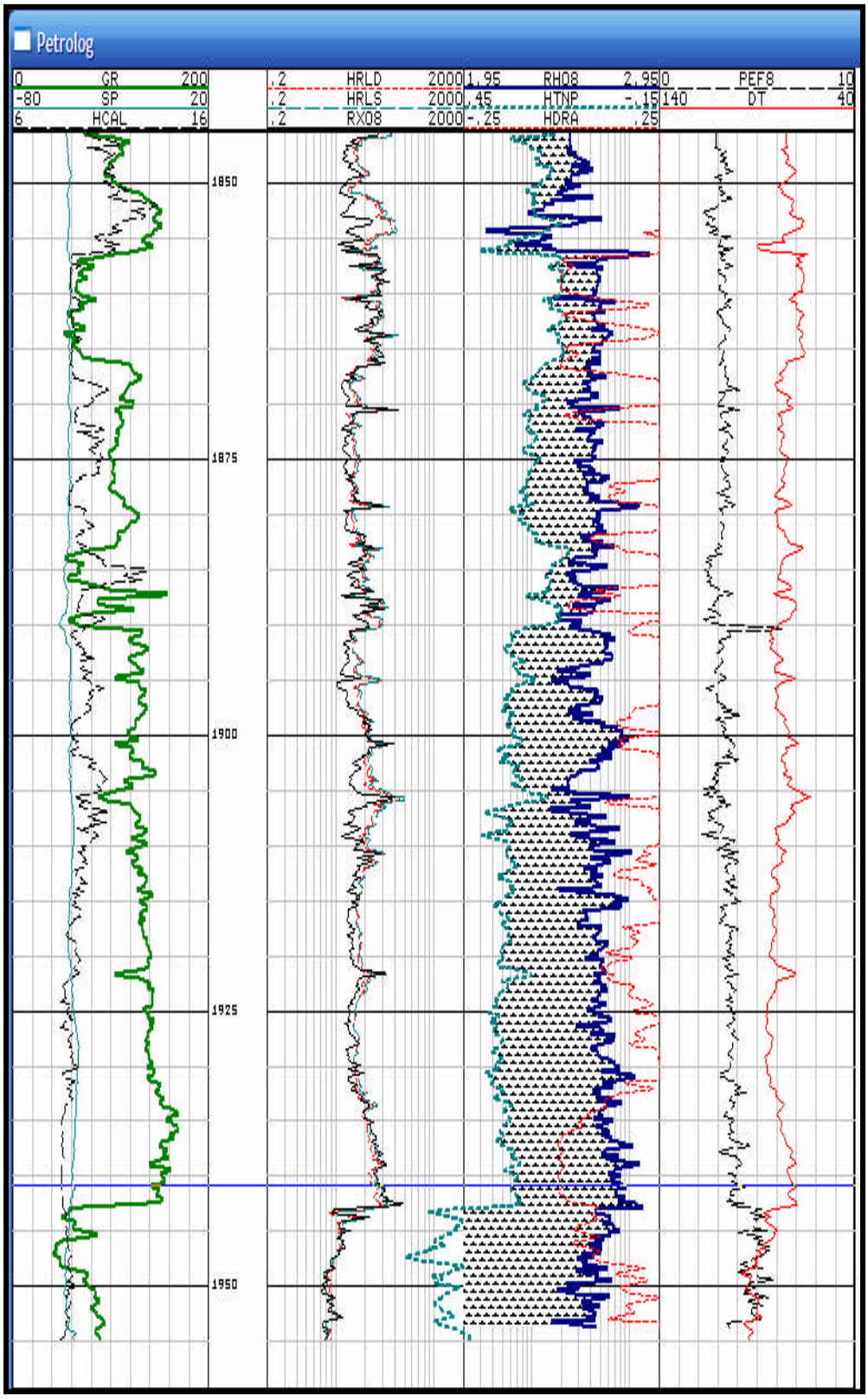

FIGURE 1 – Megascolides-1 Input Logs (Hi Resolution Data)

4. Environmental corrections

Borehole corrections were undertaken at wellsite. No further corrections applied.

5. Petrolog Model Selection

The Silt Shale Sand Model (SSS) was selected for the interpretation. This is a deterministic model that computes Vclay, Vsilt, Vsand, Porosity (PHIT and PHIE) and Water Saturation (SWT, SWE).

6. Vclay Determination

The following clay indicators have been used:
VGR, VS, VN, VD, VRT, VN-D, VS-D, VS-N VMN
The lowest Vclay indicator is used as final Vclay.
A good match has been achieved with all the Vcl indicators except VRT.

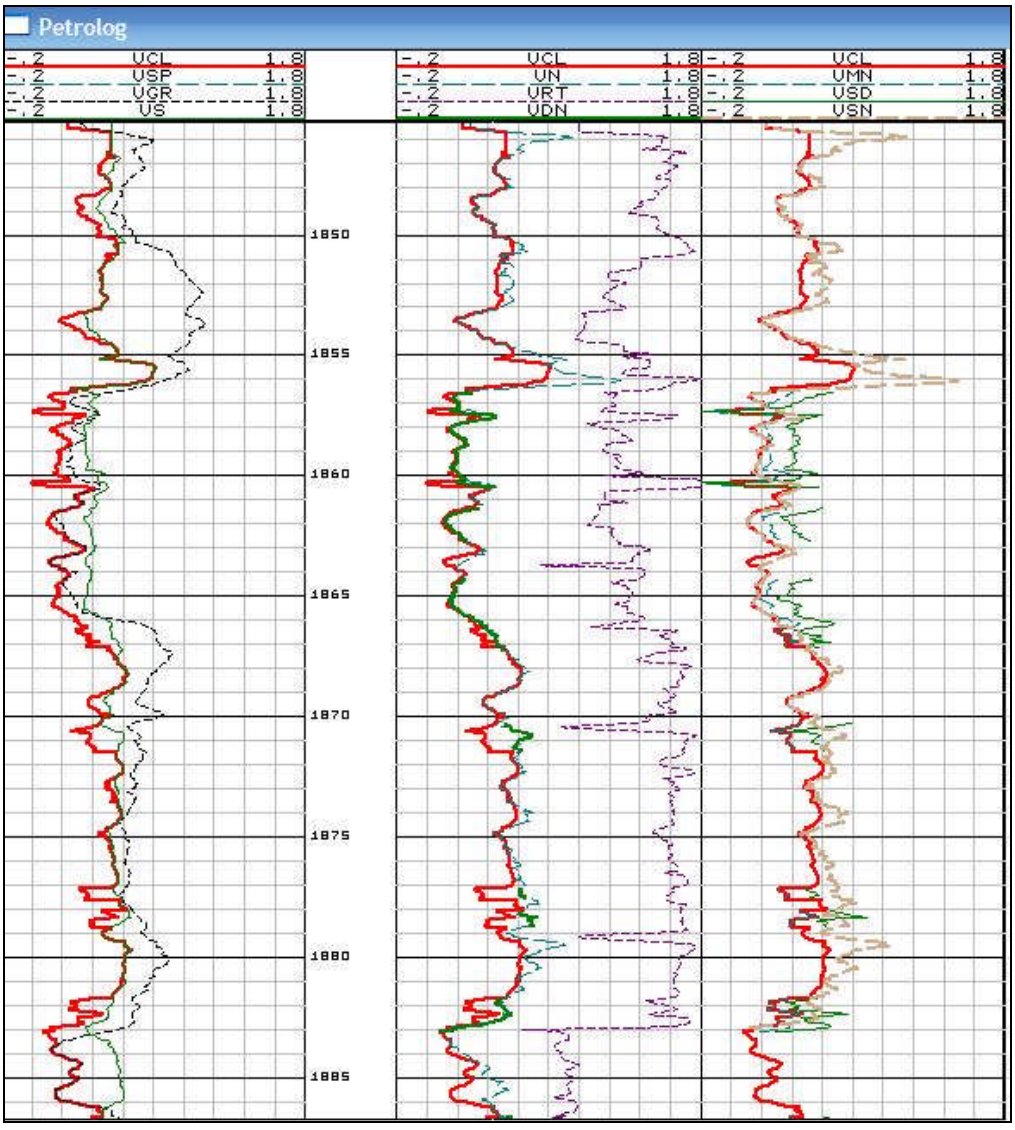

Figure 2 Vcl determination

7. Porosity Determination

Total porosity (PHIT) is calculated using input logs Neutron and Density using Density-Neutron crossplot and Sonic using the Raymer-Hunt-Gardner algorithm. Due to borehole rugosity across the zone of interest bad hole logic was invoked. Effective porosity was calculated after Vcl determination.

$$PHIE = PHIT (1-Vcl)$$

8. RW Determination

Based on clients local knowledge an Rw equivalent to 17000ppm NaCl formation water salinity was used.

The Rw was not calculated from this suite of logs as there are no clean water sands. In conventional log analysis the formation water salinity in the hydrocarbon zone is assumed to be the same as that of the underlying water sands. However it has been found in offshore Gippsland Basin (Kuttann et.al. APEA 1986) that the water salinity associated with the hydrocarbon zones is significantly more saline (30-40,000ppm NaCl equivalent) than the salinities associated with the underlying water sands (less than 5,000ppm NaCl equivalent).

9. Determination of Sw, a, m, n

For this interpretation the **Indonesia equation** was used to compute water saturation (Sw) and is defined as follows:

Swe = (1.0 / (Y*SQRT(RT)))(2.0/n)**
And Y = VCL(1.0-VCL/2)/ SQRT(RCL) + PHIE**(m/2)/SQRT(a*Rw)**

In this interpretation a=1, m= 2.00 and n=2.

10. Results

The interpretation results are presented in Figure 3 and Table 2 presents a summary of reservoir properties at different porosity (PHIE) cut-off values. Although the two thin sand units examined (1883-1886m, 1888-1891m)appear to exhibit good reservoir properties, permeability to oil is yet to be established.

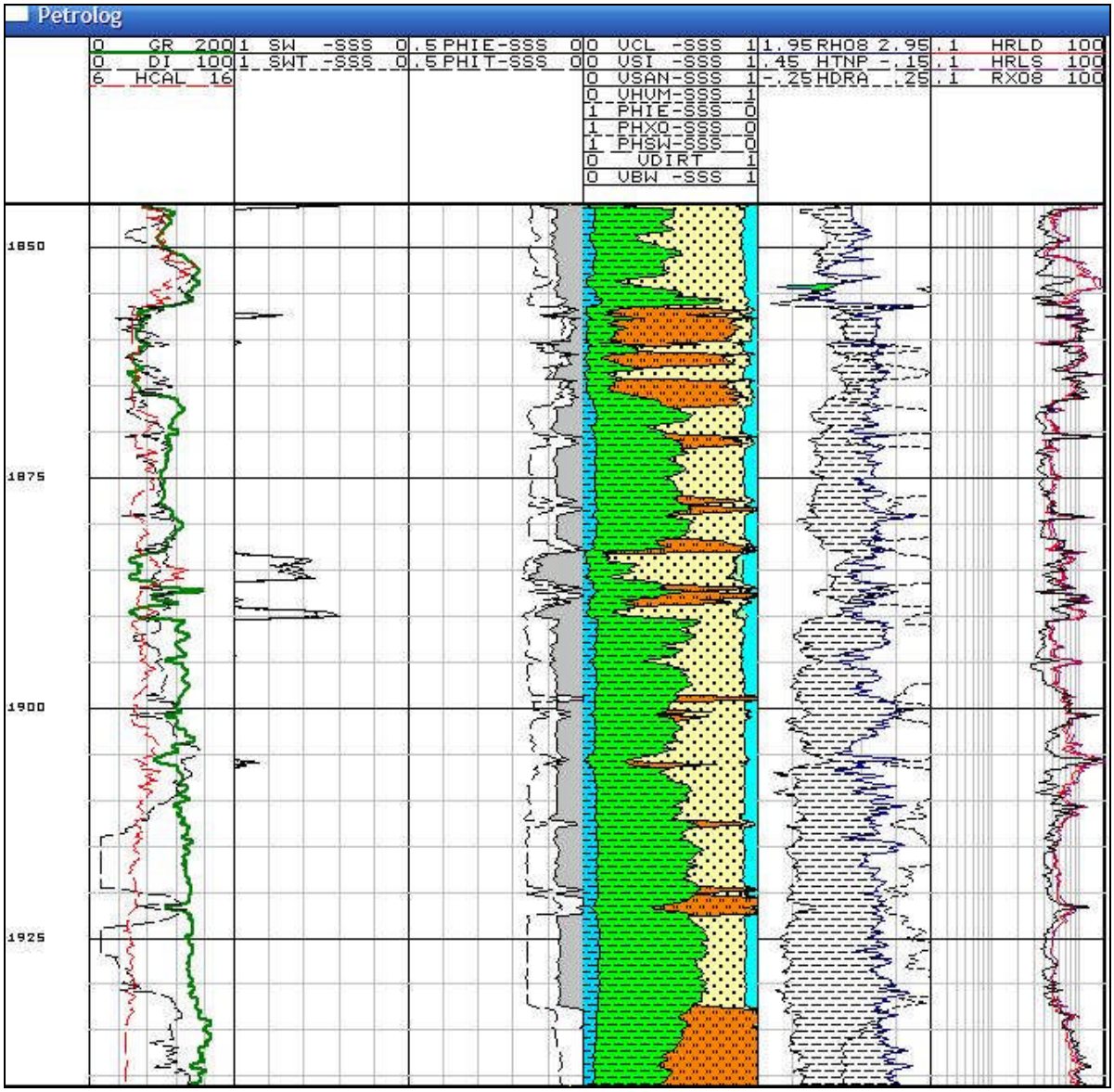

FIGURE 3. Sand-Silt-Shale Results plot using salinity 17,000ppm NaCl.

Interval	PHIE cut-off	Gross	Net	PHIE av	Vcl av	Swe av
m	%	m	m	%	%	%
1883-1886	12.00	3.00	2.39	13.75	20.87	59.82
	10.00	3.00	2.74	13.44	21.32	61.97
	9.00	3.00	2.79	13.37	21.13	62.66
	8.00	3.00	2.90	13.21	20.78	63.97
1888-1891	0.12	2.00	0.76	13.32	22.11	42.52
	0.10	2.00	1.07	12.61	23.52	46.62
	0.09	2.00	1.57	11.65	25.13	63.84
	0.08	2.00	1.63	11.54	25.03	64.97

Cut-off used: Vcl <0.5,

Table 2 Reservoir Summary for different porosity cut-off values

11. Assumptions

The formation water salinity 17,000ppm NaCl equivalent used in this analysis may be not be correct.

Clay mineralogy is more complex than assumed for this model.

12. Reference

Kuttan, K., Kulla, J.B. and Neumann, R.G. 1986 APEA Journal:
Freshwater Influx In The Gippsland Basin: Impact On Formation Evaluation, Hydrocarbon Volumes, and Hydrocarbon Migration.

Appendix 1 – Work Sheet and Log Analysis Inputs

Petrolog

Zone no.		1	2	3	4
Top depth	M	1845.310	1856.029	1883.004	1891.030
Bottom depth	M	1855.978	1882.953	1890.979	1954.987
Formation Name					
Top depth	M	1845.310	1856.029	1883.004	1891.030
Bottom depth	M	1855.978	1882.953	1890.979	1954.987
Facies		.000	.000	.000	.000
No logs					
RM	ohmm	4.300	4.300	4.300	4.300
Temp. RM	degC	20.400	20.400	20.400	20.400
RMF	ohmm	3.700	3.700	3.700	3.700
Temp. RMF	degC	20.400	20.400	20.400	20.400
RMC	ohmm	4.300	4.300	4.300	4.300
Temp. RMC	degC	20.600	20.600	20.600	20.600
Bit size	inch	8.500	8.500	8.500	8.500
Mud wt	gm/cc	1.138	1.138	1.138	1.138
SSP		.000	.000	.000	.000
RW (SP)	ohmm	1.487	1.480	1.474	1.461
Temperature	degC	67.144	67.557	67.939	68.727
RW @ FT	ohmm	.182	.181	.180	.179
RW@75F(23.9C	ohmm	.355	.355	.355	.355
RW salinity	ppm	17000	17000	17000	17000
RMF @ FT	ohmm	1.750	1.750	1.750	1.750
RMF salinity	parts	.0015283	.0015283	.0015283	.0015283
RM @ FT	ohmm	2.033	2.024	2.015	1.998
RHO H	gm/cc	.800	.800	.800	.800
Gas Flag		.000	.000	.000	.000
RHO F	gm/cc	.995	.995	.995	.995
t F	us/ft	189.000	189.000	189.000	189.000
RHOMA	gm/cc	2.650	2.650	2.650	2.650
PHIN min		.100	.100	.100	.100
t MA	us/ft	58.000	58.000	58.000	58.000
t MA min	us/ft	48.000	48.000	48.000	48.000
Sonic option		1.000	1.000	1.000	1.000
Compact/Ovrt		1.000	1.000	1.000	1.000
CAL cut off	inch	16.000	16.000	16.000	16.000
RUGO.cut off	inch	2.000	2.000	2.000	2.000
DRHO cut off	gm/cc	.150	.150	.150	.150
Bad Hole		1.000	1.000	1.000	1.000
No clay		SP	SP	SP	SP

Petrolog

Zone no.		1	2	3	4
Top depth	M	1845.310	1856.029	1883.004	1891.030
Bottom depth	M	1855.978	1882.953	1890.979	1954.987
Formation Name					
Vclay Flag		.000	.000	.000	.000
Vclay type		.000	.000	.000	.000
Vclay inp1		.200	.200	.200	.200
Vclay out1		.150	.150	.150	.150
Vclay inp2		.800	.800	.800	.800
Vclay out2		.800	.800	.800	.800
Vclay 50%		.500	.500	.500	.500
VclayGR type		1.000	1.000	1.000	1.000
GR clean		40.000	40.000	40.000	40.000
GR clay		140.000	140.000	140.000	140.000
GR1		51.000	51.000	51.000	91.000
VGR1		.100	.100	.100	.100
GR2		84.000	84.000	84.000	92.000
VGR2		.800	.800	.800	.800
GR50%		70.000	70.000	70.000	91.000
R clay		60.000	60.000	12.000	60.000
R limit		1000.000	1000.000	1000.000	1000.000
Rclay1 flag		.000	.000	.000	.000
Rclay1		10.000	10.000	10.000	10.000
Vcl @ Rclay1		.150	.150	.150	.150
RHOB sand	gm/cc	2.150	2.150	2.150	2.150
RHOB silt	gm/cc	2.700	2.700	2.700	2.700
RHOB clay	gm/cc	2.540	2.540	2.540	2.540
RHO Dry Clay	gm/cc	2.780	2.780	2.780	2.780
Rhob Calcite		2.800	2.800	2.800	2.800
PHIN Sand		.250	.250	.250	.250
PHIN silt		.150	.150	.150	.150
PHIN clay		.350	.350	.300	.450
Phin Calcite		.100	.100	.100	.100
PHISILT		.000	.000	.000	.000
Calcite Flag		1.000	1.000	1.000	1.000
t clay	us/ft	100.000	100.000	100.000	100.000
M clay		.790	.790	.790	.790
N clay		.678	.678	.678	.678
PHIN 2.2		.152	.152	.152	.152
t 2.2	us/ft	90.000	90.000	90.000	90.000

Petrolog

Zone no.		1	2	3	4
Top depth	M	1845.310	1856.029	1883.004	1891.030
Bottom depth	M	1855.978	1882.953	1890.979	1954.987
Formation Name					
a		1.000	1.000	1.000	1.000
A1		1.000	1.000	1.000	1.000
m		2.000	2.000	2.000	2.000
m1		2.000	2.000	2.000	2.000
m Function		1.000	1.000	1.000	1.000
n		2.000	2.000	2.000	2.000
n1		2.000	2.000	2.000	2.000
B from BQV		8.963	9.013	9.060	9.155
A(QV)		.0003050	.0003050	.0003050	.0003050
B(QV)		-3.450	-3.450	-3.450	-3.450
Lithomod		3.000	3.000	3.000	3.000
SXO limit		.200	.200	.200	.200
PHI max		.264	.264	.264	.260
PHI min c.o.		.110	.100	.100	.100
EXPX		1.500	1.500	1.500	1.500
Pay Flag typ		.000	.000	.000	.000
Clay cut off		.500	.500	.500	.500
PHIe cut off		.120	.120	.120	.120
PHIt cut off		.250	.250	.250	.250
SWe cut off		1.000	1.000	1.000	1.000
SWt cut off		1.000	1.000	1.000	1.000
GrossRockVol	Mbbl	.000	.000	.000	.000
Oil Exp.Fact		1.200	1.200	1.200	1.200
FormGeom.Fac		1.000	1.000	1.000	1.000
RecoveryFact		.200	.200	.200	.200
SWB max		1.000	1.000	1.000	1.000
RWB	ohmm	.100	.100	.100	.100
SWB cut off		.300	.300	.300	.300
RWF	ohmm	.182	.181	.180	.179
RMFF	ohmm	1.750	1.742	1.734	1.719
Sw Eq. CPX		1.000	1.000	1.000	1.000
Sw Eq. SSS		1.000	1.000	1.000	1.000
Glauconite		.000	.000	.000	.000
SWirr.cutoff		.300	.300	.300	.300
Perm Expon.		6.000	6.000	6.000	6.000
PERM K coef		62500	62500	62500	62500