ROBERTSON RESEARCH INTERNATIONAL LIMITED

NORWAY II STUDY - PRELIMINARY REPORTS G15 TO G23 AND PRELIMINARY REPORTS B11 TO B19

ROBERTSON RESEARCH INTERNATIONAL LIMITED

NORWAY II STUDY - PRELIMINARY REPORTS G15 TO G23

Project No. RRPS/8182/B/2043

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF 33/9-1, 33/9-3, 33/12-2, UK 23/11-1, UK 30/18-2, D-1, F-1, J-1 AND K-1 WELLS

APRIL 1981

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WELL: 33/9-1 MOBIL

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
6000-110	Ctgs	SH, ol-gy, slty	2.5-3	0.31(6); 0.52(3)	80	10	10				
6390-520	"	A/a	3	0.35(5)	70	20	10				
6900-960	"	A/a	3	0.34(3); 0.65(4)	70	20	10				
7350-420	"	A/a	3	0.37(7)	80	10	10				
7710-760	"	SH, a/a+10% SH, med gy						60	40	*	*
7770-820	"	A/a	*	*	*	*	*				
7990	"	A/a	3.5		80	10	10				
8090	"	A/a	4		90	10	*				
8180-260	"	A/a						50	50	*	*
8270-320	"	SLTST, yel-gy+ 30% SND+20% SH, med-dk gy+10% COAL						75	10	*	15
	P	SH, med-dk gy						30	20	5	45
	P	COAL		0.51(30)							
8300	Ctgs	SH, med-dk gy+ 30% SND+40% SLTST, a/a 10% COAL	4-4.5		70	30	*				
8330-390	"	SH, gn-gy, slty+ 20% COAL						65	25	*	10
8460-510	"	SH, coaly+20% SH, med gy+20% SST, pale yel-brn						70	15	*	15
	P	COAL		0.51(26)							
8520-620	Ctgs	SH, gn-gy+20% SH, med-dk gy+ 10% SH, coaly+ 30% SND						60	40	*	*
8700	"	SST, yel-gy+20% SH, med-dk gy+ 10% SH, gn-gy +mnr COAL	4-4.5		70	30	*				
8750-800	"	SND+30% SH, med gy+30% SH, gn-gy+mnr SST, lt brn+tr COAL						75	25	*	*
8870-920	P	SH, med-dk gy						50	50	*	*
8900	Ctgs	SST, yel-gy+30% SH, a/a	4-4.5		80	20	*				
8930-980	"	SST, a/a+SH, a/a						20	80	*	*
	P	SH, med-dk gy						70	30	*	*
9100	Ctgs	SST, a/a+30% SH, a/a	4.5-5		50	30	20				

TABLE 1 A Maturity and Kerogen Data

WELL: 33/9-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
9110-160	Ctgs	SH, med-dk gy, mic+40% SH, gn-gy						70	30	*	*
	P	SH, med-dk gy, mic						60	40	*	*
9170-220	P	SH, med-dk gy, mic						60	40	*	*
9230-260	P	SH, dk gy						80	20	*	*
9290-310	Ctgs	SH, a/a+40% SST, yel-gy+tr COAL						60	40	*	*
	P	COAL		0.53(26)							
9300	Ctgs	SH, a/a+20% SST, a/a	4.5		40	30	30				
9320-370	"	SH, med-dk gy/ dk gy+30% SND									
	P	SH, med-dk gy/ dk gy						75	20	*	5
9380-430	P	SH, dk gy						60	40	*	*
9440-490	Ctgs	SH, a/a+20% SND/SST, yel-gy						60	40	*	*
	P	SH, dk gy						75	25	*	*
9500	Ctgs	SH, a/a+30% SND/SST, a/a	4.5		40	30	30				
9560-610	"	SND+20% SH, med gy						55	45	*	*
	P	SH, med gy						75	25	*	*
9700	Ctgs	SND+10% SH, a/a	4.5-5		40	30	30				

TABLE 1 B Maturity and Kerogen Data

WELL: 33/9-1

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP. – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/gOF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO-CARBONS
6000-110	Ctgs	SH, ol-gy, slty	0.42											
6180-240	"	A/a	0.37											
6250-310	"	A/a	0.39											
6320-380	"	A/a	0.46											
6390-520	"	A/a	0.55											
6540-620	"	A/a	0.48											
6640-760	"	A/a	0.43											
6780-880	"	A/a	0.37											
6900-960	"	A/a	0.38											
6980-7060	"	A/a	0.39											
7080-140	"	A/a	0.37											
7160-220	"	A/a	0.43											
7230-280	"	A/a	0.35											
7290-340	"	A/a	0.46											
7350-420	"	A/a	0.45											
7480-530	"	SH, a/a+mnr SH, med gy	0.42											
7540-590	"	A/a	0.63											
7600-640	"	A/a	0.43											
7650-700	"	A/a	0.54											
7710-760	"	SH, a/a+10% SH, a/a	0.67	429	42	60	0.1	300						
7770-820	"	A/a	0.53											
7830-890	"	A/a	0.43											
7900-950	"	A/a	0.58											
7960-8070	"	A/a	0.88											
8030-070	"	SH, med gy+mnr SH, gy-gn +mnr SH, gy-red	1.68						1690	510	10.1	30	30	82
8180-260	"	SH, ol-gy+10% SH, med gy	1.90	431	53	20	0.2	1000						
8250-300	"	COAL+SH, med gy+SH, gy-gn	8.43						8080	1470	9.6	17	18	64
8270-320	"	SLTST, yel-gy+30% SND+20% SH, med-dk gy+10% COAL	10.48	433	120	12	0.2	12600						
	P	SH, med-dk gy	4.05	435	394	15	0.1	16000						
8330-390	Ctgs	SH, gn-gy, slty+20% COAL+ CMT	7.07	432	113	16	0.2	8000						
	P	SH, gn-gy, slty	0.32											
8370-400	Ctgs	SH, med gy+SH, gy-gn+tr COAL	2.94						3340	920	11.4	31	27	73
8400-450	"	SH, gn-gy, slty+10% COAL+ CMT+30% SND	4.21											
8460-510	"	SH, coaly+20% SH, med gy+ 20% SST, pale yel-brn	13.43	434	149	9	0.1	20100						

TABLE 2 A Chemical Analysis Data

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/gOF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO– CARBONS
8520–620	Ctgs	SH, gn-gy+20% SH, med-dk gy +10% SH, coaly+30% SND+mnr SST+PYR	2.65	433	45	16	0.2	1200						
8630–680	"	SH, med-dk gy+20% SH, gn-gy +30% SND+tr COAL+mnr LST, sndy	1.38											
8690–740	"	SST, yel-gy+30% SH, a/a+mnr SH, a/a+10% SH, gy-red+ mnr COAL	–											
8750–800	"	SND+30% SH, med gy+30% SH, gn-gy+mnr SST, lt brn+ tr COAL	2.63	435	49	12	0.2	1300						
8750–800	"	A/a	2.72						1680	260	6.2	10	15	74
8810–860	"	SST, yel-gy+30% SH, med-dk gy	–											
8820–900	"	SH, dk gy	2.90						1980	530	6.8	18	27	78
8870–920	"	SST, a/a+30% SH, med-dk gy	1.63											
	P	SH, med-dk gy	1.75	436	70	22	0.2	1200						
8930–980	Ctgs	SST, a/a+30% SH, a/a	1.87	440	61	33	0.1	1100						
	P	SH, med-dk gy	1.56	427	37	14	0.2	600						
8990–9040	Ctgs	SST, a/a+20% SH, a/a	–											
9040–080	"	SH, med-lt gy	2.10						1210	270	5.8	13	23	80
9050–100	"	SST, a/a+30% SH, med-dk gy	1.46											
9110–160	"	SH, med-dk gy, mic+40% SH, gn-gy	1.39	433	60	58	0.2	800						
	P	SH, med-dk gy, mic	1.53	435	50	17	0.1	800						
	P	SH, gn-gy	0.39											
9170–220	Ctgs	SH, med-dk gy, mic+30% SST, yel-gy	1.27											
	P	SH, med-dk gy, mic	1.50	439	54	15	0.1	800						
9230–260	Ctgs	SH, dk gy+20% SST, a/a	1.54											
	P	SH, dk gy	1.74	437	44	9	0.1	300						
9240–250	Ctgs	SH, med-lt gy (caved?)	2.20						1240	360	5.6	16	29	73
9290–310	"	SH, dk gy+40% SST, a/a+tr COAL	1.50	430	45	51	0.2	700						
9300–340	"	SH, med-lt gy (caved?)	2.03						2540	1150	12.5	57	45	65
9320–370	"	SH, med-dk gy/dk gy+30% SND	1.33											
	P	SH, med-dk gy/dk gy	1.59	439	70	12	0.2	1100						
9380–430	Ctgs	SND/SST, yel-gy+20% SH, dk gy	1.53											
	P	SH, dk gy	1.40	440	26	16	0.3	400						
9440–490	Ctgs	SH, a/a+20% SND/SST, a/a	1.69	435	43	41	0.2	700						
	P	SH, dk gy	1.93	442	36	12	0.1	700						

TABLE 2 B Chemical Analysis Data

WELL: 33/9-1

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO– CARBONS
9480-520	Ctgs	SH, gy	2.00						2060	280	10.3	14	13	71
9500-550	"	SH, dk gy+30% SND/SST, yel-gy	1.53											
9560-610	"	SND+20% SH, med gy	2.46	436	11	18	0.2	300						
	P	SH, med gy	1.46	443	22	11	0.3	300						
9620-670	Ctgs	SND+10% SH, a/a	-											
9680-730	"	A/a	-											
9740-790	"	SND+mnr SH, a/a	-											
9770	"	SH, gy (caved?)	1.20						1660	650	13.8	54	39	61
9800-850	"	SND+mnr SH, dk gy	-											
9860-900	"	A/a	-											
9950	"	A/a	0.21											

TABLE 2 c Chemical Analysis Data

WELL: 33/9 - 1

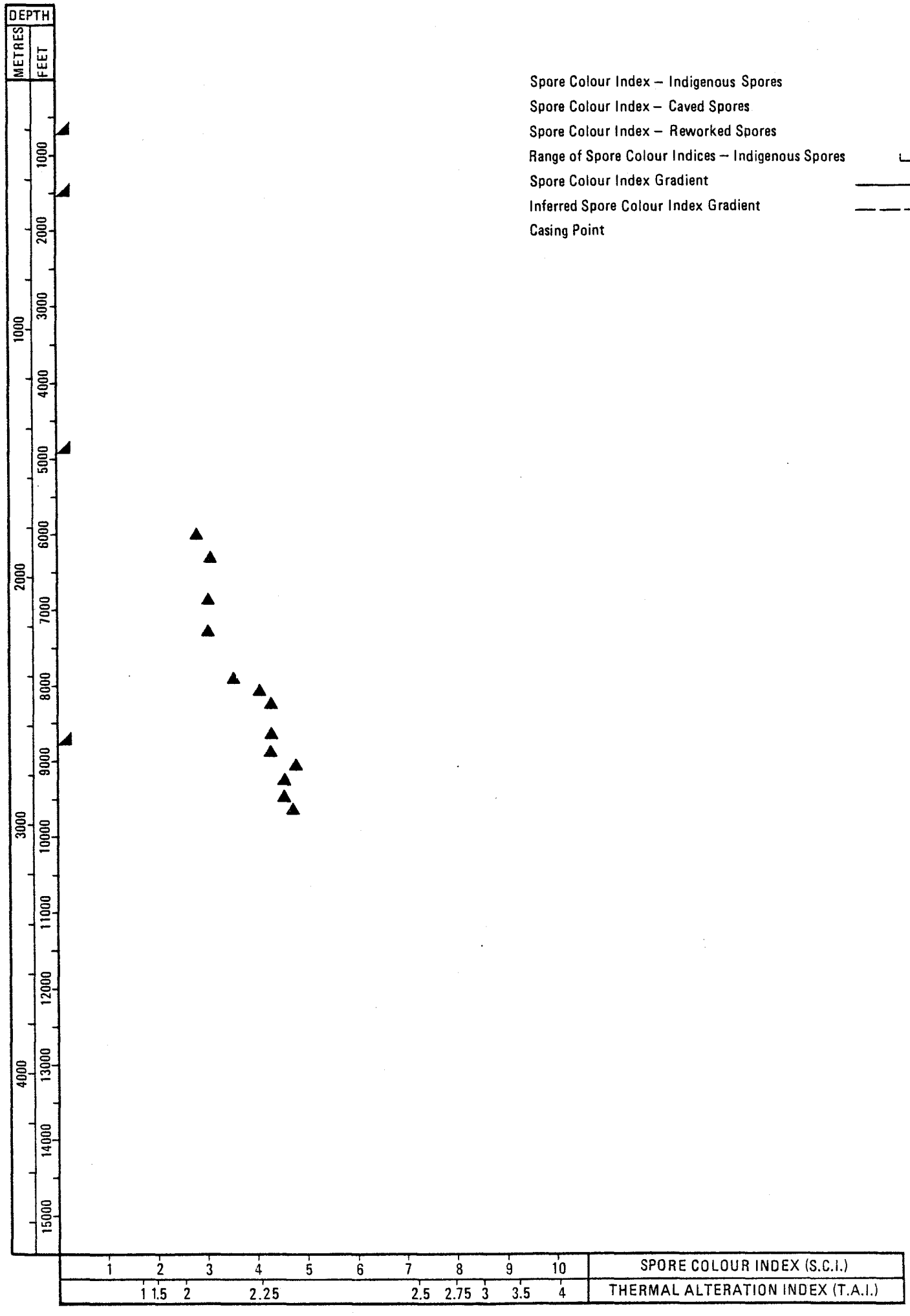

FIGURE 1 Spore Colour Indices against Depth

WELL: 33/9 - 1

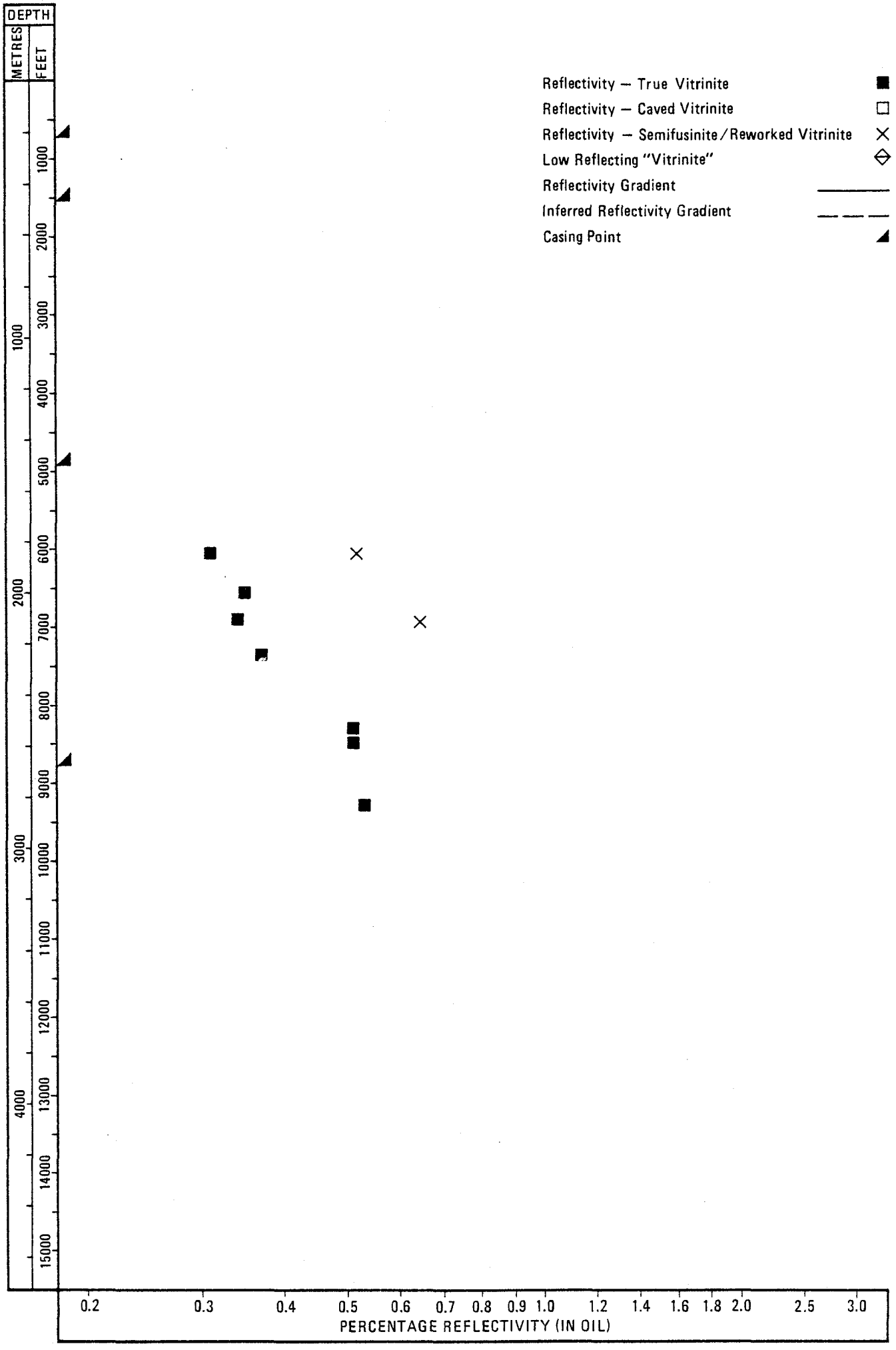

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G16 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF 33/9-3 WELL

SUMMARY

The Triassic to Early Tertiary section (5220' to 9810') is immature to early mature, and contains no significant oil source rocks. Dark grey shales from a number of cuttings samples between 8120' and 8530' exhibit minor oil potential, and are attributed to the interval between 7890' and 7909' which has a relatively high gamma ray log response. However, on-structure these shales are not sufficiently rich , thick, or mature enough to generate significant quantities of oil. The remaining analysed intervals contain either insufficient organic carbon (Early Tertiary and Cretaceous), or predominantly inertinitic kerogens (most of the Jurassic), and are without oil source potential.

GENERAL COMMENTS

Well status: Plugged and abandoned, oil discovery (Statfjord field).

Drilling data: Drilled with sea water/gel and lignosulphonate based muds to 9815' (T.D.). Casing points at 725' (30"), 1503' (20"), 3039' (13⅜"), 7045' (9⅝").
BHT 187°F at 9815' (T.D.).

Interval analysed: 5220' to 9810' (T.D. 9815').

Age of analysed interval: Triassic to Early Tertiary.

Sample type and quality: 92 composited dried ditch cuttings samples of generally good quality.

Maturation data quality: Adequate to good.

Source rock data quality: Adequate to good.

Gas chromatography run at: 7920'-8040'.

MATURATION (Table 1; Figures 1 and 2)

The spore colour indices increase with depth from 2.5-3 at 5500' to 4.5 at 9800' and vitrinite reflectivities increase from 0.32% (interpreted) to 0.55% (interpreted) over the same interval. A transition from an immature to an early mature state is thus inferred at a depth of around 7000'. Oil-prone kerogen present below this depth will yield liquid hydrocarbons.

OIL SOURCE ROCKS (Tables 1 and 2)

Picked dark grey shale lithologies from a number of horizons between 8120' and 8530' are rich in organic carbon (3.33% to 6.91%) and yield fair to good quantities of hydrocarbon (3600 ppm to 11100 ppm) on pyrolysis, although the kerogen has relatively poor oil source quality. These shales are attributed to the interval with a relatively high gamma ray log response between 7890' and 7909'. On-structure this interval is of no importance as an oil source, but if its lateral equivalents are thicker and more deeply buried, then it could have some significance as an oil source rock.

GEOCHEMICAL CHARACTERISTICS OF THE REMAINING SEDIMENTS

The Triassic to Jurassic intervals between 7900' and 9755' mostly contain about average quantities of predominantly inertinitic organic matter so that these horizons have no source potential irrespective of thermal maturity. The hydrocarbon contents are generally low except between 7900' and 8210' where migrated oil is indicated. The sample from 7920'-8040' was analysed by gas chromatography and revealed a crude oil-like alkane distribution.

The Late Cretaceous to Early Tertiary sediments between 5220' and 7820' are organically lean and have no significant hydrocarbon generating potential. Extractive source potential evaluation of the interval confirmed both the lack of hydrocarbon generating potential and the absence of migrated oil in the Tertiary.

WELL: 33/9-3

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
5220-360	Comp	SLTST/SH,ol-gy +mnr LST		*							
5500	Ctgs	SLTST, lt ol-gy +40% SLTST gn-gy, sl calc+10% LST, wht	2.5-3	*	30	70	*				
5540-700	"	SLTST/SH,ol-gy +mnr LST		0.34(15)							
5600-620	"	SLTST, gn-gy, sl calc+10% LST, a/a	2.5-3	*							
5800-820	"	SLTST, a/a+30% SLTST, ol-gy, sl calc	3	0.43(4)							
5900-920	"	SLTST, gn-gy, sl calc	3								
6000-020	"	SLTST, lt ol-gy/ ol-gy, sl calc+ 10% LST, v lt gy	3	*							
6100-120	"	SLTST, gn-gy+ 50% SLTST, ol-gy calc+mnr LST, med gy	3								
6200-240	"	SLTST, lt ol-gy, calc+30% SLTST, ol-gy, calc+mnr LST, wht	3	*							
6300-340	"	SLTST, gn-gy, calc+10% LST, wht/ med gy	3-3.5								
6500-550	"	SH, a/a+10% LST, a/a+mnr SH,ol-gy	3.5	0.33(6)							
6600-640	"	SH, lt ol-gy, sl calc+20% SH, med -lt gy, mic+mnr SH,yel-gy,calc	3.5	0.36(7)							
6800-820	"	SH, lt ol-gy, calc+10% LST, wht/ med gy	3.5	0.33(2)							
7000-020	"	SH, mtl, med-lt gy/lt ol-gy, calc		*							
7150-210	"	A/a		0.40(4)							
7200-210	"	SLTST, lt gy / v lt gy, calc +20% SLTST/SH, med-lt gy, calc		*							
7400-410	"	SH, mtl, lt gy/ med-lt gy, calc, slty+mnr SLTST, pale red		0.35(1)							
7430-630	Comp	SND/SLTST, mod yel-brn+SST, lt gy+SND+SH, gn-gy	3-3.5	0.43(11)							
7600-610	Ctgs	SH, a/a		0.45(1)							

TABLE 1A Maturity and Kerogen Data

WELL: 33/9-3

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
7800-810	Ctgs	SH, mtl, lt gy/ med-lt gy, calc, slty+10% SLTST, lt gy, calc+mnr SLTST, pale red		0.38(9)							
7860	"	SH, med gy, slty +20% LST, wht	3-4		50	50	*				
7900	"	A/a	?3.5		20	50	30				
7920	"	A/a	?4								
8000-010	"	SH, mtl, lt gy/ med-lt gy+mnr LST, a/a		0.44(4)							
8057	Core	SST, brn+mnr SH, dk gy+COAL						50	50	*	*
8078	"	A/a	3.5								
8120-180	Ctgs	SND+20% SH, a/a +10% LST, a/a+ mnr SLTST, mod yel-brn		0.46(13)							
	P	SH, dk gy						70	10	*	20
8200-210	Ctgs	SH, mtl, lt gy/ med-lt gy+mnr LST, a/a+10%, SH a/a+10% SND+mnr SLTST, wht, mic		0.33(5)							
8260-320	P	SH, dk gy						70	20	*	10
8260-390	Comp	SND+20% SH, a/a +30% SH, med gy+ LST, a/a+mnr SST lt gy						80	20	*	*
8300-310	Ctgs	SH, mtl, lt gy/ med-lt gy+10% SH dk gy+40% SND		0.46(1)							
8400-410	"	SH, mtl, lt gy/ med-lt gy+30% SND		0.44(7)							
8400-460	"	SST, a/a+30% SH, dk gy+20% SND+ mnr LST, a/a						90	10	*	*
	P	SH, dk gy						60	30	*	10
8470-530	P	SH, dk gy						50	40	*	10
8500-510	Ctgs	SH, lt gy/med-lt gy, calc, slty+30% SND		*							
8558	Core	SH, dk gy						60	40	*	*
8540-600	P	SH, dk gy						35	65	*	*
8600-610	Ctgs	SH, lt gy/med-lt gy, calc, slty		0.43(13)							
8610	"	SH, dk gy+50% SH med gy	4.5		70	30	*				
8610-670	P	SH, dk gy						40	60	*	*
	P	SH, med gy						60	40	*	*

TABLE 1 B Maturity and Kerogen Data

WELL: 33/9-3

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INOEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
8650	Ctgs	SH, dk gy+50% SH, med gy	4-4.5		50	50	*				
8680-740	P	SH, dk gy						80	20	*	*
	P	SH, med gy						80	20	*	*
8680-820	Comp	SH, dk gy+SH, a/a+SND+LST,a/a						80	20	*	*
8770	Ctgs	SH, med gy+SH, dk gy+LST, a/a	4-4.5		40	60	*				
8800-810	"	SH, mtl, lt gy/ med-lt gy, calc, slty+20% SLTST, med-lt gy		0.53(1)							
8840-910	P	SH, dk gy						60	30	*	10
8890	Ctgs	SH, a/a+mnr SST, lt gy	4-4.5		50	30	20				
8920-980	"	A/a						80	20	*	*
	P	SH, dk gy						75	25	*	*
8990-9050	Ctgs	SH, a/a, slty+ mnr SST, a/a						80	20	*	*
9000-010	"	SH, mtl, med-lt gy/med-dk gy+mnr LST, a/a+mnr SND		0.52(13)							
9050	"	SH, dk gy, slty+ mnr SST, a/a	4-4.5		40	60	mnr				
9130-190	"	A/a						75	25	*	*
9200-210	"	SH, mtl, med-lt gy/med-dk gy+ mnr SND		0.53(7)							
9270-330	"	SH, dk gy, slty +mnr SST						75	25	*	*
9400-410	"	SH, mtl, med gy/ med-dk gy+40% SND, wht, crs		0.53(3)							
9420	"	SH, dk gy+40% SND	4		20	60	20				
9530	"	A/a	*		20	60	20				
9600-610	"	SH, mtl, med gy/ med-dk gy+30% SND, a/a+mnr SLTST, gn-red		*							
9650	"	A/a	4.5		20	60	20				
9800	"	A/a	4.5		20	30	50				
9800-810	"	SH, a/a+50% SND/ SST, +mnr SH, gy -red		0.37(20)							

TABLE 1c Maturity and Kerogen Data

WELL: 33/9-3

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP - °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/gOF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO-CARBONS
5220-360	Comp	SLTST/SH, ol-gy+mnr LST	0.69	*	37	69	0.1	300						
5380-440	Ctgs	SLTST/SH, a/a+20% LST	-											
5460-520	"	SLTST/SH, a/a+10% LST	0.55											
5500-520	"	SLTST, lt ol-gy+40% SLTST, gn-gy, sl calc+10% LST, wht	0.31						140	20	4.5	6	*	*
	P	LST, wht	0.11											
5540-700	Comp	SLTST/SH, a/a+10% LST	0.54											
5600-620	Ctgs	SLTST, gn-gy, sl calc+10% LST a/a	0.31						310	220	10.0	71	71	93
5720-780	"	SLTST/SH, a/a+mnr LST	0.35											
5800-820	"	SLTST, a/a+30% SLTST, ol-gy, sl calc	0.39						150	20	3.8	5	*	*
	P	LST, wht	0.10											
5880-6020	Comp	SLTST/SH, a/a+mnr LST	0.53											
5900-920	Ctgs	SLTST, a/a+30% SLTST, a/a	0.32						140	25	4.4	8	18	> 80
6000-020	"	SLTST, lt ol-gy/ol-gy, sl calc+10% LST, v lt gy	0.33						120	45	3.6	14	36	> 80
	P	SLTST, ol-gy, sl calc	0.19											
6040-100	"	SLTST/SH, a/a+mnr LST	0.31											
6100-120	"	SLTST, gn-gy+50% SLTST, ol-gy, calc+mnr LST, med gy	0.33						120	85	3.6	26	68	> 90
6120-180	"	SLTST/SH, a/a+mnr LST	0.20											
6200-240	"	SLTST, lt ol-gy, calc+30% SLTST, ol-gy, calc+mnr LST, wht	0.36						120	20	3.3	6	16	> 80
6200-260	"	SLTST/SH, a/a+mnr LST	-											
6280-340	"	A/a	0.42											
6300-340	"	SLTST, gn-gy, calc+10% LST, wht+mnr LST, med gy	0.32						180	50	5.6	16	29	> 90
	P	SLTST, gn-gy, calc	0.35											
6360-420	"	SLTST/SH, a/a+mnr LST	-											
6440-500	"	A/a	0.48											
6500-540	"	SH, a/a+10% LST, a/a+mnr LST, a/a+mnr SH, ol-gy	0.37						<120					
6520-580	"	SLTST/SH, a/a+mnr LST	-											
6600-640	"	SH, lt ol-gy, sl calc+20% SH, med-lt gy, mic+mnr SH, yel-gy, calc	0.34						<120					
6600-740	Comp	SLTST/SH, a/a +mnr LST	0.64											
6700-740	Ctgs	SH, lt ol-gy, calc+30% LST, v lt gy+LST, med-dk gy	0.28						<120					
6760-820	"	SLTST/SH, a/a+mnr LST	-											

TABLE 2A Chemical Analysis Data

WELL: 33/9-3

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO-CARBONS
6800-820	Ctgs	SH,lt ol-gy,calc+10% LST,wht +mnr LST, med-gy	0.41											
6840-900	"	SLTST/SH, ol-gy+mnr LST	0.45											
6900-940	"	SH, mtl, med-lt gy/lt ol-gy, calc+10% SH, red, calc	0.47						<220					
6920-980	"	SLTST/SH, a/a+mnr LST	-											
7000-020	"	SH, a/a+10% SH, a/a	0.47						380	60	8.1	13	16	>90
7000-060	"	SLTST/SH, a/a+mnr LST	-											
7080-140	"	SH, gn-gy, slty+20% SH, med-lt gy, slty+mnr SH, gy-red	-											
7100-120	"	SLTST, lt gy, sl calc+50% SLTST, v lt gy, sl calc+mnr LST, med-dk gy	0.39						<120					
7150-210	"	SH, med-dk gy+30% SLTST, mod yel-brn+20% SND	0.64											
7200-210	"	SLTST, v lt gy, calc+30% SLTST, lt gy, calc+20% SH, med-lt gy, calc	0.46						<180					
7220-280	"	SST, lt gy+mnr SH, gn-gy, slty+30% SLTST, mod yel-gy	0.40											
7290-350	"	SND+30% SST, a/a+30% SLTST, a/a	-											
7300-320	"	SH, mtl, lt gy/med-lt gy, calc, slty+10% SLTST, lt gy, calc	0.59						780	60	13.2	10	8	>90
7360-420	"	SND/SST, lt gy+SLTST, a/a	-											
7400-410	"	SH, a/a+10% SLTST, lt gy, calc+mnr SLTST, pale red	0.68						500	70	7.4	10	13	90
	P	SLTST, pale red	0.14											
7430-630	Comp	SND/SLTST, mod yel-brn+SST, lt gy+SND+SH, gn-gy	0.43											
7500-510	Ctgs	SH, mtl, lt gy/med-lt gy, calc, slty+10% SLTST, lt gy, calc+mnr SLTST, pale red	0.81						450	60	5.6	7	13	83
7600-610	"	A/a	0.80						250	35	3.1	4	14	> 90
7640-700	"	SND/SLTST, a/a+SST, lt gy	0.23											
7700-710	"	SH, a/a+10% SLTST, lt gy, calc+mnr SLTST, pale red	0.82						510	90	6.2	11	18	33
7710-770	"	SND/SLTST, a/a+SST,a/a	-											
7780-840	"	A/a+tr LST	0.31											
7800-820	"	SH, a/a+10% SLTST, lt gy, calc+mnr SLTST, pale red	0.82						400	140	4.9	17	35	64
7850-910	"	SH, med gy, slty+20% LST, wht	-											

TABLE 2B Chemical Analysis Data

WELL: 33/9-3

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/gOF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO– CARBONS
7900-910	Ctgs	SH, mtl, lt gy/med-lt gy, calc, slty+10% SLTST, lt gy, calc+mnr SLTST, pale red+30% LST, wht	0.95						1580	680	16.6	72	43	73
	P	SH, mtl, med-lt gy, slty	1.01											
7920-8040	Comp	SND+SH, dk gy+SST, lt gy+mnr SLTST, mod yel-brn+mnr LST, a/a	-											
7980-8040	P	SH, dk gy	0.23											
8000-010	Ctgs	SH, mtl, lt gy/med-lt gy+mnr LST, a/a	0.67						400	80	6.0	12	19	68
8057	Core	SST, brn+mnr SH, dk gy+COAL	4.07	427	8	21	0.8	300						
8100-110	Ctgs	SH, mtl, lt gy/med-lt gy+mnr LST, a/a	1.24						1200	250	9.7	20	21	41
8120-180	"	SND+20% SH, dk gy+10% LST, a/a+mnr SLTST, a/a	-											
	P	SH, dk gy	6.91	430	161	14	0.5	11100						
8190-250	Ctgs	SND+SH, med gy/dk gy	-											
8200-210	"	SH, mtl, lt gy/med-lt gy+mnr LST, a/a+10% SH, dk gy+10% SND+mnr SLTST, wht, mic	1.11						1390	460	12.5	41	33	76
	P	SH, dk gy	10.12											
8260-320	P	SH, dk gy	4.50	436	111	15	0.5	5000						
8260-390	Comp	SND+20% SH, a/a+SH, med gy+ LST, a/a+mnr SST, lt gy	1.26	434	50	47	0.6	600						
8300-310	Ctgs	SH, mtl, lt gy/med-lt gy+10% SH, dk gy+40% SND	0.81						500	75	6.2	9	15	57
	P	SH, dk gy	5.01											
8400-410	"	SH, mtl, lt gy/med-lt gy+30% SND	0.52						600	120	11.5	23	20	67
8400-460	"	SST, a/a+30% SH, dk gy+20% SND+mnr LST, a/a	0.89	433	24	91	0.8	200						
	P	SH, dk gy	4.50	436	98	19	0.6	4400						
8470-530	Ctgs	SST, a/a+30% SH, a/a+20% SND+10% LST, a/a	0.71											
	P	SH, dk gy	3.33	437	108	24	0.5	3600						
8500-510	Ctgs	SH, lt gy/med-lt gy, calc, slty+30% SND	1.14						720	70	6.3	6	10	57
8558	CORE	SH, dk gy	2.48	433	32	18	0.5	800						
8540-600	Ctgs	SH, med gy+20% SH, dk gy+30% SND	1.38											
	P	SH, dk gy	3.03	438	106	32	0.5	3200						
8600-610	Ctgs	SH, lt gy/med-lt gy, calc, slty	1.10						750	90	6.8	8	12	62

TABLE 2 c Chemical Analysis Data

WELL: 33/9-3

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/g OF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO-CARBONS
8610-670	Ctgs	SH, dk gy+50% SH, med gy	1.67											
	P	SH, dk gy	2.45	438	56	29	0.5	1400						
	P	SH, med gy	0.89	438	37	35	0.5	300						
8680-740	P	SH, dk gy	2.26	439	61	29	0.6	1400						
	P	SH, med gy	1.21	437	59	44	0.6	700						
8680-820	Comp	SH, dk gy+SH, a/a+SND	1.71	430	49	42	0.6	800						
8700-710	Ctgs	SH, lt gy/med-lt gy, calc, slty	1.12						790	100	7.1	9	13	55
8800-810	"	SH, a/a+20% SLTST, med-lt gy	1.14						550	45	4.8	4	8	>80
8840-910	"	SH, dk gy+mnr SST, lt gy	1.58											
	P	SH, dk gy	1.93	436	95	18	0.6	1800						
8900-910	Ctgs	SH, mtl, med-lt gy/med-dk gy	1.32						590	80	4.5	6	14	85
	P	SH, med-dk gy	1.75											
8920-980	Ctgs	SH, dk gy+mnr SST, a/a	1.82	433	52	50	0.7	1000						
	P	SH, dk gy	1.90	436	84	36	0.7	1600						
8990-9050	Ctgs	SH, a/a, slty+mnr SST, a/a	1.73	431	46	36	0.7	800						
9000-010	"	SH, med-lt gy/med-dk gy+mnr LST, wht+mnr SND	1.29						540	130	4.2	10	24	91
9060-120	"	SH, dk gy, slty+mnr SST	1.66											
9100-110	"	SH, med-lt gy/med-dk gy	1.37						620	80	4.5	6	13	89
9130-190	"	SH, dk gy, slty+mnr SST	1.57	432	72	42	0.7	1200						
9200-210	"	SH, mtl, med-lt gy/med-dk gy+ mnr SND	1.34						650	80	4.9	6	13	86
9200-260	"	SH, dk gy, slty+mnr SST	1.72											
9270-330	"	A/a	1.52	433	84	24	0.6	1300						
9300-310	"	SH, mtl, med gy/med-dk gy	1.37						640	100	4.7	7	16	86
9340-400	"	SH, dk gy+30% SND	1.24											
9400-410	"	SH, mtl, med gy/med-dk gy+40% SND, wht, crs	0.71						430	110	6.1	15	25	81
	P	SH, med-dk gy	1.50											
9420-500	Ctgs	SH, dk gy+40% SND	0.79											
9500-510	"	SH, mtl, med gy/med-dk gy+ 50% SND, a/a	0.52						260	80	5.0	15	29	>90
	P	SH, med-dk gy	1.30											
9600-610	Ctgs	SH, mtl, med gy/med-dk gy+ 30% SND a/a+mnr SLTST, gn-red	0.20						<120					
	P	SH, med-dk gy	1.42											
9700-710	Ctgs	SND a/a+40% SH, mtl, med gy/ med-dk gy+mnr SLTST, a/a	0.23						140	80	6.1	35	59	>90

TABLE 2D Chemical Analysis Data

WELL: 33/9-3

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP - °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/gOF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO-CARBONS
9800-810	Ctgs	SH,mtl,med gy/med-dk gy+50% SND/SST+mnr SH, gy-red	0.34						160	130	4.7	38	82	94
	P	SH, med-dk gy	2.04											

TABLE 2 E Chemical Analysis Data

WELL: 33/9 - 3

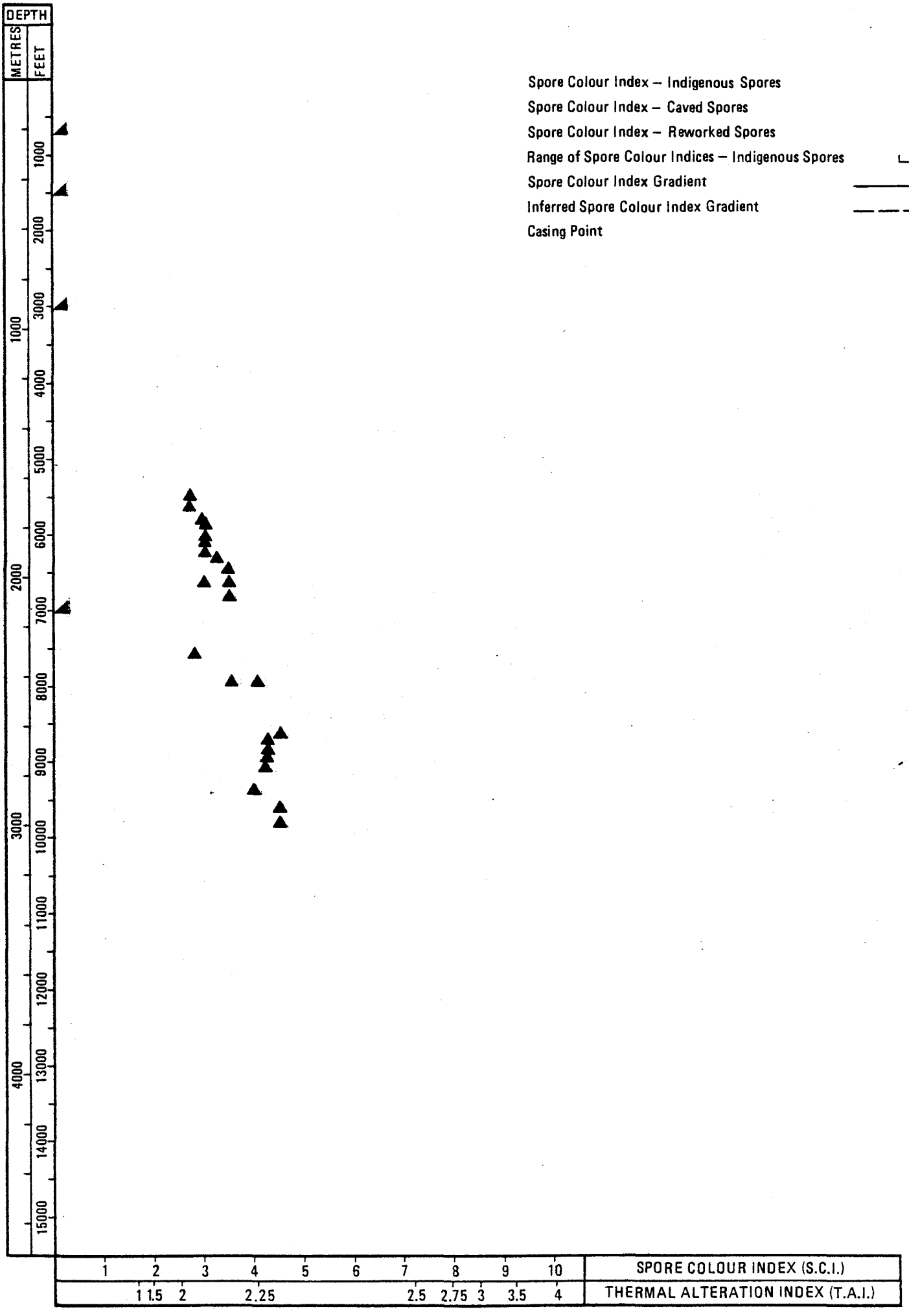

FIGURE 1 Spore Colour Indices against Depth

WELL: 33/9 - 3

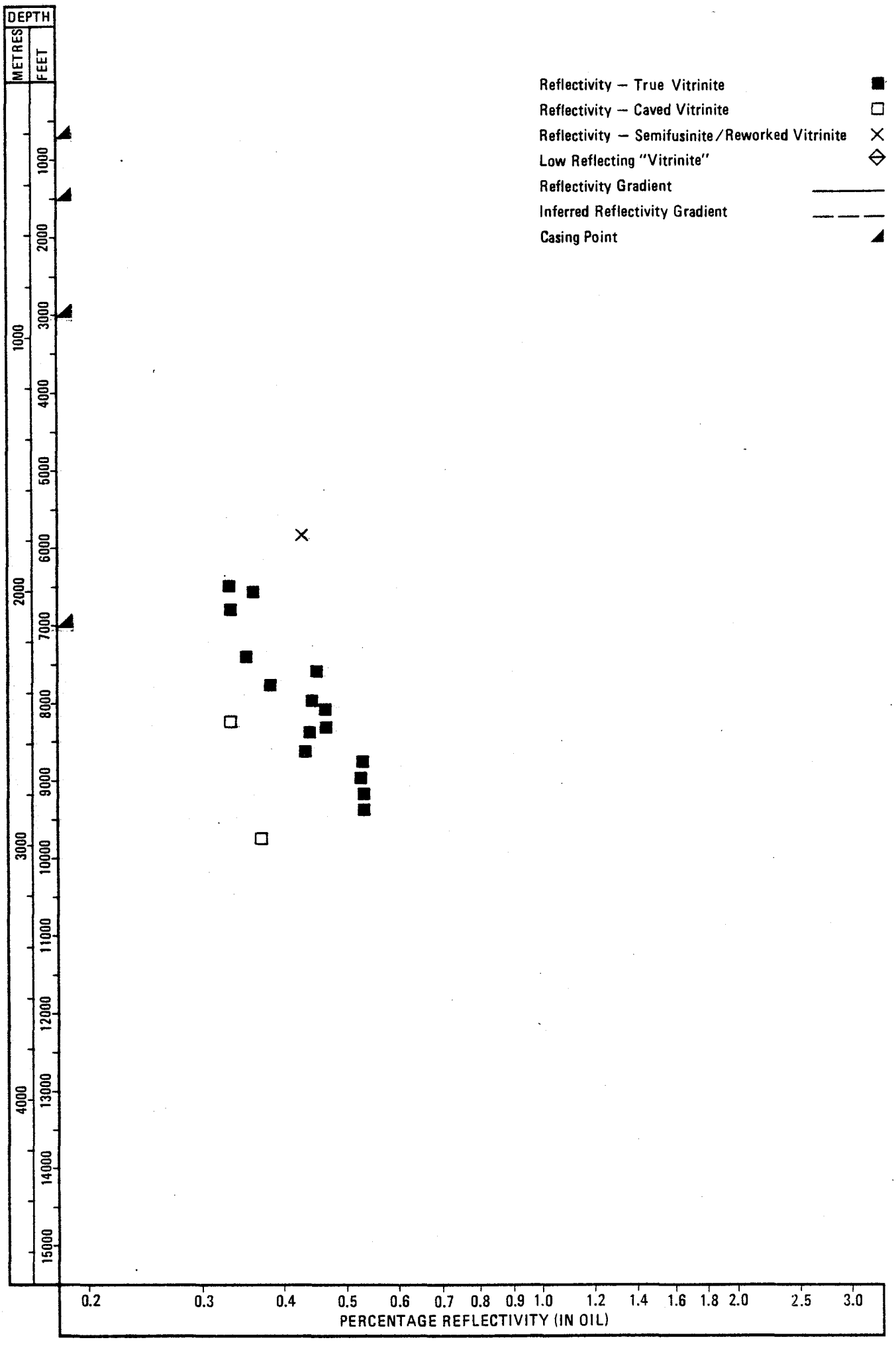

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G17 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF 33/12-2 WELL

SUMMARY

No significant oil source rocks have been identified in the analysed section (5500' to 13900'). The Triassic, Cretaceous and Early Tertiary intervals contain insufficient organic carbon, and the Jurassic interval, although mostly containing average amounts of organic matter, is inertinitic. The Early Cretaceous - Late Jurassic 'hot' shale interval between 8140' and 8148' contains above average organic carbon content, but being very thin, it is unlikely to generate significant quantities of hydrocarbons, irrespective of kerogen composition. Oil stain is noted in the Triassic interval particularly between 10100' and 10400'. The section is early mature in the Jurassic to Early Tertiary, and middle to late mature in the Triassic.

GENERAL COMMENTS

Well status: Plugged and abandoned, oil discovery (Statfjord field).

Drilling data: Drilled with sea water/gel and lignosulphonate based muds to 14286' (T.D). Casing points at 729' (30"), 1619' (20"), 5248' (13⅜"), 9542' (9⅝"). BHT 224°F at 13635'.

Interval analysed: 5500' to 13900' (T.D. 14286').

Age of analysed interval: Triassic to Early Tertiary.

Sample type and quality: 107 dried ditch cuttings samples and 2 core samples of fair quality.

Maturation data quality: Adequate to good.

Source rock data quality: Adequate to good.

Gas chromatography run at: 8890' - 8950'.

MATURATION (Table 1; Figures 1 and 2)

The Triassic sediments between 9900' and 13600' are middle to late mature, with spore colour indices increasing with depth from 6.5 to 7.5-8. The kerogen composition in this interval is dominantly inertinitic; vitrinite reflectivity data were unobtainable as no reliably identified vitrinite was observed. Spore colour indices increase with depth from 3 to 4 in the Early Cretaceous to Jurassic section, while the interpreted vitrinite reflectivity data increase from 0.36% to 0.53% over the same interval, indicating early thermal maturity. Oil-prone kerogen at such maturity levels should generate minor quantities of

stage of maturity for hydrocarbon generation from oil-prone kerogen. Early maturity is also inferred in the Cretaceous sediments analysed, by a spore colour index of 3.5.

OIL SOURCE ROCKS (Tables 1 and 2)

Oil source rocks are present in the analysed cuttings samples between 8270' and 8510'. In these samples the hydrocarbon potential appears to be derived from secondary quantities of waxy sapropel contained in the medium - dark grey and coaly shales. The samples contain above average (up to around 10%) organic carbon, high pyrolysis hydrocarbon yields (8000 ppm to 20100 ppm), and fair quantities (920 ppm) of free hydrocarbons. At elevated levels of thermal maturity these samples could generate oil such as that reservoired in the Middle Jurassic sands in this well.

It seems likely that these oil prone samples are caved from the 'hot' shale interval (8033' to 8050'), which has a characteristically high gamma ray log response; the interval 8270' to 8510' is dominantly sandstone and contains only minor shales and coals. The small thickness of the 'hot' shale interval limits its potential for hydrocarbon generation, but with thickening off-structure it could become a major oil source.

The hydrocarbon contents of the shales analysed between 8033' and 8900' are between 260 ppm and 1470 ppm, and gas chromatographic analysis indicates that they have mature, crude oil-like alkane distributions often with a significant high molecular weight alkane component. These hydrocarbons are considered to have migrated into the section, and probably represent oil-staining from the Middle Jurassic sandstone reservoirs in this well. It is anticipated that more deeply buried lateral equivalents of the 'hot' shale interval 8033' to 8050', could generate oil with alkane distributions such as those noted in the oil stain.

GEOCHEMICAL CHARACTERISTICS OF THE REMAINING SEDIMENTS

Between 8520' and 9770', the Early Jurassic - Late Triassic to Middle Jurassic shales contain average to above average amounts of organic carbon, but lack hydrocarbon generating potential because of inertinitic kerogen. Between 6000' and 8260', the samples generally contain insufficient organic matter to generate hydrocarbons, irrespective of their level of maturity or type of kerogen present.

Gas chromatography of the analysed horizons between 8750' and 9520' shows mature crude oil-like alkane distributions with significant wax contents; at 9770' a biodegraded 'dead' oil-like distribution is noted. The quantities (up to 1150 ppm) of hydrocarbons and the alkane distributions indicate that the hydrocarbons have migrated into the section.

WELL: 33/12-2 Statoil

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
5500	Ctgs	SH, lt ol-gy+mnr SH, red		*							
5600	"	SH, ol-gy/lt ol-gy+mnr SST, dk gy		*							
5700	"	A/a		0.38(6)							
5800	"	SH, a/a		0.38(2)							
5900	"	SH, lt ol-gy		0.38(6)							
6000	"	SH, a/a, slty		*							
6100	"	SH, a/a+mnr SH, gy-gn		*							
6170-230	"	SH, ol-gy, slty	3	0.41(3)	80	10	10				
6200	"	SH, lt ol-gy, slty+mnr SH, gy-gn		0.37(1)							
6300	"	A/a		0.36(3)							
6400	"	A/a		*							
6460-520	"	SH, ol-gy, slty						~ 100	*	*	*
6500	"	SH, lt ol-gy, slty+mnr SH, gy-gn		*							
6600	"	SH, lt ol-gy/gn-gy		0.39(4)							
6620-680	"	SH, ol-gy, slty	3	*	80	10	10				
6700	"	SH, lt ol-gy/gn-gy		0.46(5)							
6800	"	A/a		*							
6900	"	SH, a/a, slty		*							
6940-7000	"	SH, ol-gy, slty	3-3.5	0.41(6)	80	10	10				
7000	"	SH, lt ol-gy/gn-gy, slty+tr SH, red-brn		*							
7100	"	A/a		0.60(20)							
7100-160	"	SH, ol-gy, slty						~ 100	*	*	*
7200	"	SH, lt ol-gy/gn-gy, slty		0.40(17)							
7250-310	"	SH, ol-gy, slty	3-3.5	*	80	10	10				
7300	"	SH, gn-gy+mnr SH, lt ol-gy		*							
7400	"	SH, gn-gy+tr SLTST/SST		0.41(1)							
7500	"	SH, ol-gy, slty+ 10% SND		*							
7600	"	SND+SH, a/a		*							
7700	"	SND+40% SH, ol-gy		*							
7740-940	"	SND+SLTST, mod yel-brn+SST, lt gy+SH, dk yel-brn	3		80	10	10				

TABLE 1A Maturity and Kerogen Data

WELL: 33/12-2

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
7800	Ctgs	SH, gy+SH, ol-gy +20% SND		*							
7810-870	"	A/a		*							
7900	"	SH, gy+SLTST		0.61(11)							
8000	"	SH, a/a+SH, ol-gy+mnr SND		*							
8100	"	SH, gy+mnr SND		0.62(8)							
8180	"	SND+SST, lt gy+ SLTST, mod brn+ tr SH, med-dk gy/dk gy	?3		70	30	*				
8180-270	"	A/a	4-4.5		80	20	*				
8200	"	SLTST+20% SH, gy		*							
8260-320	"	SH, dk gy+30% SST, lt brn-gy+ 30% SND+10% SLTST, dk yel-brn						80	20	*	*
	P	SH, dk gy						60	40	*	*
8280	Ctgs	SH, a/a+SST, a/a+SND+SLTST, a/a	3-3.5		60	40	*				
8290-750	"	SH, dk gy/med-dk gy+SND+SST, a/a+ SLTST, a/a	4.5-5		40	40	20				
8300	"	SH, gy+20% SH, lt ol-gy+30% SLTST		0.36(3)							
8330-390	"	SH, dk gy+20% SST, a/a+30% SND+20% SLTST, a/a						70	30	*	*
	P	SH, dk gy						60	40	*	*
8400	Ctgs	SH, gy+20% SH, lt ol-gy+30% SLTST	3-3.5	*	20	50	30				
8400-460	"	SH, dk gy+10% SST, lt brn-gy +30% SND+30% SLTST, dk yel-brn						80	20	*	*
	P	SH, dk gy						45	55	*	*
8470-530	Ctgs	SH, a/a+20% SST, a/a+30% SND+30% SST, a/a						85	15	*	*
	P	SH, dk gy						45	55	*	*
8500	Ctgs	SH, gy+20% SLTST		0.38(5)							
8540-600	"	SLTST, a/a+20% SH, dk gy+10% SST, a/a+30% SND						90	10	*	*
8600	"	SH, gy+20% SLTST	3.5	*	20	50	30				

TABLE 1 B Maturity and Kerogen Data

WELL: 33/12-2

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
8610-670	Ctgs	SH, dk gy+30% SST, lt brn-gy+ 30% SND+10% SLTST, dk yel-brn						85	15	*	*
	P	SH, dk gy						50	50	*	*
8662-692	Core	SH, med gy/med ol-gy, mic		0.50(3)							
8680-740	Ctgs	SH, med-dk gy+ 30% SLTST, a/a+ 20% SND						80	20	*	*
8700	"	SH, gy+20% SLTST	4	0.53(9)	70	20	10				
8750-810	"	SH, med-dk gy+30% SND+20% SLTST, a/a						80	20	*	*
8800	"	SH, gy/ol-gy, slty+20% SLTST, a/a	4	0.45(6)	80	20	*				
8820-880	"	SH, med-dk gy+ 30% SND+20% SLTST a/a						85	15	*	*
8890-950	P	SH, med-dk gy						35	65	*	*
8900	Ctgs	SH, ol-gy+10% SH, gn+20% SND/SLTST+ mnr LST		*							
8950	"	SND+20% SH, med-dk gy	4		70	10	20				
9000	"	SH, gy-gn+40% SND, crs		0.41(1)							
9100	"	A/a		0.45(9)							
9150	"	SH, a/a+SND	4		70	10	20				
9300	"	SND, med gy+30% SH/CLYST, gn	4-4.5		80	20	*				
9410	"	SND+10% SH/CLYST a/a+30% SH/CLYST, mtl, red/gy-gn		?0.67(9)							
9700	"	SH/CLYST, mtl, red/gy-gn		*							
9900	"	SH/CLYST, a/a+ SH/CLYST, yel-brn		1.45(6)							
10200	"	SH/CLYST, mtl, red/gy-gn		1.42(2)							
10500	"	A/a		1.51(3)							
10700	"	A/a		1.01(3)							
10903	SWC	A/a	6.5		95	5	*				
10990	Ctgs	A/a		1.79(2)							
11196	SWC	A/a	*		~100	*	*				
11200	Ctgs	A/a		1.39(7)							
11290	SWC	A/a	*		~100	*	*				
11700	Ctgs	MDST/SLTST, red-brn, calc+tr ANH+ SLTST, gy-gn		*							

TABLE 1c Maturity and Kerogen Data

WELL: 33/12-2

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
12100	Ctgs	MDST/SLTST, red-brn, calc +SLTST, gy-gn		1.60(3)							
12343	SWC	A/a	*		∿100	*	*				
12378	"	A/a	*		∿100	*	*				
12410-910	Comp	A/a	7-7.5		∿90	10	*				
12500	Ctgs	A/a+30% SH, gy, calc		1.52(2)							
12910-13510	Comp	MDST/SLTST, a/a+ SH, a/a+mnr SST, wht	7.5		∿ 90	10	*				
13000	Ctgs	MDST/SLTST, a/a+ 20% SH, a/a+mnr SST, a/a		1.43(8)							
13300	"	MDST/SLTST, a/a+ 20% SH, a/a+10% SST, pnk		1.54(19)							
13500	"	MDST/SLTST, a/a+ 30% SH, a/a+mnr SST, a/a		1.73(22)							
13510-14240	Comp	MDST/SLTST, a/a +SH, gy+SH, red +SST, a/a	7.5-8		∿ 90	10	*				
13600	Ctgs	MDST/SLTST, a/a +30% SH, gy, calc+mnr SST, a/a		1.55(18)							

TABLE 1 D Maturity and Kerogen Data

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP — ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO— CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO— CARBONS
5500	Ctgs	SH, lt ol-gy+mnr SH, red	0.17						370	70	21.8	41	19	57
5600	"	SH, ol-gy/lt ol-gy+mnr SST/ ?BASALT, dk gy	0.27						390	30	14.4	11	8	32
5700	"	A/a	0.37						470	80	12.7	22	17	35
5800	"	SH, a/a	0.39						600	80	15.4	21	14	40
5900	"	SH, lt ol-gy	0.34						390	75	11.5	22	19	53
6000	"	SH, a/a, slty	0.40						570	25	14.3	6	4	35
6100	"	SH, a/a+mnr SH, gy-gn	0.47						430	85	9.1	18	20	61
6170-230	"	SH, ol-gy, slty	0.30											
6200	"	SH, lt ol-gy, slty+mnr SH, gy-gn	0.50						500	55	10.0	11	11	41
6240-300	"	SH, ol-gy, slty	0.30											
6300	"	SH, lt ol-gy, slty+mnr SH, gy-gn	0.41						450	60	11.0	15	13	51
6310-370	"	SH, ol-gy, slty	0.38											
6380-440	"	A/a	0.39											
6400	"	SH, lt ol-gy, slty+mnr SH, gy-gn	0.38						150	35	3.9	9	23	31
6460-520	"	SH, ol-gy, slty	0.44	*	13	115	0.4	< 100						
6500	"	SH, lt ol-gy, slty+mnr SH, gy-gn	0.42						510	100	12.1	24	19	46
6540-600	"	SH, ol-gy, slty	0.41											
6600	"	SH, lt ol-gy/gn-gy	0.38						580	130	15.3	34	23	36
6620-680	"	SH, ol-gy, slty	0.45											
6700	"	SH, lt ol-gy/gn-gy	0.43						440	65	10.2	15	15	45
6700-760	"	SH, ol-gy, slty	0.43											
6780-840	"	A/a	0.40											
6800	"	SH, lt ol-gy/gn-gy	0.43						680	110	15.8	26	16	34
6860-920	"	SH, ol-gy, slty	0.42											
6900	"	SH, lt ol-gy/gn-gy, slty	0.48						480	100	10.0	21	21	32
6940-7000	"	SH, ol-gy, slty	0.43											
7000	"	SH, lt ol-gy/gn-gy, slty+tr SH, red-brn	0.52						610	90	11.7	17	15	37
7020-080	"	SH, ol-gy, slty	0.46											
7100	"	SH, lt ol-gy/gn-gy, slty+tr SH, red-brn	0.51						450	65	8.8	13	14	34
7100-160	"	SH, ol-gy, slty	0.45	*	17	83	0.3	< 100						
7180-240	"	A/a	0.38											
7200	"	SH, lt ol-gy/gn-gy, slty	0.59						450	80	7.6	14	18	33
7250-310	"	SH, ol-gy, slty	0.40											

TABLE 2A Chemical Analysis Data

WELL: 33/12-2

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO– CARBONS
7300	Ctgs	SH, gn-gy+mnr SH, lt ol-gy	0.53						530	85	10.0	16	16	40
7320-380	"	SH, ol-gy, slty	0.32											
7390-450	"	SH, a/a	0.34											
7400	"	SH, gn-gy+tr SLTST/SST	0.72						510	65	7.1	9	13	46
7460-520	"	SH, ol-gy, slty	0.38											
7500	"	SH, a/a+10% SND	0.46						480	60	10.4	13	13	42
7530-590	"	SH, a/a	0.03											
7600	"	SND+SH, a/a	0.39											
7600-660	"	SND+SH, a/a+SH, brn-gy	-											
7670-730	"	A/a	-											
7700	"	SND+40% SH, ol-gy	0.38											
7740-940	"	SND/SLTST, mod yel-brn+SST, lt gy+SH, dk yel-brn	6.44											
7800	"	SH, gy+SH, ol-gy+20% SND	0.48						480	75	10.0	16	16	42
7900	"	SH, gy+SLTST	0.58											
7950-8010	"	SND+SH, ol-gy	-											
8000	"	SH, gy+SH, a/a+mnr SND	4.20						1270	130	3.0	3	10	56
8020-080	"	SST, lt gy+SND+SLTST, mod yel-brn	-											
8090-150	"	A/a	-											
8100	"	SH, gy+mnr SND	2.12						3000	260	14.2	12	9	39
8160-250	"	SND+40% SST, a/a+10% SLTST, mod brn+tr SH, med-dk gy+tr SH, dk gy	-											
8200	"	SLTST+20% SH, gy	4.44											
8260-320	"	SH, dk gy+30% SST, lt brn-gy +30% SND+10% SLTST, dk yel-brn	1.20	425	23	60	0.4	300						
	P	SH, dk gy	1.54	436	54	19	0.3	800						
8300	Ctgs	SH, gy+20% SH, lt ol-gy+30% SLTST	2.11						2650	340	12.6	16	13	57
8330-390	"	SH, dk gy+20% SST, a/a+30% SND+20% SLTST, a/a	1.04	440	43	78	0.4	500						
	P	SH, dk gy	1.66	437	67	19	0.3	1100						
8400	Ctgs	SH, gy+20% SH, lt ol-gy+30% SLTST	2.19						2170	700	9.9	32	32	42
8400-460	"	SH, dk gy+10% SST, a/a+30% SND+30% SLTST, a/a	0.44	432	41	155	0.5	200						
	P	SH, dk gy	1.65	433	82	28	0.3	1400						
8470-530	Ctgs	SH, a/a+20% SST, a/a+30% SND +30% SLTST, a/a	0.40	431	35	151	0.4	200						
	P	SH, dk gy	1.56	434	68	25	0.3	1100						

TABLE 2B Chemical Analysis Data

WELL: 33/12-2

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO-CARBONS
8500	Ctgs	SH, gy+20% SLTST, dk yel-brn	3.88						1580	360	4.1	9	23	57
8540-600	"	SLTST, a/a+20% SH, dk gy+10% SST, lt brn-gy+30%SND	0.58	*	19	103	0.4	100						
8600	"	SH, gy+20% SLTST	2.84						1440	220	5.1	8	15	55
8610-670	"	SH, dk gy+30% SST, a/a+30% SND+10% SLTST, a/a	0.33	*	30	248	0.3	100						
	P	SH, dk gy	1.47	435	59	22	0.2	900						
8662	Core	SH, med gy/med ol-gy, mic	0.92						710	110	7.7	12	15	38
8672	"	SH, a/a, carb	0.92						750	110	8.2	12	15	34
8680-740	Ctgs	SH, med-dk gy+30% SLTST, a/a +20% SND	0.79	430	47	66	0.3	400						
8682	Core	SH, med gy/med ol-gy, carb	1.40						940	120	6.7	9	13	41
8692	"	A/a	1.20						730	100	6.1	8	14	42
8700	Ctgs	SH, gy+20% SLTST	1.13											
8750-810	"	SH, med-dk gy+30% SND+20% SLTST, a/a	0.81	434	49	78	0.2	400						
8800	"	SH, gy/ol-gy, slty, lam+20% SLTST	1.19						970	70	8.2	6	7	68
8820-880	"	SH, med-dk gy+30% SND+20% SLTST, a/a	0.74	435	34	87	0.4	300						
8890-950	"	SND+20% SH, a/a	–											
	P	SH, med-dk gy	1.44	440	62	29	0.2	900						
8900	Ctgs	SH, ol-gy+10% SH, gn+20% SND/ SLTST+mnr LST	0.72						780	90	10.8	13	12	40
8960-9020	"	SND+20% SH, med-dk gy	0.37											
9000	"	SH, gy-gn+40% SND, crs	0.73						980	90	13.4	12	9	50
9100	"	SH, a/a +40% SND	0.43						550	40	12.8	9	7	52
9200	"	SND, med gy+10% SH, a/a	0.11											
9300	"	SND, a/a+30% SH/CLYST, gn	0.14											
9410	"	SND+10% SH/CLYST, a/a+30% SH/CLYST, mtl, red/gy-gn	0.20											
9500	"	SND+10% SH/CLYST, gy/gn-gy+ 30% SH/CLYST, mtl, red/gy-gn	0.13											
9600	"	SH/CLYST, mtl, red/gy-gn+20% SLT/SLTST	0.48						370	85	7.7	18	23	71
9700	"	SH/CLYST, a/a	0.10						330	55	33.0	55	17	75
9820	"	SH/CLYST, a/a+SH/CLYST, yel-brn	0.14						430	55	30.7	40	13	72
9900	"	A/a	0.07						240	40	34.3	57	17	78
10000	"	SH/CLYST, mtl, red/gy-gn	0.08						220	40	27.5	50	18	84
10100	"	A/a	0.07						5240	460	750.0	657	9	64
10200	"	A/a	0.08						170	160	21.3	200	94	63

TABLE 2c Chemical Analysis Data

WELL: 33/12-2

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/g OF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO-CARBONS
10300	Ctgs	SH/CLYST, mtl, red/gy-gn	0.09						790	130	87.8	144	16	63
10400	"	A/a	0.09						1290	240	143.0	267	10	58
10500	"	A/a	0.13						170	100	13.1	76	59	42
10610	"	A/a	0.10											
10700	"	A/a	0.11											
10800	"	A/a	0.16											
10890	"	A/a	0.14											
11000	"	A/a	0.11											
11100	"	A/a	0.10											
11200	"	A/a	0.12						470	180	39.2	150	39	31
11300	"	A/a	0.12											
11700	"	MDST/SLTST, red-brn, calc+ tr ANH+SLTST, gy-gn	0.08						480	80	60.0	100	17	41
12100	"	MDST/SLTST, a/a+SLTST, a/a	0.09						270	130	30.0	144	48	40
12500	"	MDST/SLTST, a/a+30% SLTST, a/a+30% SH, gy, calc	0.18						210	100	11.7	56	48	42
	P	MDST/SLTST, red-brn, calc	0.16											
13000	Ctgs	MDST/SLTST, a/a+20% SH, a/a+ mnr SST, wht	0.17											
13300	"	MDST/SLTST, a/a+20% SH, a/a+10% SST, pnk	0.19						560	140	29.5	74	25	37
13500	"	MDST/SLTST, a/a+30% SH, a/a+ mnr SST, a/a	0.25											
13600	"	A/a	0.27						300	100	11.1	37	33	50
13800-900	"	SH, gy	0.66											
13800-900	"	SH, red	0.12											

TABLE 2 D Chemical Analysis Data

WELL: 33/12 - 2

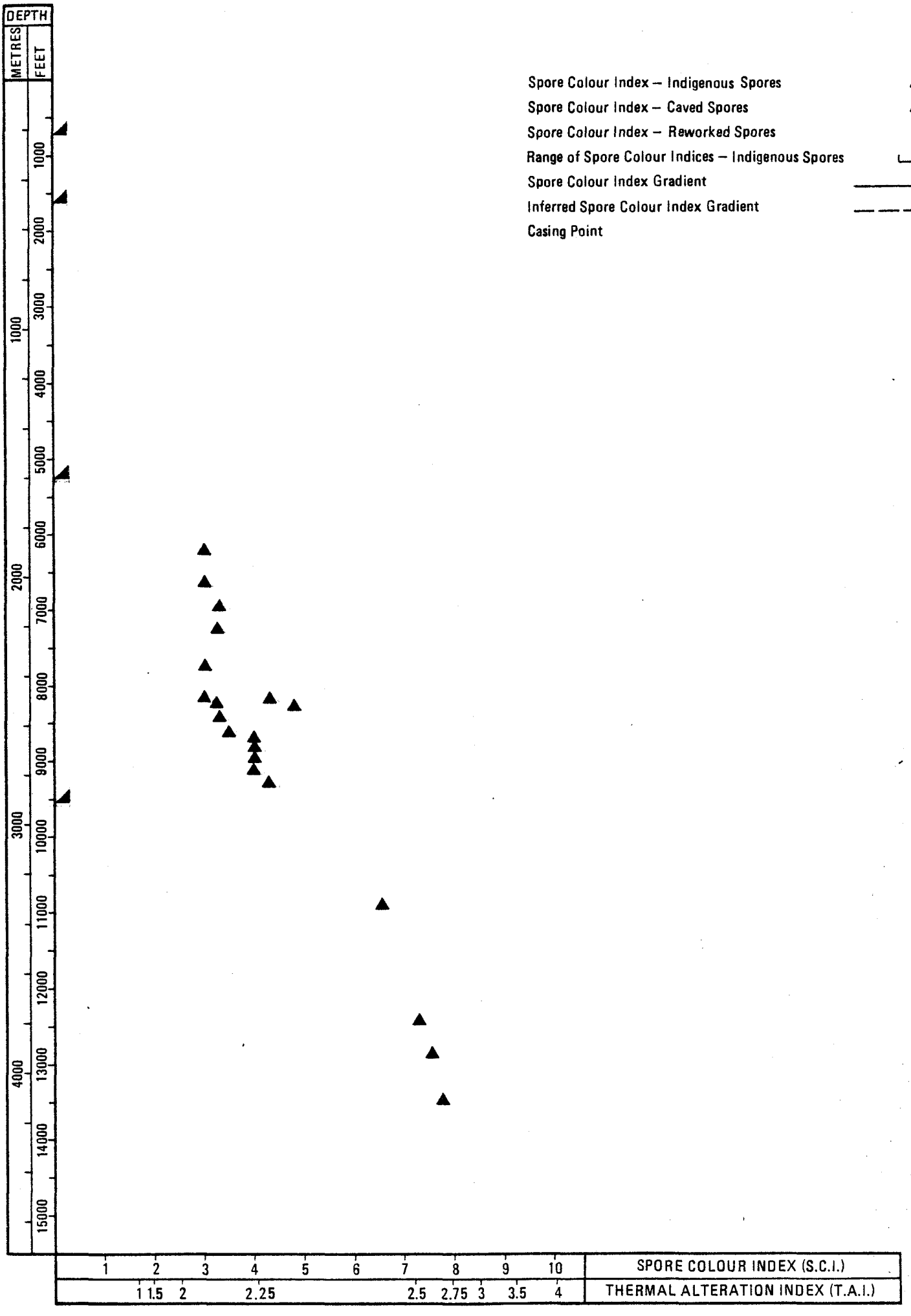

FIGURE 1 Spore Colour Indices against Depth

WELL: 33/12 - 2

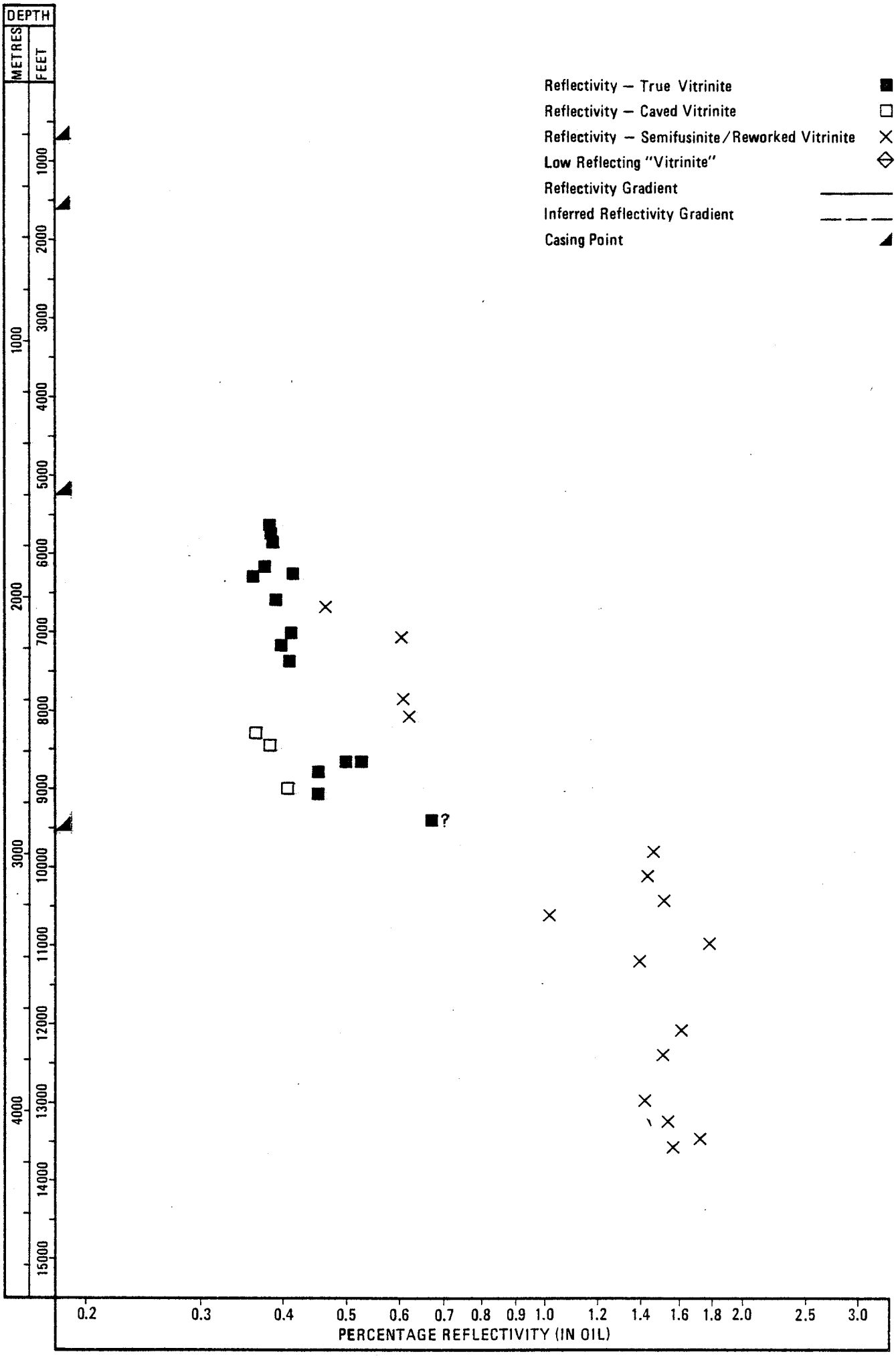

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G18 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF U.K. 23/11-1 WELL

SUMMARY

The interval 8500' to 9740' (Triassic and Early Cretaceous to Early Tertiary) is immature to transitionally mature and contains no source rocks, due to insufficient, or unsuitable kerogen compositions. Minor stain by biodegraded oil is noted between 8500' and 9630'.

GENERAL COMMENTS

Well status: Plugged and abandoned, dry hole.

Drilling data: Drilled with SS 100/KCl based mud to 10087' (T.D.). Casing points at 1164' (18⅝"), 3017' (13⅜"), 7510' (9⅝"). BHT 190°F at 9080'.

Interval analysed: 8500' to 9740'.

Age of analysed interval: Triassic and Early Cretaceous to Early Tertiary.

Sample type and quality: 12 dried ditch cuttings samples of poor to fair quality.

Maturation data quality: Fair to good.

Source rock data quality: Good.

Gas chromatography run at: 8500'-8560', 8570'-8630'

MATURATION (Table 1; Figures 1 and 2)

The spore colour indices increase from 2.5-3 at 8500'-8560' to 3.5 at 9620'-9640' and the vitrinite reflectivity data increase from 0.32% at 8500'-8560' to 0.37% at 9560'-9620'. These data suggest palaeotemperatures slightly lower than the present day bottom hole temperature of 190°F at 9080', and may point to a relatively recent increase in the geothermal gradient. The analysed section is immature to transitionally mature.

OIL SOURCE ROCKS (Tables 1 and 2)

No oil source rocks have been identified in the analysed interval of this well.

GEOCHEMICAL CHARACTERISTICS OF THE SEDIMENTS

There is insufficient organic carbon in the interval 8640' to 9720' to generate significant quantities of hydrocarbons, irrespective of thermal maturity. The interval between 8500' and 8630' contains an average quantity of organic matter, but despite containing a proportion of amorphous kerogen, it has no source potential.

Solvent extraction shows that the samples from 8500'-8560' and 8570'-8630' contain more hydrocarbon than expected considering the poor source quality (600 ppm and 275 ppm of hydrocarbon respectively). Gas chromatographic analysis reveals a composition suggestive of a partially biodegraded 'dead' oil, but the quantities present are probably not significant.

WELL: U.K. 23/11-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
8500-560	Ctgs	SH, ol-gy	2.5-3	0.32(18)	30	50	20	35	65	*	*
8570-630	"	SH, med-dk gy+ 40% SH, gn-gy						35	65	*	*
	P	SH, med-dk gy						35	65	*	*
8710-770	Ctgs	SH, gn-gy+50% SH, gy-red	2.5-3	0.34(10)	30	60	10				
9070-130	"	CHK+tr SH	*	0.37(2)	10	20	?70				
9560-620	"	CHK+30% SH, gn-gy+10% SH, gy-red	3-3.5	0.37(4)	90	10	*				
9620-640	"	CHK+30% SH, a/a +20% SH, a/a	?3.5		40	50	10				
9720-740	"	A/a	*		20	80	*				

TABLE 1 Maturity and Kerogen Data

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
												HYDROCARBONS		
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO– CARBONS
8500-560	Ctgs	SH, ol-gy	1.23	430	70	73	0.2	900	1030	600	8.4	49	58	67
8570-630	"	SH, med-dk gy+40% SH, gn-gy	1.17	435	75	82	0.1	900	525	275	4.5	24	53	64
	P	SH, gn-gy	0.23											
	P	SH, med-dk gy	1.28	432	79	36	0.1	1000						
8640-700	Ctgs	SH, gn-gy+50% SH, gy-red+tr SH, med gy	0.44											
	P	SH, gn-gy	0.09											
	P	SH, gy-red	0.09											
8710-770	Ctgs	SH, gn-gy+50% SH, a/a	0.33											
8790-850	"	CHK+20% SH, med-dk gy+10% SH, gn-gy	0.23											
	P	SH, med-dk gy	0.46											
8860-920	Ctgs	CHK+tr SH	-											
8930-990	"	A/a	-											
9000-060	"	A/a	-											
9070-130	"	A/a	0.56											
	P	SH, med-dk gy	0.55											
9140-200	Ctgs	CHK+tr SH	-											
9210-270	"	A/a	-											
9280-340	"	A/a	0.13											
9350-410	"	A/a	0.03											
9420-480	"	A/a	0.15											
9490-550	"	CHK+10% SH, med-dk gy	0.14											
	P	SH, med-dk gy	0.54											
9560-620	Ctgs	CHK+30% SH, a/a+10% SH, gy-red	0.18											
	P	SH, med-dk gy	0.35											
9630-720	Ctgs	CHK+30% SH, a/a+20% SH, gy-red	0.27											
	P	SH, med-dk gy	0.42											

TABLE 2 Chemical Analysis Data

WELL: UK 23/11 - 1

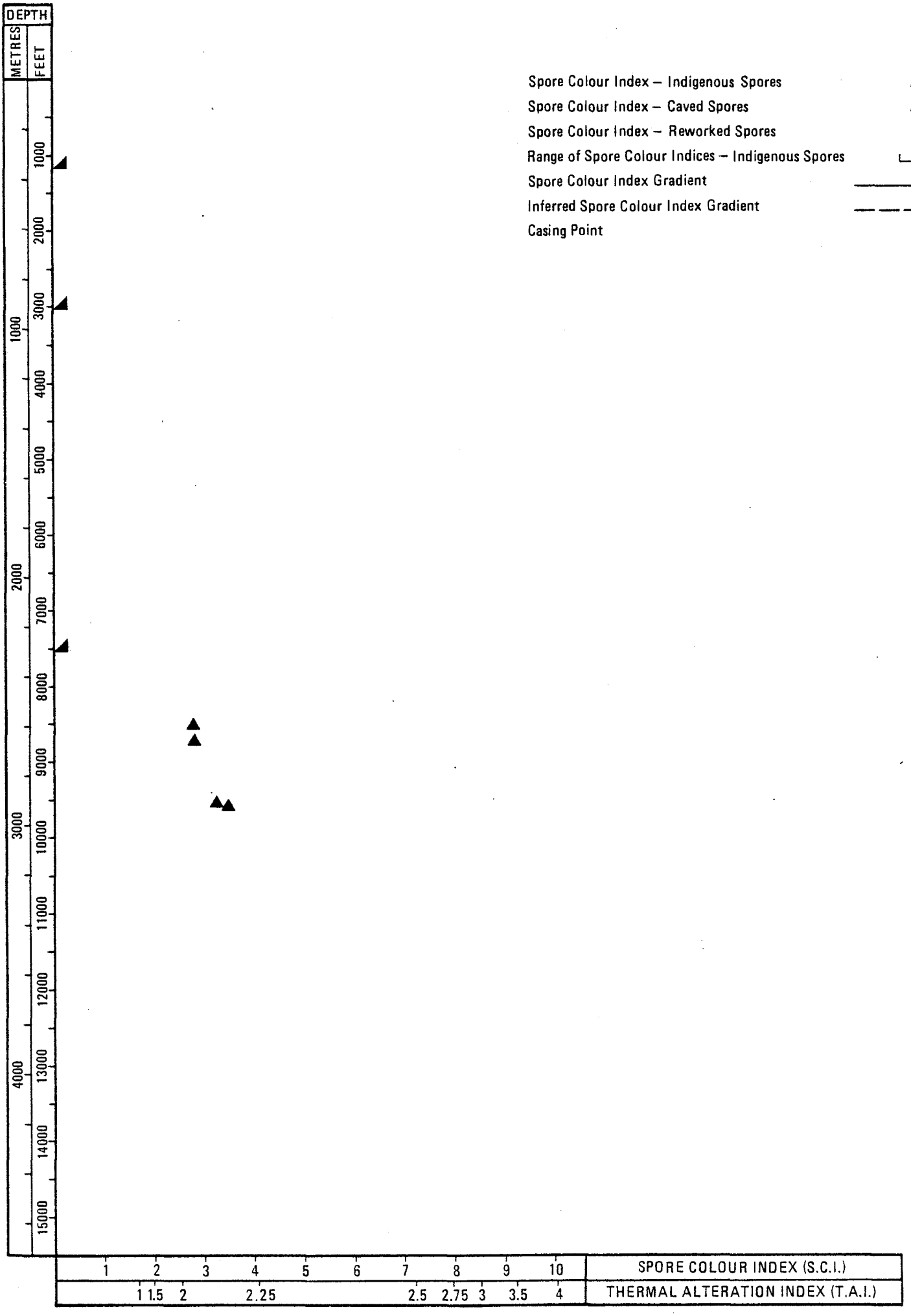

FIGURE 1 Spore Colour Indices against Depth

WELL: UK 23/11 - 1

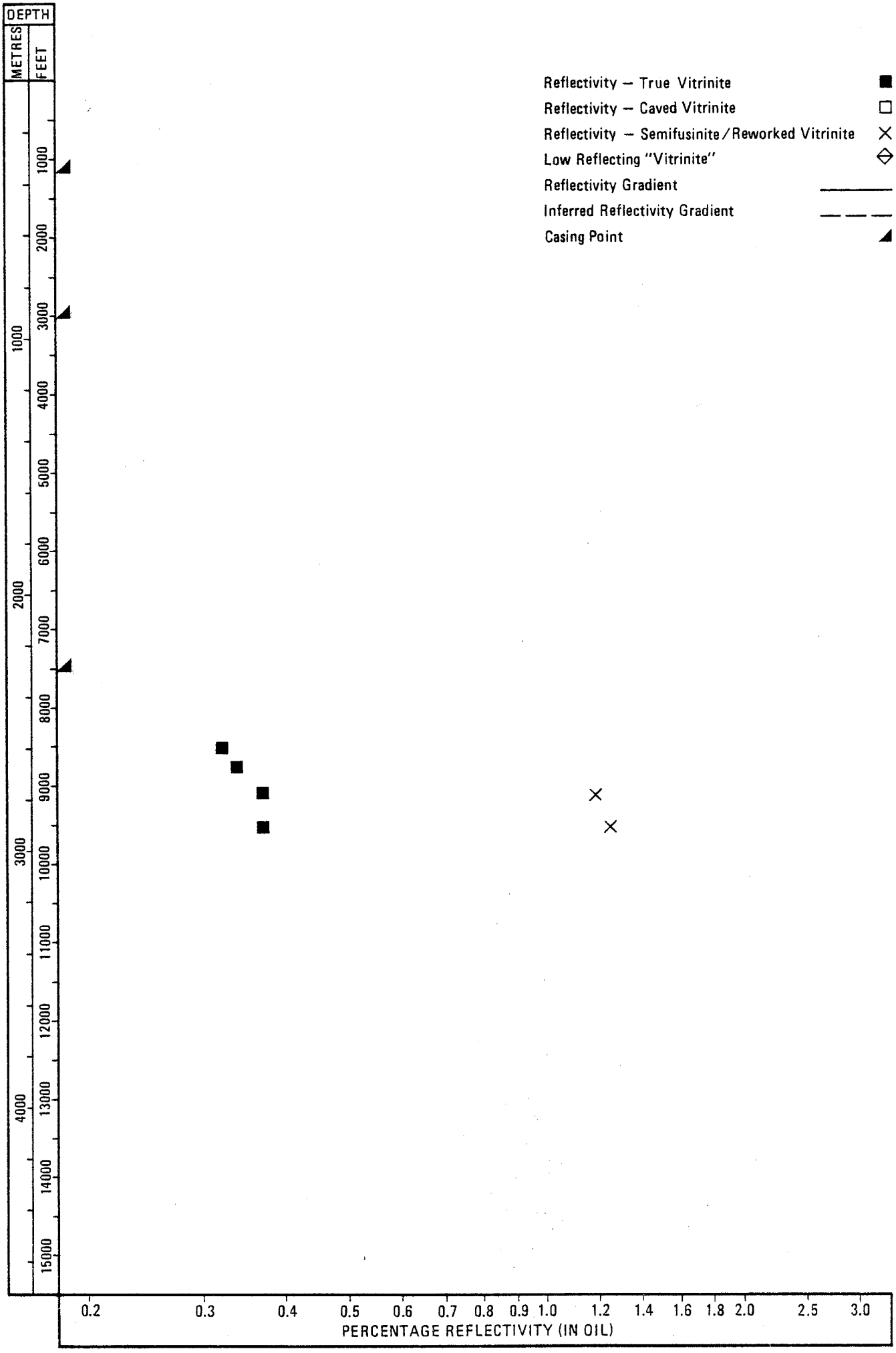

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G19 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF U.K. 30/18-2 WELL

SUMMARY

The Late Jurassic to Early Cretaceous section between 13400' and 14925' comprises claystones and siltstones, some of which are late mature oil source rocks with only minor potential for condensate and gas remaining. The interval between 14240' and 14595' has a high gamma ray log response and is probably the richest part of this section. No other significant hydrocarbon source rocks have been identified in the analysed sections. The analytical data indicate the presence of migrated oil in the Late Jurassic and to a lesser extent in the Tertiary.

GENERAL COMMENTS

Well status: Plugged and abandoned, dry hole.

Drilling data: The well was drilled with sea water/lignosulphonate based mud to 15050' (T.D.). Casing points at 415' (30"), 828' (20"), 4525' (13⅜"), 10307' (9⅝"), 13982' (7" liner). BHT 240°F at 13700' and 298°F at 15050' (T.D.).

Intervals analysed: 9180' to 10000' and 13400' to 15050' (T.D.).

Ages of analysed intervals: Late Jurassic to Early Cretaceous and Tertiary.

Sample type and quality: 23 composited dried ditch cuttings samples of fair to good quality.

Maturation data quality: Variable; poor to good.

Source rock data quality: Poor to fair.

Gas chromatography run at: 9580'-9680', 9680'-9780', 9880'-10000', 13590'-13670', 14380'-14500', 14640'-14750', 14760'-14880'.

MATURATION (Table 1; Figures 1 and 2)

Between 9180'-9280' in the Tertiary and 15050' (T.D.) in the Late Jurassic the spore colour indices increase from 3-3.5 to 8.5, while the vitrinite reflectivity data increase from 0.37% to 1.20% (interpreted) over the same interval. The transition between early maturity in the Tertiary and late maturity in the Late Jurassic is inferred to occur at a depth of about 11000' in the Late Cretaceous. Oil-prone kerogen in the early mature Tertiary sediments may only generate minor quantities of hydrocarbon. However, any

source rocks present in the Late Jurassic will have already realised most of their potential, and have only minor remnant potential for condensate and/or gas generation. In the Early Cretaceous the sediments are late mature.

OIL SOURCE ROCKS (Tables 1 and 2)

Between 13400' and 14925' the claystones and siltstones contain above average quantities of amorphous (possibly sapropelic) kerogen, which is at a high level of thermal maturity. Olive-grey/olive-black claystones between 14240' and 14430' and siltstones between 14430' and 14595' have a high gamma ray log response, and are probably the richest part of this section. The present pyrolysis potential yields of up to 3100 ppm indicate good original oil source potential, although only minor potential for condensate and gas now remains. High production indices reflect the presence of poorly soluble ?bitumen-like material, and extractable hydrocarbons.

Between 14380' and 14880' the silty lithologies contain extensive solvent extractable oil staining, which gas chromatography analysis reveals contains a mature oil-like alkane distribution.

GEOCHEMICAL CHARACTERISTICS OF THE REMAINING SEDIMENTS

The Late Jurassic sandstones between 14925' and 15050' (T.D.) do not have any source potential, probably because of insufficient organic matter. This is not evident in the data, however, because the samples contain dominantly shale and siltstone cavings.

The early mature Tertiary shales between 9180' and 10000' have no oil source potential due to predominantly inertinitic kerogen compositions. However, the Tertiary picked shale lithologies between 9480' and 9680' have above average carbon content and contain vitrinitic kerogen, and could generate minor quantities of gas, but only at a very much elevated level of thermal maturity. Migrated hydrocarbons are present in the interval 9680' to 10000' and have a mature oil-like alkane distribution.

WELL: UK 30/18-2

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
9180-280	Ctgs	SH, gn-gy, mic+ 40% SH, brn-gy, mic+10% SH, yel-gy+mnr SH, dk gy	3-3.5	0.37(4)	10	90	mnr	70	30	*	*
9280-380	"	SH, gn-gy+20% SH, dk red-brn+ 10% SH, dk gy						80	20	*	*
9380-480	"	SH, gn/dk gn-gy +20% SH, dk red-brn+10% SH, dk gy	3-3.5	0.39(9)	30	50	20	90	10	*	*
9480-580	"	SH, gn-gy+30% SH, brn-gy+10% SH, dk red-brn+10% SH, dk gy						70	30	*	*
	P	SH, brn-gy						65	20	*	15
9580-680	Ctgs	SH, gn-gy+20% SH, brn-blk+20% SST+mnr SH, dk gy						40	60	*	*
	P	SH, gn-gy						70	30	*	*
	P	SH, brn-blk						30	70	*	*
9680-780	Ctgs	SH, gn-gy+20% SH, brn-gy+20% SH, yel-gy+10% SH, dk gy	3-3.5	0.39(18)	10	90	mnr	70	30	*	*
9780-880	"	SH, dk gn-gy+30% SH, brn-gy+30% SH, yel-gy						60	40	*	*
9880-10000	"	SH, dk gn-gy+40% SH, brn-gy/brn-blk+mnr LST	3.5	0.41(19)	20	50	30	60	40	*	*
13400-470	"	SH, dk gy+mnr SH, gy-red+mnr SLTST, brn	8	0.73(8)	80	20	*				
13590-670	"	SH, a/a+tr SH, a/a+20% SLTST, a/a	8	*	*	*	*				
13810-930	"	SH, a/a+mnr SH, a/a+mnr SLTST, a/a+mnr LST, pnk-gy	8	*	90	10	*				
14030-130	"	SH, dk gy	7.5-8	*	10	30	60				
14200-240	"	SH, a/a+50% SH, med gy+mnr LST, brn-gy	8-8.5	*	40	60	*				
14350-390	"	SH, a/a+40% SH, a/a+mnr LST, a/a	8-8.5	0.84(4)	40	*	?60				
14500-540	"	SH, med-dk gy+ 40% SH, med gy	8-8.5	1.29(9)	40	*	?60				
14600-640	"	SH, a/a+50% SH, a/a	8.5	1.12(2)	30	20	?50				
14750-790	"	SH, a/a+40% SH, a/a	8.5	*	30	*	?70				
14900-940	"	SH, a/a+60% SH, a/a	8.5	*	70	*	?30				

TABLE 1 A Maturity and Kerogen Data

WELL: UK 30/18-2

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
15010-050	Ctgs	SH, med-dk gy+ 40% SH, med gy	8.5	*	70	*	?30				

NOTE: CALCULATIONS OF KEROGEN COMPOSITION (%) FROM PYROLYSIS DATA NOT POSSIBLE BELOW 13400' BECAUSE OF HIGH LEVELS OF THERMAL MATURITY.

TABLE 1 B Maturity and Kerogen Data

WELL: UK 30/18-2

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP ~ °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO- CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/g OF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO- CARBONS
9180-280	Ctgs	SH, gn-gy, mic+40% SH, brn-gy, mic+10% SH, yel-gy+mnr SH, dk gy	0.68	440	62	51	0.1	400						
9280-380	"	SH, gn-gy+20% SH, dk red-brn +10% SH, dk gy	0.66	435	54	56	0.1	400						
9380-480	"	SH, gn/dk gn-gy+20% SH, dk red-brn+10% SH, dk gy	1.02	430	39	42	0.1	400						
9480-580	"	SH, gn-gy+30% SH, brn-gy+10% SH, dk red-brn+10% SH, dk gy	1.09	430	78	43	0.04	900						
	P	SH, brn-gy	3.90	432	147	22	0.01	5800						
9580-680	Ctgs	SH, gn-gy+20% SH, brn-blk+ 20% SST+mnr SH, dk gy	0.90	431	88	109	0.04	800						
	P	SH, gn-gy	1.03	436	61	50	0.04	600						
	P	SH, brn-blk	2.87	438	125	40	0.01	3600						
9680-780	Ctgs	SH, gn-gy+20% SH, brn-gy+20% SH, yel-gy+10% SH, dk gy	1.01	430	80	65	0.04	800						
9780-880	"	SH, dk gn-gy+30% SH, brn-gy +30% SH, yel-gy	1.00	429	114	68	0.1	1100						
9880-10000	"	SH, dk gn-gy+40% SH, brn-gy/ brn-blk+mnr LST	0.92	428	100	79	0.1	900						
13400-470	"	SH, dk gy+mnr SH, gy-red+mnr SLTST, brn	1.00	415	152	100	0.2	1500						
	P	SH, dk gy	1.58	453	32	22	0.4	500						
13480-580	Ctgs	SH, a/a+mnr SH, gy-red+mnr SLTST, a/a	0.61											
13590-670	"	SH, a/a+tr SH, a/a+20% SLTST, a/a	2.41	*	103	197	0.6	2500	725	415	3.0	17	58	71
		After Extraction	2.63	*	54	205	0.8	1400						
13680-800	"	SH, a/a+mnr SH, a/a+mnr SLTST, a/a+10% LST, pnk-gy	0.65											
	P	SH, dk gy	0.79											
13810-930	Ctgs	SH, a/a+mnr SH, gy-red+mnr SLTST, a/a+mnr LST, a/a	0.43											
13940-14020	"	SH, a/a+mnr SH, a/a+tr SLTST, a/a+mnr LST, a/a	1.54	400	184	137	0.3	2800						
		After Extraction	1.18	*	91	241	0.4	1100						
	P	SH, dk gy	1.09	454	37	29	0.4	400						
14030-130	Ctgs	SH, a/a	-											
	P	SH, dk gy	1.08	*	189	75	0.7	2000						
14140-260	Ctgs	SH, a/a	-											
	P	SH, dk gy	0.45											
14270-370	Ctgs	SH, a/a	-											
	P	SH, dk gy	0.40											
14380-500	Ctgs	SH, a/a	2.22	420	73	123	0.6	1600	1775	1580	8.0	71	89	69

TABLE 2 A Chemical Analysis Data

WELL: UK 30/18-2

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS		ALKANES % OF HYDRO– CARBONS
												mg/g OF ORGANIC CARBON	% OF EXTRACT	
14510-630	Ctgs	SH, dk gy+20% SLTST, brn	1.11											
	P	SH, dk gy	0.44											
14640-750	Ctgs	SH, a/a+40% SLTST, a/a	3.03	421	84	106	0.6	2500	2560	2185	8.9	72	86	77
14760-880	"	SH, a/a+30% SLTST, a/a	2.56	*	123	81	0.3	3100	4325	3270	16.9	128	76	75
	P	SH, dk gy	0.52											
14890-980	Ctgs	SH, a/a+30% SLTST, a/a	1.56	*	59	108	0.4	900						
		After Extraction	0.89	*	88	249	0.3	800						
	P	SH, dk gy	1.15	433	40	49	0.6	500						
14990-15050	Ctgs	SH, a/a+20% SLTST, a/a	0.63											
	P	SH, dk gy	0.84	448	55	38	0.4	500						

TABLE 2B Chemical Analysis Data

WELL: UK 30/18 - 2

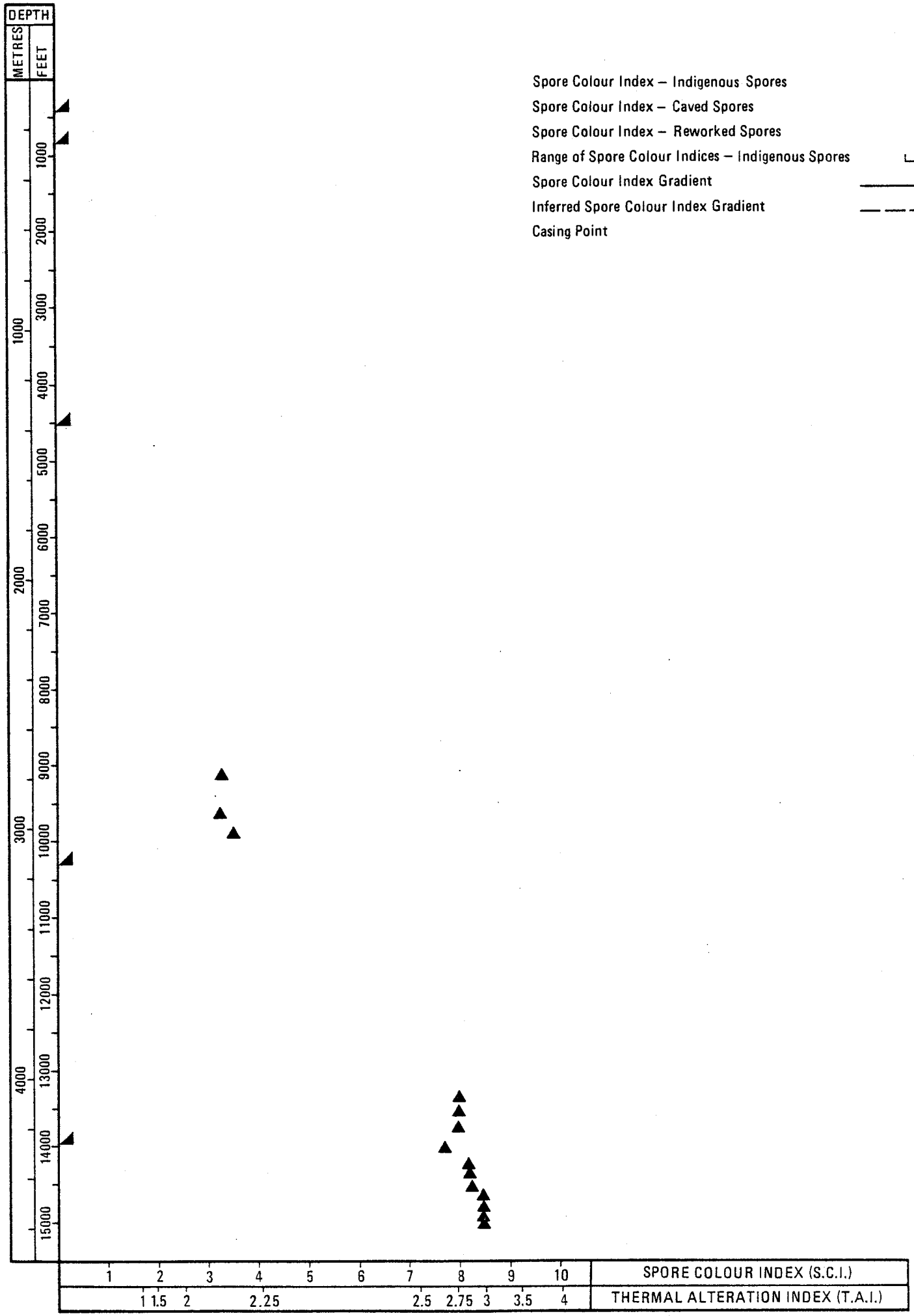

FIGURE 1 Spore Colour Indices against Depth

WELL: UK 30/18 - 2

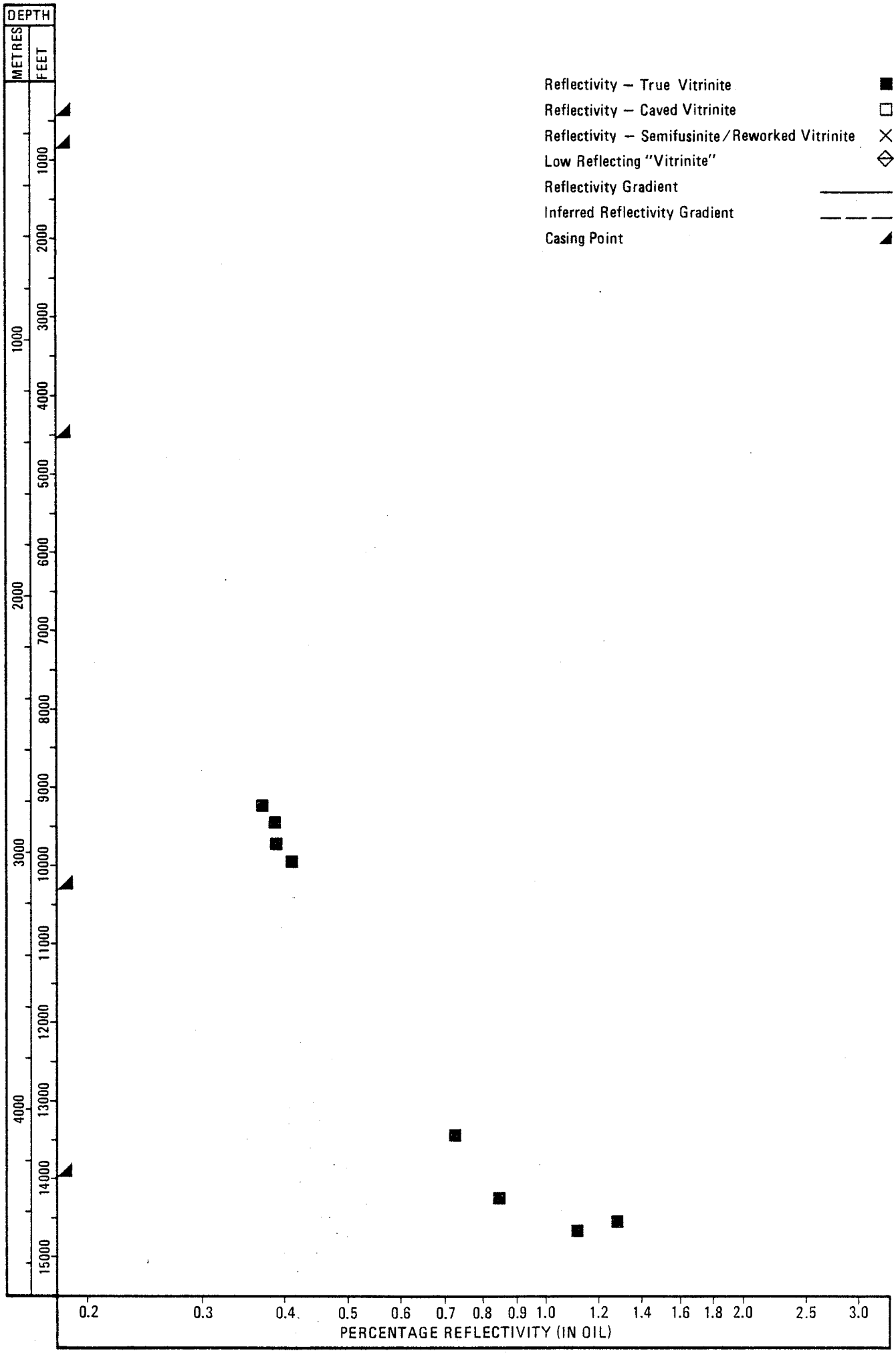

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G20 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF D-1 WELL

SUMMARY

The Late Jurassic to Early Cretaceous dark grey shales of the interval 5040' to 5180' are presently immature, but at an elevated level of thermal maturity they will have significant oil generating potential. The interval 4920' to 5020' contains insufficient organic matter to source significant quantities of hydrocarbons.

GENERAL COMMENTS

Well status: Plugged and abandoned, dry hole.

Drilling data: Drilled with salt-saturated mud with 7% oil to 3309', then salt-saturated mud to 11689' (T.D.). Casing points at 368' (42"), 732' (20"), 3309' (13⅜"). BHT 160°F at 11689' (T.D.).

Interval analysed: 4920' to 5180' (T.D. 11689').

Age of analysed interval: Late Jurassic to Early Cretaceous.

Sample type and quality: 5 dried ditch cuttings samples of fair quality.

Maturation data quality: Adequate.

Source rock data quality: Good.

Gas chromatography run at: 5040'-5080', 5090'-5120', 5140'-5180'.

MATURATION (Table 1, Figure 1)

Spore colour indices of 3-3.5, and pyrolysis temperatures of less than 431°C indicate that the analysed section is presently immature. No vitrinite reflectivity data were obtained.

OIL SOURCE ROCKS (Tables 1 and 2)

Dark grey shales in the interval 5040' to 5180' are very rich in oil-prone kerogen, containing up to 6.92% organic carbon, of which up to 40% is waxy (with minor algal) sapropel. The pyrolysis potential yields of these shales are as high as 29400 ppm, showing that they would generate abundant oil when mature.

The hydrocarbon contents of the shales are between 245 ppm and 670 ppm,

indicating the presence of migrated oil. This is confirmed by gas chromatography analysis which reveals mature, crude oil-like alkane distributions. The pristane to phytane ratios of the alkane distributions are around unity (or less), suggesting a highly reducing source environment; this is in accord with the interpretation of the presence of waxy sapropels.

GEOCHEMICAL CHARACTERISTICS OF THE REMAINING SEDIMENTS

The limestones and olive-grey shales of the interval 4920' to 5020' contain insufficient organic carbon to source significant quantities of oil, irrespective of thermal maturity.

WELL: D-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
4980-5020	Ctgs	SND+SH, ol-gy+ SH, red-brn+LST, wht	?3-3.5	*	10	90	*				
5040-080	"	SND+30% SH, dk gy+10% SH, ol-gy+10% SLTST, mod yel-brn						35	65	*	*
	P	SH, dk gy						25	40	*	35
5090-120	Ctgs	SH, a/a+SH, ol-gy+mnr SLTST, a/a+40% SND	3	*	10	40	50	25	50	*	25
	P	SH, dk gy						35	20	10	35
5140-180	Ctgs	SND+20% SH, a/a						40	60	*	*
	P	SH, dk gy						20	55	5	20

TABLE 1 Maturity and Kerogen Data

WELL: D-1

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
												HYDROCARBONS		
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT% OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO– CARBONS
4920–960	Ctgs	LST, wht+tr SH, ol-gy	-											
4980–5020	"	SND+SH, a/a+SH, red-brn+LST, a/a	0.34											
	P	SH, ol-gy	0.65											
5040–080	Ctgs	SND+30% SH, dk gy+10% SH, ol-gy+10% SLTST, mod yel-brn	1.90	431	119	73	0.1	2300	830	245	4.3	13	29	80
	P	SH, dk gy	6.23	431	390	28	0.01	24300						
5090–120	Ctgs	SH, a/a+tr SH, ol-gy+mnr SLTST, a/a+40% SND	3.81	428	301	49	0.02	11500	1100	530	2.9	14	48	63
	P	SH, dk gy	6.92	426	425	20	0.01	29400						
5140–180	Ctgs	SND+20% SH, a/a+tr LST	1.31	430	87	141	0.2	1100	1067	670	8.1	51	63	73
	P	SH, dk gy	6.27	428	334	37	0.01	20900						

TABLE 2 Chemical Analysis Data

WELL: D - 1

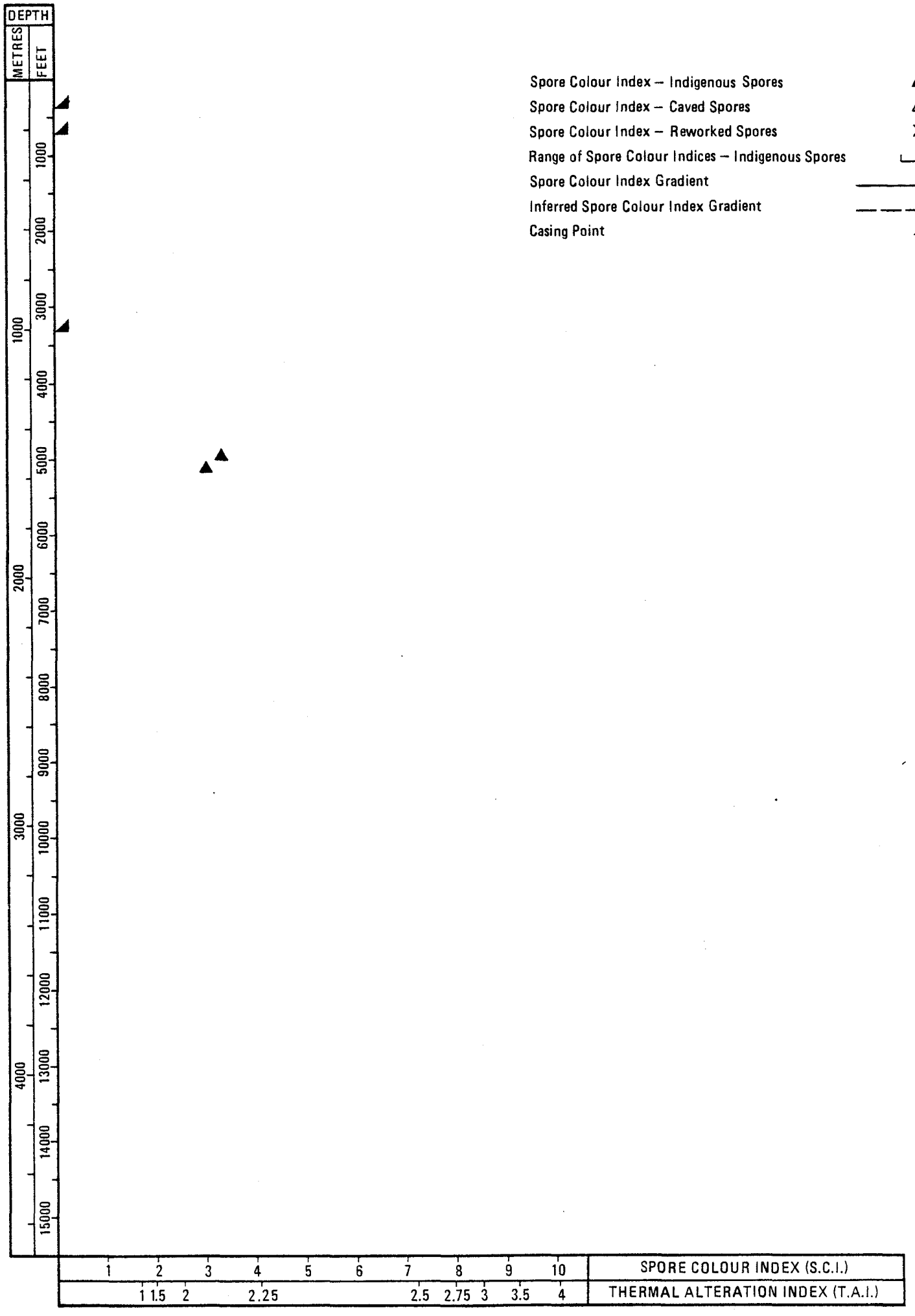

FIGURE 1 Spore Colour Indices against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G21 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF F-1 WELL

SUMMARY

The Jurassic to Early Cretaceous analysed interval between 4850' and 6620' is immature to early mature. A minor Jurassic grey shale in the interval 5870'-5900' would generate minor quantities of oil and gas at suitably elevated levels of thermal maturity. However, there are no other source rocks in the analysed section because of a dominance of inertinitic kerogens, and no significant traces of migrated hydrocarbons are noted.

GENERAL COMMENTS

Well status: Plugged and abandoned, dry hole.

Drilling data: Drilled with freshwater gel mud to 7938' (T.D.). Casing points at 336' (32"), 705' (13⅜"), 2598' (9⅝"). BHT 258°F at 7938' (T.D.).

Interval analysed: 4400' to 6620' (T.D. 7938').

Age of analysed interval: Jurassic to Early Cretaceous.

Sample type and quality: 28 composite dried ditch cuttings samples of generally fair quality.

Maturation data quality: Adequate to good.

Source rock data quality: Fair to good.

Gas chromatography run at: 5870'-5900', 6520'-6560'.

MATURATION (Table 1; Figures 1 and 2)

Vitrinite reflectivity and spore colour indices increase from 0.31% and 2.5 respectively, to 0.40% and 3.5 respectively, over the interval 4850' to 6620'. These data indicate that the analysed section is immature, to just early mature.

OIL SOURCE ROCKS (Tables 1 and 2)

A picked dark grey shale from 5870'-5900' is rich in organic matter, (8.21% carbon content) and has a good pyrolysis potential yield of 11800 ppm. The kerogen composition is dominantly inertinite, with secondary quantities of vitrinite and waxy sapropel. It is considered that this shale will have minor oil and minor gas generating potential at suitably elevated levels of thermal maturity. Gas chromatography analysis of the hydrocarbons of this horizon

shows a mixture of both mature and immature alkane distributions.

GEOCHEMICAL CHARACTERISTICS OF THE REMAINING SEDIMENTS

The shales indigenous to the interval 5090' to 6620' contain average to above average quantities of organic matter, but this is mainly inertinite, and hence they have no source potential irrespective of maturity. The sample from 6520'-6560' contains 280 ppm of extractable hydrocarbon, the alkane distribution of which has a mature oil-like pattern; this hydrocarbon is considered to have migrated into the section, but is present in insignificant amounts.

WELL: F-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
4850-5060	Ctgs	CHK+SH, med gy +SND+SLTST, gy-red	2.5	0.31(8); 0.21(5)	60	40	*				
5090-130	"	SH, med-dk gy, slty+30% SND						~90	~10	*	*
5150-180	"	SH, a/a+25% SND						~90	~10	*	*
5210-240	"	SH, a/a+20% SND						~90	~10	*	*
5210-300	"	SH, a/a+SND+ SLTST+CHK	2.5	*	30	70	*				
5270-300	"	SH, a/a+30% SND						~95	~5	*	*
5330-360	"	SH, a/a+40% SND +10% SLTST, a/a						~95	~5	*	*
5390-420	"	SH, a/a						~95	~5	*	*
5450-510	"	SH, a/a+20% SND						~90	~10	*	*
5450-600	"	SH, a/a+SND	2.5-3	*	70	30	*				
5540-600	"	SH, a/a+30% SND						~90	~10	*	*
5630-660	"	SH, dk gy						~90	~10	*	*
5690-720	"	SH, a/a						~90	~10	*	*
5750-780	"	SH, a/a	3.5	0.35(3); 0.52(4)	70	20	10	~85	~15	*	*
	P	SH, dk gy						~85	~15	*	*
5870-900	P	SH, dk gy						70	15	15	*
5920-950	Ctgs	SH, med-dk gy+ 20% SH, a/a+ 10% CHK						~85	~15	*	*
5960-6010	"	SH, a/a+20% SH, a/a	3	0.38(3); 0.51(4)	40	30	30				
6080-120	"	SH, med-dk gy						~80	~20	*	*
	P	SH, med-dk gy						~80	~20	*	*
6140-180	Ctgs	SH, a/a+mnr CHK						~80	~20	*	*
6200-240	"	SH, dk gy+10% SND	3.5	0.35(5)	50	40	10				
	P	SH, dk gy						~85	~15	*	*
6260-290	Ctgs	SH, a/a						~80	~20	*	*
	P	SH, dk gy						~80	~20	*	*
6380-430	Ctgs	SH, a/a	3.5	0.41(4); 0.54(10)	70	20	10	~90	~10	*	*
	P	SH, dk gy						~100	*	*	*
6520-560	Ctgs	SH, a/a+30% SH, ol-gy						~90	~10	*	*
	P	SH, dk gy						~90	~10	*	*
6580-620	Ctgs	SH, a/a+30% SH, ol-gy+20% SND	3.5	0.40(21); 0.62(7)	70	20	10				
	P	SH, dk gy						~90	~10	*	*

TABLE 1 Maturity and Kerogen Data

WELL: F-1

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO-CARBONS
5090-130	Ctgs	SH, med-dk gy, slty+30% SND +mnr SLTST, gy-red+mnr CHK	1.07	*	21	80	0.3	200						
5150-180	"	SH, a/a+25% SND+tr SLTST, a/a+mnr CHK	1.03	420	25	58	0.2	300						
5210-240	"	SH, a/a+20% SND+tr SLTST, a/a+mnr CHK	0.74	417	18	86	0.2	100						
5270-300	"	SH, a/a+30% SND+mnr SLTST, a/a+mnr CHK	0.84	424	17	66	0.2	100						
5330-360	"	SH, a/a+40% SND+10% SLTST, a/a+mnr CHK	0.68	425	13	146	0.3	100						
5390-420	"	SH, a/a+mnr SND+mnr SLTST, a/a+tr CHK	0.90	425	10	144	0.5	100						
5450-510	"	SH, a/a+20% SND+mnr SLTST, a/a+mnr CHK	1.04	427	21	55	0.1	200						
5540-600	"	SH, a/a+30% SND+mnr SLTST, a/a+mnr CHK	0.84	422	23	52	0.2	200						
5630-660	"	SH, dk gy+mnr SND	1.28	424	18	27	0.1	200						
5690-720	"	SH, a/a+mnr CHK	1.10	424	24	31	0.1	300						
5750-780	"	A/a	1.60	427	28	27	0.1	400						
	P	SH, dk gy	2.01	430	32	15	0.1	600						
5810-840	Ctgs	SH, med-dk gy+10% SH, a/a+ mnr CHK+mnr SLTST, a/a +30% SND	1.97											
5870-900	"	SND+30% SH, dk gy+20% SH, med-dk gy+tr SLTST	–											
	P	SH, dk gy	8.21	437	144	11	0.02	11800						
5920-950	Ctgs	SH, med-dk gy+20% SH, dk gy +mnr SND+10% CHK	1.30	430	40	35	0.1	500						
5960-6010	"	SH, a/a+20% SH, a/a+mnr SND +mnr CHK+mnr SLTST, a/a	1.61											
6080-120	"	SH, med-dk gy	1.28	433	47	29	0.1	600	200	55	1.6	4	28	6
	P	SH, med-dk gy	1.97	435	42	19	0.1	800						
6140-180	Ctgs	SH, a/a+tr SLTST+mnr CHK	1.33	431	45	30	0.1	600						
6200-240	"	SH, dk gy+10% SND	1.89											
	P	SH, dk gy	2.41	438	36	16	0.1	800						
6260-290	Ctgs	SH, a/a	1.67	437	48	23	0.1	800	425	16	2.5	1	4	60
	P	SH, dk gy	2.16	440	48	10	0.1	1000						
6320-360	Ctgs	SH, a/a	1.69											
6380-430	"	A/a	1.03	436	24	32	0.1	200						
	P	SH, dk gy	1.28	*	11	32	0.1	100						
6460-500	Ctgs	SH, a/a	1.39											
6520-560	"	SH, a/a+30% SH, ol-gy+tr SLTST	1.01	438	26	40	0.2	300	520	280	5.2	28	53	81
	P	SH, dk gy	1.26	343	24	16	0.2	300						

TABLE 2 A Chemical Analysis Data

WELL: F-1

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
												HYDROCARBONS		
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/g OF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO– CARBONS
6580–620	Ctgs	SH, dk gy+30% SH, ol-gy+mnr SLTST+tr CHK+20% SND	1.39											
	P	SH, dk gy	1.17	343	28	10	0.1	300						

TABLE 2 B Chemical Analysis Data

WELL: F - 1

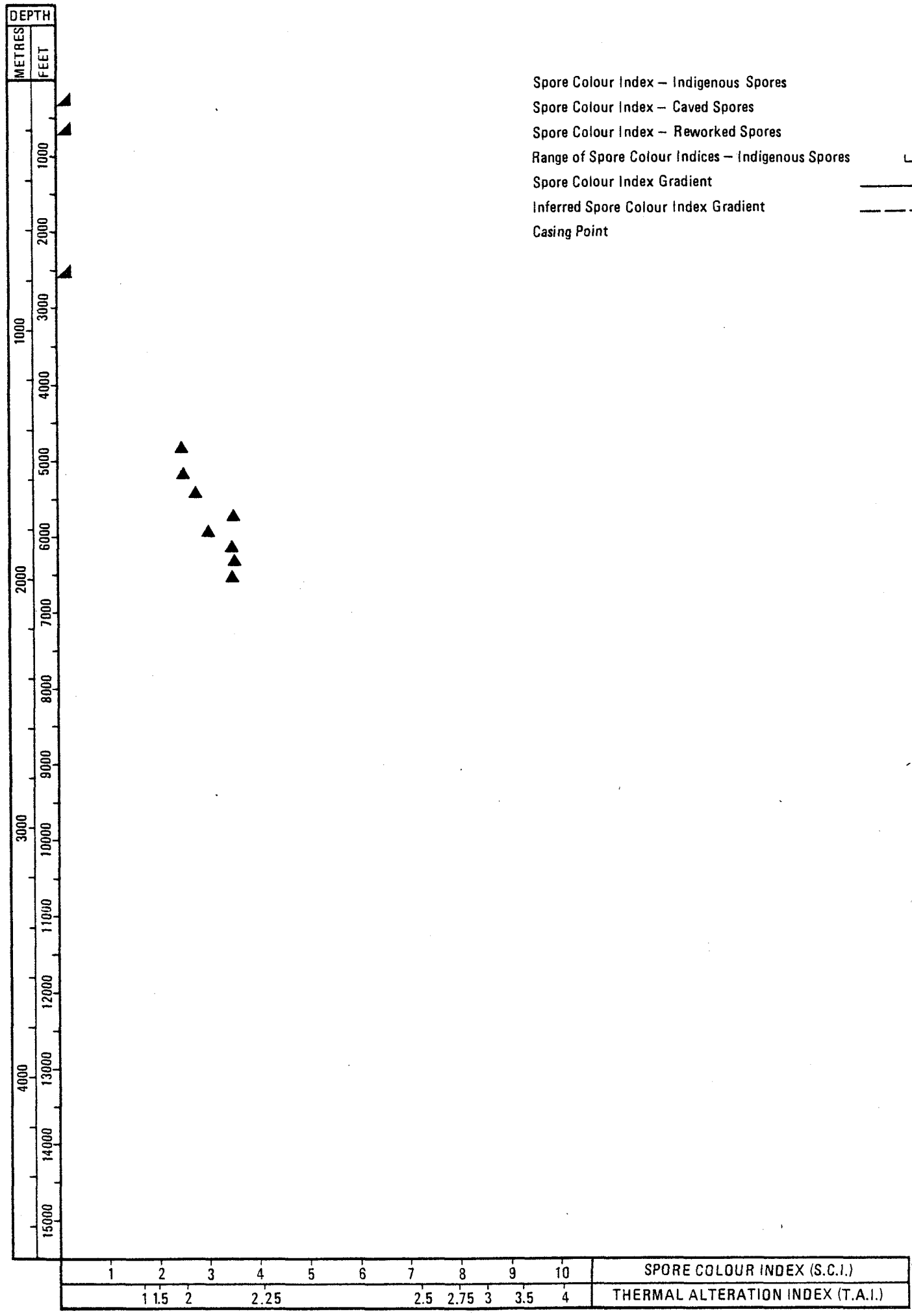

FIGURE 1 Spore Colour Indices against Depth

WELL: F - 1

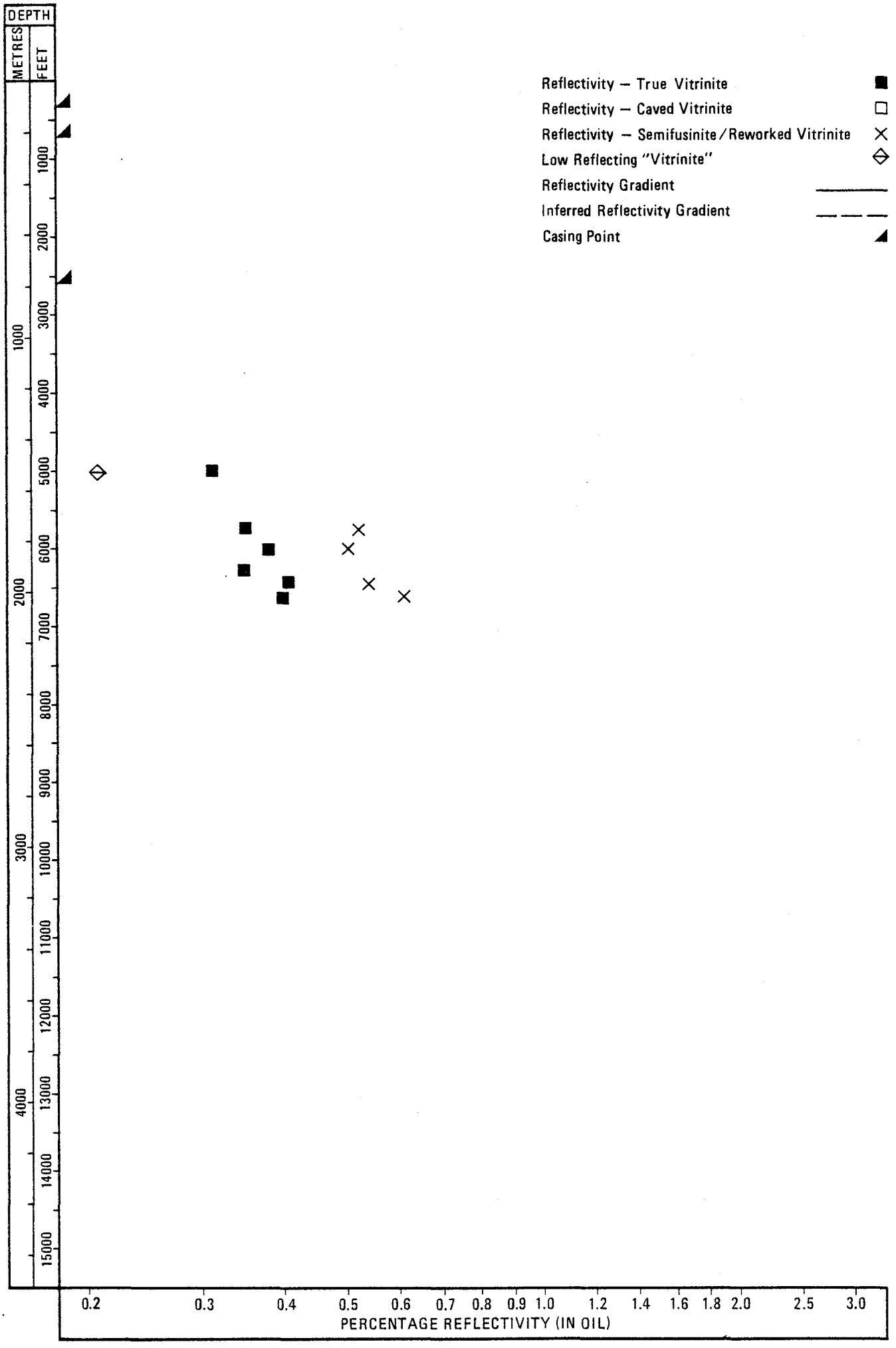

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G22 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF J-1 WELL

SUMMARY

No potential source rocks have been identified in the Early Jurassic to Early Cretaceous interval 1010' to 5840'. The section is immature to early mature and the intercept of the maturity gradient at the surface suggests that some 3000' of section is missing. Non-indigenous hydrocarbons in the section below 3540' are attributed to diesel oil additive.

GENERAL COMMENTS

Well status: Plugged and abandoned, dry hole.

Drilling data: Drilled with gel and freshwater spersene mud to 6518' (T.D.). Casing points at 345' (36"), 744' (20"), 3481' (13⅜)". BHT 170°F at 6518' (T.D.).

Interval analysed: 1010' to 5840' (T.D. 6518').

Age of analysed interval: Early Jurassic to Early Cretaceous.

Sample type and quality: 46 dried ditch cuttings samples of generally good quality, but of very small quantity in the uppermost part of the analysed interval.

Maturation data quality: Good.

Source rock data quality: Good.

Gas chromatography run at: 1400'-1490', 3540'-3640', 3880'-3960', 4400'-4480', 4700'-4800', 5800'-5840'.

MATURATION (Table 1; Figures 1 and 2)

The spore colour indices progressively increase from a value of 2.5 at 1010' to 4 at 5800', indicating a transition from an immature state to an early mature state at around 4000'. The vitrinite reflectivity data increase from 0.28% (interpreted) at 1490', to 0.44% (interpreted) at 5800', showing reasonable accord with the spore colour indices. Extrapolation of the maturity gradient gives an intercept at the surface indicating that up to 3000' of section may be missing by erosion.

OIL SOURCE ROCKS (Tables 1 and 2)

No oil source rocks have been identified in the analysed section of this well.

GEOCHEMICAL CHARACTERISTICS OF THE SEDIMENTS

The analysed horizons contain average (around 1%) amounts of organic carbon, but because of a dominantly (70% to 90%) inertinitic kerogen composition, yield only insignificant quantities of hydrocarbons on pyrolysis. These sediments have no oil or gas generating potential, irrespective of thermal maturity.

The hydrocarbon contents of the samples are anomalously high between 3540' and 5840', ranging between 240 ppm and 850 ppm. The alkane distributions of these hydrocarbons show a pattern characteristic of a fully mature source. However, it is noted that diesel oil was added to the drilling mud at 3400' and at 3530', and the alkane distributions of the samples can be attributed to diesel oil. The observed oil stain is thus considered to be attributable, at least in part, to contamination.

WELL: J-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
1010-070	Ctgs	SH+SND+PEBBLES	2.5	*	90	10	*				
1400-490	"	SLTST, dsky yel-brn/med gy						90	10	*	*
1490-550	"	A/a	2.5	0.30(2)	80	10	10				
1640-730	P	SH, slty, med-dk gy						90	10	*	*
1970-2030	Ctgs	SH, ol-gy+SH, a/a+SND+SLTST, mod brn	2.5-3	0.34(2); 0.43(2)	60	40	mnr				
2450-510	"	SH, ol-gy+SLTST, a/a	3	*	40	40	20				
2600-690	"	SH, a/a+mnr SLTST, a/a+mnr SH, med-dk gy						80	20	*	*
2840-930	"	SH, a/a+60% SH, a/a						80	20	*	*
2900-960	"	SH, a/a+SLTST, a/a+SH, a/a	3	0.33(13)	90	mnr	10				
3050-110	"	A/a	3.5	0.32(11)	90	10	mnr				
3080-170	"	SH, a/a+50% SH, a/a						85	15	*	*
3290-380	"	SH, a/a+SH, a/a+SLTST, a/a+SH, dk gy	3-3.5	*	90	10	mnr				
3320-410	"	SH, dk gy+10% SH, ol-gy						90	10	*	*
	P	SH, dk gy						75	25	*	*
3410-500	Ctgs	SH, a/a+SST, wht/brn	3.5	0.29(3)	70	30	*				
3440-520	"	SH, a/a+10% SST, a/a						85	15	*	*
3540-640	"	A/a						75	25	*	*
	P	SH, dk gy						75	25	*	*
3580-620	Ctgs	SH, a/a+SST, a/a	3.5	0.33(22); 0.53(2)	60	10	30				
3660-760	"	SH, a/a+20% SLTST, a/a						80	20	*	*
3740-820	"	SH, a/a+SLTST, a/a+SH, dk yel-brn	3.5	0.34(13)	30	50	20				
3780-860	P	SH, dk gy						75	25	*	*
3880-960	Ctgs	SH, dk yel-brn+ 10% SLTST, a/a						60	30	*	?10
4200-280	"	SH, a/a+10% SLTST, a/a						70	30	*	*
	P	SH, dk yel-brn						55	25	*	?20
4200-320	Ctgs	SH, a/a+SLTST, a/a+SH, dk gy	3.5	0.38(15)	70	10	20				

TABLE 1 A Maturity and Kerogen Data

WELL: J-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
4400-480	Ctgs	SH, dk yel-brn+ SLTST, mod brn+ 20% SH, dk gy						80	20	*	*
	P	SH, dk gy						75	25	*	*
4500-580	Ctgs	SH, dk yel-brn+ mnr SLTST, a/a+ 30% SH, a/a						80	20	*	*
4600-680	P	SH, dk gy						80	20	*	*
4680-740	Ctgs	SH, a/a+SH, dk yel-brn+SLTST, a/a	4	0.40(21); 0.62(5)	80	10	10				
4700-780	"	SH, a/a+60% SH, a/a						80	20	*	*
4800-880	P	SH, dk gy						85	15	*	*
4900-980	Ctgs	SH, a/a+30% SH, dk yel-brn+10% SST, wht						90	10	*	*
5200-280	"	SH, dk gy+20% SST, a/a						85	15	*	*
5280-400	"	SH, a/a+SST, a/a	3.5	0.41(8)	80	10	10				
5500-580	"	SH, a/a+30% SST, a/a						90	10	*	*
5720-800	"	SH, a/a+SST, a/a	4	0.48(24)	90	10	mnr				
5800-840	"	A/a						80	20	*	*

TABLE 1B Maturity and Kerogen Data

WELL: J-1

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP-ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS mg/gOF ORGANIC CARBON	HYDROCARBONS % OF EXTRACT	ALKANES % OF HYDRO-CARBONS
800-890	Ctgs	CHK	-											
920-1010	"	SH+SND+PEBBLES	-											
1040-130	"	A/a	-											
1160-250	"	SLTST, dsky yel-brn+40% SLTST, mod brn	-											
1280-370	"	SLTST, dsky yel-brn/med gy+ SND	-											
1400-490	"	A/a	1.23	425	32	132	0.3	400	3400	145	27.6	12	4	83
1520-610	"	A/a	-											
1640-730	"	SH, slty, ol-gy+30% SH, slty, med-dk gy	0.70											
	P	SH, slty, ol-gy	0.59											
	P	SH, slty, med-dk gy	1.01	*	19	57	0.1	200						
1760-850	Ctgs	SH, med-dk gy	-											
1880-970	"	SH, ol-gy+mnr SH, a/a+mnr SND	0.56											
2000-090	"	SND+SH, ol-gy+SLTST, mod brn	-											
2120-210	"	A/a	-											
2240-330	"	A/a	-											
2360-450	"	SH, ol-gy+30% SLTST, mod brn	0.61											
	P	SH, ol-gy	0.47											
2480-570	Ctgs	SH, a/a+30% SLTST, a/a	0.46											
2600-690	"	SH, a/a+mnr SLTST, a/a+mnr SH, med-dk gy	0.55	428	39	50	0.1	200						
2720-810	"	SH, a/a+mnr SLTST, a/a+10% SH, a/a	0.56											
2840-930	"	SH, a/a+tr SLTST, a/a+60% SH, a/a	0.72	430	42	48	0.1	300						
2960-3050	"	SH, a/a+tr SLTST, a/a+40% SH, a/a	0.64											
	P	SH, med-dk gy	0.76											
3080-170	Ctgs	SH, ol-gy+tr SLTST, a/a+50% SH, a/a	0.69	*	36	56	0.04	300						
3200-290	"	SH, med-dk gy+40% SH, ol-gy +tr SLTST, a/a	0.67											
3320-410	"	SH, dk gy+10% SH, ol-gy	0.79	435	24	57	0.1	200						
	P	SH, dk gy	1.37	441	49	38	0.05	700						
3440-520	Ctgs	SH, a/a+10% SST, wht/brn	1.11	434	32	42	0.1	400						
3540-640	"	A/a	1.35	439	54	41	0.1	700	720	430	53	32	60	70
	P	SH, dk gy	1.60	443	54	23	0.05	900						
3660-760	Ctgs	SH, a/a+20% SLTST, a/a	0.96	435	38	71	0.3	400						
	P	SH, dk gy	1.34											

TABLE 2 A Chemical Analysis Data

WELL: J-1

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
												HYDROCARBONS		
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO– CARBONS
3780–860	Ctgs	SH, dk yel-brn+10% SH, dk gy	0.85											
	P	SH, dk gy	1.59	440	52	31	0.1	800						
	P	SH, dk yel-brn	0.90											
3880–960	Ctgs	SH, a/a+10% SLTST, a/a+tr SH, dk gy	1.51	431	112	64	0.2	1700	1105	850	7.3	56	77	76
3980–4060	"	SH, a/a+mnr SLTST, a/a+mnr SH, dk gy	1.01											
4080–160	"	SH, a/a+10% SLTST, a/a+10% SH, a/a	1.00											
4200–280	"	SH, a/a+10% SLTST, a/a+mnr SH, a/a	1.17	436	56	62	0.2	700						
	P	SH, dk yel-brn	2.01	437	165	49	0.05	3300						
4300–380	Ctgs	SH, a/a+mnr SLTST, a/a+10% SH, dk gy	1.14											
4400–480	"	SH, a/a+mnr SLTST, a/a+20% SH, a/a	1.12	436	38	106	0.3	400	765	460	6.8	41	60	75
	P	SH, dk gy	1.47	443	53	30	0.1	800						
4500–580	Ctgs	SH, dk yel-brn+mnr SLTST, a/a+30% SH, a/a	0.99	437	38	81	0.3	400						
4600–680	"	A/a	0.88											
	P	SH, dk yel-brn	0.58											
	P	SH, dk gy	1.33	442	42	23	0.2	550						
4700–780	Ctgs	SH, dk yel-brn+mnr SLTST, a/a+40% SH, a/a	0.86	436	40	75	0.4	300	440	240	5.1	28	54	68
4800–880	"	SH, dk gy+mnr SLTST, a/a+ 40% SH, dk yel-brn	0.83											
	P	SH, dk yel-brn	0.87											
	P	SH, dk gy	1.18	443	29	30	0.1	300						
4900–980	Ctgs	SH, a/a+30% SH, dk yel-brn +mnr SLTST, a/a+10% SST, wht	0.82	437	23	59	0.3	200						
5000–080	"	SH, dk gy+30% SST, a/a+mnr SLTST, mod yel	0.88											
	P	SH, dk gy	1.06											
5100–180	Ctgs	SH, a/a+10% SST, a/a+mnr SLTST, a/a	0.79											
5200–280	"	SH, a/a+20% SST, a/a+mnr SLTST, a/a	0.84	438	33	68	0.2	300						
	P	SH, dk gy	1.05											
5300–380	Ctgs	SH, a/a+30% SST, a/a+mnr SLTST, a/a	0.76											
5400–480	"	A/a	0.95											
	P	SH, dk gy	0.95											
5500–580	Ctgs	SH, a/a+30% SST, a/a+mnr SLTST, a/a	0.84	437	24	41	0.3	200						

TABLE 2B Chemical Analysis Data

WELL: J-1

GENERAL DATA			CHEMICAL ANALYSIS DATA												
				PYROLYSIS					SOLVENT EXTRACTION						
												HYDROCARBONS			
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP - ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO - CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	mg/gOF ORGANIC CARBON	% OF EXTRACT	ALKANES % OF HYDRO - CARBONS
5600-680	Ctgs	SH, dk gy+30% SST, wht+mnr SLTST, mod yel	0.87											
	P	SH, dk gy	1.01											
5700-780	Ctgs	SH, a/a+30% SST, a/a+mnr SLTST, a/a	0.83											
5800-840	"	A/a	1.06	438	37	53	0.2	400	765	405	7.2	38	53	79
	P	SH, dk gy	1.01											

TABLE 2c Chemical Analysis Data

WELL: J - 1

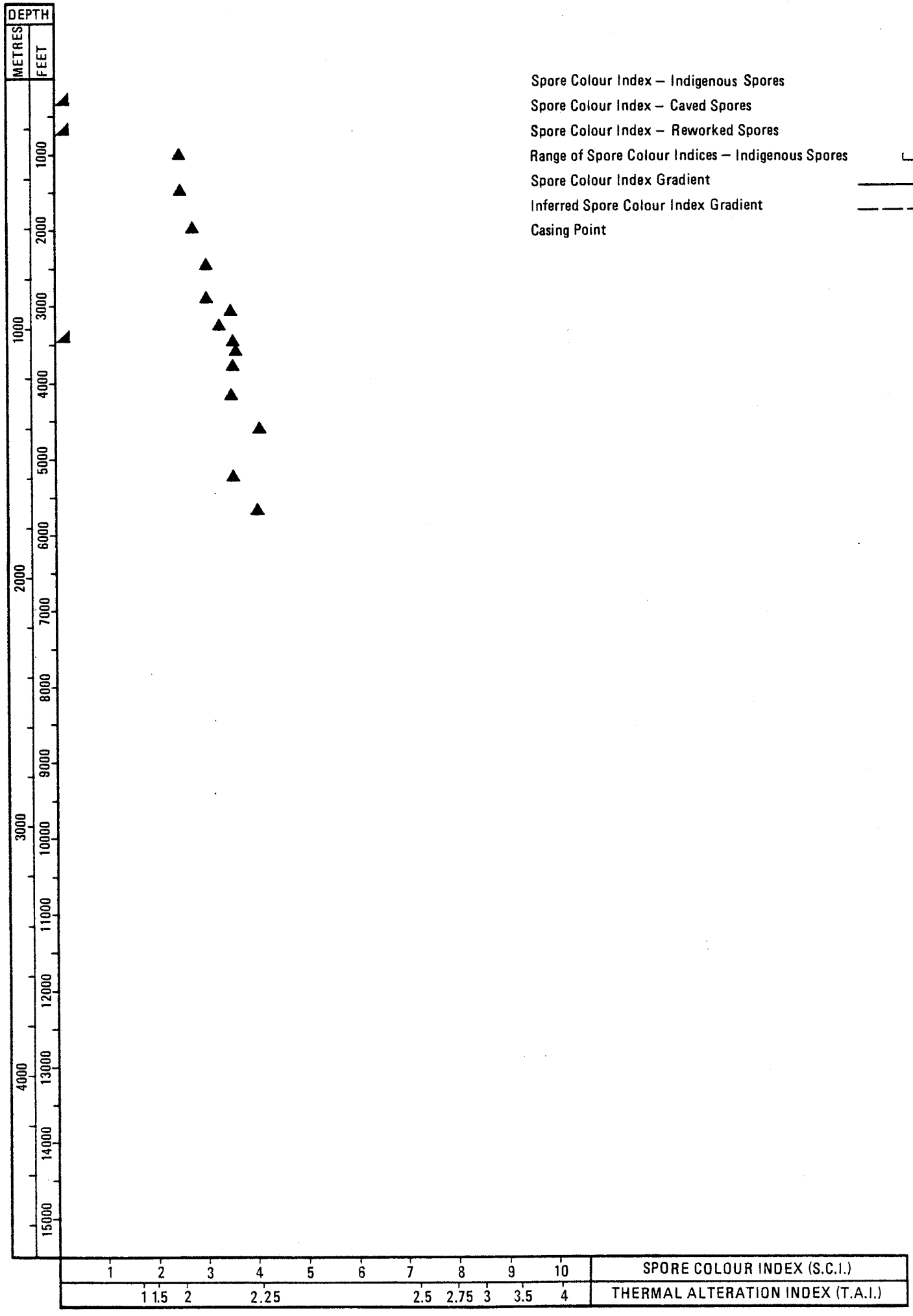

FIGURE 1 Spore Colour Indices against Depth

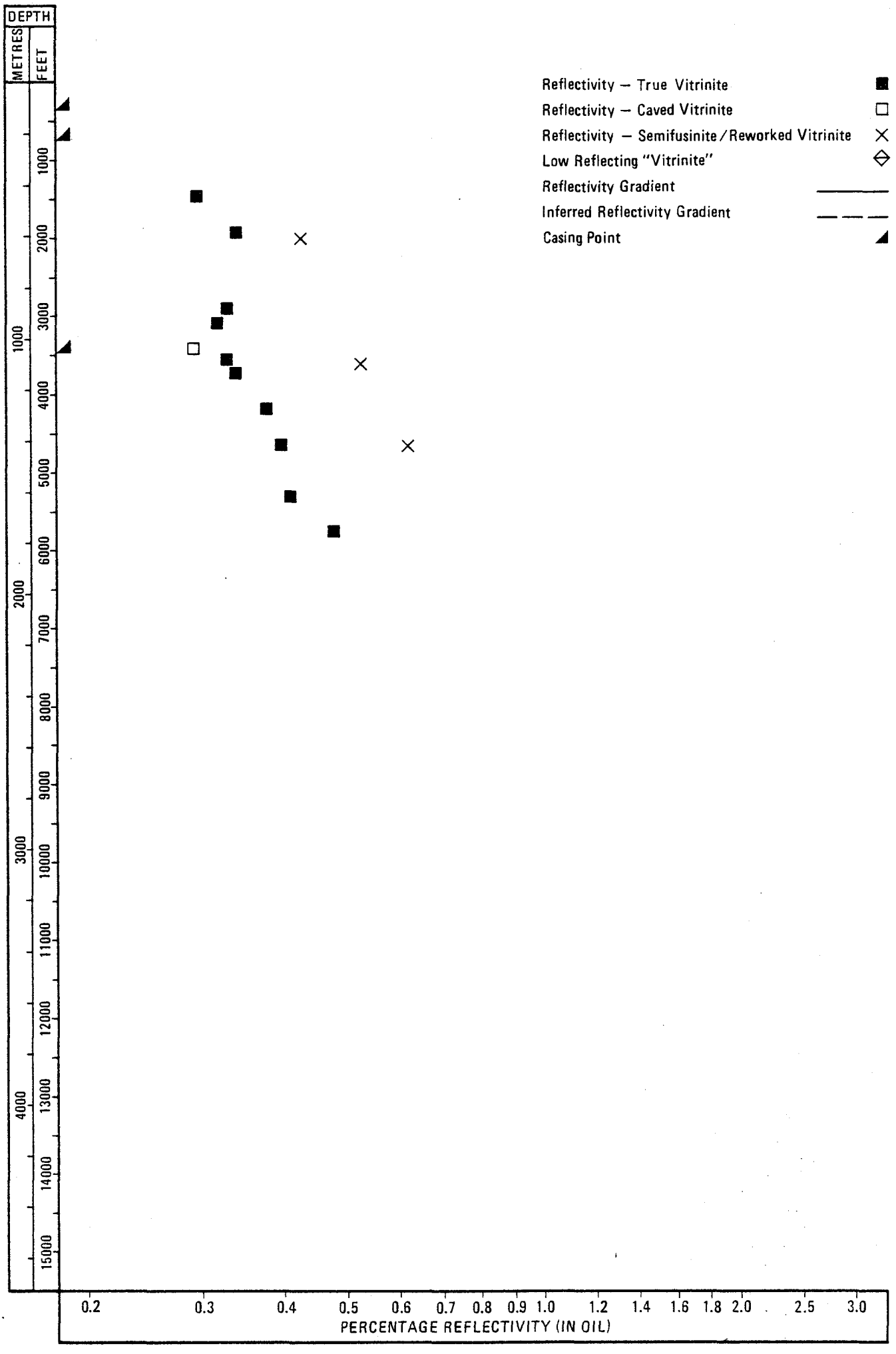

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT G23 (30/4/81)

PRELIMINARY PETROLEUM GEOCHEMISTRY RESULTS OF K-1 WELL

SUMMARY

No source rocks have been identified in the ?Triassic/?Early Jurassic to Early Cretaceous interval (3860' to 6920'), irrespective of maturity, because of a dominance of inertinitic kerogens. The Jurassic and Early Cretaceous interval is early mature, and the ?pre-Jurassic interval is middle mature. Minor oil stain noted between 4850' and 5300' is from a mature source and has migrated into the section.

GENERAL COMMENTS

Well status: Plugged and abandoned, dry hole.

Drilling data: Drilled with freshwater gel and freshwater XP-20 spersene based muds to 7518' (T.D.). Casing points at 372' (36"), 711' (20"), 1882' (13⅜"). BHT 163°F at 7518' (T.D.).

Interval analysed: 3860' to 6920' (T.D. 7518').

Age of analysed interval: ? Triassic/?Early Jurassic to Early Cretaceous.

Sample type and quality: 22 dried ditch cuttings samples of fair quality.

Maturation data quality: Good.

Source rock data quality: Good.

Gas chromatography run at: 4850'-4940', 4970'-5060', 5090'-5180', 5210'-5300'.

MATURATION (Table 1; Figures 1 and 2)

Over the analysed interval, the spore colour indices and vitrinite reflectivity increase with depth, from 3-3.5 to 5, and 0.39% to 0.63% respectively. These data are in reasonable accord, and indicate early thermal maturity over the Jurassic to Early Cretaceous section, and middle maturity at 6830'-6920' in the ?pre-Jurassic interval. The intercepts of the maturity gradient lines at the surface suggest the possibility that some section is missing within the Tertiary.

OIL SOURCE ROCKS (Tables 1 and 2)

No oil source rocks have been identified in the analysed section of this well.

GEOCHEMICAL CHARACTERISTICS OF THE SEDIMENTS

A picked shale from the sample at 3980'-4070' shows a potential yield of 5800 ppm, and a dominantly vitrinitic kerogen composition. At a much elevated level of thermal maturity this shale could generate gas, but because the horizon appears to have very limited thickness, it is unlikely to generate significant quantities.

The remaining horizons analysed in the Jurassic and Early Cretaceous interval, between 3950' and 6470', contain around average quantities of organic matter, but with a dominantly inertinitic composition. The samples give very low pyrolysis yields and are considered to have no source potential, irrespective of thermal maturity.

High production indices and extraction analyses confirm the presence of minor amounts of oil stain (up to 450 ppm) between 4850' and 5300'. Gas chromatography analysis indicates that these hydrocarbons are derived from a middle to late mature source, and they are therefore considered to have migrated into the section.

WELL: K-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
3880-950	Ctgs	LST, pnk-gy+10% SH, med-dk gy+10% SH, mod brn	3.5		100	*	*				
3980-4070	P	SH, med-dk gy						35	50	*	15
4100-190	Ctgs	SH, med-lt gy+ 10% SH, a/a+20% LST, a/a						80	20	*	*
4220-310	"	A/a+SND						85	15	*	*
4240-310	"	A/a	3-3.5	0.39(1)	70	20	10				
4370-460	"	SH, med gy						60	35	*	5
4490-580	"	SH, med-dk gy+ 10% SH, med-lt gy+10% SLTST						80	20	*	*
4610-670	"	SND+20% SH, dk gy+30% SH, med gy+10% SLTST	3.5-4	*	40	20	40				
4610-700	"	A/a						85	15	*	*
	P	SH, dk gy						65	35	*	*
	P	SH, med gy						75	25	*	*
4730-820	Ctgs	SH, dk gy+20% SLTST						75	25	*	*
4850-940	"	SH, a/a+10% SLTST						80	20	*	*
4970-5030	"	SH, a/a+mnr SLTST	3.5	0.43(13)	60	30	10				
4970-5060	"	A/a						80	20	*	*
5090-180	"	SH, med-dk gy+ 10% SLTST						90	10	*	*
5210-300	"	SH, med-lt gy+ 40% SH, dk gy						90	10	*	*
5330-390	"	SH, med-dk gy +10% SLTST	3.5-4	0.46(1)	70	20	10				
5330-420	"	A/a						90	10	*	*
5450-540	"	SH, dk gy						90	10	*	*
5570-660	"	SH, med-dk gy/dk gy						90	10	*	*
5690-750	"	SH, dk gy	4	*	80	20	*				
5690-780	"	A/a						90	10	*	*
	P	SH, dk gy						80	20	*	*
5810-900	Ctgs	SH, a/a						90	10	*	*
5930-6020	"	A/a						85	15	*	*
	P	SH, dk gy						85	15	*	*
6050-110	Ctgs	SH, a/a	4	0.49(4)	80	20	*				
6050-140	"	A/a						85	15	*	*
	P	SH, dk gy						85	15	*	*

TABLE 1A Maturity and Kerogen Data

WELL: K-1

SAMPLE DEPTH (FEET)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY IN OIL, R av%	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
6170-260	Ctgs	SH, dk gy						85	15	*	*
6290-380	"	A/a						85	15	*	*
	P	SH, dk gy						80	20	*	*
6410-470	Ctgs	SH, a/a						90	10	*	*
6440-530	"	SH, a/a+SND	4.5		60	30	10				
6830-920	"	SND+mnr SH, a/a	5	0.63(26)	70	30	*				

TABLE 1 B Maturity and Kerogen Data

WELL: K-1

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – ERATURE °C	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO-CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS		ALKANES % OF HYDRO-CARBONS
												mg/g OF ORGANIC CARBON	% OF EXTRACT	
3860-950	Ctgs	LST, pnk-gy+10% SH, med-dk gy+10% SH, mod brn	-											
3980-4070	"	LST, a/a+20% SH, a/a+mnr SH, a/a+20% SH, med-lt gy	0.79											
	P	SH, med-dk gy	3.17	433	184	33	0.03	5800						
4100-190	Ctgs	SH, med-lt gy+10% SH, a/a +20% LST, a/a+mnr SH, mod brn	0.43	*	41	242	0.05	200						
4220-310	"	A/a+SND	0.51	*	31	252	0.1	200						
4370-460	"	SH, med gy+mnr SH, mod brn+ mnr SLTST	0.98	437	89	189	0.1	900						
	P	SH, med gy	1.01											
4490-580	Ctgs	SH, med-dk gy+10% SH, med-lt gy+10% SLTST	1.21	431	40	53	0.1	500						
4610-700	"	SND+20% SH, dk gy+30% SH, med gy+mnr SH, mod brn+10% SLTST	0.98	436	34	74	0.1	300						
	P	SH, dk gy	1.83	435	73	29	0.04	1300						
	P	SH, med gy	2.12	434	48	27	0.1	1000						
4730-820	Ctgs	SH, dk gy+20% SLTST	1.21	436	49	66	0.1	600						
4850-940	"	SH, a/a+10% SLTST	1.20	436	40	84	0.2	500	515	435	4.3	36	85	86
4970-5060	"	SH, a/a+mnr SLTST	1.24	435	40	78	0.3	500	530	450	4.3	36	86	77
5090-180	"	SH, med-dk gy+10% SLTST+mnr SH, mod brn	1.09	431	25	85	0.3	300	490	355	4.5	33	73	79
5210-300	"	SH, med-lt gy+40% SH, dk gy+ mnr SLTST	1.29	435	28	67	0.2	400	350	315	2.7	24	90	66
5330-420	"	SH, med-dk gy+mnr SH, mod brn+10% SLTST	1.01	434	28	57	0.1	300						
5450-540	"	SH, dk gy+mnr SH, mod brn +mnr SLTST	1.01	435	24	56	0.1	200						
5570-660	"	SH, med-dk gy/dk gy+mnr SH, mod brn+mnr SLTST	1.03	*	20	50	0.3	200						
	P	SH, med-dk gy/dk gy	0.96											
5690-780	Ctgs	SH, dk gy+mnr SH, mod brn +mnr SLTST	1.03	433	24	51	0.1	200						
	P	SH, dk gy	1.02	435	43	21	0.1	400						
5810-900	Ctgs	SH, a/a+mnr SH, mod brn+mnr SLTST	1.05	435	23	42	0.1	200						
5930-6020	"	A/a	1.04	435	29	40	0.1	300						
	P	SH, dk gy	1.04	433	28	22	0.1	300						
6050-140	Ctgs	SH, a/a+mnr SH, mod brn	1.02	435	29	59	0.1	300						
	P	SH, dk gy	1.00	434	33	25	0.04	300						
6170-260	Ctgs	SH, a/a+mnr SH, mod brn	1.05	438	28	46	0.1	300						
6290-380	"	A/a	0.95	435	30	67	0.1	300						
	P	SH, dk gy	1.00	434	47	20	0.03	500						

TABLE 2A Chemical Analysis Data

WELL: K-1

GENERAL DATA			CHEMICAL ANALYSIS DATA											
				PYROLYSIS					SOLVENT EXTRACTION					
SAMPLE DEPTH (FEET)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	TEMP – °C ERATURE	HYDROGEN INDEX	OXYGEN INDEX	PRODUCTION INDEX	POTENTIAL YIELD (ppm)	TOTAL EXTRACT (ppm)	HYDRO– CARBONS (ppm)	EXTRACT % OF ORGANIC CARBON	HYDROCARBONS		ALKANES % OF HYDRO– CARBONS
												mg/g OF ORGANIC CARBON	% OF EXTRACT	
6410–470	Ctgs	SH, dk gy+mnr SH, mod brn	0.95	438	26	42	0.1	300						

TABLE 2B Chemical Analysis Data

WELL: K - 1

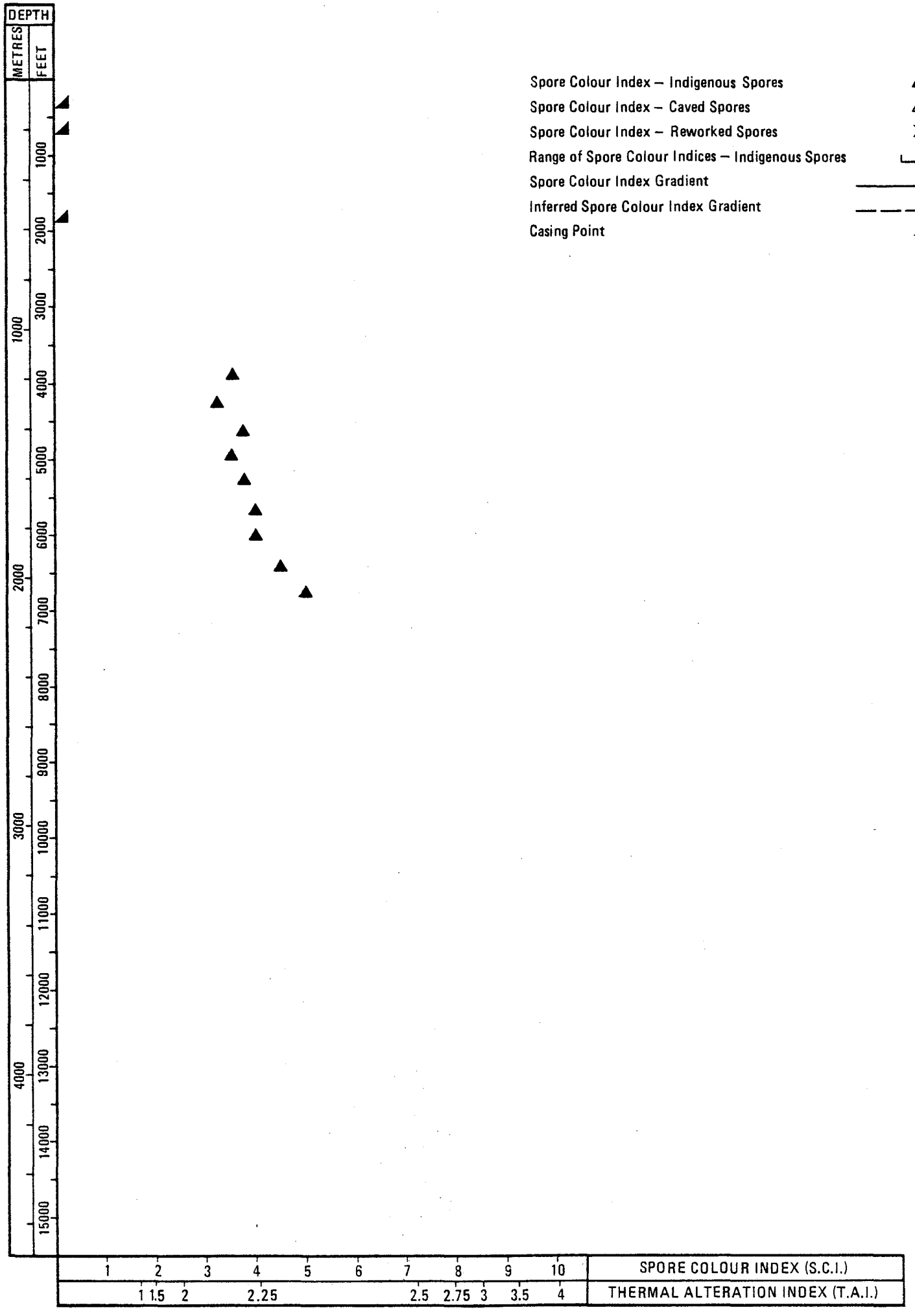

FIGURE 1 Spore Colour Indices against Depth

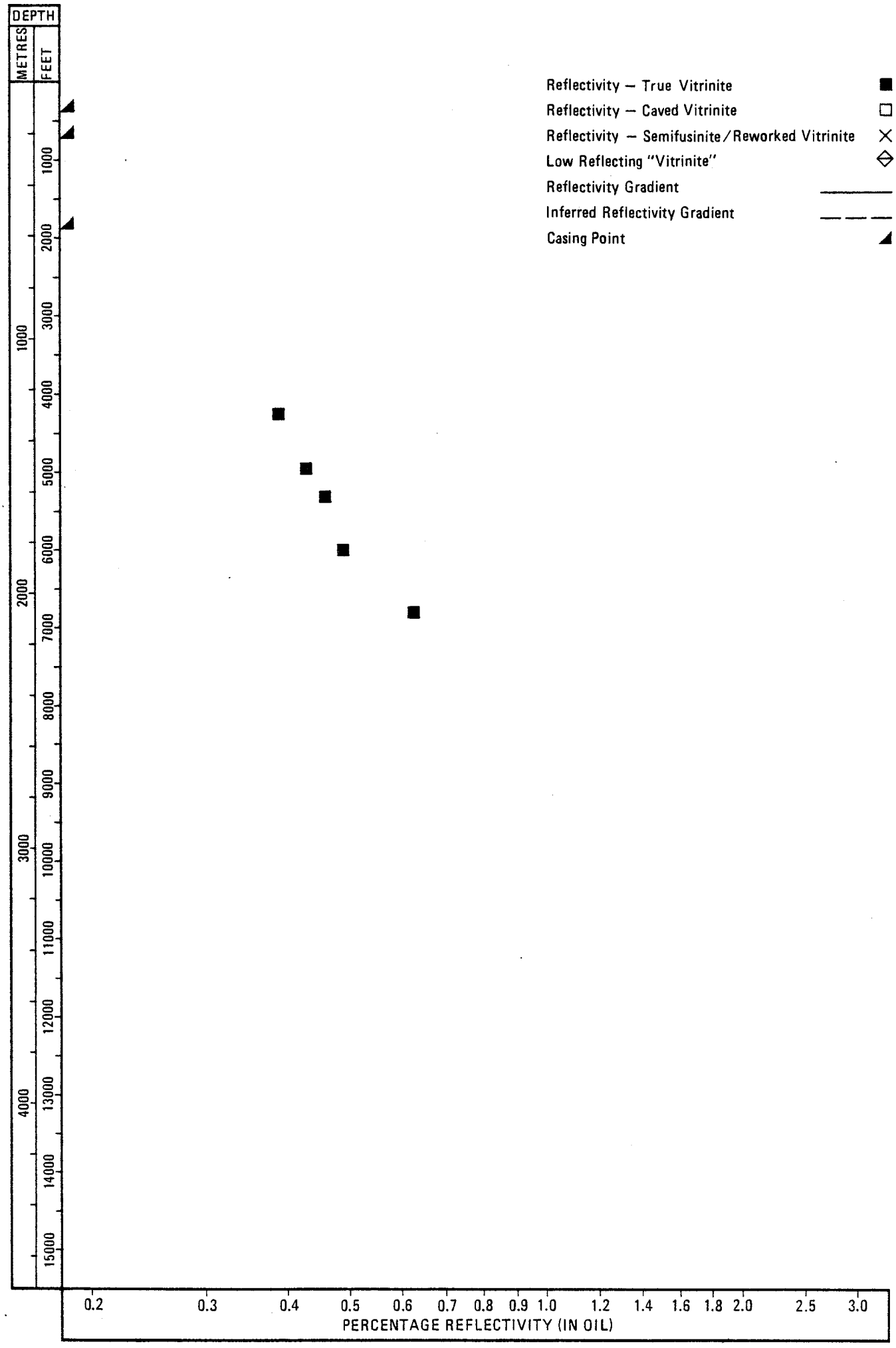

FIGURE 2 Vitrinite Reflectivity against Depth

ROBERTSON RESEARCH INTERNATIONAL LIMITED

NORWAY II STUDY - PRELIMINARY REPORTS B11 TO B19

Project No. RRPS/8182/B/2043

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWNS OF 2/4-11, 2/4-B19, 15/3-1, 15/6-2, UK 16/23-1, UK 23/11-1, UK 23/21-2, UK 30/13-2, AND UK 30/18-2 WELLS

APRIL 1981

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Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT B11 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF 2/4-11 WELL

		Tops (in feet)
Late Cretaceous	early Campanian	12080 (top not seen)
	----------Unconformity----------	
	(early Aptian - ?Barremian	12288 (log)
	(----------Unconformity----------	
	(early Barremian - late Hauterivian	12425
Early Cretaceous	(Hauterivian	12480
	(----------Unconformity----------	
	(Valanginian	12600
	(early Valanginian - latest Ryazanian	12900
Early Cretaceous - Late Jurassic	Ryazanian - middle? Volgian	13072
	----------Unconformity----------	
Late Jurassic		13521 (log)
	----------Unconformity----------	
Late Permian	Zechstein	13800 to 14045 T.D.

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Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT B12 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF 2/4-B19 WELL

		Tops (in feet)
Late Palaeocene		9640 (top not seen)
Early Palaeocene	Danian	9774 (log)
Late Cretaceous?		10210 (log)
Late Cretaceous	late Maastrichtian	10280
	Maastrichtian - early? Campanian	10320
	Santonian - ?Turonian	11380
	Turonian - Cenomanian	12389 (log)
Early Cretaceous	Albian	12600
	early Albian - Aptian	12720
	early Aptian	12810
	Barremian	12940
	early Barremian - Valanginian	12990
	early Valanginian - latest Ryazanian	13220
Early Cretaceous - Late Jurassic	late Ryazanian - late Volgian	13362 (log)
Late Jurassic	middle Volgian	13400
	early? Volgian	14440
	early Volgian	15000 to 15108 T.D.

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT B13 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF 15/3-1 WELL

		Tops (in metres)	
Late Cretaceous		3800	(top not seen)
----------	Unconformity ----------		
Early Cretaceous	(Albian	3812	
	(early Albian - Aptian	3830	
	(early Aptian	3860	
	(Barremian - Neocomian	3880	
Early Cretaceous - Late Jurassic	Ryazanian - middle Volgian	3947	(log)
Late Jurassic	(middle Volgian	3985	
	(early Volgian - Kimmeridgian	4090	
	(Oxfordian	4195	
	(early Oxfordian - Callovian	4535	to 5129 T.D.

UK 16/23-1 Well continued.....

	(Kimmeridgian	10720 (log)
Late Jurassic	(Oxfordian	11060 (log)
	(Callovian	11167 (log)
----------?Unconformity----------		
?Jurassic		11431 (log)
----------?Unconformity----------		
Late Triassic	Rhaetian	11740 (log)
----------Unconformity----------		
Devonian		11950 (log) to 12680 T.D.

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NORWAY II STUDY - PRELIMINARY REPORT B16 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF UK 23/11-1 WELL

		Tops (in feet)
Late Cretaceous	Santonian	9500 (top not seen)
----------	Unconformity ----------	
Early Cretaceous	early Barremian - Neocomian	9612 (log)
----------	Unconformity ----------	
Triassic		9663 (log) to 10087 T.D.

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NORWAY II STUDY - PRELIMINARY REPORT B17 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF UK 23/21-2 WELL

		Tops (in feet)
Late Cretaceous		11000 (top not seen)
----------Unconformity----------		
Early Cretaceous		11121
Early Cretaceous	(early Aptian	11205
	(Barremian - Valanginian	11210
	(earliest Valanginian - latest Ryazanian	11240
Early Cretaceous - Late Jurassic	Ryazanian - middle Volgian	11250
Late Jurassic	(middle Volgian	11310
	(----------Unconformity----------	
	(middle Volgian - early Volgian	11352
----------Unconformity----------		
Late Jurassic		11380
----------Unconformity----------		
Middle? Jurassic		11485 to 11634 T.D.

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Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT B18 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF UK 30/13-2 WELL

		Tops (in feet)
Late Cretaceous		11900 (top not seen)
Early Cretaceous		11995 (log)
Early Cretaceous - Late Jurassic	Ryazanian - middle Volgian	12272 (log)
Late Jurassic	middle Volgian	12550
	----------Unconformity----------	
	Volgian/?Kimmeridgian	13065
	Kimmeridgian - Oxfordian	13210
----------Unconformity----------		
?Triassic		13797 (log)
Late Permian	Zechstein	13910 (log) to 14550 T.D.

ROBERTSON RESEARCH INTERNATIONAL LIMITED

Project No. RRPS/8182/B/2043

NORWAY II STUDY - PRELIMINARY REPORT B19 (30/4/81)

PRELIMINARY BIOSTRATIGRAPHIC BREAKDOWN OF UK 30/18-2 WELL

		Tops (in feet)	
Pleistocene		890	(top not seen)
Pliocene		1960	
Late Miocene - Middle Miocene		3260	
Middle? Miocene - Early? Miocene		5370	
Early Miocene		5530	
Late Oligocene		6170	
Early Oligocene		8000	
Early Oligocene? - Middle Eocene?		8560	
Middle? Eocene - Early? Eocene		8840	
----------?Unconformity----------			
Late Palaeocene		9308	(log)
Early Palaeocene	Danian	9980	
Late Cretaceous	late Maastrichtian	10450	(log)
	Maastrichtian - late Campanian	10560	
	early Campanian	10920	
	Santonian - Coniacian	11120	
	Coniacian - Turonian	11760	
	Cenomanian	12600	
Early Cretaceous	Albian	12950	
	early Albian - Aptian	13040	
	----------Unconformity----------		
	Barremian - late Hauterivian	13425	(log)
	Hauterivian	13600	
	early Hauterivian - Valanginian	13760	
	Valanginian - latest Ryazanian	14000	
Early Cretaceous - Late Jurassic	Ryazanian? - Volgian - ?Oxfordian	14238 - 15050	(log) to T.D.