

5.2 TESTING

5.2.1 Repeat formation tester

Five RFT samplings were performed, both in the hydrocarbon and water bearing zones. All samples show unusually high oil filtrate recovery due to a very deep invasion by the oil base mud. The results are summarized in table 6a/b/c.

Both the upper and the lower chamber were 22.7 liters (6 gallons).

5.2.2 Drill stem tests

Four DSTs were performed

DST 1B RESULTS

Packer set at	:	3782 m
Perforated intervals	:	3802 - 3803.5 m
		3807 - 3810 m
		3813 - 3822 m

Table 4

SUMMARY OF PRESSURE RESULTS (SGP)

Run No.	DEPTH			HYDROSTATIC PRESSURE		FORMATION PRESSURE	
	RKB (mTMD)	RKB (mTVD)	MSL (mTVD)	kg/cm ²	eq.MW. (g/cm ³)	kg/cm ²	eq.MW. (g/cm ³)
5A (SGP)	3526.5	3525.5	3500.2	539.20	1.529	494.59	1.413
	3528.0	3527.0	3501.7	539.39	1.529	493.30	1.409
	3530.0	3529.0	3503.7	539.57	1.529	493.46	1.408
	3532.5	3531.5	3506.2	540.07	1.529	493.74	1.408
	3534.5	3533.5	3508.2	540.31	1.529	493.88	1.408
	3536.5	3535.5	3510.2	540.79	1.530	494.09	1.408
	3540.0	3539.0	3513.7	541.35	1.530	494.46	1.407
	3542.0	3541.0	3515.7	541.84	1.530	494.68	1.407
7B (SGP)	3530.0	3529.0	3503.7	568.07	1.610	494.66	1.412
	3531.0	3530.0	3504.7	568.42	1.610	494.80	1.412
	3553.5	3552.2	3527.0	571.59	1.609	497.12	1.409
	3554.0	3552.9	3527.6	571.73	1.609	497.05	1.409
	3557.5	3556.4	3531.1	572.22	1.609	497.47	1.409
	3558.0	3556.9	3531.6	572.36	1.609	497.54	1.409
	3559.0	3557.9	3532.6	--	--	497.75	1.409
	3572.5	3571.4	3546.1	574.54	1.609	498.31	1.405
	3610.0	3608.7	3583.4	--	--	506.19	1.413
	3610.2	3608.9	3583.6	580.73	1.609	506.05	1.412
	3653.5	3652.1	3626.8	587.76	1.609	531.43	1.465
	3653.7	3652.3	3627.0	587.83	1.609	531.22	1.465
	3685.0	3683.5	3658.0	592.48	1.608	560.06	1.531
	3697.5	3696.0	3658.2	594.59	1.608	560.90	1.533
	3716.5	3715.0	3670.0	597.75	1.609	560.62	1.527
3719.0	3717.5	3692.2	598.03	1.609	560.90	1.519	
3723.0	3721.5	3696.2	598.73	1.609	561.18	1.518	
3732.6	3731.1	3705.8	600.49	1.609	562.36	1.518	
3759.3	3757.7	3732.2	604.29	1.608	566.32	1.517	
3783.0	3781.4	3756.1	607.95	1.608	556.75	1.482	
7C (SGP)	3557.5	3556.4	3531.1	572.43	1.610	497.47	1.409
	3653.7	3652.3	3627.0	587.83	1.609	531.22	1.465
	3732.6	3731.1	3705.8	600.49	1.609	562.31	1.517
7F (SGP)	3719.0	3717.7	3692.4	599.86	1.613	560.90	1.519
	3819.0	3817.2	3791.9	615.05	1.611	564.84	1.490
	3819.2	3817.4	3792.1	615.19	1.612	566.17	1.493
	3820.0	3818.2	3792.9	615.54	1.612	562.38	1.483
	3820.8	3819.0	3793.7	615.33	1.611	560.20	1.477
	3821.5	3819.7	3794.4	615.47	1.611	559.35	1.474
	3860.4	3858.2	3832.9	621.24	1.610	548.31	1.431
	3860.7	3858.5	3833.2	621.87	1.612	549.93	1.435

Table 5

SUMMARY OF PRESSURE RESULTS (HPG)

Run No.	DEPTH			HYDROSTATIC PRESSURE		FORMATION PRESSURE	
	RKB (mMD)	RKB (mTVD)	MSL (mTVD)	kg/cm ²	eq.mw. (g/cm ³)	kg/cm ³	eq.mw. (g/cm ³)
5A (SGP)	3526.5	3525.5	3500.2	539.20	1.529	494.59	1.413
	3528.0	3527.0	3501.7	539.39	1.529	493.30	1.409
	3530.0	3529.0	3503.7	539.57	1.529	493.46	1.408
	3532.5	3531.5	3506.2	540.07	1.529	493.74	1.408
	3534.5	3533.5	3508.2	540.31	1.529	493.88	1.408
	3536.5	3535.5	3510.2	540.79	1.530	494.09	1.408
	3540.0	3539.0	3513.7	541.35	1.530	494.46	1.407
	3542.0	3541.0	3515.7	541.84	1.530	494.68	1.407
7B (HP)	3530.0	3529.0	3503.7	567.20	1.607	494.63	1.412
	3531.0	3530.0	3504.7	567.44	1.607	495.08	1.413
	3553.5	3552.3	3527.0	571.26	1.608	497.24	1.410
	3554.0	3552.9	3527.6	571.31	1.608	497.33	1.410
	3556.3	3555.2	3529.9	571.45	1.608	497.48	1.409
	3557.5	3556.4	3531.1	571.52	1.607	497.47	1.409
	3558.0	3556.9	3531.6	571.91	1.608	497.75	1.409
	3572.5	3571.4	3546.1	574.05	1.607	498.49	1.406
	3610.0	3608.7	3583.4	579.76	1.607	505.84	1.412
	3610.2	3608.9	3583.6	580.03	1.607	506.02	1.412
	3653.5	3652.1	3626.8	586.92	1.607	531.25	1.465
	3653.7	3652.3	3627.0	587.13	1.608	531.28	1.465
	3685.0	3683.5	3658.2	592.23	1.608	559.40	1.529
	3697.5	3696.0	3670.7	594.02	1.607	560.82	1.528
	3716.5	3715.0	3689.7	597.05	1.607	560.55	1.519
	3719.0	3717.5	3692.2	597.38	1.607	560.62	1.518
3723.0	3721.5	3696.2	597.93	1.607	560.76	1.517	
3732.6	3731.1	3705.8	599.72	1.607	562.27	1.517	
3759.3	3757.5	3732.2	604.01	1.607	566.24	1.517	
3783.0	3781.4	3756.1	607.35	1.606	556.94	1.483	
7C (HP)	3557.5	3556.4	3531.1	571.52	1.607	497.47	1.409
	3653.7	3652.3	3627.0	587.13	1.608	531.28	1.465
	3732.6	3731.1	3705.8	599.72	1.607	562.27	1.517
7F (HP)	3719.0	3817.7	3791.9	--	--	564.43	1.489
	3820.0	3818.2	3792.9	614.39	1.609	562.09	1.482
	3820.8	3819.0	3793.7	614.64	1.609	559.71	1.475
	3821.5	3819.7	3794.4	614.59	1.609	559.18	1.474

TOTAL MARINE NORSK A.S

RFT RESULTS

Well: 29/3-1

Table 6a

RFT NUMBER Run/Test	DEPTH TMD SS	STRATIGRAPHIC ATTRIBUTION	CHAMBER gal choke	MUD WEIGHT (g/cm ³)	PRESSURES (kg/cm ²)			Sampling Time (min)	RECOVERY DATA					
					Hydrost. s.g	Shut in eq.d	Surface chamber		GAS (dm ³)	GAS COMPOSITION (%)				
										C1	C2	C3	iC4	nC4
3 Ch.1	3556.4		6	1.58	570.2	-	0	20	-	-	-	-	-	-
	3530	2x20	1.60		-	-			-	-	-	-		

INTERPRETATION :	RECOVERY DATA														
	CONDENSATE				OIL				WATER						
	(cm ³)	ph			(cm ³)	ph			Pour Point °C	(cm ³)	Rml 75°F	Sal. ppm	Rrf 75°F	Sal. ppm	Titration ppm
	g/cm ³	API	T°C		g/cm ³	API	T°C								
WATER & FILTRATE	-	-	-	-	-	-	-	-	-	16000	-	-	-	-	CL ⁻ = 11300

REMARKS : SEAL PARTIALLY LOST DURING CLOSING OF SEAL VALVE. SAMPLING WAS STOPPED TO AVOID ANY FLUID CONTAMINATION. SCHLUMBERGER RUN/TEST NO: 7E/1

RFT NUMBER Run/Test	DEPTH TMD SS	STRATIGRAPHIC ATTRIBUTION	CHAMBER gal choke	MUD WEIGHT (g/cm ³)	PRESSURES (kg/cm ²)			Sampling Time (min)	RECOVERY DATA					
					Hydrost. s.g	Shut in eq.d	Surface chamber		GAS (dm ³)	GAS COMPOSITION (%)				
										C1	C2	C3	iC4	nC4
3 Ch.2	3556.4		6	1.58	570.2	-	0	6	-	-	-	-	-	-
	3530	2x20	1.60		-	-			-	-	-			

INTERPRETATION :	RECOVERY DATA														
	CONDENSATE				OIL				WATER						
	(cm ³)	ph			(cm ³)	ph			Pour Point °C	(cm ³)	Rml 75°F	Sal. ppm	Rrf 75°F	Sal. ppm	Titration ppm
	g/cm ³	API	T°C		g/cm ³	API	T°C								
WATER & FILTRATE	-	-	-	-	-	-	-	-	-	8000	-	-	-	-	CL ⁻ = 11300

REMARKS : SEAL PARTIALLY LOST DURING CLOSING OF SEAL VALVE. SAMPLING WAS STOPPED TO AVOID ANY FLUID CONTAMINATION. SCHLUMBERGER RUN/TEST NO: 7E/2

RFT RESULTS

RFT NUMBER Run/Test	DEPTH TMD SS	STRATIGRAPHIC ATTRIBUTION	CHAMBER gal choke	MUD WEIGHT (g/cm ³)	PRESSURES (kg/cm ²)			Sampling Time (min)	RECOVERY DATA						
					Hydrost. s g	Shut in eq d	Surface chamber		GAS (dm ³)	GAS COMPOSITION (%)					
										C1	C2	C3	iC4	nC4	iC5
2	3697.8 3671		6 2x20	1.58	593.3 1.60	-	45.7	16	914	4.8	2.6	.87	.092	.058	-

INTERPRETATION :	RECOVERY DATA														
	CONDENSATE				OIL				WATER						
	(cm ³)	ph			(cm ³)	ph			Pour Point °C	(cm ³)	Rmf 75°F	Sal. ppm	Rrf 75°F	Sal. ppm	Titration ppm
	g/cm ³	API	T°C		g/cm ³	API	T°C								
OIL & GAS SAMPLE	-	-	-	-	13000	.81	124	-	3500	-	-	-	-	-	CL ⁻ = 1200
REMARKS :	SUCCESSFUL SAMPLING AFTER FIRST ATTEMPT AT 3697.5 m, CAUSING PLUGGING. THE VERY LOW SALINITY IS PROBABLY CAUSED BY SURFACE POLLUTION.														
	SCHLUMBERGER RUN/TEST No: 7D/1														

RFT NUMBER Run/Test	DEPTH TMD SS	STRATIGRAPHIC ATTRIBUTION	CHAMBER gal choke	MUD WEIGHT (g/cm ³)	PRESSURES (kg/cm ²)			Sampling Time (min)	RECOVERY DATA						
					Hydrost. s g	Shut in eq d	Surface chamber		GAS (dm ³)	GAS COMPOSITION (%)					
										C1	C2	C3	iC4	nC4	iC5
1	3530 3504		6 2x20	1.58	567.0 1.60	-	105.5	24	442	18.0	0.8	0.23	.02	.025	-

INTERPRETATION :	RECOVERY DATA														
	CONDENSATE				OIL				WATER						
	(cm ³)	ph			(cm ³)	ph			Pour Point °C	(cm ³)	Rmf 75°F	Sal. ppm	Rrf 75°F	Sal. ppm	Titration ppm
	g/cm ³	API	T°C		g/cm ³	API	T°C								
GAS & WATER SAMPLE	-	-	-	-	-	-	-	-	-	16500	-	-	-	-	CL ⁻ = 9000
REMARKS :	SAMPLING PRESSURE: 112.5 kg/cm ²														
	SCHLUMBERGER RUN/TEST No: 7D/2														

TOTAL MARINE NORSK A.S

RFT RESULTS

Well: 29/3-1

Table 6c

RFT NUMBER Run/Test	DEPTH TMD SS	STRATIGRAPHIC ATTRIBUTION	CHAMBER gal choke	MUD WEIGHT (g/cm ³)	PRESSURES (kg/cm ²)			Sampling Time (min)	RECOVERY DATA						
					Hydrost. s.g	Shut in eq.d	Surface chamber		GAS (dm ³)	GAS COMPOSITION (%)					
										C1	C2	C3	iC4	nC4	iC5
5	3719m		6	1.59	599.9	-	-	27	651	45	1.8	0.73	0.72	0.66	-
	3692m	4x20	1.61		-										

INTERPRETATION :	RECOVERY DATA														
	CONDENSATE				OIL				MUD						
	(cm ³)	ρh		T°C	(cm ³)	ρh		T°C	Pour Point °C	(cm ³)	Rmf 75°F	Sal. ppm	Rrf 75°F	Sal. ppm	Titration ppm
OIL & GAS SAMPLES	-	-	-		-	8000	-			.81	-	-	10000	-	-

REMARKS : ALL PRESSURES ARE SGP VALUES
 PARTIAL PLUGGING CAUSED LACK OF STABILIZATION OF THE PRESSURES SCHLUMBERGER RUN/TEST No. 7F/1

RFT NUMBER Run/Test	DEPTH TMD SS	STRATIGRAPHIC ATTRIBUTION	CHAMBER gal choke	MUD WEIGHT (g/cm ³)	PRESSURES (kg/cm ²)			Sampling Time (min)	RECOVERY DATA						
					Hydrost. s.g	Shut in eq.d	Surface chamber		GAS (dm ³)	GAS COMPOSITION (%)					
										C1	C2	C3	iC4	nC4	iC5
4	3821.5m		6	1.59	614.6	-	-	6	-	-	-	-	-	-	-
	3794	4x20	1.61		-										

INTERPRETATION :	RECOVERY DATA														
	CONDENSATE				OIL				MUD						
	(cm ³)	ρh		T°C	(cm ³)	ρh		T°C	Pour Point °C	(cm ³)	Rmf 75°F	Sal. ppm	Rrf 75°F	Sal. ppm	Titration ppm
OIL & WATER SAMPLE	-	-	-		-	12000	-			.82	-	-	8000	-	-

REMARKS : ALL PRESSURES ARE SGP VALUES
 PARTIAL PLUGGING CAUSED LACK OF STABILIZATION OF THE PRESSURES SCHLUMBERGER RUN/TEST No. 7E/2

Timing

Initial flow : 3 mn
" build up : 114 mn
Clean up flow : 618 mn
Build up after clean up : 222 mn
Main flow : 696 mn
Main build up : 1410 mn

No flow of reservoir fluid reached surface in 22 hours. Oil (specific gravity: 0.88 g/cm³) was recovered during reverse circulation.

Fluid properties: Gas: specific gravity (air=1): 0.69

composition: C₁: 81.7%, C₂: 10.5%

C₃⁺: 5.2%, iC₄: 1.2%, nC₄: 1.4%

H₂S: NIL, CO₂: NIL

Pressures - Temperatures

Gauge depth for pressure measurements: 3775.0 m
Initial flow : 379.5 kg/cm² (5396.5 psi)
Initial build up : 523.6 kg/cm² (7445.1 psi)
Build up after clean up : 512.6 kg/cm² (7288.5 psi)
Main flow : 371.9 kg/cm² (5288.5 psi)
Main build up : 537.1 kg/cm² (7637.4 psi)
Extrapolated pressure : 553.8 kg/cm² (7874.4 psi)
Bottom hole temperature : 130.0°C (266°F) at 3775.0 m

Analysis results

Kh : 1.174 mD.m
K : 0.10 mD
Skin: - 1
Radius of investigation: 14.8 m

DST 2B RESULTS

Packer set at : 3671.6 m
Perforated intervals : 3682 - 3685.5 m
3695 - 3699 m
3715 - 3725 m

Timing

Initial flow : 3 mn
Initial build up : 480 mn
Main flow (32/64") : 756 mn
Main build up : 1082 mn

Production data

Choke : 32/64"
Gas flow (initial-final): 396480 - 535250 m³/d (14.0 - 18.9 MMSCF/d)
Oil flow (initial-final): 666.4 - 433.4 m³/d (4191 - 2726 STB/d)
GOR (initial-final) : 595.0 m³/m³ - 1235.0 m³/m³
(3338 - 6808 SCF/STB)

BSW : 0%
Well head pressure : 272.0 - 307.3 kg/cm² (3867.8 - 4369.8 psi)
Well head temperature : 74°C (165°F)
Separator pressure : 58.4 kg/cm² (830.4 psi)
Separator temperature : 53°C (127°F)

The variations in the production parameters indicate a gas coning effect.

Fluid properties

- gas: specific gravity (air=1) = 0.68
CO₂: 5%, H₂S NIL
- oil: specific gravity = 0.87

Pressures - Temperatures

Gauge depth for pressure measurements: 3663.6 m
Initial flow : 510.7 kg/cm² (7262.2 psi)
Initial build up : 558.4 (7940.4 psi)
Main flow : 521.6 kg/cm² (7417.2 psi)

Main build up : 557.3 kg/cm² (7924.8 psi)
Bottom hole temperature : 123.9°C (255°F)

DST 2C RESULTS

Packer set at : 3671.6 m
Perforated intervals : 3682 - 3685.5 m
3695 - 3699 m

Timing

Initial flow (0.32 mm) : 3 mn
" build up : 63 mn
Main flow (12.7 mm) : 668 mn
Main build up : 1075 mn

Production data

Choke : 12.7 mm (32/64")
Gas flow : 438960 m³/d (15.5 MMSCF/d)
Oil flow : 238.5 m³/d (1500 STB/d)
GOR : 1840.5 m³/m³ (10400 SCF/STB)
BSW : 0%
Well head pressure :
(initial-final) : 220.9 - 216.6 kg/cm² (3141.2 - 3080.1 psi)
Well head temperature : 62.5°C (145°F)
Separator pressure : 55.9 kg/cm² (794.9)
Separator temperature : 74°C (165°F)

Fluid properties

-
- gas: specific gravity (air=1) = 0.72
composition: CO₂: 5.5%, H₂S: NIL
 - oil: specific gravity = 0.85

Pressures - Temperatures

Gauge depth for pressure measurements: 3649.9 m

Initial flow	:	552.9 kg/cm ²	(7862.2 psi)
Initial build up	:	551.9	(7848.0 psi)
Main flow	:	378.1 kg/cm ²	(5376.6 psi)
Main build up	:	548.9 kg/cm ²	(7805.4 psi)
Bottom hole temperature	:	129°C (264°F) at 3659 m	

DST 3 RESULTS

Packer set at : 3509.9 m
Perforated intervals : 3522 - 3530 m

Timing

Initial flow	:	3 mn
" build up	:	62 mn
Main flow (12.7 mm)	:	496 mn
Main build up	:	779 mn

Production data

Choke : 12.7 mm (32/64")
Gas flow : Non-detectable rate
Water flow : 219.4 m³/d (1380 STB/d)
BSW : 100%
Well head pressure : 7.7 kg/cm² (109.5 psi)
Well head temperature : 55°C (131°F)

Fluid properties

- gas: CO₂: 21%, H₂O: NIL
- water: specific gravity = 1.008 (22°C)
salinity = 14000 - 15000 ppm (NaCl equivalent)
formation volume factor = 1.035
viscosity = 0.248 cp

Pressures - Temperatures

Gauge depth for pressure measurements: 3505 m
Initial flow : 449.7 kg/cm² (6394.7 psi)
Initial build up : 490.8 kg/cm² (6979.2 psi)
Main flow : 348.6 kg/cm² (4957.1 psi)
Main build up : 491.0 kg/cm² (6982.0 psi)
Extrapolated pressure : 492.2 kg/cm² (6999.1 psi) at 3492 m
Bottom hole temperature : 119°C (246°F) at 3505 m

Analysis results

Kh = 244.797 mD.m
Average permeability to water: K = 6.5 mD
Skin = +26

Table 7

DST - RESULTS

Test no.	1B	2B	2C	3
Perf. int. (mRKB)	3802-3803.5 3807-3810 3813-3822	3682-3685.5 3695-3699 3715-3725	3682-3685.5 3695-3699	3522-3530
Flow period no	1	1	1	1
Duration (min)	696	756	668	496
Choke (mm)	7.94	12.7	12.7	12.7
Liquid HC rate (sm ³ /d)	-	666.4-433.4	238.5	-
Gas rate (sm ³ /d)	-	396480-535250	438960	tr
GOR (sm ³ /sm ³)	-	595-1235	1840.5	-
Water rate (sm ³ /d)	-	tr.	tr.	219.4
Oil dens. (kg/m ³)	0.88	0.87	0.85	-
Gas sp.g. (air=1)	0.69	0.68	0.72	-
WHP (kg/cm)	0	272-307.2	220.9-216.6	7.7
WHT (°C)	12.3	73	62.5	55
BHT (°C)	127.5	122	129	119
BHP (kg/cm ²) (main flow)	371.9	520.9	378.1	349.6
Reserv. Press. (kg/cm ²)	553.7	557.4	557.4	492.2

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1/2

ROBERTSON RESEARCH INTERNATIONAL LIMITED

REPORT NO. 6040/Ic

A GEOCHEMICAL EVALUATION OF THE
TOTAL MARINE NORSK 29/3-1 WELL,
NORWEGIAN NORTH SEA

by

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 **Robertson
Research**

2 INTRODUCTION

A geochemical evaluation has been conducted on canned drill cuttings, core chip and sidewall core samples mainly from within the 3000m to TD interval of the Total Marine Norsk A/S 29/3-1 well drilled in the Norwegian North Sea, in accordance with the agreed analytical programme as summarised in telex ref. 2427/DG of 4/3/86. The samples arrived at the laboratories of Robertson Research International Limited in North Wales between 28/7/86 and 29/9/86. All of the cuttings samples were heavily contaminated by the oil-based drilling fluid, and had been affected by turbo-drilling. However, both a core chip sample and the sidewall core samples were of good quality for geochemical analysis.

A preliminary copy of this report was forwarded to the client on 11th November 1986. The report was finalised following discussion between the client and P.C. Barnard on 3rd December 1986. Our client contact with Total Marine Norsk has been P. Raingeard, whose co-operation and assistance during the course of the study is acknowledged.

The Robertson Research International Limited personnel involved with this study have been as follows:

Project supervision and co-ordination	-	P.C. Barnard, S. Thompson
Report preparation	-	M.A. Bastow, S. Thompson
Microscopy studies	-	F. James, S. Coleman, supervised by A.G. Collins
Chemical analysis	-	supervised by D. Bell

The total numbers of analyses carried out in this evaluation are as follows:

Airspace gaseous hydrocarbon analysis	:	139
Gasoline hydrocarbon analysis	:	15
Solvent extraction (non-quantitative)	:	55
Sample preparation (washing and lithology description)	:	62
Picking of individual lithologies	:	15
Total organic carbon content	:	69
Carbon isotopic composition (methane)	:	2
Rock-Eval pyrolysis	:	63

Solvent extraction (quantitative)	:	1
Alkane gas chromatography	:	1
Kerogen preparation	:	19
Vitrinite reflectivity (including 2 polished rocks)	:	21
Spore colour index	:	19

The stratigraphic breakdown of the well used in this report is taken from the Summary Log from Robertson Research International Limited confidential report number 3572/Ia issued in December 1986. Information on mud types, casing points, temperatures and drilling procedures were supplied by the client and obtained from the electric logs.

WELL DATA

Operator	:	Total Marine Norsk
Well designation	:	Exploration
Location	:	Block 29, Norwegian North Sea
Co-ordinates	:	Latitude 60°57'50.500"N Longitude 01°56'13.200"E
Spud date	:	20th May 1986
Completion date	:	16th September 1986
Total depth	:	4428m (14525')
Well status	:	Plugged and abandoned
Contractor	:	Dolphin A/S
Rig	:	Byford Dolphin
Rig type	:	Semi-submersible

Water depth : 131m (430')

Drill floor elevation : 24.8m (81')

Kelly bushing elevation : 25.3m (83')

Casing details : 30" casing set at 204m (669')
 20" casing set at 756m (2480')
 13 $\frac{3}{8}$ " casing set at 2252m (7389')
 9 $\frac{5}{8}$ " casing set at 3560m (11680')
 7" casing set at 3916m (12848')

Formation temperatures : 30°C at 758.0m
 (circulation ceased 11.75 hours)
 corrected temperature 36.7°C
 51°C at 2250.0m
 (circulation ceased 7.75 hours)
 corrected temperature 66°C
 104°C at 3485.5m
 (circulation ceased 13.75 hours)
 corrected temperature 114°C
 109°C at 3487.0m
 (circulation ceased 18.75 hours)
 corrected temperature 118°C
 113°C at 3613.0m
 (circulation ceased 9.5 hours)
 corrected temperature 131°C
 133°C at 4432.0m
 (circulation ceased 9.5 hours)
 corrected temperature 151°C

Drilling fluids : 17 $\frac{1}{2}$ " hole drilled with KCL/polymer fluid. Well section below 13 $\frac{3}{8}$ " casing point drilled with Safemud Invert Emulsion; composition over interval 2280m to 3484m: 78% oil, 22% water, density 1.35 to 1.58, yield point 16, plastic viscosity 9-22, gels 4/12; composition over interval 3484m to

4427m: 80% oil, 20% water, density 1.58, yield point 24, plastic viscosity 22, gels 5/13.

GENERAL DATA

Interval analysed : Source rock and maturity studies of the interval 2970m to 4385m; airspace gaseous hydrocarbon analyses carried out over the interval 230m to 4410m.

Sample type and quality : 139 canned, wet drill cuttings samples were received; in addition, 13 sidewall core samples and 2 conventional core samples were obtained.

Maturity data quality : Good spore colour index and vitrinite reflectivity maturity data were obtained despite the use of oil-based drilling fluid and turbine-operated drill bits.

Source rock data quality : Generally good; oil-based drilling fluid necessitated the solvent extraction of samples prior to analysis.

Gas chromatography run at: 3535.5m-3536.1m(core)

SAMPLE DEPTH (METRES)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY R oil av %	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)				
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL	
2970	Ctgs	MDST, med gy, calc	5.0?	.53(8) .36(2)C .77(14)R	IND	ETERMIN	ATE					
	"	After extraction						10	60	*	30	
3000	"	MDST, med gy, calc										
	"	After extraction						*	60	10	30	
3030	"	MDST, med gy, calc										
	"	After extraction						10	65	*	25	
3060	"	MDST, med gy, calc	5.5 - 6.0	.49(12) .79(16)R 1.07(2)R	IND	ETERMIN	ATE					
	"	After extraction						10	60	*	30	
3090	"	MDST, med gy, calc										
	"	After extraction						10	65	*	25	
3120	"	MDST, med gy, calc										
	"	After extraction						15	60	*	25	
3150	"	MDST, med gy, calc	*	.52(17) .81(12)R 1.32(1)R	IND	ETERMIN	ATE					
	"	After extraction						10	60	*	30	
3180	"	MDST, med gy, calc										
	"	After extraction						10	65	*	25	
3210	"	MDST, med gy, calc										
	"	After extraction						35	35	*	30	
3240	"	MDST, med gy, calc	6.5	.58(19) .43(9)C .86(18)R	IND	ETERMIN	ATE					
	"	After extraction						35	35	*	30	
3270	"	MDST, med gy, calc										
	"	After extraction						40	40	*	30	
3300	"	MDST, med gy, calc+ 20% MDST, lt gy, calc										
	P	MDST, med gy, calc										
	P	After extraction						40	45	*	15	
3330	Ctgs	MDST, dk gy, calc	*	.62(5) .36(1)C 1.00(8)R	IND	ETERMIN	ATE					
	"	After extraction						45	45	*	10	
3390	"	MDST, med gy, calc+ mnr MDST, lt gy, calc										
	"	After extraction						35	45	*	20	

Maturity and Kerogen Composition Data

TABLE 1A

SAMPLE DEPTH (METRES)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY R _{oil av} %	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)				
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL	
3420	Ctgs	MDST, med gy, calc	5.5 - 6.0	.61(28) .39(2)C .88(13)R	IND	ETERMIN	ATE					
	"	After extraction						*	25	10	65	
3480	"	MDST, med-dk gy, calc										
	"	After extraction						25	45	10	20	
3506	"	MDST, med-dk gy, calc+ mnr MDST, v lt gy, calc	5.5 - 6.0	.60(19) .41(2)C .86(7)R 1.28(5)R	50?	50?	* ?					
	"	After extraction						20	80	*	*	
	P	MDST, med-dk gy, calc										
	P	After extraction						20	80	*	*	
3553	Swc	SH, ol-gy						60	15	15	10	
3560	Core	SH, gy-blk	6.5	.58(30)	30?	70?	* ?	65	5	*	30	
3570	Ctgs	MDST, med-dk gy + mnr MDST, v lt gy, calc										
	"	After extraction						35	50	10	5	
	P	MDST, med-dk gy										
	P	After extraction						20	50	15	15	
3600	Ctgs	MDST, med-dk gy + 30% MDST, v lt gy, calc	6.5	.60(19) .47(17)C .89(19)R	40	60	*					
	"	After extraction						25	60	10	5	
3630	"	MDST, v lt gy, calc+ 20% MDST, dk gy										
	"	After extraction						45	40	5	10	
	P	MDST, dk gy										
	P	After extraction						35	35	15	15	
3660	Ctgs	MDST, v lt gy, calc+ 30% MDST, dk gy										
	"	After extraction						45	50	*	5	
	P	MDST, dk gy										
	P	After extraction						85	10	*	5	
3667.5	Swc	LIG						55	5	20	20	
	"	LIG		.69(21) .85(33)R								
3687	"	SH, dk gy						40	60	*	*	
3690	Ctgs	SH, dk gy+ 30% CMT	6.0 - 6.5	.60(47) .49(6)C .76(2)R	20	80	*					
	"	After extraction						25	70	*	5	
	P	SH, dk gy										
	P	After extraction						45	5	10	40	

Maturity and Kerogen Composition Data

TABLE 1B

SAMPLE DEPTH (METRES)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1-10)	VITRINITE REFLECTIVITY R _{oil av} %	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
3710	Swc	SH, blk, carb	7.0	.59(41) .47(14)L	30	70	*	55	10	30	5
	"	SH, blk, carb		.67(28) .84(21)R .51(5)L							
3720	Ctgs	CMT+ 10% SST, wht+ mnr SH, dk gy									
	P	SH, dk gy									
	P	After extraction						35	50	5	10
3750	Ctgs	SH, dk gy+ 10% SST, v lt gy+ mnr CMT									
	"	After extraction						45	25	10	20
3780	"	SH, dk gy+ 30% SST, v lt gy	7.0	.54(51) .42(2)C .85(2)R	20	80	*				
3810	"	SH, dk gy+ 10% SST, v lt gy									
	"	After extraction						20	80	*	*
3825	Swc	SH, dk gy, slty						50	50	*	*
3840	Ctgs	SST, v lt gy+ 20% SH, dk gy									
	P	SH, dk gy									
	P	After extraction						55	45	*	*
3870	Ctgs	SST, yel-gy+ 20% SH, med-dk gy	7.0	.65(22) .49(27)C 1.01(6)R	10?	90?	* ?				
	P	SH, med-dk gy									
	P	After extraction						55	45	*	*
3930	Ctgs	SH, dk gy									
	"	After extraction						45	55	*	*
3960	"	SH, dk gy	6.5 - 7.0	.73(26) .47(4)C 1.01(8)R	20	80	*				
	"	After extraction						20	60	*	20
3990	"	SH, blk									
	"	After extraction						20	55	*	25
4000	Swc	SH, dk gy						65	35	*	*
4050	Ctgs	SH, med-dk gy+ 20% CHK	7.0	.75(8) .41(24)C 1.24(3)R	10	90	*				
4140	"	SH, blk	7.0 - 7.5	.79(8) .50(8)C 1.18(2)R	10	90	*				
	"	After extraction									
4230	"	SH, med-dk gy	7.5	.73(19) .50(10)C 1.16(3)R	10	90	*				

Maturity and Kerogen Composition Data

TABLE 1C

SAMPLE DEPTH (METRES)	SAMPLE TYPE	GENERALISED LITHOLOGY	SPORE COLOUR INDEX (1 - 10)	VITRINITE REFLECTIVITY R _{oil av} %	KEROGEN COMPOSITION (%) (by microscopic examination)			KEROGEN COMPOSITION (%) (by calculation from pyrolysis data)			
					INERTINITE	VITRINITE	SAPROPEL	INERTINITE	VITRINITE	ALGAL SAPROPEL	WAXY SAPROPEL
4320	Ctgs	SH, dk gy	7.0	.83(34) .55(3)C 1.21(18)R	20	80	*				
4380	"	SH, dk gy	8.0?	.75(37) .56(10)C 1.07(8)R	10?	90?	* ?				

Maturity and Kerogen Composition Data

TABLE 1D

GENERAL DATA			CHEMICAL ANALYSIS DATA														
SAMPLE DEPTH (METRES)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	PYROLYSIS					SOLVENT EXTRACTION								
				TEMPERATURE °C	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	% OF EXTRACT	ALKANES % OF HYDRO-CARBONS			
2970	Ctgs	MDST, med gy, calc	-							*							
	"	After extraction	.90	438	288	65	.14	2600									
3000	"	MDST, med gy, calc	-							*							
	"	After extraction	1.08	440	322	63	.42	3480									
3030	"	MDST, med gy, calc	-							*							
	"	After extraction	1.22	440	267	53	.48	3270									
3060	"	MDST, med gy, calc	-							*							
	"	After extraction	1.00	443	286	57	.07	2860									
3090	"	MDST, med gy, calc	-							*							
	"	After extraction	1.18	442	252	61	.11	2980									
3120	"	MDST, med gy, calc	-							*							
	"	After extraction	1.19	443	234	68	.17	2800									
3150	"	MDST, med gy, calc	-							*							
	"	After extraction	1.13	439	275	61	.22	3120									
3180	"	MDST, med gy, calc	-							*							
	"	After extraction	1.37	440	249	47	.56	3420									
3210	"	MDST, med gy, calc	-							*							
	"	After extraction	1.35	445	209	50	.35	2830									
3240	"	MDST, med gy, calc	-							*							
	"	After extraction	1.07	449	211	56	.10	2270									
3270	"	MDST, med gy, calc	-							*							
	"	After extraction	1.31	446	220	61	.32	2890									
3300	"	MDST, med gy, calc+ 20% MDST, lt gy, calc	-							*							
	"	After extraction	.54														
	P	MDST, med gy, calc	-							*							
	P	After extraction	.79	450	154	106	.09	1220									
3330	Ctgs	MDST, dk gy, calc	-							*							
	"	After extraction	.95	449	130	94	.06	1240									
3360	"	MDST, med-dk gy, calc+ 40% MDST, lt gy, calc	-							*							
	"	After extraction	.54														
	P	MDST, med-dk gy, calc+ 40% MDST, lt gy, calc	-							*							
	P	After extraction	.46														
3390	Ctgs	MDST, med gy, calc+ mnr MDST, lt gy, calc	-							*							
	"	After extraction	.80	455	208	88	.03	1670									
	P	MDST, med gy, calc	-							*							

Chemical Analysis Data

TABLE 2A

GENERAL DATA			CHEMICAL ANALYSIS DATA											
SAMPLE DEPTH (METRES)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	PYROLYSIS					SOLVENT EXTRACTION					
				TEMPERATURE °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	
3390	P	After extraction	.68	456	180	112	.06	1230						
3420	Ctgs	MDST, med gy, calc	-						*					
	"	After extraction	.71	441	400	213	.03	2840						
3450	"	MDST, med-lt gy, calc	-						*					
	"	After extraction	.39											
3480	"	MDST, med-dk gy, calc	-						*					
	"	After extraction	2.22	436	222	195	.02	4930						
3506	"	MDST, med-dk gy, calc+ mnr MDST, v lt gy, calc	-						*					
	"	After extraction	3.34	437	107	45	.04	3600						
	P	MDST, med-dk gy, calc	-						*					
	P	After extraction	3.49	437	123	57	.04	4310						
3535.5 - 536.1	Core	SST, lt gy	-						3110					
3553	Swc	SH, ol-gy	5.79	434	144	8	.13	8390						
3560	Core	SH, gy-blk	5.51	434	210	33	.47	11580						
3570	Ctgs	MDST, med-dk gy+ mnr MDST, v lt gy, calc	-						*					
	"	After extraction	8.83	438	161	11	.02	14230						
	P	MDST, med-dk gy	-						*					
	P	After extraction	10.80	436	220	35	.02	23840						
3600	Ctgs	MDST, med-dk gy+ 30% MDST, v lt gy, calc	-						*					
	"	After extraction	6.60	438	153	23	.02	10140						
	P	MDST, v lt gy, calc	-						*					
	P	After extraction	.66											
3630	Ctgs	MDST, v lt gy, calc+ 20% MDST dk gy	-						*					
	"	After extraction	2.18	440	114	57	.03	2500						
	P	MDST, dk gy	-						*					
	P	After extraction	6.85	436	180	16	.02	12380						
3660	Ctgs	MDST, v lt gy, calc+ 30% MDST dk gy	-						*					
	"	After extraction	2.62	*	109	53	.03	2880						
	P	MDST, dk gy	-						*					
	P	After extraction	10.89	*	78	3	.03	8510						
3667.5	Swc	LIG	23.84	436	209	5	.04	50060						
3687	"	SH, dk gy	1.39	439	97	49	.33	1350						
3690	Ctgs	SH, dk gy+ 30% CMT	-						*					
	"	After extraction	3.44	444	132	49	.02	4580						

Chemical Analysis Data

TABLE 2B

GENERAL DATA			CHEMICAL ANALYSIS DATA														
SAMPLE DEPTH (METRES)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	PYROLYSIS					SOLVENT EXTRACTION								
				TEMP - ERATURE °C	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	% OF EXTRACT	ALKANES % OF HYDRO-CARBONS			
3690	P	SH, dk gy	-							*							
	P	After extraction	9.59	442	229	3	.01	22030									
3710	Swc	SH, blk, carb	9.30	435	160	6	.06	14930									
3720	Ctgs	CMT+ 10% SST, wht+ mnr SH, dk gy	-														
	P	SH, dk gy	-							*							
	P	After extraction	2.94	441	132	18	.03	3900									
3750	Ctgs	SH, dk gy+ 10% SST, v lt gy+ mnr CMT	-							*							
	"	After extraction	3.10	445	143	55	.03	4450									
3780	"	SH, dk gy+ 30% SST, v lt gy	-														
3810	"	SH, dk gy+ 10% SST, v lt gy	-							*							
	"	After extraction	2.36	445	122	54	.03	2880									
3825	Swc	SH, dk gy, slty	1.69	436	74	73	.28	1260									
3840	Ctgs	SST, v lt gy+ 20% SH, dk gy	-							*							
	P	SH, dk gy	-							*							
	P	After extraction	1.22	439	69	26	.12	850									
3870	Ctgs	SST, yel-gy+ 20% SH, med-dk gy	-														
	P	SH, med-dk gy	-							*							
	P	After extraction	1.65	448	74	176	.08	1230									
3900	Ctgs	SST, yel-gy+ mnr SH, dk gy	-							*							
	P	SH, dk gy	-							*							
	P	After extraction	-														
3930	Ctgs	SH, dk gy	-							*							
	"	After extraction	1.29	442	86	72	.06	1120									
3935	Swc	SH, dk gy, slty	2.04	442	66	13	.27	1360									
3960	Ctgs	SH, dk gy	-							*							
	"	After extraction	1.33	442	126	39	.03	1680									
3990	"	SH, blk	-							*							
	"	After extraction	1.15	439	149	94	.09	1720									
4000	Swc	SH, dk gy	1.91	446	55	19	.34	1060									
4020	Ctgs	MDST, med gy	-							*							
	"	After extraction	.83	439	95	112	.07	800									
4042	Swc	SH, dk gy	1.31	444	101	30	.29	1330									
4050	Ctgs	SH, med-dk gy+ 20% CHK	-														
	P	SH, med-dk gy	-							*							
	P	After extraction	.84	442	147	86	.09	1240									

Chemical Analysis Data

TABLE 2C

GENERAL DATA			CHEMICAL ANALYSIS DATA										
SAMPLE DEPTH (METRES)	SAMPLE TYPE	ANALYSED LITHOLOGY	ORGANIC CARBON % OF ROCK	PYROLYSIS				SOLVENT EXTRACTION					
				TEMPERATURE °C	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	% OF EXTRACT	
4080	Ctgs	SH, blk+ 10% CHK	-										
	P	SH, blk	-							*			
	P	After extraction	.92	441	84	29	.12	780					
4110	Ctgs	SH, dk gy+ mnr CHK	-							*			
	"	After extraction	1.07	443	102	54	.04	1100					
4140	"	SH, blk	-							*			
	"	After extraction	1.15	446	133	65	.03	1540					
4170	"	SH, dk gy	-							*			
	"	After extraction	1.19	446	160	68	.02	1910					
4195	Swc	SH, dk gy	1.34	438	54	160	.36	740					
4200	Ctgs	SH, med-dk gy	-							*			
	"	After extraction	1.37	445	233	65	.02	3200					
4208	Swc	SH, dk gy	1.13	453	60	214	.39	690					
4230	Ctgs	SH, med-dk gy	-							*			
	"	After extraction	1.23	446	143	91	.02	1770					
4260	"	SH, med-dk gy+ mnr CHK	-							*			
	"	After extraction	1.12	446	120	75	.02	1350					
4272	Swc	SH, dk gy	1.01	448	57	47	.29	590					
4290	Ctgs	SH, dk gy	-							*			
	"	After extraction	1.12	447	85	87	.05	960					
4320	"	SH, dk gy	-							*			
	"	After extraction	1.04	446	101	76	.06	1060					
4350	"	SH, dk gy	-							*			
	"	After extraction	.60										
4360	Swc	SH, dk gy, slty	.63	*	34	234	.76	220					
4375	"	SH, gy-blk, slty	.58	443	81	149	.45	470					
4380	Ctgs	SH, dk gy	-							*			
	"	After extraction	.80	446	139	105	.04	1120					
4385	Swc	SH, gy-blk, slty	.80	448	73	58	.53	590					

Chemical Analysis Data

TABLE 2D

TABLE 3(A-C)

Rock-Eval Pyrolysis Raw Data

TOTAL MARINE 29/3-1

	S1	S2	S3	TEMP	S2/S3	HIND	OIND	PIND	YIELD
2970.0	0	0.	0	0	0	0	0	0.00	0.
2970.0	420	2600.	590	438	4	288	65	.14	2600.
3000.0	0	0.	0	0	0	0	0	0.00	0.
3000.0	2515	3480.	685	440	5	322	63	.42	3480.
3030.0-----	0	0.	0	0	0	0	0	0.00	0.
3030.0	3035	3265.	650	440	5	267	53	.48	3265.
3060.0	0	0.	0	0	0	0	0	0.00	0.
3060.0	225	2860.	575	443	4	286	57	.07	2860.
3090.0	0	0.	0	0	0	0	0	0.00	0.
3090.0-----	385	2975.	730	442	4	252	61	.11	2975.
3120.0	0	0.	0	0	0	0	0	0.00	0.
3120.0	585	2795.	810	443	3	234	68	.17	2795.
3150.0	0	0.	0	0	0	0	0	0.00	0.
3150.0	900	3115.	700	439	4	275	61	.22	3115.
3180.0-----	0	0.	0	0	0	0	0	0.00	0.
3180.0	4415	3420.	655	440	5	249	47	.56	3420.
3210.0	0	0.	0	0	0	0	0	0.00	0.
3210.0	1505	2825.	680	445	4	209	50	.35	2825.
3240.0	0	0.	0	0	0	0	0	0.00	0.
3240.0-----	240	2265.	600	449	3	211	56	.10	2265.

TOTAL MARINE 29/3-1

	S1	S2	S3	TEMP	S2/S3	HIND	OIND	PIND	YIELD
3270.0	0	0.	0	0	0	0	0	0.00	0.
3270.0	1330	2890.	800	446	3	220	61	.32	2890.
3300.0	0	0.	0	0	0	0	0	0.00	0.
3300.0	0	0.	0	0	0	0	0	0.00	0.
3300.0-----	0	0.	0	0	0	0	0	0.00	0.
3300.0	125	1220.	845	450	1	154	106	.09	1220.
3330.0	0	0.	0	0	0	0	0	0.00	0.
3330.0	75	1235.	900	449	1	130	94	.06	1235.
3360.0	0	0.	0	0	0	0	0	0.00	0.
3360.0-----	0	0.	0	0	0	0	0	0.00	0.
3360.0	0	0.	0	0	0	0	0	0.00	0.
3360.0	0	0.	0	0	0	0	0	0.00	0.
3390.0	0	0.	0	0	0	0	0	0.00	0.
3390.0	55	1665.	705	455	2	208	88	.03	1665.
3390.0-----	0	0.	0	0	0	0	0	0.00	0.
3390.0	85	1225.	765	456	1	180	112	.06	1225.
3420.0	0	0.	0	0	0	0	0	0.00	0.
3420.0	75	2840.	1515	441	1	400	213	.03	2840.
3450.0	0	0.	0	0	0	0	0	0.00	0.
3450.0-----	0	0.	0	0	0	0	0	0.00	0.

TOTAL MARINE		29/3-1								
	SI	S2	S3	TEMP	S2/S3	HIND	OIND	PIND	YIELD	
3480.0	0	0.	0	0	0	0	0	0.00	0.	
3480.0	120	4930.	4350	436	1	222	195	.02	4930.	
3506.0	0	0.	0	0	0	0	0	0.00	0.	
3506.0	140	3600.	1520	437	2	107	45	.04	3600.	
3506.0-----	0	0.	0	0	0	0	0	0.00	0.	
3506.0	200	4305.	2015	437	2	123	57	.04	4305.	
	0	0.	0	0	0	0	0	0.00	0.	
3553.0	1250	8385.	515	434	16	144	8	.13	8385.	
3560.0	10465	11580.	1860	434	6	210	33	.47	11580.	
3570.0-----	0	0.	0	0	0	0	0	0.00	0.	
3570.0	260	14225.	990	438	14	161	11	.02	14225.	
3570.0	0	0.	0	0	0	0	0	0.00	0.	
3570.0	500	23840.	3840	436	6	220	35	.02	23840.	
3600.0	0	0.	0	0	0	0	0	0.00	0.	
3600.0-----	225	10140.	1520	438	6	153	23	.02	10140.	
3600.0	0	0.	0	0	0	0	0	0.00	0.	
3600.0	0	0.	0	0	0	0	0	0.00	0.	
3630.0	0	0.	0	0	0	0	0	0.00	0.	
3630.0	85	2500.	1245	440	2	114	57	.03	2500.	
3630.0-----	0	0.	0	0	0	0	0	0.00	0.	

TOTAL MARINE		29/3-1								
	SI	S2	S3	TEMP	S2/S3	HIND	OIND	PIND	YIELD	
3630.0	260	12375.	1155	436	10	180	16	.02	12375.	
3660.0	0	0.	0	0	0	0	0	0.00	0.	
3660.0	80	2875.	1405	-5	2	109	53	.03	2875.	
3660.0	0	0.	0	0	0	0	0	0.00	0.	
3660.0-----	250	8510.	385	-5	22	78	3	.03	8510.	
3667.5	2165	50055.	1265	436	39	209	5	.04	50055.	
3687.0	670	1350.	685	439	1	97	49	.33	1350.	
3690.0	0	0.	0	0	0	0	0	0.00	0.	
3690.0	110	4575.	1690	444	2	132	49	.02	4575.	
3690.0-----	0	0.	0	0	0	0	0	0.00	0.	
3690.0	150	22030.	345	442	63	229	3	.01	22030.	
3710.0	1000	14930.	610	435	24	160	6	.06	14930.	
3720.0	0	0.	0	0	0	0	0	0.00	0.	
3720.0	0	0.	0	0	0	0	0	0.00	0.	
3720.0-----	115	3900.	545	441	7	132	18	.03	3900.	
3750.0	0	0.	0	0	0	0	0	0.00	0.	
3750.0	115	4445.	1705	445	2	143	55	.03	4445.	
3780.0	0	0.	0	0	0	0	0	0.00	0.	
3810.0	0	0.	0	0	0	0	0	0.00	0.	
3810.0-----	85	2880.	1290	445	2	122	54	.03	2880.	

TOTAL MARINE 29/3-1

	S1	S2	S3	TEMP	S2/S3	HIND	DIND	PIND	YIELD
3825.0	490	1260.	1240	436	1	74	73	.28	1260.
3840.0	0	0.	0	0	0	0	0	0.00	0.
3840.0	0	0.	0	0	0	0	0	0.00	0.
3840.0	120	845.	325	439	2	69	26	.12	845.
3870.0-----	0	0.	0	0	0	0	0	0.00	0.
3870.0	0	0.	0	0	0	0	0	0.00	0.
3870.0	100	1225.	2920	448	0	74	176	.08	1225.
3900.0	0	0.	0	0	0	0	0	0.00	0.
3900.0	0	0.	0	0	0	0	0	0.00	0.
3900.0-----	0	0.	0	0	0	0	0	0.00	0.
3930.0	0	0.	0	0	0	0	0	0.00	0.
3930.0	70	1115.	930	442	1	86	72	.06	1115.
3935.0	515	1360.	280	442	4	66	13	.27	1360.
3960.0	0	0.	0	0	0	0	0	0.00	0.
3960.0-----	55	1680.	525	442	3	126	39	.03	1680.
3990.0	0	0.	0	0	0	0	0	0.00	0.
3990.0	160	1715.	1090	439	1	149	94	.09	1715.
4000.0	535	1055.	365	446	2	55	19	.34	1055.
4020.0	0	0.	0	0	0	0	0	0.00	0.
4020.0-----	60	795.	930	439	0	95	112	.07	795.

TOTAL MARINE 29/3-1

	S1	S2	S3	TEMP	S2/S3	HIND	DIND	PIND	YIELD
4042.0	530	1325.	400	444	3	101	30	.29	1325.
4050.0	0	0.	0	0	0	0	0	0.00	0.
4050.0	0	0.	0	0	0	0	0	0.00	0.
4050.0	125	1240.	730	442	1	147	86	.09	1240.
4080.0-----	0	0.	0	0	0	0	0	0.00	0.
4080.0	0	0.	0	0	0	0	0	0.00	0.
4080.0	110	775.	270	441	2	84	29	.12	775.
4110.0	0	0.	0	0	0	0	0	0.00	0.
4110.0	40	1100.	585	443	1	102	54	.04	1100.
4140.0-----	0	0.	0	0	0	0	0	0.00	0.
4140.0	40	1535.	755	446	2	133	65	.03	1535.
4170.0	0	0.	0	0	0	0	0	0.00	0.
4170.0	35	1910.	820	446	2	160	68	.02	1910.
4195.0	420	735.	2145	438	0	54	160	.36	735.
4200.0-----	0	0.	0	0	0	0	0	0.00	0.
4200.0	60	3200.	900	445	3	233	65	.02	3200.
4208.0	430	685.	2420	453	0	60	214	.39	685.
4230.0	0	0.	0	0	0	0	0	0.00	0.
4230.0	45	1765.	1128	446	1	143	91	.02	1765.
4260.0-----	0	0.	0	0	0	0	0	0.00	0.

TOTAL MARINE 29/3-1

	S1	S2	S3	TEMP	S2/S3	HIND	DIND	PIND	YIELD
4260.0	30	1345.	840	446	1	120	75	.02	1345.
4272.0	240	585.	480	448	1	57	47	.29	585.
4290.0	0	0.	0	0	0	0	0	0.00	0.
4290.0	55	955.	975	447	0	85	87	.05	955.
4320.0-----	0	0.	0	0	0	0	0	0.00	0.
4320.0	65	1060.	800	446	1	101	76	.06	1060.
4350.0	0	0.	0	0	0	0	0	0.00	0.
4350.0	0	0.	0	0	0	0	0	0.00	0.
4360.0	685	215.	1475	-5	0	34	234	.76	215.
4375.0-----	380	470.	865	443	0	81	149	.45	470.
4380.0	0	0.	0	0	0	0	0	0.00	0.
4380.0	50	1115.	840	446	1	139	105	.04	1115.
4385.0	675	590.	470	448	1	73	58	.53	590.

SAMPLE DEPTH (METRES)	RELATIVE GASEOUS HYDROCARBON COMPONENT ABUNDANCE (%)					TOTAL ABUNDANCE (ppm)	TOTAL C ₂ -C ₄ (%)	RATIO $\frac{i\text{-Butane}}{n\text{-Butane}}$
	C ₁	C ₂	C ₃	<i>i</i> -C ₄	<i>n</i> -C ₄			
230	99.90	.10	.00	.00	.00	17965	.10	.00
290	98.70	1.30	.00	.00	.00	21675	1.30	.00
320	99.90	.10	.00	.00	.00	28590	.10	.00
350	99.90	.10	.00	.00	.00	26750	.10	.00
380	99.80	.20	.00	.00	.00	13040	.20	.00
410	99.90	.10	.00	.00	.00	10385	.10	.00
440	99.90	.10	.00	.00	.00	9845	.10	.00
470	99.90	.10	.00	.00	.00	9910	.10	.00
500	99.90	.10	.00	.00	.00	15665	.10	.00
530	99.90	.10	.00	.00	.00	16030	.10	.00
560	99.90	.10	.00	.00	.00	15355	.10	.00
590	99.90	.10	.00	.00	.00	13700	.10	.00
620	99.90	.10	.00	.00	.00	11905	.10	.00
650	99.90	.10	.00	.00	.00	7990	.10	.00
680	99.80	.20	.00	.00	.00	3730	.20	.00
710	99.90	.10	.00	.00	.00	12350	.10	.00
730	99.90	.10	.00	.00	.00	6010	.10	.00
760	99.90	.10	.00	.00	.00	6125	.10	.00
790	99.50	.40	.10	.00	.00	785	.50	.00
820	99.70	.10	.20	.00	.00	3640	.30	.00
850	99.60	.30	.10	.00	.00	15130	.40	.00
880	99.80	.10	.10	.00	.00	25120	.20	.00
910	99.90	.10	.00	.00	.00	10315	.10	.00
940	99.80	.10	.10	.00	.00	7665	.20	.00
970	99.90	.10	.00	.00	.00	4040	.10	.00
1000	99.30	.60	.10	.00	.00	905	.70	.00
1060	98.50	1.00	.50	.00	.00	225	1.50	.00

Note: Total gaseous hydrocarbon abundance values are expressed as volume of hydrocarbon gases relative to volume of airspace

TABLE 4A Airspace Gaseous Hydrocarbon Analysis Data

SAMPLE DEPTH (METRES)	RELATIVE GASEOUS HYDROCARBON COMPONENT ABUNDANCE (%)					TOTAL ABUNDANCE (ppm)	TOTAL C ₂ -C ₄ (%)	RATIO $\frac{i\text{-Butane}}{n\text{-Butane}}$
	C ₁	C ₂	C ₃	$i\text{-C}_4$	$n\text{-C}_4$			
1090	95.10	3.20	1.50	.00	.10	75	4.90	.00
1120	92.40	4.60	2.40	.10	.50	40	7.60	.30
1150	92.90	4.60	2.20	.00	.30	40	7.10	.00
1180	95.90	2.90	1.10	.00	.10	60	4.10	.00
1210	92.30	5.00	2.30	.10	.30	35	7.70	.30
1240	95.00	3.40	1.40	.00	.10	60	5.00	.00
1270	95.60	3.40	.90	.00	.10	35	4.40	.00
1300	97.20	2.10	.80	.00	.00	35	2.80	.00
1330	98.00	1.40	.60	.00	.00	35	2.00	.00
1360	96.00	2.60	1.30	.10	.10	55	4.00	1.60
1390	96.70	2.70	.50	.00	.00	30	3.30	.00
1420	97.90	1.50	.50	.00	.10	40	2.10	.00
1450	97.60	1.80	.60	.00	.00	20	2.40	.00
1480	98.10	1.20	.70	.00	.00	25	1.90	.00
1510	96.60	2.40	1.00	.00	.00	25	3.40	.00
1540	96.70	2.30	1.00	.00	.20	20	3.30	.00
1570	96.10	2.90	1.00	.00	.00	20	3.90	.00
1600	95.80	3.60	.60	.00	.00	20	4.20	.00
1630	98.10	1.10	.60	.00	.20	60	1.90	.00
1660	99.50	.30	.20	.00	.00	235	.50	.00
1690	99.40	.50	.10	.00	.00	835	.60	.00
1710	99.40	.50	.10	.00	.00	700	.60	.00
1730	99.50	.40	.00	.00	.00	950	.50	.00
1760	99.00	.80	.10	.10	.00	1870	1.00	1.00
1790	98.00	1.50	.10	.30	.10	1085	2.00	1.90
1820	97.20	2.30	.20	.20	.10	2600	2.80	2.80
1850	97.90	1.80	.10	.10	.00	4510	2.10	.00

Note: Total gaseous hydrocarbon abundance values are expressed as volume of hydrocarbon gases relative to volume of airspace

TABLE 4B Airspace Gaseous Hydrocarbon Analysis Data

SAMPLE DEPTH (METRES)	RELATIVE GASEOUS HYDROCARBON COMPONENT ABUNDANCE (%)					TOTAL ABUNDANCE (ppm)	TOTAL C ₂ -C ₄ (%)	RATIO i-Butane / n-Butane
	C ₁	C ₂	C ₃	i-C ₄	n-C ₄			
1880	97.00	2.60	.20	.20	.10	2890	3.00	3.10
1910	97.80	2.00	.20	.00	.00	3020	2.20	.00
1940	97.20	2.40	.30	.10	.00	2250	2.80	.00
1970	96.40	2.60	.70	.20	.00	2950	3.60	.00
2000	94.00	3.30	1.30	.70	.70	2080	6.00	1.10
2030	90.40	3.90	2.50	1.40	1.90	975	9.60	.70
2060	88.00	2.90	3.70	1.60	3.80	2950	12.00	.40
2090	82.30	3.50	4.80	2.60	6.70	1795	17.70	.40
2120	84.00	3.60	5.20	1.90	5.40	1850	16.00	.30
2150	79.50	4.10	6.90	2.70	6.90	1380	20.50	.40
2180	46.20	3.20	13.20	11.00	26.40	5920	53.80	.40
2210	51.30	3.70	16.10	7.60	21.20	3625	48.70	.40
2240	27.80	4.30	23.50	10.80	33.60	6275	72.20	.30
2265	69.10	4.50	10.50	3.60	12.30	5095	30.90	.30
2300	89.30	4.80	4.00	.40	1.60	1835	10.70	.20
2330	85.50	4.80	5.90	1.20	2.70	1500	14.50	.40
2360	92.00	3.40	2.90	.50	1.10	1290	8.00	.40
2390	88.70	5.50	3.90	.50	1.30	975	11.30	.40
2420	89.60	4.70	4.00	.43	1.40	1370	10.40	.30
2450	91.80	3.80	3.00	.30	1.10	1695	8.20	.30
2480	90.90	4.50	3.10	.30	1.10	1455	9.10	.30
2510	86.40	6.10	5.10	.60	1.70	1055	13.60	.40
2540	89.90	4.80	3.10	.80	1.30	1500	10.10	.60
2570	92.50	4.00	2.40	.30	.80	2470	7.50	.30
2600	85.70	6.50	5.40	.70	1.70	1510	14.30	.40
2630	87.30	6.10	4.40	.70	1.40	2235	12.70	.50
2660	90.60	5.40	2.70	.40	.90	2630	9.40	.40

Note: Total gaseous hydrocarbon abundance values are expressed as volume of hydrocarbon gases relative to volume of airspace

TABLE 4C Airspace Gaseous Hydrocarbon Analysis Data

SAMPLE DEPTH (METRES)	RELATIVE GASEOUS HYDROCARBON COMPONENT ABUNDANCE (%)					TOTAL ABUNDANCE (ppm)	TOTAL C ₂ -C ₄ (%)	RATIO $\frac{i\text{-Butane}}{n\text{-Butane}}$
	C ₁	C ₂	C ₃	<i>i</i> -C ₄	<i>n</i> -C ₄			
2690	88.20	5.80	4.00	.60	1.40	1720	11.80	.40
2720	90.00	6.10	2.80	.30	.70	5655	10.00	.50
2750	88.90	6.10	3.50	.40	1.10	2885	11.10	.40
2780	79.60	9.30	7.20	1.30	2.60	995	20.40	.50
2810	84.50	8.00	5.10	.70	1.60	1820	15.50	.50
2840	89.30	6.00	3.10	.40	1.10	1500	10.70	.40
2870	92.50	4.00	2.30	.40	.80	1840	7.50	.50
2900	78.90	8.40	7.70	1.70	3.30	600	21.10	.50
2930	89.10	5.70	3.40	.50	1.30	975	10.90	.40
2950	89.90	5.40	3.00	.60	1.10	1555	10.10	.50
2970	90.80	5.00	2.70	.40	1.00	1340	9.20	.40
3000	92.00	4.40	2.40	.40	.90	1490	8.00	.40
3030	90.50	5.20	2.80	.50	1.00	990	9.50	.40
3060	89.80	5.70	2.70	.60	1.10	1940	10.20	.60
3090	92.00	4.90	2.00	.40	.70	2375	8.00	.60
3120	86.70	7.30	4.10	.50	1.40	960	13.30	.40
3150	90.90	5.80	2.30	.30	.70	2600	9.10	.40
3180	85.40	7.60	4.70	.70	1.70	1330	14.60	.40
3210	85.60	7.80	4.60	.60	1.40	2065	14.40	.40
3240	87.40	7.30	3.90	.30	1.20	1645	12.60	.30
3270	89.90	6.10	2.70	.30	.90	2555	10.10	.40
3300	86.70	8.70	3.40	.40	.90	3045	13.30	.50
3330	86.80	8.40	3.60	.30	1.00	1400	13.20	.30
3360	83.60	10.10	4.40	.40	1.60	485	16.40	.30
3390	75.70	11.40	9.60	.80	2.50	440	24.30	.10
3420	85.40	9.50	3.80	.20	1.20	1320	14.60	.10
3450	83.30	10.90	5.70	.00	.20	660	16.70	.00

Note: Total gaseous hydrocarbon abundance values are expressed as volume of hydrocarbon gases relative to volume of airspace

TABLE 4D Airspace Gaseous Hydrocarbon Analysis Data