3.3 FMT pressures

Six FMT-runs were performed in the 6610/3-1 and 6610/3-1R wells. Out of this, two runs were performed in the 17 1/2" section and one run in the 12 1/4" section in the well 6610/3-1 and three runs in the 8 1/2" section in the well 6610/3-1R. The pretest pressures are listed in table 3.3.1 to 3.3.5 and plotted in figures 3.3 and 3.4.

Well 6610/3-1 (Table 3.3.1 and 3.3.2 and figure 3.3):

Run 2A: Out of nine attempts seven were good, one tight and one No Seal. The good pretest pressure points give a water gradient of 1.026 g/cc.

Run 2B: One Segregated sample was taken at 1645 m RKB.

Run 3B: Out of 41 attempts eight indicated good permeability, eight indicated fair permeability, three indicated poor permeability, twelve gave no seal and ten tight pretest pressure points. The eight good pretest pressure points gives a water gradient of 1.013 g/cc. One segregated sample was taken at 2664 m RKB.

The analysis of the ion composition of the sample gave:

	TDS, ppm	Cl^-, ppm
Mudfiltrate	46736	21289
10 litre tank	32953	16269
4 litre tank	24881	12014

The sample were highly contaminated by mudfiltrate. But the analysis gives an indication of the salinity of the formation water.

Well 6610/3-1R (Table 3.3.3, 3.3.4 and 3.3.5 and figure 3.4):

Run 2A: Out of 19 attempts four gave very low permeability, twelve were tight and three no seal. There is no possibility of defining a gradient.

Run 3B: Out of 43 attempts two were poor permeability, 23 were tight, and 16 No Seal. There is no possibility of defining a gradient.

Run 3C: Out of 12 attempts five were poor permeability, three were tight, and four No Seal. There is no possibility of defining a gradient.

One segregated sample was taken at 4064.6 m MD RKB. The 10 litre chamber contained one litre of mudfiltrate and the four litre chamber contained 200 ml of mudfiltrate. The permeability is reported as poor. The salinity of the sample was measured offshore to 39000 ppm Cl^-. The pressure in both chambers were measured to be atmospheric.

FMT PRESSURES

WELL: **6610/3-1**, 17 1/2" SECTION

RUN no.	Depth m MD RKB	Hyd. pres. kPa	Form. pres. kPa	Form. pres. g/cc	Comment
2A	1735.8	22827	17343	1.018	Good
2A	1709.5	22536	17051	1.017	Good
2A	1700.1	22417	16982	1.018	Good
2A	1686	22234	16826	1.017	Good
2A	1678	22129	16755	1.018	Good
2A	1660	21900	16575	1.018	Good
2A	1645	21702	16421	1.018	Good
2A	1595	21040	20429	1.306	Tight
2B	1645	21696	16415	1.017	Good, Sampling

Table 3.3.1

WELL: **6610/3-1**, 12 1/4" SECTION

RUN no.	Depth m MD RKB	Hyd. pres. kPa	Form. pres. kPa	Form. pres. g/cc	Comment
3B	1763	21950	17575	1.016	Good Perm.
3B	1770	22050	17594	1.013	Good Perm.
3B	1774	22090	17636	1.013	Good Perm.
3B	1790.5	22300	17798	1.013	Good Perm.
3B	1800.5	22424	17895	1.013	Good Perm.
3B	1825	22720	18142	1.013	Good Perm.
3B	1844	22960	18336	1.014	Fair Perm.
3B	2285	28380	22798	1.017	Poor Perm.
3B	2288	28420	22750	1.014	Good Perm
3B	2291.6	28470	22854	1.017	Fair Perm.
3B	2296	28520	-	-	Tight
3B	2299.5	28570	-	-	Tight
3B	2302.5	28600	22896	1.014	Good Perm
3B	2459.1	30536	25180	1.044	Poor Perm.
3B	2514.8	31215	-	-	Tight
3B	2519.1	31275	25298	1.024	Fair Perm.
3B	2533	31442	-	-	Tight
3B	2560.1	31775	27883	1.11	Poor Perm.
3B	2585.3	32085	-	-	Tight
3B	2632.5	32670	-	-	Tight
3B	2655.3	32930	29945	1.15	Poor Perm.
3B	2664	33040	26434	1.011	Fair Perm.Sample
3B	2668	33080	26406	1.009	Fair Perm.
3B	2669.5	33100	26447	1.01	Fair Perm.
3B	2671.6	33130	26482	1.01	Fair Perm.
3B	2674.6	33160	26480	1.009	Fair Perm.
3B	2680	33230	-	-	Tight

3B	2684.5	33290	-	-	Tight
3B	2686.8	33320	-	-	Tight
3B	2831.7	35070	-	-	Tight

Table 3.3.2

WELL: **6610/3-1R**, 8 1/2" SECTION

RUN no.	Depth m MD RKB	Hyd. pres. kPa	Form. pres. kPa	Form. pres. g/cc	Comment
2A	3718.5	65080	-	-	Tight
2A	3718.2	65074	-	-	Tight
2A	3720.5	65104	-	-	Tight
2A	3732.6	65313	-	-	Tight
2A	3733.8	65335	-	-	Tight
2A	3737.8	56400	-	-	
2A	3681	64400	-	-	Tight
2A	3668.8	64152	-	-	Tight
2A	3665.2	64110	-	-	Tight
2A	3646.6	63780	-	-	Tight
2A	3631.4	63526	-	–	Tight
2A	3626.6	63435	-	-	Tight
2A	3615.3	-	-	-	
2A	3615.1	-	-	-	
2A	3562.5	62330	-	-	Tight
2A	3551.1	62123	55800	1.602	W. Low Perm
2A	3539.7	61932	-	-	W. Low Perm
2A	3538.8	61904	-	-	W. Low Perm
2A	3511.3	61435	-	-	W. Low Perm

Table 3.3.3

WELL: **6610/3-1R**, 8 1/2" SECTION

RUN no.	Depth m MD RKB	Hyd. pres. kPa	Form. pres. kPa	Form. pres. g/cc	Comment
3B	3717.5	64935	-	-	Tight
3B	3736.5	65251	-	-	Tight
3B	3756	65588	-	-	Tight
3B	3764	65703	-	-	Tight
3B	3774.2	65890	-	-	Tight
3B	3852	67203	67314	1.781	Poor
3B--	3873.2	67567	-	-	Tight
3B	3874.8	67588	-	-	Tight
3B	3878.9	67652	-	-	Tight
3B	3878.5	67624	-	-	Tight
3B	3888.5	67814	-	-	Tight
3B	3892	67886	-	--	Tight
3B	3909.2	68146	-	-	
3B	3921.1	68380	-	-	Tight
3B	3939.9	68700	-	-	Tight
3B	3944	68745	-	-	Tight
3B	3943.8	68738	-	-	Tight
3B	3943.3	68731	-	-	Tight
3B	3950	68869	-	-	Tight
3B	3953.7	68937	-	-	Tight
3B	3955	68941	-	-	Tight
3B	3957	68979	60850	1.568	Poor Perm
3B	3986.5	69479	-	-	Tight
3B	3996.5	69633	70242	-	Tight
3B	4007.4	69806	-	-	Tight
3B	4043	70245	-	-	Tight
3B	4075.5	70913	-	-	Tight
3B	3852	67114	-	-	No Seal

Table 3.3.4

WELL: **6610/3-1R**, 8 1/2" SECTION

RUN no.	Depth m MD RKB	Hyd. pres. kPa	Form. pres. kPa	Form. pres. g/cc	Comment
3C	4066.1	70672	70833	1.776	Poor Perm
3C	4066.1	70687	70715	1.773	Poor Perm
3C	4069	70735	70178	1.758	Poor Perm
3C	4064.6	70643	70660	1.772	Poor Perm
3C	3972	69087	-	-	Tight
3C	3976	69164	-	-	Tight
3C	4057.9	70507	-	-	Tight
3C	4064.6	70644	70634	1.771	Poor Perm , samples

Table 3.3.5

3.4 Well Testing

Two drill stem tests were performed DST no. 1 was perforated in the interval 3370 - 3412 m RKB and DST no. 2 was perforated in the interval 3201 - 3249 m RKB. No fluids were produced to surface. Both test intervals were tight.

DRILLSTEM TESTING

ACTIVITY START	*21.11.93 AT 12:30 HRS*
DURATION	*9,23 DAYS (221,5 HRS)*

DST no 1	3412 - 3370m
DST no 2	3249 - 3201m

Testing fluid:	Ancotherm
Weight:	1,40 g/cm^3

No problems were experienced with the test fluid.

Dst. no. 1 Perforated - no flow.
Shut in for pressure build up - none.
Waited in 13,5 hrs. for daylight to perforate and flow the well.

Dst.no. 2, Perforated - no flow.
Shut in for pressure build up - none
Waited in 2 hrs. for daylight to perforate and flow the well.

No operational problems was experienced during the testing of the well.

TOTAL MATERIAL COST AND CONSUMPTION

OPERATOR: STATOIL **WELL: 6610/3-1**

Product	Unit size	Unit price NOK	36" sect.	Cost NOK	26" sect.	Cost NOK	17 1/2" sect.	Cost NOK	12 1/4" sect.	Cost NOK	8 1/2" sect.	Cost NOK	P & A	Cost NOK	Total consumed	Total cost NOK
Barite	M.T	825,00	17	14 025,00	130	107 250,00	348	287 100,00	970	800 250,00			124	102 300,00	1589	1 310 925,00
Bentonite	M.T.	2 240,00			1	2 240,00			21	47 040,00			22	49 280,00	44	98 560,00
Soda Ash	kg	2,31			25	57,75			125	288,75			100	231,00	250	577,50
Celpol LV	kg	28,00					16000	448 000,00	40000	1 120 000,00					56000	1 568 000,00
Celpol Reg	kg	28,00					1075	30 100,00	5725	160 300,00			50	1 400,00	6850	191 800,00
KCL Brine	m3															
CMC EHV	kg	14,56	3950	57 512,00	6925	100 828,00	425	6 188,00							11300	164 528,00
Lime	kg	2,30			20	46,00	660	1 518,00	4640	10 672,00			60	138,00	5380	12 374,00
Mica	kg	3,92					1225	4 802,00							1225	4 802,00
Ancocide	ltr	16,22					2150	34 873,00	6500	105 430,00					8650	140 303,00
Nutplug	kg	3,75					1725	6 468,75							1725	6 468,75
Ligthin	kg	15,20							100	1 520,00					100	1 520,00
Ancotemp	kg	90,37														
Anco Resin	kg	12,46														
Ironite Sponge	kg	24,81					272	6 748,32					635	15 754,35	907	22 502,67
Desco CF	kg	19,68														
Bicarbonate	kg	2,31							500	1 155,00			500	1 155,00	1000	2 310,00
Gypsum	kg	1,62					21550	34 911,00	50125	81 202,50					71675	116 113,50
Thermopol	kg															
Defoamer	ltr	15,55														
Citric Acid	kg	13											50			
Bentonite	kg	2,45							375	918,75			500	1 225,00	875	2 143,75
Total cost	NOK			71 537,00		210 421,75		860 709,07		2 328 777,00				171 483,35		3 642 928,17
Hole drilled	m			63		540		823		1367						2793
Cost per metre	NOK			1 135,51		389,67		1 045,82		1 703,57						1 304,31
Total days				2		6		16		84				3		111
Cost per day	NOK			35 768,50		35 070,29		53 794,32		27 723,54				57 161,12		32 819,17
Mud mixed	m3			305		635		1290		3152				214		5 596,00
Cost per m3	NOK			234,55		331,37		667,22		738,83				801,32		650,99

TOTAL COST AND CONSUMPTION

OPERATOR: STATOIL — WELL: 6610/3-1R

Product	Unit size	Unit price NOK	Clean out cement	Cost NOK	12 1/4" sect.	Cost NOK	8 1/2" sect.	Cost NOK	TEST, P & A	Cost NOK	Total consumed	Total cost NOK
Barite	M.T	825,00	60	49 500,00	413	340 725,00	478	394 350,00	329	271 425,00	1280	1 056 000,00
Bentonite	M.T.	2 240,00	12	26 880,00					31	69 440,00	43	96 320,00
ANCO 2000 mud	m3	700,00			93	65 100,00	-126	-88 200,00			-33	-23 100,00
Celpol LV	kg	28,00			9300	260 400,00	575	16 100,00			9875	276 500,00
Celpol Reg	kg	28,00	25	700,00	2950	82 600,00	125	3 500,00	100	2 800,00	3200	89 600,00
KCL Brine	m3	485,00			440	213 400,00					440	213 400,00
Lime	kg	2,30	100	230,00	185	425,50			15	34,50	300	690,00
KCL	kg	2,00			20000	40 000,00					20000	40 000,00
Thermopol	kg	148,00			1175	173 900,00	4225	625 300,00	2050	303 400,00	7450	1 102 600,00
Ligthin	kg	15,20	775	11 780,00			125	1 900,00	500	7 600,00	1400	21 280,00
Ancotemp	kg	90,37					3525	318 554,25	1550	140 073,50	5075	458 627,75
Anco Resin	kg	12,46					4500	56 070,00			4500	56 070,00
Mica Fine	kg	3,92			250	980,00					250	980,00
Mica Medium	kg	3,92			275	1 078,00					275	1 078,00
Soda ash	kg	2,31	100	231,00	2350	5 428,50	25	57,75	200	462,00	2675	6 179,25
Sod. bicarb.	kg	2,31	550	1 270,50	650	1 501,50	6675	15 419,25	425	981,75	8300	19 173,00
Citric Acid	kg	13,00	625	8 125,00	725	9 425,00	4675	60 775,00	375	4 875,00	6400	83 200,00
Anco 208	ltr	17,00			25152	427 584,00	2909	49 453,00			28061	477 037,00
Defoamer SB	kg	21,53					100	2 153,00	200	4 306,00	300	6 459,00
Nutplug Fine	kg	3,75			400	1 500,00	100	375,00			500	1 875,00
Total cost	NOK			98 716,50		1 624 047,50		1 455 807,25		805 397,75		3 983 969,00
Hole drilled	m			1233		1838		720		N/A		3791
Cost per metre	NOK			80,06		883,59		2 021,95		N/A		1 050,90
Total days				2		34		31		20		87
Cost per day	NOK			49 358,25		47 766,10		46 961,52		40 269,89		45 792,75
Mud mixed	m3			204		733		257		441		1635
Cost per m3	NOK			483,90		2 215,62		5 664,62		1 826,30		2 436,68

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Geochemistry Department

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Title
GEOCHEMICAL EVALUATION OF WELL 6610/3-1, PART 1 OF 2.

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Abstract

See Summary, p. iii.

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1 INTRODUCTION

This report presents the results of a standard geochemical study of well 6610/3-1 (Figure 1), drilled down to 3126 mRKB

A total of 19 canned cuttings gases and 89 sediment samples (cf. Table 1) were analysed according to the following analytical program:

ANALYSIS	NUMBER OF SAMPLES			
	Cuttings	SWC	Core	Total
Headspace and occluded gas				19
Isotopic composition of headspace gas				19
TOC	6	52	17	75
THA pyrolysis	6	52	17	75
Vitrinite reflectance	4	19		23
Kerogen description	1	14	3	18
Pyrolysis-GC	1	19	3	23
Thermal extraction			3	3
Solvent extraction		7	4	11
Iatroscan separation		7	4	11
MPLC separation		4	4	8
GC total extract		3		3
GC saturates		4	4	8
GC aromatics		4	4	8
GC-MS biomarkers		7	4	11
Isotope δ13C of EOM and fractions		4	4	8
Isotope δ13C of kerogen	1	5	3	9

The analytical work was performed in accordance with the guidelines given in "The Norwegian Industry Guide to Organic Geochemical Analyses (1992)". The project was carried out at Statoil's Department of Geochemistry with subcontracts to Geolab Nor (Geochemical analyses of headspace and occluded gas, 6610/3-1, Appendix I) and IFE (Data report of $^{13}C/^{12}C$ isotope ratios in extracts and kerogens, Appendix H).

TABLE 1 SAMPLES ANALYSED FROM WELL 6610/3-1.

DEPTH m RKB	SAMPLE No.	SAMPLE TYPE	LITHOLGY
942.5	S6713	SWC	CLST, OLV GRY, SFT, SLI MICROMIC, SLI CALC
977	S6714	SWC	CLST, A/A
1000	S6871	CUTT	100% CLST, MED GRY - MED DK GRY, OLV GRY, SFT - FRM, AMOR, SOL I.P., SLTY - V SLTY, SDY, MICROMIC, MICROPYR, NON -SL CALC
1012.5	S6715	SWC	CLST, A/A
1070	S6716	SWC	CLST, A/A
1097	S6717	SWC	CLST, DK GRY, SFT, SLTY, SLI MICROMIC, SLTY, CALC
1202	S6718	SWC	CLST, BRN BK, SFT, SLI MICROMIC, V.CALC
1217	S6719	SWC	CLST, OLV GRY, SFT, SLI MICROMIC, V.CALC
1248	S6720	SWC	CLST, DK GRY, SFT, SLI MICROMIC, V.CALC
1259	S6721	SWC	CLST, OLV GRY, SFT, SLI MICROMIC, NON CALC
1300	S6872	CUTT	100% CLST, GRN GRY-MED GRY-LT GRY, OLV GRY-BRN GRY-GRY BRN, SFT-BRN, AMOR-BLKY, WXY I.P., MICROMIC I.P., MICROPY I.P., SL-NON CALC
1337	S6722	SWC	CLST, DKGRY, SFT - FRM, MICROMIC, SLI CALC
1345	S6723	SWC	CLST, OLV GRY, SFT, MICROMIC, NON CALC
1390	S6724	SWC	CLST, DK GRY, SFT, SO , MICROMIC, NON CALC
1393	S6725	SWC	CLST, GRY BK, SFT, SO, MICROMIC, NON CALC,
1400	S6873	CUTT	100% CLST, PRED OLV OLV GRY - BRN GRY, LT GRY - MED GRY, GN GRY, BL GRY, FRM, BLKY-AMOR, SLTY I.P., MICROMIC, MICROPYR, OCC TF AND SPKLD WH -BLK, PRED NON CALC, OCC SL CALC
1423	S6726	SWC	CLST, DK GRY, SFT, MICROMIC, NON CALC
1456	S6727	SWC	CLST, GRY BK, SFT, NON CALC
1472	S6728	SWC	CLST, OLV BK, SFT, SLI SLTY, MICROMIC, NON CALC
1475	S6729	SWC	CLST, A/A
1480	S6730	SWC	CLST, A/A
1488	S6731	SWC	CLST ,MUDDY, A/A
1502	S6732	SWC	CLST, A/A
1516	S6733	SWC	CLST, OLV BK, SFT, WXY, MICROMIC, SLI SLTY, NON CALC
1520	S6734	SWC	CLST, BRN BK, V SLTY, SFT, NON CALC
1532	S6735	SWC	CLST, BRN BK, V SLTY, SFT, NON CALC

TABLE 1, CONT.

DEPTH m RKB	SAMPLE No.	SAMPLE TYPE	LITHOLGY
1537	S6736	SWC	CLST, OLV BK, SFT, V SLTY/SDY, MICROMIC, NON
1542	S6737	SWC	CLST, OLV BK, SFT - FRM, SLTY, SLI SDY,
1547.5	S6738	SWC	CLST, OLV BK, SLTY, SLI SDY, FRM, NON CALC
1550	S6874	CUTT	100 % CLST, BRN BLK - OLV BLK - GRY BLK, DSKY YEL BRN, SFT - FRM, AMOR - OCC BLKY, SOL I.P., SL SLTY - SLTY, MICROMIC, MICROPYR, NON CALC
1550	S6739	SWC	CLST, SLTY, OLV BK, SFT, SDY, ABD MICA, NON CALC
1554	S6740	SWC	CLST, ESS ST, SD, MICA THAN ABOVE
1580.5	S6741	CORE	CLST
1581.5	S6742	CORE	CLST
1583.05	S6680	CORE	SST
1584.5	S6743	CORE	CLST
1597	S6744	SWC	CLST, BRN BK, FRM, SLI SLTY, MICROMIC, NON CALC
1603	S6745	SWC	CLST, GRY BK, FRM, SLI SLTY, MICROMIC, NON CALC
1608	S6746	SWC	CLST, GRY BK, HOM, FRM, NON CALC
1616	S6747	SWC	CLST, OLV BK, SFT, SLI WXY, NON CALC
1630	S6748	SWC	CLST, GRY BK, SFT, SLTY, NON CALC
1637.5	S6749	SWC	CLST, GRY BK, FRM, SLTY, MICROMIC, NON
1640	S6750	SWC	CLST, Y BK, FRM, SLI SLTY, S MICROMIC NON
1653	S6751	SWC	SD/SST, GRY GN, V FN - MED, PRED FN, MOD SRTD,
1675	S6752	SWC	SD/SST, GRY GN, FN - MED, MOD SRTD, SUBANG - SUBRND, LSE, ABD GLAUC, MIC, CALC, EX VIS POR
1700	S6875	CUTT	70% SD, CLR QTZ, MED-CRS, OCC V CRS, FR SRT, SUBANG-RND, LSE, SL MIC, SL GLAUC, GD VIS POR 30% SD, CLR QTZ, VF-F, SUBRND, LSE GRNS IN A GLAUC, SFT AND STKY MTX, SL CALC I.P.
1712.8	S6686	CORE	SST
1719	S6797	SWC	SD/SST, GRY GN, FN, MOD SRTD, SUBABG - SUBRND, LSE, ABD GLAUC, MIC, CALC, EX VIS POR
1724	S6753	SWC	A/A
1735	S6754	SWC	SD/SST, A/A BUT W/V CRS QTZ GRNS

TABLE 1, CONT.

DEPTH m RKB	SAMPLE No.	SAMPLE TYPE	LITHOLGY
1744	S6755	SWC	A/A
1750	S6876	CUTT	100% SD, CLR-LT YEL TRNSL QTZ, MED-CRS, OCC V CRS OR F, FAIR SRT, ANG-SUBANG, SUBRND I.P., V GLAUC, F BLK GRNS, MIC, LSE, PROBABLY GD POR
1770	S6756	CUTT	80% SST, CLR-TRANS QTZ, MED-V.CRS, PR SRDT, SUBANG-RNDD, LSE GRNS 20% SST, GLAUC, GRY GN, FN-VFN, PR SRTD, ABD GLAUC MTX, SFT, PR VIS POOR
1800	S6877	CUTT	80% SST, CLR-TRANS QTZ, MED-V CRS, PR SRDT, SUBANG-RND, LSE GRNS 20% SST, GLAUC, GRY GN, FN-VFN, PR SRDT, ABD GLAUC MTX, SFT, PR VIS POR
1807.5	S6757	SWC	CLST, OLV BK, FRM, MICROMIC, NON CALC
1815	S6758	SWC	CLST, SLTY, DK GRY, MOD HD, MICROMIC, NON CALC
1830	S6759	SWC	CLST, OLV BLK, MOD HD, MICROMIC, NON CALC
1866	S6760	SWC	CLST, A/A, SLTY - SDY, MICROPYR I.P
1870.5	S6761	SWC	CLST, SLTY - SDY, DK GRY, MOD HD - FRM, MICA, CALC - V CALC
1900	S6878	CUTT	100% CLST, DK GRY, SLTY-SDY, SFT, AMOR, CALC
1915	S6762	SWC	CLST, OLV GRY, FRM - MOD HD, MIC, V CALC
1930	S6798	SWC	CLST, A/A, SLTY - SDY I.P.
1982	S6763	SWC	CLST, A/A, HOMOGENOUS
2062	S6764	SWC	CLST, OLV GRY, FRM - MOD HD, MICROMIC, NON CALC
2081.5	S6799	SWC	CLST, A/A, PARTLY WAXY TXT, SL MICROMIC
2162	S6765	SWC	CLST, A/A
2176	S6800	SWC	CLST, A/A, SL - MOD CALC
2200	S6879	CUTT	95% CLST, DK GRY, FRM, SUBFISS, OCC SLTY, V SLILY MICROMIC, NON SLILY CALC, GEN HYDR: MED DK GRY, SFT, AMOR, STKY 5 % SD, CLR QTZ, LSE
2238	S6766	SWC	CLST, A/A, SL - NON CALC
2250	S6880	CUTT	100% CLST, DK GRY - OLV GRY, FRM, SUBFISS, OCC SLTY, V SLILY MICROMIC, SLILY CALC, GEN HYDR: MED DK GRY, SFT, AMOR, STKY
2267	S6801	SWC	CLST, MED DK GRY, SFT STKY, SL CALC

TABLE 1, CONT.

DEPTH m RKB	SAMPLE No.	SAMPLE TYPE	LITHOLGY
2292	S6881	CUTT	90% SST, WH - LT GRY, CLR QTZ, VF - MED, PR - MOD SRT, SUBANG - SUBRND, WH ARG MTX, SLILY CALC CMT, SFT - MOD HD, MICA, GLAU, PR VIS POR 10% CLST, DK GRY - OLV GRY, FRM, SUBFISS, OCC SLTY, V SLILY MICROMIC, SLILY CALC, GEN HYDR: MED DK GRY, SFT, AMOR, STKY
2292	S6557	CORE	SST
2293.45	S6767	CORE	CLST
2293.75	S6690	CORE	SST
2294	S6568	CORE	SST
2296.5	S6768	CORE	CLST
2298.75	S6769	CORE	CLST
2299	S6559	CORE	SST
2303.95	S6696	CORE	SST
2306.8	S6770	CORE	CLST
2309.8	S6771	CORE	CLST
2339	S6772	SWC	CLST, DK GRY, MOD HD, MICROMIC, NON CALC
2365	S6802	SWC	CLST, DK GRY, MOD HD, MICROMIC, NON CALC
2400	S6882	CUTT	100% CLST, GRYSH BLK, MOD HD, SUBFISS, MICROMIC, NONCALC, CUTTINGS GEN HYDR, SFT AND AMOR
2450	S6883	CUTT	100% CLST, OLV GRY - OLV BLK, FRM - MOD HD, SUBFISS, SLTY, SDY, MICROMIC, CALC - OCC V CALC
2451	S6773	SWC	CLST, OLV GRY - DK GRY, FRM, MICROMIC, MOD CALC
2463.5	S6803	SWC	CLST, DK GRY, MOD HD, MICROMIC, MOD CALC
2520.5	S6703	CORE	SST
2529.8	S6774	CORE	CLST
2590	S6863	CUTT	90% CLST, OLV GRY - OLV BLK, FRM - MOD HD, BLKY - SUBFISS, SLTY, SDY I.P., MICROMIC - MIC, PRED NONE CALC
2593	S6775	CUTT	100% CLST, OLV GRY - OLV BLK, FRM - MOD HD, BLKY, SLTY, SDY I.P., MICROMIC - OCC MIC, MICROPYR I.P., OCC GLAUC, MOD CALC
2608	S6776	CUTT	100% CLST, NONE CALC - SLILY CALC, ELSE A.A.

TABLE 1, CONT.

DEPTH m RKB	SAMPLE No.	SAMPLE TYPE	LITHOLGY
2650	S6884	CUTT	70% CLST, GRYSH GN OLV GRY, FRM - MOD HD, BLKY - SUB FISS, V GLAUC, CALC, SDY I.P., MIC, ABND SFT, AMOR, HYDR CLST 20% SST, LT OLV GRY, WH, CLR - TRNSP QTZ, MED - CRS, OCC V CRS, PR SRT, SUBANG - SUBRND, GNSH GRY ARG MTX, CALC CMT, MOD HD, V GLAUC, MICA, PR VIS POR, ABND LSE, MED - V CRS QTZ 10% LS, LT OLV GRY - YELSH GRY, GRYSH GN, SFT - FRM, V ARG, V GLAUC, I.P. SDY
2663.25	S6706	CORE	SST
2685.6	S6777	CORE	CLST
2692.25	S6778	CORE	CLST
2700	S6889	CUTT	90% CLST, DK GRY, MOD HD, SUBFISS, NON CALC, SL SLTY, MICROMIC 10% SST, QTZ, CLR, FN - CRS, PR SRT, SUBANG, LSE, OCC MOD CALC CMT AND FRI
2719	S6779	CUTT	100% CLST, MED GRY, V SLTY, SFT - FRM, NON CALC, OCC GLAU, MICROMICA/A
2720	S6864	CUTT	100% CLST, A/A
2773	S6780	CUTT	100% CLST, MED GRY - DK GRY, OLV GRY - OLV BLK, FRM - MOD HD, BLKY - SUBFISS, SLTY - V SLTY, I.P. SDY - V SDY, OCC V MIC, NON CALC
2776	S6865	CUTT	90% CLST, MED GRY - DK GRY, OLV GRY - OLV BLK, FRM - MOD HD, BLKY - SUBFISS, SLTY - V SLTY, I.P. SDY - V SDY, MICROMIC - MIC, OCC V MIC, PRED NONE CALC, OCC SLILY CALC
2800	S6885	CUTT	100% CLST, PRED OLV GRY, MED GRY - DK GRY, OLV BLK, FRM - MOD HD, BLKY - SUBFISS, SLTY I.P., MICROMIC - MIC, NONE -SLILY CALC
2839	S6781	CUTT	90% CLST, PRED OLV GRY, MED GRY - DK GRY, OLV BLK, FRM - MOD HD, BLKY - SUBFISS, SLTY, SDY I.P., MICROMIC - MIC, NONE - SLILY CALC
2845	S6866	CUTT	90 % CLST, A/A
2900	S6886	CUTT	80% CLST, OLV GRY - DK GRY, OLV BLK, FRM, BLKY, SLTY, SDY, OCC V SDY, MIC, PRED NON CALC - SLILY CALC, OCC MOD CALC 10% SST, LT GRY - MED GRY, CLR - TRNSP QTZ, V FN - FN, MOD SRTD, SUBANG - SUBRND, CALC CMT, MOD HD, MIC, ARG, PR VIS POR 10% LS, GRY WH - LT GRY, FRM - MOD HD, MICR, ARG, SDY

TABLE 1, CONT.

DEPTH m RKB	SAMPLE No.	SAMPLE TYPE	LITHOLGY
3100	S6887	CUTT	80% CLST, OLV BLK - BRN BLK, FRM - MOD HD, BLKY - SUBFISS, FISS I.P., MOD CALC, V MICROMIC, SLILY CARB. 15% LS, GRY WH-LT GRY, FRM - MOD HD, MICR, ARG, AREN I.P. 5% SST, LT BRN GRY, CLR QTZ, F, OCC MED - CRS, MOD - PR SRT, SUBANG, FRI -MOD HD, CALC CMT, MICA PR VIS POR
3150	S6888	CUTT	100% CLST, A/A

TABLE 2 TOC AND THA DATA, WELL 6610/3-1.

DEPTH m RKB	S No.	S1 mgHC/grock	S2 mgHC/grock	TOC wt%	HI mgHC/gTOC	PP mgHC/grock	PI	Tmax °C
STD		0.54	19.0			19.5	0.03	419
STD		0.50	19.1			19.6	0.03	417
942.50	S6713	0.14	0.97	1.2	80	1.1	0.13	416
977.00	S6714	0.11	0.85	1.5	57	0.96	0.11	409
1012.50	S6715	0.15	1.9	1.5	130	2.1	0.07	427
1070.00	S6716	0.07	0.86	1.0	88	0.93	0.08	415
1097.00	S6717	0.04	0.53	0.5	113	0.57	0.07	423
1202.00	S6718	0.17	4.7	4.1	113	4.8	0.04	420
1217.00	S6719	0.04	0.68	1.0	72	0.72	0.06	425
1248.00	S6720	0.01	0.13	0.3	46	0.14	0.07	n.d.
STD		0.46	19.1			19.6	0.02	421
STD				4.2				
1259.00	S6721	0.02	0.33	0.2	174	0.35	0.06	n.d.
1337.00	S6722	0.04	0.31	0.5	63	0.35	0.11	n.d.
1345.00	S6723	0.10	1.6	1.4	120	1.7	0.06	425
1390.00	S6724	0.06	1.3	1.2	102	1.3	0.05	426
1393.00	S6725	0.08	1.5	1.3	120	1.6	0.05	427
1423.00	S6726	0.10	0.64	1.9	34	0.74	0.14	406
1456.00	S6727	0.07	1.6	1.4	119	1.7	0.04	432
1472.00	S6728	0.09	1.9	1.4	139	2.0	0.04	431
1475.00	S6729	0.19	1.5	2.0	75	1.7	0.11	412
1480.00	S6730	0.20	1.9	2.3	84	2.1	0.10	415
1488.00	S6731	0.21	1.7	2.2	78	2.0	0.11	415
1502.00	S6732	0.20	1.1	2.2	50	1.3	0.16	412
1516.00	S6733	0.05	0.83	0.8	105	0.88	0.06	432
STD		0.51	18.9			19.4	0.03	419
STD		0.46	17.9			18.4	0.03	423
1520.00	S6734	0.22	3.3	2.3	144	3.5	0.06	421
1532.00	S6735	0.18	1.7	1.9	87	1.9	0.10	412
1537.00	S6736	0.19	2.0	2.0	103	2.2	0.09	415
1542.00	S6737	0.20	1.9	1.6	120	2.1	0.09	425
1547.50	S6738	0.23	1.5	1.9	81	1.7	0.13	416
1550.00	S6739	0.15	1.4	1.3	109	1.5	0.10	417
1554.00	S6740	0.14	1.3	0.9	140	1.5	0.10	417
1580.50	S6741	0.01	0.11	0.4	30	0.12	0.08	n.d.
STD		0.47	20.1			20.6	0.02	422
1581.50	S6742	0.04	0.42	0.5	78	0.46	0.09	n.d.
1583.05	S6680	0.02	0.24	0.2		0.26	0.08	n.d.
1584.50	S6743	0.02	0.18	0.5	36	0.20	0.10	n.d.
1597.00	S6744	0.01	0.02	0.3	8	0.03	0.33	n.d.
1603.00	S6745	0.04	0.32	0.6	52	0.36	0.11	n.d.
1608.00	S6746	0.01	0.26	0.6	44	0.27	0.04	n.d.
1616.00	S6747	0.00	0.20	0.5	44	0.20	0.00	n.d.
1630.00	S6748	0.04	0.53	0.8	66	0.57	0.07	n.d.
STD		0.44	18.1			18.5	0.02	422
1637.50	S6749	0.04	0.51	1.4	37	0.55	0.07	414
1640.00	S6750	0.06	0.73	1.4	54	0.79	0.08	425
1653.00	S6751	0.15	0.13	0.5		0.28	0.54	n.d.
1675.00	S6752	0.10	0.15	0.4		0.25	0.40	n.d.
1712.80	S6686	0.01	0.00	0.1		0.01	1.00	n.d.
STD		0.44	18.8			19.2	0.02	421
STD		0.41	17.9			18.3	0.02	420
1724.00	S6753	0.05	0.08	0.1		0.13	0.38	n.d.

TABLE 2, CONT.

DEPTH m RKB	S No.	S1 mgHC/grock	S2 mgHC/grock	TOC wt%	HI mgHC/gTOC	PP mgHC/grock	PI	Tmax °C
1735.00	S6754	0.11	0.17	0.4		0.28	0.39	n.d.
1744.00	S6755	0.09	0.18	0.4		0.27	0.33	n.d.
1770.00	S6756	0.07	1.1	1.0	107	1.2	0.06	431
1807.50	S6757	0.04	0.29	0.7	43	0.33	0.12	n.d.
1815.00	S6758	0.03	0.29	0.6	48	0.32	0.09	n.d.
1830.00	S6759	0.01	0.20	0.5	39	0.21	0.05	n.d.
1866.00	S6760	0.01	0.15	0.4	43	0.16	0.06	n.d.
STD		0.49	19.5			20.0	0.03	417
1870.50	S6761	0.01	0.18	0.4	50	0.19	0.05	n.d.
1915.00	S6762	0.00	0.08	0.3	32	0.08	0.00	n.d.
1982.00	S6763	0.02	0.55	0.6	95	0.57	0.04	427
2062.00	S6764	0.02	0.42	0.6	72	0.44	0.05	n.d.
2162.00	S6765	0.03	0.41	0.6	66	0.44	0.07	n.d.
2238.00	S6766	0.03	0.68	0.8	82	0.71	0.04	436
2293.45	S6767	0.31	6.7	3.0	225	7.0	0.04	427
2293.75	S6690	3.7	0.25	0.4		3.9	0.94	n.d.
STD		0.45	19.8			20.3	0.02	422
2296.50	S6768	0.07	0.97	1.1	91	1.1	0.07	435
2298.75	S6769	0.14	2.1	1.4	143	2.2	0.06	433
2303.95	S6696	14.4	0.10	1.1		14.5	0.99	n.d.
2306.80	S6770	0.11	0.97	1.1	92	1.1	0.10	436
2309.80	S6771	0.07	0.94	1.0	94	1.0	0.07	435
2339.00	S6772	0.05	0.51	0.7	69	0.56	0.09	421
2451.00	S6773	0.05	0.40	0.7	58	0.45	0.11	n.d.
2520.50	S6703	0.01	0.03	0.1		0.04	0.25	n.d.
2529.80	S6774	0.10	0.91	1.5	59	1.0	0.10	n.d.
2593.00	S6775	0.04	0.58	0.9	67	0.62	0.06	432
2608.00	S6776	0.03	0.68	0.8	82	0.71	0.04	434
2663.25	S6706	0.00	0.00	0.1		0.00	0.00	n.d.
2685.60	S6777	0.17	2.6	2.3	112	2.8	0.06	438
2692.25	S6778	0.02	0.23	0.6	39	0.27	0.07	n.d.
2719.00	S6779	0.34	0.58	0.8	74	0.92	0.37	438
2773.00	S6780	0.03	0.54	0.8	68	0.57	0.05	433
2839.00	S6781	0.05	0.71	1.0	68	0.76	0.07	446
STD		0.41	20.7			21.1	0.02	419

TABLE 3 PYROLYSIS-GC DATA, WELL 6610/3-1.

DEPTH m RKB	S No.	C1 %	C2-C5 %	C6-C14 %	C15+ %
STD		5	10	31	54
1012.50	S6715	11	8	32	49
1202	S6718	11	13	44	32
1345	S6723	5	12	35	48
1390	S6724	11	10	34	45
STD		5	10	28	57
1393	S6725	13	10	35	40
1423	S6726	13	10	39	38
1456	S6727	14	11	39	36
1472	S6728	11	14	41	34
1475	S6729	10	11	42	37
1488	S6731	8	10	42	40
1502	S6732	5	19	54	22
1520	S6734	6	17	51	26
1532	S6735	5	22	58	15
1537	S6736	7	17	57	19
1542	S6737	5	17	61	17
1547.50	S6738	8	9	38	45
1550	S6739	11	10	40	39
1554	S6740	11	11	41	37
1640	S6750	13	10	35	42
1770	S6756	13	12	38	37
2293.45	S6767	8	11	32	49
2298.75	S6769	9	10	37	44
2685.60	S6777	10	17	55	18
2293.75	S6690asph	4	15	43	38
2303.95	S6696asph	9	13	37	41
2309.15	S6699asph	5	15	39	41
STD		9	11	32	48

TABLE 4 VISUAL KEROGEN DESCRIPTIONS (%), WELL 6610/3-1.

S No.	DEPTH m RKB	AM FA	AM HA	AL	HE	WO	CO	Comments
S6718	1202		74		4	22		
S6723	1345			1	57	40	2	
S6724	1390		9	1	14	76		WO degraded
S6725	1393			1	36	63		WO degraded
S6726	1423		55		36	8	1	
S6727	1456			4	19	77		WO degraded
S6729	1475			1	52	46	1	WO and HE degraded
S6731	1488	7	14	1	51	17	10	WO and HE degraded
S6732	1502		60		21	19		
S6735	1532	1	29		55	9	6	
S6737	1542	10	50		14		26	
S6738	1547.5		45	1	41	13		HE degraded
S6740	1554	49	8		13	28	2	HE degraded
S6750	1640				55	34	11	
S6756	1770		39		25	36		
S6767	2293.45	2	37		29	29	3	
S6769	2298.75				66	24	10	
S6777	2685.5		14		30	38	18	

AM, FA: fluoramorphinite, i.e. fluorescent amorphous material
AM, HA: hebamorphinite, i.e. non-fluorescent amorphous material
AL: algal organic matter
HE: herbaceous organic matter
WO: woody organic matter
CO: coaly organic matter

TABLE 5 NORMALISED COMPONENT GROUP COMPOSITION (WT%) OF EXTRACTED ORGANIC C_{15+}-MATTER, WELL 6610/3-1.

DEPTH	S No.	STD[1]	ROCK (mg)	EOM (mg)	EOM (ppm)	% SAT	% ARO	% POL	% ASP	% HC	% NON-HC
1472.00	S6728	IV	18.5	48.7	2573	11	15	60	14	26	74
1480.00	S6730	II	10.7	39.4	3675	7	9	28	56	16	84
1520.00	S6734	II	13.6	35.5	2608	4	10	28	58	14	86
1537.00	S6736	II	10.1	43.3	4291	7	17	52	24	24	76
1550.00	S6739	III	19.6	47.4	2413	6	15	37	42	21	79
1653.00	S6751	III	16.6	14.6	878	19	5	36	40	24	76
1675.00	S6752	III	13.3	13.4	1008	20	6	64	10	26	74
2293.45	S6767	IV	30.6	44.5	1452	3	25	28	44	28	72
2293.75	S6690	I	22.9	249.6	10895	41	38	15	6	79	21
2303.95	S6696	I	20.0	240.7	12065	38	40	15	7	78	22
2685.60	S6777	IV	30.1	64.6	2148	4	44	26	26	48	52
Janus		V	20.3	27.5	1355	20	20	46	14	40	60
Standard	I					46	48	6			
	II					47	48	5			
	III					48	47	6			
	IV					45	48	6			
	V					47	45	8			

[1] Roman numeral refers to the standard analysed in the same series as that sample.

TABLE 6 EXTRACTION DATA, WELL 6610/3-1.

SAMPLE No.	DEPTH mRKB	TOC (%)	EOM	SAT	ARO	POL	ASPH	SAT/ARO	HC/non HC
			< ------- mg/g TOC -------->						
S6728	1472	1.4	184	19	28	111	26	0.7	34
S6730	1480	2.3	160	11	15	44	90	0.7	19
S6734	1520	2.3	113	5	12	32	65	0.4	17
S6736	1537	2.0	215	15	36	112	51	0.4	32
S6739	1550	1.3	186	11	27	70	78	0.4	26
S6751	1653	0.5	176	33	9	63	71	3.7	31
S6752	1675	0.4	229	46	15	146	22	3.1	36
S6767	2293.45	3.0	48	1	12	14	21	0.1	39
S6690	2293.75	0.4	2534	1035	963	388	147	1.1	374
S6696	2303.95	1.1	1149	436	461	175	77	1.0	356
S6777	2685.60	2.3	93	4	41	24	24	0.1	94

TABLE 7 GAS CHROMATOGRAPHIC DATA FOR EXTRACT FRACTIONS, WELL 6610/3-1.

DEPTH m RKB	SAMPLE No.	(A) Pristane n-C17	(B) Phytane n-C18	A B	Pristane Phytane	nC17 nC17+nC27	CPI 1	F1	F2	MPI 1
1480.00	S6730	2.3	1.9	1.2	1.2	n.d.	n.d.	0.28	0.21	0.41
1520.00	S6734	1.1	0.99	1.1	0.88	n.d.	n.d.	0.38	0.26	0.65
1537.00	S6736	2.1	1.5	1.4	1.2	n.d.	n.d.	0.43	0.34	0.76
1550.00	S6739	2.6	2.0	1.3	1.1	0.58	0.70	0.37	0.30	0.48
1675	S6752	1.2	0.37	3.2	1.2	0.50	1.5	0.74	0.30	1.7
2293.45	S6767	3.8	0.92	4.1	3.8	0.47	1.5	0.41	0.20	0.52
2685.60	S6777	2.1	0.68	3.0	2.9	0.61	1.3	0.45	0.24	0.60
Janus	Standard	0.97	0.59	1.6	1.4	0.63	1.2	0.51	0.32	0.97

TABLE 8 BIOMARKER PARAMETERS[1] FROM GC-MS ANALYSIS OF SATURATED HYDROCARBON FRACTIONS. WELL 6610/3-1.

SAMPLE No.	DEPTH mRKB	IDENT.	20S	ββ	22S	Ts/Tm	TtX	30D/H	C30αβ
S6728[2]	1472	6610M24	0.32	0.26	n.d.	n.d.	n.d.	n.d.	n.d.
S6730	1480	6610M27	0.38	0.21	n.d.	n.d.	n.d.	n.d.	n.d.
S6734	1520	6610M23	0.38	0.26	n.d.	n.d.	n.d.	n.d.	n.d.
S6736	1537	6610M07	0.28	0.26	n.d.	n.d.	n.d.	n.d.	n.d.
S6739	1550	6610M08	0.16	0.26	n.d.	n.d.	n.d.	n.d.	n.d.
S6751[2]	1653	6610M25	0.47	0.47	0.67	0.83	0.56	0.08	0.89
S6752	1675	S6752SA	0.50	0.43	0.57	1.07	0.38	0.05	0.89
S6767	2293.45	6610M09	0.23	0.35	0.45	0	0.18	0.06	0.66
S6690	2293.75	6610M21	0.74	0.73	n.d.	n.d.	n.d.	n.d.	n.d.
S6696	2303.95	6610M03	0.74	0.69	n.d.	n.d.	n.d.	n.d.	n.d.
S6777	2685.6	6610M10	0.28	0.28	0.56	0	0.21	0.06	0.67
Janus	Standard	6610M11	0.49	0.53	0.59	1.20	2.14	0.14	0.84
Bulgaria	Standard	6610M	0.48	0.40	0.60	1.33	1.00	0.10	0.86
Bulgaria	Standard	6610M12	0.48	0.41	0.57	1.33	1.00	0.09	0.85
Bulgaria	Standard	6610M20	0.48	0.41	0.59	1.36	1.00	0.08	0.88

TABLE 8, CONT.

SAMPLE No.	DEPTH mRKB	IDENT.	%C27	%C28	%C29	C30/ST	Dia	C28αβ	H/S
S6728[2]	1472	6610M24	n.d.	n.d.	n.d.	n.d.	0.39		
S6730	1480	6610M27	n.d.	n.d.	n.d.	n.d.	0.09		
S6734	1520	6610M23	n.d.	n.d.	n.d.	n.d.	0.32		
S6736	1537	6610M07	n.d.	n.d.	n.d.	n.d.	0.31		
S6739	1550	6610M08	n.d.	n.d.	n.d.	n.d.	0.38		
S6751[2]	1653	6610M25	35	27	37	0.17	1.28	0.97[3]	3.23
S6752	1675	S6752SAA	35	28	37	0.16	1.25	1.80[3]	3.52
S6767	2293.45	6610M09	24	48	28	0.05	0.76	0.04	12.11
S6690	2293.75	6610M21	29	31	40	0.12	2.79		0
S6696	2303.95	6610M03	32	30	39	0.11	2.58	0	
0S6777	2685.6	6610M10	31	37	31	0.09	1.44	0	10.57
Janus	Standard	6610M11	34	28	38	0.10	1.25	0	4.70
Bulgaria	Standard	6610M	29	37	34	0.07	0.52	0.18	
Bulgaria	Standard	6610M12	29	37	34	0.07	0.54	0.16	
Bulgaria	Standard	6610M20	29	37	33	0.07	0.48	0.17	

TABLE 8, CONT.

SAMPLE No.	DEPTH mRKB	IDENT.	ppmH	ppmS	3R/H	4R/H	35/34H	29/30H	Dem/H	O/H	G/H
S6728[2]	1472	6610M24	0	0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6730	1480	6610M27	0	0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6734	1520	6610M23	0	0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6736	1537	6610M07	0	0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6739	1550	6610M08	0	0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6751[2]	1653	6610M25	842	260	n.d.	n.d.	0.90[4]	0.80	0.18	0	
S6752	1675	6610M26	912	259	0.29	0.18	1.08[4]	0.75	0.18	0	0.07
S6767	2293.45	6610M09	1922	159	0.04	0.05	0.60	0.54	0	0	
S6690	2293.75	6610M21	0	1061	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6696	2303.95	6610M03	0	1092	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6777	2685.6	6610M10	1659	157	0.10	0.07	0.56	0.67	0	0	0.02
Janus	Standard	6610M11	3777	804	0.11	0.05	0.52	0.38	0	0	0.09
Bulgaria	Standard	6610M	n.d.	n.d.	0.06	0.08	1.13	0.40	0	0.28	0.07
Bulgaria	Standard	6610M12	n.d.	n.d.	0.07	0.08	1.09	0.39	0	0.27	0.02
Bulgaria	Standard	6610M20	n.d.	n.d.	0.06	0.07	1.10	0.41	0	0.26	0.05

[1] The derivation of parameters is described in Appendix G.
[2] Analysis of whole extract.
[3] 28αβ tentatively identiifed
[4] Unreliable

TABLE 9 BIOMARKER PARAMETERS[1] FROM GC-MS ANALYSIS OF AROMATIC HYDROCARBON FRACTIONS, WELL 6610/3-1.S

SAMPLE No.	DEPTH mRKB	IDENT.	Arom1	Arom2	Crack1	Crack2
S6730	1480	6610A05	n.d.	n.d.	n.d.	n.d.
S6734	1520	6610A06	n.d.	n.d.	n.d.	n.d.
S6736	1537	6610A07	n.d.	n.d.	n.d.	n.d.
S6739	1550	6610A08	n.d.	n.d.	n.d.	n.d.
S6752	1675	S6752SAA	1.00	1.00	0.38	0.52
S6767	2293.45	6610A09	0.94	0.79	0.08	0.06
S6690	2293.75	6610A02	0.82	0.61	0	0
S6696	2303.95	6610A03	1.00	1.00	0.04	0.03
S6777	2685.6	610A10	n.d.	n.d.	n.d.	n.d.
Janus	Standard	6610A11	1.00	1.00	0.65	0.43
Bulgaria	Standard	6610A01	0.79	0.57	0.29	0.14
Bulgaria	Standard	6610A12	0.79	0.58	0.29	0.13
STD05	Standard	STD05	1.09	0.54	0.24	0.10

[1] The derivation of parameters is described in Appendix H.
n.d. = not determined

TABLE 10 VITRINITE REFLECTANCE DATA, 6610/3-1.

SAMPLE No.	DEPTH mRKB	SAMPLE TYPE	LITHOLOGY	VITRINITE REFLECTANCE %Rm	(N)	STD	reliability	sample quality
S6713	942.5	SWC	clst	0.32	(23)	0.03	H	IIIII
S6715	1012.5	SWC	clst	0.33	(23)	0.04	H	IIIII
S6716	1070	SWC	clst	0.34	(20)	0.04	H	IIIII
S6719	1217	SWC	clst	0.33	(17)	0.03	M	LIIII
S6722	1337	SWC	clst	0.33	(3)	0.02	L	LLIIL
S6727	1456	SWC	clst	0.31	(13)	0.04	M	LLIII
S6734	1520	SWC	clst	0.33	(16)	0.05	M	LIIII
S6740	1554	SWC	clst	-	(0)			
S6748	1630	SWC	clst	0.39	(4)	0.03	L	LIHIL
S6797	1719	SWC	slst	0.35	(9)	0.02	L	IILIL
S6758	1815	SWC	clst	0.35	(5)	0.05	L	LLIIL
S6759	1830	SWC	clst	-	(0)			
S6798	1930	SWC	clst	0.46	(2)	-	L	ILIHL
S6763	1982	SWC	clst	0.38	(2)	-	L	IIIIL
S6799	2081.5	SWC	clst	0.48	(3)	0.04	L	LIHIL
S6800	2176	SWC	clst	0.44	(1)	-	L	LIIHL
S6801	2267	SWC	clst	0.48	(4)	0.00	M	IIIIL
S6802	2365	SWC	clst	0.43	(7)	0.05	M	IIIIL
S6803	2463.5	SWC	clst	0.48	(3)	0.02	L	LIHHL
S6863	2590	CUTT	clst	0.51	(1)	-	L	LIIHL
S6864	2720	CUTT	clst	0.52	(2)	-	L	LLIIL
S6865	2776	CUTT	clst	0.59	(2)	-	L	LIIHL
S6866	2845	CUTT	clst	0.59	(2)	-	L	LLIHL

N : number of readings
Reliability:
H: high
M: medium
L: low
Sample quality:
item 1: particle surface quality
item 2: particle size
item 3: type of vitrinite
item 4: identification of vitrinite
item 5: abundance of vitrinite

L: may give a too low vitrinite reflectance value
I: has no effect on the resulting vitrinite reflectance value
H: may give a too high vitrinite reflectance value

TABLE 11 INTERPRETED VITRINITE REFLECTANCE TREND, WELL 6610/3-1.

DEPTH mRKB	VITRINITE REFLECTANCE %Rm
1000	0.30
1200	0.32
1400	0.34
1600	0.36
1800	0.38
2000	0.39
2200	0.41
2400	0.43
2600	0.45
2800	0.47

APPENDIX I

Geochemical analyses of headspace and occluded gas,
well 6610/3-1.
Geolab Nor, 28.04.93.

REPORT:	DATA REPORT Geokjemiske analyser av Headspace og Okkludert gass, 6610/3-1
CLIENTS:	STATOIL Att:K. Knudsen
RESPONSIBLE SCIENTIST:	Rita Moe
RESPONSIBLE TECHNICIAN:	Anne Lise Holmedal
DATE:28.04.93	**GEOLAB PROJECT:**62049

Experimental

Headspace Gas Analysis

The analysis is performed using a Perkin Elmer 8310 gas chromatograph with a 50 m Plot fused silica Al_2O_3/KCL column, loop injector and flame ionization detector. Nitrogen is used as carrier gas and the column is run from 70°C to 200°C, at a rate of 12°C/min. Final hold time is 5 min.

Two cm^3 of headspace gas are removed from each sample can for chromatographic analysis of the C_1 to C_7 range of hydrocarbons.

Occluded Gas Analysis

The gas chromatograph used for this analysis is identical to that used for headspace gas analysis and is operated under the same conditions.
The canned samples are washed in thermostat-controlled water to remove drilling contaminants and sieved on a 2 mm mesh sieve to remove large, caved rock fragments. An aliquot (ca 25 mg) of sieved sample is crushed with 25 cm^3 water in an airtight ball mill. After crushing, 2 cm^3 of the released gas are removed from the ball mill for gas chromatographic analysis.

EXPERIMENTAL

Combined Gas Chromatography - Isotope Ratio Mass Spectrometry (GC-IRMS) for Gas

For the gas analyses the GC is fitted with a fused silica column of 25 metres length, 0.32 mm I.D., coated with PORAPLOT Q stationary phase leading directly into the combustion furnace. The GC is started at -40°C and held isothermally for 2.0 minutes, and then programmed to 140°C at 8°C/min and then to 200°C at 15°C/min and held isothermally for 5 min. Helium is used as a carrier gas and the injections are performed in splitless/split mode depending on the concentration of gas.

Inside the GC oven, a valve is used to direct the column effluent between the FID and the IRMS. At the exit from the GC oven, make-up carrier gas (helium) is added to the flow from the capillary column. This ensures that the full performance of the GC separation is preserved by maintaining the linear velocity of the carrier gas in the interface and the combustion furnace. The furnace is made of capillary-bore quartz tubing packed with platinised copper oxide. The furnace temperature is set to 750°C for gas analysis. Before the gas enters the mass spectrometer, water is removed in a cold trap using liquid N2.

For calculation purposes a CO_2 reference gas is automatically introduced into the IRMS in series of pulses before and after the array of chromatogram peaks of interest.

The IRMS is operated at 100 ev electron energy, having a trap current of 400 ua.

δ-values

The isotope ratios are given as δ-values in ‰ versus the PDB-standard:

$$\delta^{13}C = (R \text{ sample} - R \text{ standard}/R \text{ standard}) \times 1000$$

$$R = {}^{13}C/{}^{12}C$$

The PDB standard (a marine chalk of the Pee Dee-formation, USA) was created by Craig 1957. All results of $^{13}C/^{12}C$-analyses of organic matter today are calculated (Craig correction) against this international standard.

Reproducibility

The reference gas used on the GC-IRMS is calibrated against the NBS 22 oil (international calibrated standard). A house standard (alkane-mixture) is used daily. Double analysis on samples are also done.

Table 1a: C1 to C7 hydrocarbons in HEADSPACE gas
(µl gas/kg rock)

Project: 6610/3-1
Well: NOCS 6610/3-1
Depth unit of measure: m * Indicated values in ml gas/kg rock

Depth	C1	C2	C3	iC4	nC4	C5+	sum C1-C4	sum C2-C4	%wet ness	iC4 / nC4
1000.00	328383	8071	808	398	107	162	337767	9384	2.8	3.72
1300.00	490	13	3	1	1	8	508	18	3.5	1.00
1400.00	25049	730	193	68	32	20	26072	1023	3.9	2.13
1550.00	20868	669	390	164	119	197	22210	1342	6.0	1.38
1700.00	657	12	3	2	1	3	675	18	2.7	2.00
1750.00	879	29	7	3	2	8	920	41	4.5	1.50
1800.00	510	7	2	1	-	2	520	10	1.9	-
1900.00	2594	65	22	18	7	10	2706	112	4.1	2.57
2200.00	3894	277	175	106	27	10	4479	585	13.1	3.93
2250.00	13468	653	273	121	26	13	14541	1073	7.4	4.65
2292.00	6858	666	424	219	60	16	8227	1369	16.6	3.65
2400.00	2533	447	390	158	64	54	3592	1059	29.5	2.47
2450.00	33	17	17	5	2	2	74	41	55.4	2.50
2650.00	19	5	4	1	1	5	30	11	36.7	1.00
2700.00	287	115	87	22	12	100	523	236	45.1	1.83
2800.00	6953	1418	628	89	54	94	9142	2189	23.9	1.65
2900.00	3081	705	445	49	44	4	4324	1243	28.8	1.11
3100.00	65	22	17	2	3	5	109	44	40.4	0.67
3150.00	6611	2663	2844	290	462	185	12870	6259	48.6	0.63

Table 1b: C1 to C7 hydrocarbons in CUTTINGS gas
(µl gas/kg rock)

Project: 6610/3-1
Well: NOCS 6610/3-1
Depth unit of measure: m * Indicated values in ml gas/kg source rock

Depth	C1	C2	C3	iC4	nC4	C5+	sum C1-C4	sum C2-C4	%wet ness	iC4 / nC4
1000.00	68	16	13	16	8	62	121	53	43.8	2.00
1300.00	30	4	3	4	3	21	44	14	31.8	1.33
1400.00	60	26	49	36	29	124	200	140	70.0	1.24
1550.00	67	27	77	49	69	202	289	222	76.8	0.71
1700.00	195	12	6	2	4	59	219	24	11.0	0.50
1750.00	168	11	9	7	10	100	205	37	18.1	0.70
1800.00	224	20	9	1	4	27	258	34	13.2	0.25
1900.00	128	16	8	4	5	30	161	33	20.5	0.80
2200.00	77	21	53	56	27	49	234	157	67.1	2.07
2250.00	91	30	80	76	39	48	316	225	71.2	1.95
2292.00	68	27	79	72	36	50	282	214	75.9	2.00
2400.00	84	23	79	59	44	77	289	205	70.9	1.34
2450.00	101	36	89	43	34	49	303	202	66.7	1.26
2650.00	129	78	145	51	53	74	456	327	71.7	0.96
2700.00	91	29	83	33	34	39	270	179	66.3	0.97
2800.00	123	168	231	50	327	43	899	776	86.3	0.15
2900.00	121	84	210	32	67	29	514	393	76.5	0.48
3100.00	216	423	601	86	171	181	1497	1281	85.6	0.50
3150.00	238	310	642	92	218	230	1500	1262	84.1	0.42

Table 1c: C1 to C7 hydrocarbons in HEADSPACE and CUTTINGS gas
(µl gas/kg rock)

Project: 6610/3-1
Well: NOCS 6610/3-1
Depth unit of measure: m * Indicated values in ml gas/kg source rock

Depth	C1	C2	C3	iC4	nC4	C5+	sum C1-C4	sum C2-C4	%wet ness	iC4 / nC4
1000.00	328451	8087	821	414	115	224	337888	9437	2.8	3.60
1300.00	520	17	6	5	4	29	552	32	5.8	1.25
1400.00	25109	756	242	104	61	144	26272	1163	4.4	1.70
1550.00	20935	696	467	213	188	399	22499	1564	7.0	1.13
1700.00	852	24	9	4	5	62	894	42	4.7	0.80
1750.00	1047	40	16	10	12	108	1125	78	6.9	0.83
1800.00	734	27	11	2	4	29	778	44	5.7	0.50
1900.00	2722	81	30	22	12	40	2867	145	5.1	1.83
2200.00	3971	298	228	162	54	59	4713	742	15.7	3.00
2250.00	13559	683	353	197	65	61	14857	1298	8.7	3.03
2292.00	6926	693	503	291	96	66	8509	1583	18.6	3.03
2400.00	2617	470	469	217	108	131	3881	1264	32.6	2.01
2450.00	134	53	106	48	36	51	377	243	64.5	1.33
2650.00	148	83	149	52	54	79	486	338	69.6	0.96
2700.00	378	144	170	55	46	139	793	415	52.3	1.20
2800.00	7076	1586	859	139	381	137	10041	2965	29.5	0.36
2900.00	3202	789	655	81	111	33	4838	1636	33.8	0.73
3100.00	281	445	618	88	174	186	1606	1325	82.5	0.51
3150.00	6849	2973	3486	382	680	415	14370	7521	52.3	0.56

Table 2: Isotope GC Analysis of Headspace Gas for Well 6610/3-1 .

Depth unit of measure: m

Depth	n-C1	CO2	n-C2	n-C3	i-C4	n-C4
1000	-72.7	-24.3	-64.1	-59.4	-	-
1300	-60.9	-10.6	-	-	-	-
1400	-61.3	-12.6	-51.6	-39.2	-35.0	-35.6
1550	-52.7	-12.0	-49.7	-39.2	-35.3	-38.9
1700	-52.0	-12.1	-57.7	*-82.5	*-51.6	-
1750	-52.1	-22.5	-52.2	*-52.9	-	-
1800	-48.5	-16.4	*-49.4	-	-	-
1900	-43.5	- 6.1	-42.9	*-45.3	*-36.6	-
2200	-48.2	-19.4	-37.5	-34.6	-32.7	*-41.0
2250	-51.0	-10.6	-38.1	-32.8	-30.3	*-36.0
2292	-24.5	-13.3	-30.5	-30.1	-29.6	*-34.6
2400	-49.5	-10.8	-39.4	-35.1	-32.8	*-45.7
2450	*-25.2	- 8.6	*-18.2	*-22.7	-	-
2650	-	-13.5	-	-	-	-
2700	*-29.5	-12.2	*-33.1	*-30.6	-	-
2800	-26.4	-17.2	-26.5	-26.7	*-23.7	*-18.0
2900	- 1.0	- 8.9	-19.5	-22.7	*-23.2	-18.5
3100	-27.7	- 8.1	-27.8	-27.9	*-29.7	-28.0
3150	-36.2	-15.4	-30.4	-29.0	-30.1	-28.6

* Uncertain values due to small concentration of compound.

APPENDIX J

Datareport of $^{13}C/^{12}C$ isotope ratios in extracts and kerogens.
IFE, 10.05.93.

Institutt for energiteknikk

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SUMMARY
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KEYWORDS

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PREPARED BY	Bjørg Andresen	1993-05-10	Bjørg Andresen
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INTRODUCTION

8 extracts (EOM) included the different compound classes (SAT, ARO, NSO, ASPH) and 9 kerogens are received for the determination of the $^{13}C/^{12}C$ isotope ratios.

ANALYTICAL PROCEDURES

EOM/compound classes

The sample materials are dissolved in a known amount of dichloromethane, and aliquots of 2 - 4 mg (or as much as possible) are put into Pyrex glass tubes. The solvent is evaporated at room temperature overnight, and CuO is added the glass tubes. The tubes are evacuated, sealed with a torch and combusted for 1 hour at 550°C (Zofer, 1980). The combustion products CO_2 and H_2O are separated and the $^{13}C/^{12}C$ isotope ratios determined on a Finnigan MAT 251 mass spectrometer.

A laboratory standard (whole oil) is analysed for every 10th sample. The analytical results is within ± 0.1‰.

Kerogens

About 20 mg of the kerogen samples are combusted with CuO in sealed quarts tubes at 900°C for 15 minutes. The combustion products CO_2 and H_2O are separated and the $^{13}C/^{12}C$ isotope ratio determined on a Finnigan MAT 251 mass spectrometer.

A laboratory standard (grafite) is analysed for every 10th sample. The analytical results is within ± 0.1‰.

RESULTS

The stable isotope results are given in Table 1. IFEs value on NBS 22 is -29.77 ± 0.06 ‰ PDB.

The $^{13}C/^{12}C$ isotope ratios of the EOMs from S6730 and S6736 are not determined together with the aromatics from sample S6739 due to low amount of sample material.

The $^{13}C/^{12}C$ isotope ratios are shown in Galimov plot in Figure 1. Figure 2 shows a cross plot of the $^{13}C/^{12}C$ isotope ratio of the saturates and aromatics.

LITERATURE

Sofer, Z. (1980). Preparation of carbon dioxide for stable isotope analysis of petroleum fractions. *Analytical Chemistry*, **52**, 1389-1391.

Table 1: $^{13}C/^{12}C$ isotope ratio of EOMs, compound classes and kerogens.

Sample	IFE no.	EOM $\delta^{13}C$ ‰ PDB	SAT $\delta^{13}C$ ‰ PDB	ARO $\delta^{13}C$ ‰ PDB	NSO $\delta^{13}C$ ‰ PDB	ASPH $\delta^{13}C$ ‰ PDB	Kerogen $\delta^{13}C$ ‰ PDB
S6690	11931	-28.1	-28.6	-27.9	-28.4	-28.4	-
S6696	11932	-28.6	-29.4	-28.3	-28.5	-28.5	-
S6730	11934	nd	-28.3	-28.5	-27.8	-27.1	-
S6734	11935	-28.5	-29.0	-28.4	-28.2	-27.2	-
S6736	11936	nd	-29.7	-28.7	-28.7	-28.2	-
S6739	11937	-28.7	-31.3	nd	-28.5	-28.3	-
S6767	11938	-27.8	-29.7	-27.7	-27.3	-26.6	-26.8
S6777	11939	-26.9	-28.2	-26.8	-27.0	-26.9	-25.9
S6718	11940	-	-	-	-	-	-27.6
S6724	11941	-	-	-	-	-	-27.4
S6732	11942	-	-	-	-	-	-27.4
S6737	11943	-	-	-	-	-	-28.5
S6756	11944	-	-	-	-	-	-27.4
S6769	11946	-	-	-	-	-	-26.4
S6740	11948	-	-	-	-	-	-30.6

nd - not determined

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Trygve Meyer, department manager

TABLES

APPENDICES

1 INTRODUCTION

This report presents the results of a geochemical study performed in order to detect and characterize shows within Lower Tertiary and Upper Cretaceous strata in well 6610/3-1.

38 sandstones within the interval 1581.95 - 2691.25 mRKB, and 1 FMT sample (ZC 331434, 1645 mRKB) (see Table 1) were analysed according to the following analytical program:.

ANALYSIS	NUMBER OF SAMPLES	
	Sandstone	FMT
THA pyrolysis	35	
Extraction	18	
Iatroscan separation	18	
MPLC separation	6	
GC total extract	12	1
High temperature GC of saturates	1	
GC saturates	6	
GC aromatics	6	
GC-MS biomarkers	6	1
δ13C of EOM and fractions	5	

The analytical work was performed in accordance with the guidelines given in "The Norwegian Industry Guide to Organic Geochemical Analyses (3rd edition), 1993". The project was carried out at Statoil's Geochemistry Department and Prolab (high temperature GC) with subcontract to IFE (measurement of $^{13}C/^{12}C$ isotope ratios).

TABLE 1 SAMPLES ANALYSED.

DEPTH m RKB[1]	SAMPLE No.	SAMPLE TYPE	LITHOLOGY
1581.95	6678	CORE	sst,m
1582.50	6679	CORE	sst,m
1583.05	6680	CORE	sst,m
1583.25	6681	CORE	sst,m,glauc
1645.00	6895	FMT ZC331434	WATER[2]
1675.00	6752	SWC	sst,f-m,glauc,mic
1708.75	6682	CORE	sst,m,glauc,mic
1709.80	6683	CORE	sst,m,glauc
1710.80	6684	CORE	sst,m,,mic
1711.80	6685	CORE	sst,m,glauc,mic
1712.80	6686	CORE	sst,m,glauc,mic
1713.80	6687	CORE	sst,m,glauc,mic
1714.50	6688	CORE	sst,m,glauc,mic
2292.10	6689	CORE	sst,c,calc,
2293.75	6690	CORE	sst,c,
2295.05	6691	CORE	sst,c,calc
2299.50	6692	CORE	sst,f,glauc,mic
2300.05	6693	CORE	sst,f,mic
2301.75	6694	CORE	sst,f
2303.25	6695	CORE	sst,c,glauc
2303.95	6696	CORE	sst,m
2304.50	6697	CORE	sst,c
2305.50	6698	CORE	sst,vc
2309.15	6699	CORE	sst,m
2309.25	6700	CORE	sst,m,glauc,calc
2516.00	6701	CORE	sst,m,clayey
2519.50	6702	CORE	sst,m,glauc
2520.50	6703	CORE	sst,m
2523.05	6704	CORE	sst,m
2661.25	6705	CORE	sst,f,glauc,clayey
2663.25	6706	CORE	sst,m
2667.50	6707	CORE	sst,m,glauc,clayey
2669.50	6708	CORE	sst,f,clayey
2670.25	6709	CORE	sst,c,glauc
2672.50	6710	CORE	sst,f,clayey
2673.50	6893	CORE	sst,f,glauc,clayey
2673.85	6894	CORE	sst,f,glauc,clayey
2680.25	6711	CORE	sst,f
2691.25	6712	CORE	sst,m,calc

[1] The depths of the core chips refer to drillers depth, whilst the depths of the swc and FMT samples refer to loggers depth.
[2] The DCM extract of this water sample has been analysed in this study.

TABLE 2 RESULTS FROM ROCK-EVAL-TYPE PYROLYSIS.

DEPTH	S No.	S1	S2	S2/S1+S2
		mg HC/g rock		
1581.95	6678	0.01	0.12	0.92
1582.50	6679	0.01	0.10	0.91
1583.05	6680	0.01	1.1	0.99
1583.25	6681	0.01	0.31	0.97
1675.00	6752	0.10	0.15	0.60
1708.75	6682	0.01	0.02	0.67
1709.80	6683	0.02	0.07	0.78
1710.80	6684	0.01	0.05	0.83
1711.80	6685	0.01	0.03	0.75
1712.80	6686	0.01	0.00	0.00
1713.80	6687	0.02	0.06	0.75
1714.50	6688	0.01	0.02	0.67
2292.10	6689	0.01	0.04	0.80
2293.75	6690	3.7	0.25	0.06
2295.05	6691	0.05	0.13	0.72
2299.50	6692	0.01	0.07	0.88
2300.05	6693	0.02	0.07	0.78
2301.75	6694	0.04	0.18	0.82
2303.25	6695	0.03	0.16	0.84
2303.95	6696	14.4	0.10	0.01
2304.50	6697	0.03	0.09	0.75
2305.50	6698	0.04	0.10	0.71
2309.15	6699	11.4	0.44	0.04
2309.25	6700	0.06	0.11	0.65
2516.00	6701	0.14	1.2	0.89
2519.50	6702	0.01	0.06	0.86
2520.50	6703	0.01	0.03	0.75
2523.05	6704	0.03	0.09	0.75
2661.25	6705	0.00	0.00	-
2663.25	6706	0.00	0.00	-
2667.50	6707	0.01	0.00	0.00
2669.50	6708	0.01	0.10	0.91
2670.25	6709	0.00	0.02	1.00
2672.50	6710	0.01	0.04	0.80
2673.50	6893	0.02	0.08	0.80
2673.85	6894	0.02	0.02	0.50
2680.25	6711	0.02	0.12	0.86
2691.25	6712	0.01	0.01	0.50

TABLE 3 NORMALISED COMPOUND GROUP COMPOSITION (WT%) OF EXTRACTED ORGANIC C15+-MATTER.

DEPTH	S No.	ROCK (g)	EOM (mg)	EOM (ppm)	% SAT	% ARO	% POL	% ASP	% HC	% NON-HC
1583.05	6680	30.73	4.4	143	7	7	36	50	14	86
1675.00	6752	13.30	13.4	1008	20	6	64	10	26	74
1712.80	6686	30.56	2.0	65	5	3	42	50	8	92
2292.10	6689	32.46	1.6	49	8	5	37	50	13	87
2293.75	6690	22.90	249.6	10895	41	38	15	6	79	21
2295.05	6691	32.48	5.7	175	12	15	31	42	27	73
2299.50	6692	33.67	4.4	131	8	5	51	36	13	87
2300.05	6693	30.49	6.1	200	9	7	53	31	16	84
2301.75	6694	30.51	5.2	170	7	11	36	46	18	82
2303.25	6695	30.43	5.0	164	4	11	39	46	15	85
2303.95	6696	20.00	240.7	12065	38	40	15	7	78	22
2304.50	6697	31.49	5.5	175	9	12	47	33	20	80
2305.50	6698	30.56	5.9	193	30	16	27	27	46	54
2309.15	6699	20.62	276.3	13399	40	41	13	6	81	19
2309.25	6700	30.97	12.5	404	26	26	33	15	52	48
2516.00	6701	30.78	23.9	776	2	21	16	61	24	76
2667.50	6707	30.40	1.9	63	5	3	42	50	8	92
2680.25	6711	30.25	6.7	221	2	21	28	49	22	78

TABLE 4 GAS CHROMATOGRAPHIC DATA FOR EXTRACTED FRACTIONS.

DEPTH m RKB	SAMPLE No.	(A) Pristane n-C17	(B) Phytane n-C18	A B	Pristane Phytane	nC17 nC17+nC27	CPI 1	F1	F2	MPI 1
1675	S6752	1.2	0.37	3.2	1.2	0.50	1.5	0.74	0.30	0.63[1]
2516	S6701	4.3	0.72	6.0.	4.0.	0.25	1.4.	0.40	0.15	0.46

[1] Calculated by means of GC-MS analysis, m/z 178 and m/z 192.

TABLE 5 BIOMARKER PARAMETERS[1] FROM GC-MS ANALYSIS OF SATURATED HYDROCARBONS.

SAMPLE No.	DEPTH mRKB	IDENT.	20S	ββ	22S	Ts/Tm	TtX	30D/H	C30αβ
S6895[2]	1645FMT	6610V04B	0.47	0.49	0.58	1.00	0.38	0.05	0.86
S6752	1675	S6752SAA	0.50	0.43	0.57	1.07	0.38	0.05	0.89
S6690	2293.75	6610M21	0.74	0.73	n.d.	n.d.	n.d.	n.d.	n.d.
S6696	2303.95	6610M03	0.74	0.69	n.d.	n.d.	n.d.	n.d.	n.d.
S6699	2309.15	6610M04	0.73	0.69	n.d.	n.d.	n.d.	n.d.	n.d.
S6700	2309.25	S6700	0.67	0.68	n.d.	n.d.	n.d.	n.d.	n.d.
S6701	2516	S6701	0.43	0.45	0.54	0.13	0.24	0.08	0.69
JANUS		6610M11	0.49	0.53	0.59	1.20	2.14	0.14	0.84
BULGARIA		6610M	0.48	0.40	0.60	1.33	1.00	0.10	0.86

TABLE 5, CONT.

SAMPLE No.	DEPTH mRKB	IDENT.	%C27	%C28	%C29	C30/ST	Dia	C28αβ	H/S
S6895[2]	1645FMT	6610V04B	33	27	40	0.09	1.13	0.05	16.69
S6752	1675	S6752SAA	35	28	37	0.16	1.25	1.80[3]	4.66
S6690	2293.75	6610M21	29	31	40	0.12	2.79		
S6696	2303.95	6610M03	32	30	39	0.11	2.58		
S6699	2309.15	6610M04	31	30	38	0.12	1.15		
S6700	2309.25	S6700	31	31	38	0.11	2.13		
S6701	2516	S6701	26	45	30	0.05	0.99	0.10	7.17
JANUS		6610M11	34	28	38	0.10	1.25	0.00	5.56
BULGARIA		6610M	29	37	34	0.07	0.52	0.18	

TABLE 5, CONT.

SAMPLE No.	DEPTH mRKB	IDENT.	ppmH	ppmS	3R/H	4R/H	35/34H	29/30H	Dem/H	O/H	G/H
S6895[2]	1645FMT	6610V04B			0.08	0.05	1.06[4]	0.55	0.08	0.00	0.03
S6752	1675	S6752SAA	1207	259	0.29	0.18	1.08[4]	0.75	0.18	0.00	0.07
S6690	2293.75	6610M21	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6696	2303.95	6610M03	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6699	2309.15	6610M04	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6700	2309.25	S6700	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
S6701	2516	S6701	538	75	0.09	0.09	0.88	0.63	0.21	0.00	
JANUS		6610M11	4464	804	0.11	0.05	0.52	0.38	0.00	0.00	0.09
BULGARIA		6610M			0.06	0.08	1.13	0.40	0.00	0.28	0.07

[1] The derivation of parameters is described in Appendix B.
[2] Analysis of whole extract.
[3] 28αβ tentatively identiifed
[4] Unreliable
n.d.= not determined

TABLE 6 BIOMARKER PARAMETERS[1] FROM GC-MS ANALYSIS OF AROMATIC HYDROCARBONS.

SAMPLE No.	DEPTH mRKB	IDENT.	Arom1	Arom2	Crack1	Crack2
S6752	1675	S6752SAA	1.00	1.00	0.38	0.52
S6690	2293.75	6610A02	0.82	0.61	0	0
S6696	2303.95	6610A03	1.00	1.00	0.04	0.03
S6699	2309.15	6610A04	1.00	1.00	0	0
S6700	2309.25	S6700	0.93	0.76	0	0
S6701	2516	S6701	1.00	1.00	0.46	0.13
JANUS		6610A11	1.00	1.00	0.65	0.43
BULGARIA		6610A01	0.79	0.57	0.29	0.14

[1] The derivation of parameters is described in Appendix C.
n.d. = not determined

APPENDIX E

$^{13}C/^{12}C$ isotope ratios of extracts and fractions IFE

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INTRODUCTION

3 extracts (EOM) included the different compound classes (SAT, ARO, NSO, ASPH) are received for the determination of the $^{13}C/^{12}C$ isotope ratios.

ANALYTICAL PROCEDURES

EOM/compound classes

The sample materials are dissolved in a known amount of dichloromethane, and aliquots of 2 - 4 mg (or as much as possible) are put into Pyrex glass tubes. The solvent is evaporated at room temperature overnight, and CuO is added the glass tubes. The tubes are evacuated, sealed with a torch and combusted for 1 hour at 550°C (Zofer, 1980). The combustion products CO_2 and H_2O are separated and the $^{13}C/^{12}C$ isotope ratios determined on a Finnigan MAT 251 mass spectrometer.

A laboratory standard (whole oil) is analysed for every 10th sample. The analytical results is within ± 0.1‰.

RESULTS

The stable isotope results are given in Table 1. IFEs value on NBS 22 is -29.77 ± 0.06 ‰ PDB.

The $^{13}C/^{12}C$ isotope ratios are shown in Galimov plot in Figure 1. Figure 2 shows a cross plot of the $^{13}C/^{12}C$ isotope ratio of the saturates and aromatics.

LITERATURE

Sofer, Z. (1980). Preparation of carbon dioxide for stable isotope analysis of petroleum fractions. *Analytical Chemistry*, **52**, 1389-1391.

Table 1: $^{13}C/^{12}C$ isotope ratio of EOMs and compound classes.

Sample	IFE no.	EOM $\delta^{13}C$ ‰ PDB	SAT $\delta^{13}C$ ‰ PDB	ARO $\delta^{13}C$ ‰ PDB	NSO $\delta^{13}C$ ‰ PDB	ASPH $\delta^{13}C$ ‰ PDB
S6699	11933	-28.6	-29.1	-28.5	-28.2	-28.7
S6700	12005	-28.6	-28.5	-28.5	-28.9	-28.1
S6701	12006	-26.9	-27.1	-26.5	-27.2	-26.1