Table B - 10

(((
(ooo)
Norsk
Rydro

Daily mud properties — Date 26/5-1989

System : BORE

Well: 7321/9-1
Mud Contractor: Promud
Data: "Mid depth" from table 3, otherwise from table 14. 4

Date 26/5-1989

14. 4

Date	Mid. depth m,MD	Mud Dens. (SG)	PV cp	YP Pa	GEL 0 Pa	GEL 10 Pa	pH	100 psi (cc)	HP/HT (cc)	Cl- inn/out mg/l	Alkalinity Pf	Alkalinity Pm	Alkalinity Mf	Ca++ inn/out mg/l	Oil %	Sol %	H2O %	V.G. meter at 115 gr. F 600 rpm	300 rpm	200 rpm	100 rpm	6 rpm	3 rpm	Mud Type
881026	529	1.05	0	0																				SPUD
881027	546	1.05	0	0																				SPUD
881028	546	1.05	0	0																				SPUD
881029	562	1.05	0	0																				SPUD
881030	680	1.05	0	0																				SPUD
881031	680	1.05	0	0																				SPUD
881101	680	1.05	0	0																				SPUD
881102	680	1.08	13	6	1	1		6.5		33000/33000				40/40				38	25	18	10	2	1	KCL/POLYMER
881103	1008	1.14	14	7	1	1	9.2	4.0	20.0	34000/34000	0.50	1.20	0.40	76/76		9		42	28	19	11	3	3	KCL/POLYMER
881104	1213	1.14	16	7	1	1	9.5	5.0	20.0	31000/31000	0.50	0.20	0.40	160/160		10		46	30	23	15	2	2	KCL/POLYMER
881105	1330	1.14	16	7	1	1	9.5	4.6	17.0	33000/33000	0.60	0.20	0.60	180/180		10		47	31	23	14	2	1	KCL/POLYMER
881106	1365	1.14	16	7	1	2	9.5	4.0	18.0	32000/32000	0.60	0.30	0.60	160/160		10		47	31	22	13	3	2	KCL/POLYMER
881107	1372	1.15	16	10	1	2	9.5	4.0	17.0	32000/32000	0.50	0.30	0.50	192/192		10		52	36	26	19	4	2	KCL/POLYMER
881108	1387	1.14	17	10	1	2	9.5	4.6	14.0	34000/34000	0.60	0.30	0.60	180/180		10		55	38	28	18	3	2	KCL/POLYMER
881109	1398	1.14	17	9	1	2	9.4	4.2	15.0	35000/35000	0.70	0.20	0.70	140/140		11		52	35	25	15	3	2	KCL/POLYMER
881110	1427	1.14	17	7	1	2	9.4	3.6	8.0	35000/35000	0.70	0.20		140/140		11		48	31	23	15	2	1	KCL/POLYMER
881111	1550	1.14	16	11	1	1	8.7	3.8	14.0	38000/38000	0.10	0.10	0.90	100/100		11		55	39	27	20	2	1	KCL/POLYMER
881112	1723	1.14	18	8	1	2	9.1	4.0	14.0	35000/35000	1.00	0.30	0.90	80/80		10		52	34	21	12	1	1	KCL/POLYMER
881113	1800	1.14	18	8	1	2	9.3	4.0	14.0	35000/35000	1.00	0.30	0.80	100/100		10		52	34	24	14	2	1	KCL/POLYMER
881114	1800	1.14	17	8	1	2	9.3	4.1	15.0	35000/35000	1.00	0.30	0.80	100/100		10		50	33	23	13	1	1	KCL/POLYMER
881115	1800	1.14	18	8	1	2	9.3	4.0	15.0	35000/35000	1.00	0.30	0.70	100/100		10		52	34	24	14	1	1	KCL/POLYMER
881116	1800	1.14	18	8	1	2	9.3	4.0	15.0	35000/35000	1.00	0.30	0.80	100/100		10		52	34	24	14	1	1	KCL/POLYMER
881117	1800	1.14	18	8		2	9.2	4.0	15.0	35000/35000	0.70	0.20	0.70	100/100		10		53	35	24	15	2	1	KCL/POLYMER
881118	1800	1.14	16	7		8	9.0	3.9	14.0	35000/35000	0.10	0.20	0.60	120/120		10		46	30	22	12	1	1	KCL/POLYMER
881119	1800	1.14	15	7		1	9.0	3.9	15.0	35000/35000	0.10	0.20	0.60	120/120		10		44	29	22	12	1	1	KCL/POLYMER
881120	1800	1.14	15	7		1	9.0	3.9	14.0	35000/35000	0.10	0.20	0.60	120/120		10		44	29	21	11	1	1	KCL/POLYMER
881121	625	1.14	15	7		1	9.0	3.9	14.0	35000/35000	0.10	0.20		120/120		10		44	29	21	11	1	1	KCL/POLYMER
881122	622	1.14	15	7		1	9.0	3.9	14.0	35000/35000	0.10	0.20		120/120		10		44	29	21	11	1	1	KCL/POLYMER
881123	570	1.14	15	7		1	9.0	3.9	14.0	35000/35000	0.10	0.20		120/120		10		44	29	21	11	1	1	KCL/POLYMER
881124	500	1.14	15	7		1	9.0	3.9	14.0	35000/35000	0.10	0.20		120/120		10		44	29	21	11	1	1	KCL/POLYMER

((((ooo) ------- Norsk Hydro	Mud consumption System : BORE Well: 7321/9-1 Mud company: Promud	Date 26/5-1989 13

		Actual used
Drilling of 36 " hole		
BARITE	Kg	46000
BENTONITE	Kg	47000
SODA ASH	Kg	275
Drilling of 17 1/2" hole		
BARITE	Kg	41000
BENTONITE	Kg	25000
KOH	Kg	50
NEWDRILL	Kg	1800
PROPOL REG	Kg	775
PROPOL SL	Kg	1000
SODA ASH	Kg	150
KCL-BRINE	l	73000
Drilling of 12 1/4" hole		
BARITE	Kg	99000
BENTONITE	Kg	3000
KALIUMKLORID	Kg	7500
KCL	Kg	4000
KOH	Kg	350
NEWDRILL	Kg	5700
PROPOL REG	Kg	3000
PROPOL SL	Kg	2950
SODA ASH	Kg	250
XC-POLYMER	Kg	275
KCL-BRINE	l	127000

HYDRO

Bergen

U-594

-3

Rapport/Report BA 89-1002-1

Fortrolig/ Confidential ☐	Tittel Forfatter(e) Title Author(s)	Sign
Fordeling Distribution B. Martin/Arkiv E. Rygg/Arkiv Hydro Harstad 12 E. Rein	Petroleum Geochemistry Well: 7321/9-1 Elin Rein	E.Re

Resyme Konklusjon Anbefaling
Summary Conclusion Recommendation

Emneord/Key words			Emnekategori Subject category
Source Rocks, Maturity Migrated Hydrocarbons			Petroleum Geochemistry
Division Seksjon Avdeling Division Section Dept Geosection Petroleum Geochemistry	Kvadrant Blokk Brønn Quadrant Block Well 7321/9-1		Dato Date 26.04.89 Side Pages Appendix
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1. INTRODUCTION.

Well 7321/9-1 located in the Bjørnøya II area was spudded 26.11.88 and reached T.D. at 1800 m in siltstone of Carnian age. The well location is given in Figure 1.1 and the well summary outlining formation tops is given in Figure 1.2.

Based on the geochemical screening analyses by Norsk Hydro Research Center (L. Aakvaag and N. Telnaes), 52 drill cuttings and core samples were selected for further analysis. A list of the samples investigated is given in Table 1.1.

This report comprises the results from petroleum geochemical analyses of 52 DCs and CCs. Extraction and group type separation have been undertaken by Geochem Laboratories (Chester, UK). Vitrinite reflectance, visual kerogen and Spore Colour Indices (SCI) have been analysed by Robertson Research (North Wales, UK). In addition to this Geo-optics (Northumberland, UK) have analysed a parallel set of samples for vitrinite reflectance. Stable isotopic composition of fractions and kerogen have been analysed by Geolab Nor (Trondheim, Norway). All pyrolysis, gas chromatographic analysis of saturated and aromatic hydrocarbons, pyrolysis gas chromatography, biomarker analysis, and the interpretation of data and compilation of this report was undertaken by Norsk Hydro Research Center, Bergen Norway.

	TOC	ROCK-EVAL BE	ROCK-EVAL AE	PYGC	EXT	GC SAT	GC ARO	BIOM SAT	ISOTOP	VISUAL KEROGEN	R0 RR	R0 GEO-OPTICS
700.00											*	*
750.00											*	*
800.00											*	*
850.00											*	*
900.00											*	*
950.00	*	*	*	*	*	*				*	*	*
960.00	*	*	*	*	*	*				*		
970.00	*	*	*	*	*	*	*	*	*	*		
980.00	*	*	*	*	*	*	*	*	*	*		
990.00	*	*	*	*	*	*	*	*	*	*		
1000.00	*	*	*	*	*	*				*	*	*
1035.00	*	*										
1050.00										*	*	*
1100.00	*	*								*	*	*
1140.00	*	*								*		
1150.00											*	*
1240.00	*	*								*		
1245.00	*	*								*		
1250.00											*	*
1282.00	*	*								*		
1295.00	*	*								*		
1300.00											*	*
1310.00	*	*	*	*	*	*				*		
1317.00	*	*	*	*	*	*				*		
1322.00	*	*	*	*	*	*				*		
1327.00	*	*	*	*	*	*	*	*	*	*		
1332.00	*	*	*	*	*	*				*		
1337.00	*	*	*	*	*	*	*	*	*	*		
1342.00	*	*	*	*	*	*				*		
1347.00	*	*	*	*	*	*	*	*	*	*		
1352.00	*	*	*	*	*	*				*		
1357.00	*	*	*	*	*	*	*	*	*	*		
1367.75	*	*	*	*	*	*				*	*	*
1370.50					*	*	*	*	*			
1377.00					*	*	*	*	*			
1379.00					*	*	*	*	*			
1383.50					*	*						
1389.50					*	*	*	*	*			
1397.75											*	*
1400.00												
1425.00	*	*								*		
1450.00											*	*
1500.00											*	*
1550.00											*	*
1600.00											*	*
1622.00	*	*								*		
1642.00	*	*			*	*				*		
1650.00											*	*
1700.00											*	*
1777.00	*	*	*	*	*	*	*	*	*	*		
1780.00	*	*								*		
1800.00											*	*

Tab. 2.1. Source Rock Screening Data.

Table 2.1. **SOURCE ROCK SCREENING DATA WELL 7321/9-1**

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Depth (m)	%	Lithology	Sample	S1 Kg/t	S2 Kg/t	S3 Kg/t	TOC %	HI	OI	PI	Tmax Deg.c	Company
700.00		MDST	DC	0.0	0.3	0.9	0.8	41	121	0.09	441	F-BG
750.00		MDST	DC	0.0	0.2	0.3	0.6	29	49	0.18	441	F-BG
800.00		MDST	DC	0.0	0.2	0.2	0.6	28	38	0.11	446	F-BG
850.00		MDST	DC	0.1	0.2	0.1	0.6	40	21	0.18	437	F-BG
900.00		MDST	DC	0.4	0.3	0.3	0.6	53	45	0.54	437	F-BG
950.00		MDST	DC	1.2	1.9	0.8	1.4	139	54	0.39	434	F-BG
960.00		MDST	DC	1.1	2.7	0.7	1.3	202	53	0.29	440	F-BG
970.00		MDST	DC	3.6	17.5	0.5	4.0	434	12	0.17	437	F-BG
980.00		MDST	DC	4.7	24.1	0.4	5.3	453	8	0.16	434	F-BG
990.00		MDST	DC	3.5	16.5	0.5	4.2	395	12	0.17	437	F-BG
1000.00		MDST	DC	1.6	5.5	1.3	2.4	231	54	0.23	436	F-BG
1035.00		MDST	DC	0.8	2.2	1.0	1.4	151	67	0.26	437	F-BG
1100.00		MDST	DC	0.6	2.4	1.2	1.6	147	72	0.20	440	F-BG
1140.00		MDST	DC	0.7	2.0	1.4	1.6	127	86	0.26	441	F-BG
1150.00			DC	0.8	1.2		1.3	91		0.39	444	F-BG
1240.00		MDST	DC	0.5	2.5	0.6	2.7	93	23	0.17	446	F-BG
1245.00		MDST	DC	0.6	3.0	0.8	2.7	109	28	0.17	443	F-BG
1250.00		MDST	DC	0.6	1.8	0.6	2.1	88	29	0.23	446	F-BG

Table 2.1. **SOURCE ROCK SCREENING DATA WELL 7321/9-1** (cont'd)

Depth (m)	%	Lithology	Sample	S1 Kg/t	S2 Kg/t	S3 Kg/t	TOC %	HI	OI	PI	Tmax Deg.c	Company
1282.00		MDST	DC	0.3	2.3	0.4	2.1	110	19	0.12	448	F-BG
1295.00		MDST	DC	0.3	2.3	0.4	2.2	107	18	0.13	450	F-BG
1300.00			DC	0.5	2.5	0.4	2.5	98	15	0.17	448	F-BG
1310.00		MDST	DC	0.4	2.7	0.7	3.0	90	23	0.14	447	F-BG
1317.00		LST	DC	0.2	0.6	0.4	0.6	111	65	0.20	439	F-BG
1322.00		MDST	DC	0.9	3.3	0.3	1.5	219	16	0.22	445	F-BG
1327.00		MDST	DC	1.5	5.1	0.3	2.1	240	15	0.23	443	F-BG
1332.00		MDST	DC	1.3	4.6	0.3	2.0	230	16	0.23	446	F-BG
1337.00		MDST	DC	1.7	6.4	0.3	2.5	260	11	0.21	445	F-BG
1342.00		MDST	DC	1.8	7.7	0.3	3.0	258	11	0.19	445	F-BG
1347.00		MDST	DC	1.7	7.2	0.3	2.8	257	12	0.19	443	F-BG
1352.00		MDST	DC	1.5	6.6	0.3	2.6	255	13	0.18	446	F-BG
1357.00		MDST	DC	2.5	9.8	0.4	3.4	286	11	0.20	450	F-BG
1367.75		SLTY.MDST	DC	0.4	1.6	0.3	0.6	260	58	0.19	450	F-BG
1400.00		MDST	DC	0.2	0.3		0.6	56		0.35	442	F-BG
1425.00		SST	DC	0.7	1.2	1.3	1.0	116	131	0.38	453	F-BG
1450.00		SST	DC	0.9	0.8		1.0	76		0.54	455	F-BG
1500.00		SST	DC	0.8	0.7	0.9	0.8	87	108	0.53	454	F-BG
1550.00		MDST	DC	0.4	0.6	0.7	0.7	87	97	0.42	453	F-BG

Table 2.1. **SOURCE ROCK SCREENING DATA WELL 7321/9-1** (cont'd)

Depth (m)	%	Lithology	Sample	S1 Kg/t	S2 Kg/t	S3 Kg/t	TOC %	HI	OI	PI	Tmax Deg.c	Company
1622.00		SST	DC	0.5	1.5	0.5	1.1	142	44	0.23	453	F-BG
1642.00		SST	DC	0.8	0.9	0.3	0.7	128	42	0.46	445	F-BG
1650.00		SST	DC	0.7	0.7	0.4	0.6	114	61	0.51	454	F-BG
1700.00		SST	DC	0.1	0.2	0.3	0.4	50	75	0.33	457	F-BG
1777.00		SST	DC	0.5	3.0	0.5	2.7	110	18	0.13	454	F-BG
1780.00		MDST	DC	0.4	2.6	0.4	2.4	109	16	0.14	455	F-BG
1800.00		MDST	DC	0.1	0.4	0.6	0.7	65	85	0.17	462	F-BG

Tab. 2.2. Rock Eval Data, Extracted Samples.

DEPTH m	S1 kg/tonne	S2 kg/tonne	Tmax
950.00	0.23	1.36	437
960.00	0.20	2.32	434
970.00	0.20	15.63	433
980.00	0.24	19.36	433
990.00	0.39	15.61	434
1000.00	0.11	3.70	438
1310.00	0.14	2.57	448
1317.00	0.04	0.20	444
1322.00	0.06	1.68	445
1327.00	0.01	2.79	444
1332.00	0.12	3.12	444
1337.00	0.16	4.10	444
1342.00	0.38	5.66	446
1347.00	0.23	5.10	445
1352.00	0.14	4.40	445
1357.00	0.33	7.76	447
1367.75	0.07	0.31	451
1777.00	0.32	3.44	451

Tab. 2.3. Molecular Ratios.

Table 2.3. **SATURATED FRAC., MOLECULAR RATIOS WELL 7321/9-1**

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Depth	Pr/n-C17	Pr/Ph	CPI-I	CPI-II	n-C15+/Total	n-C20/n-C25
950.00	0.71	1.70	1.07	1.03		
960.00	0.66	1.60	1.10	1.02		
970.00	1.03	1.40	1.07	1.02		
980.00	1.08	1.50	1.17	1.00		
990.00	1.01	1.60	1.15	1.06		
1000.00	0.70	1.60	1.22	1.06		
1310.00	0.71	3.30	1.21	1.15		
1317.00	0.67	1.60	1.70	1.05		
1322.00	0.72	1.90	2.45	1.11		
1327.00	0.70	1.80	1.12	1.06		
1332.00	0.83	1.60	1.36	1.05		
1337.00	0.91	1.70	1.11	1.08		
1342.00	0.86	1.80	1.15	1.10		
1347.00	0.86	1.90	1.12	1.05		
1352.00	0.84	2.10	1.17	1.10		
1357.00	0.95	2.10	1.08	1.02		
1367.75	0.62	1.50	1.19	1.05		
1370.50	0.47	1.80	1.10	1.02		

Table 2.3. **SATURATED FRAC., MOLECULAR RATIOS WELL 7321/9-1** (cont'd)

Depth	Pr/n-C17	Pr/Ph	CPI-I	CPI-II	n-C15+/Total	n-C20/n-C25
1377.00	0.43	1.70	1.12	1.07		
1379.00	0.51	1.60	1.11	1.01		
1383.50	0.51	1.60	1.11	1.03		
1389.50	0.48	1.40	1.09	1.05		
1397.75	0.53	1.80	1.14	1.08		
1642.00	0.58	1.50	1.06	0.98		
1777.00	0.41	3.40	1.10	0.97		

Tab. 2.4. Kerogen Composition.

Table 2.4. **KEROGEN COMPOSITION, SPORE AND POLLEN COMPOSITION WELL 7321/9-1**

Petroleum Geochemistry Group
Research Center Bergen
HYDRO

Depth (m)	Amorphous matr.	Woody	Inert-inite	Palyno-morphs	Algal	Herbaceous	Reworked (%)	Particle size	Preserv. (1-3)
950.00			70.00	5.00					
960.00	45.00		25.00	10.00					
970.00	70.00		10.00						
980.00	85.00		5.00	5.00					
990.00	80.00		5.00	5.00					
1000.00	40.00		10.00	5.00					
1050.00	50.00		10.00	10.00					
1100.00	15.00		15.00	10.00					
1140.00	65.00		10.00	5.00					
1240.00	85.00		5.00						
1245.00	75.00		10.00						
1282.00	80.00		5.00						
1295.00	85.00		5.00						
1310.00	85.00			10.00					
1317.00	70.00		10.00						
1322.00	80.00		5.00	5.00					
1327.00	85.00		5.00						
1332.00	85.00		5.00						

Table 2.4. **KEROGEN COMPOSITION, SPORE AND POLLEN COMPOSITION WELL 7321/9-1** (cont'd)

Depth (m)	Amorphous matr.	Woody	Inert-inite	Palyno-morphs	Algal	Herbaceous	Reworked (%)	Particle size	Preserv. (1-3)
1337.00	85.00		5.00						
1342.00	80.00		10.00						
1347.00	80.00		10.00						
1352.00	85.00		10.00						
1357.00	80.00		10.00						
1367.75	20.00		15.00	5.00					
1425.00			25.00	10.00					
1622.00	45.00		30.00	10.00					
1642.00			60.00	30.00					
1777.00	45.00		15.00	10.00					
1780.00	60.00		15.00	10.00					

Tab. 2.5. Stable Isotopes.

DEPTH	SAT	ARO	NSO	ASPH	KEROGEN	EOM
970.0	-29.83	-29.33	-29.07	-28.23	-28.29	-29.96
980.0	-29.68	-29.46	-29.24	-28.38	-28.45	-29.87
990.0	-29.99	-29.44	-29.36	-28.24	-28.35	-29.81
1327.0	-30.90	-29.79	-29.52	-28.17	-28.33	-30.21
1337.0	-29.63	-29.33	-28.14	-28.56	-28.26	-30.17
1347.0	-29.79	-28.55	-28.40	-28.20	-27.95	-30.18
1357.0	-29.57	-28.29	-28.32	-27.75	-27.21	-29.23
1370.5	-28.68	-27.49	-25.99	-26.30		-28.75
1377.0	-28.76	-27.01	-26.21	-25.94		-29.14
1379.0	-29.10	-27.11	-26.59	-26.81		-29.26
1389.5	-28.39	-27.34	-26.66	-26.68		-28.79
1777.0	-27.77	-26.58	-26.03	-25.94	-25.82	-27.78

Tab. 3.1. Vitrinite Reflectance and SCI data.

Table 3.1. **VITRINITE REFLECTANCE DATA WELL 7321/9-1**
Average values

Petroleum Geochemistry Group
Research Center Bergen
HYDRO

Depth	Population I	Population II	Population III	SCI
700.00	0.40 (2)			
750.00	0.45 (1)			
800.00	0.44 (1)			
850.00	0.53 (3)			
900.00	0.53 (2)			
950.00	0.51 (20)			6
960.00				6
970.00				5
980.00				5
990.00				5
1000.00	0.54 (20)			5
1050.00	0.56 (17)			6
1100.00	0.60 (21)			5
1140.00				7
1150.00	0.58 (19)			
1240.00				6
1245.00				6
1250.00	0.60 (16)			

Table 3.1. **VITRINITE REFLECTANCE DATA WELL 7321/9-1** (cont'd)
Average values

Petroleum Geochemistry Group
Research Center Bergen
HYDRO

Depth	Population I	Population II	Population III	SCI
1282.00				6
1295.00				6
1300.00	0.64 (12)			
1310.00				6
1317.00				6
1322.00				6
1327.00				6
1332.00				6
1337.00				6
1342.00				6
1347.00				6
1352.00				6
1357.00				6
1367.75	0.60 (5)			7
1400.00	0.67 (8)			
1425.00				7
1450.00	0.74 (18)			
1500.00	0.72 (6)			
1550.00	0.56 (2)	0.87 (1)		

Table 3.1. **VITRINITE REFLECTANCE DATA WELL 7321/9-1** (cont'd)
Average values

Depth	Population I	Population II	Population III	SCI
1622.00				8
1642.00				7
1650.00	0.75 (9)			
1700.00	0.75 (11)			
1777.00				7
1780.00				7
1800.00	0.86 (22)			

Tab. 3.2. Vitrinite Reflectance data (RR).

Table 3.2 Vitrinite reflectance data.

DEPTH, m start int.	DEPTH, m end int.	ANALYST or COMPANY	SAMPLE TYPE	SAMPLE LITH. %	R0%	POP 1	R0%	POP 2	R0%	POP 3	R0%	POP 4
690.00	700.00	F-BG	DC	MUDST	0.56	15	0.37	2	0.80	9	1.15	9
740.00	750.00	F-BG	DC	MUDST	0.58	8	0.80	6	1.12	9		
790.00	800.00	F-BG	DC	MUDST	0.59	14	0.37	9	0.77	18	1.02	14
840.00	850.00	F-BG	DC	MUDST	0.59	9	0.85	13	1.16	6		
890.00	900.00	F-BG	DC	MUDST	0.52	2	0.77	9	1.06	12		
940.00	950.00	F-BG	DC	MUDST	0.57	14	0.40	21	0.81	13	1.08	7
990.00	1000.00	F-BG	DC	MUDST	0.58	4	0.39	14	0.78	4	1.09	5
1032.00	1035.00	F-BG	DC	MUDST	0.63	20	0.44	15	0.86	14		
1097.00	1100.00	F-BG	DC	MUDST	0.61	11	0.43	28	0.84	11	1.05	5
1145.00	1150.00	F-BG	DC		0.65	23	0.44	16	0.90	13		
1245.00	1250.00	F-BG	DC	MUDST	0.70	12	0.48	12	0.96	9	1.20	19
1297.00	1300.00	F-BG	DC		0.74	32	0.53	4	1.04	15		
1367.75	1367.75	F-BG	CORE	SL.MUDST	0.68	27	0.54	8	1.04	18		
1397.00	1400.00	F-BG	DC	MUDST	0.75	12	0.51	17	1.03	10		
1447.00	1450.00	F-BG	DC	SST	0.75	44	1.03	7				
1497.00	1500.00	F-BG	DC	SST	0.79	31	1.05	14				
1547.00	1550.00	F-BG	DC	MUDST	0.85	13	0.62	3	1.16	24		
1597.00	1600.00	F-BG	DC		0.92	13	0.70	16	1.28	16	1.58	9
1647.00	1650.00	F-BG	DC	SST	0.93	16	0.67	10	1.21	27		
1697.00	1700.00	F-BG	DC	SST	0.94	15	0.73	9	1.33	26		
1797.00	1800.00	F-BG	DC	MUDST	0.92	36	0.73	10	1.19	7		

Tab. 3.3. Biomarker Ratio.

Table 3.3 Biomarker ratio.

DEPTH, m start int.	DEPTH, m end int.	%20S
960.00	970.00	14
970.00	980.00	14
980.00	990.00	15
1325.00	1327.00	52
1377.00	1377.00	55
1775.00	1777.00	55
1345.00	1347.00	56
1370.50	1370.50	56
1355.00	1357.00	57
1379.00	1379.00	57
1335.00	1337.00	58
1383.50	1383.50	58

Tab. 4.1. Extraction data I.

Table 4.1. **SOURCE ROCK EXTRACTION DATA I WELL 7321/9-1**

Petroleum Geochemistry Group
Research Center Bergen
HYDRO

Depth(m)	EOM(mg)	EOM(%)	Hydrocarbons SAT(%)	Hydrocarbons ARO(%)	Hydrocarbons TOTAL(%)	Non Hydrocarbons NSO(%)	Non Hydrocarbons ASPH(%)	Non Hydrocarbons TOTAL(%)
950.00		0.31	73	8	80	14	6	20
960.00		0.39	66	8	75	19	6	25
970.00		0.93	52	15	67	24	9	33
980.00		1.19	41	13	54	23	23	47
990.00		0.76	52	16	68	27	5	32
1000.00		0.44	58	12	70	18	12	30
1310.00		0.13	24	22	46	22	32	54
1317.00		0.09	63	11	73	12	15	27
1322.00		0.36	56	15	72	21	8	28
1327.00		0.51	49	17	66	25	9	34
1332.00		0.44	48	15	63	25	12	37
1337.00		0.44	49	18	66	23	11	34
1342.00		0.36	44	19	64	27	10	37
1347.00		0.39	50	20	70	20	10	30
1352.00		0.46	45	18	63	26	12	37
1357.00		0.46	53	19	71	20	9	29
1367.75		0.09	67	12	79	12	9	21
1370.50		0.11	75	9	84	8	8	17

Table 4.1. **SOURCE ROCK EXTRACTION DATA I WELL 7321/9-1** (cont'd)

Depth(m)	EOM(mg)	EOM(%)	Hydrocarbons SAT(%)	ARO(%)	TOTAL(%)	Non Hydrocarbons NSO(%)	ASPH(%)	TOTAL(%)
1377.00		0.23	72	10	83	8	9	17
1379.00		0.22	82	7	89	8	4	11
1383.50		0.06	74	7	81	9	11	19
1389.50		0.07	69	11	80	10	11	20
1397.75		0.03	71	7	77	10	13	23
1642.00		0.18	78	9	87	8	5	13
1777.00		0.12	33	20	53	19	28	47

Tab. 4.2. Extraction data II.

Table 4.2. **SOURCE ROCK EXTRACTION DATA II WELL 7321/9-1**

Petroleum Geochemistry Group
Research Center Bergen
HYDRO

Depth(m)	TOC (%)	EOM(%)/TOC(%)	SAT(%)/TOC(%)	SAT(%)/ARO(%)	HC/non HC
950.00	1.40	0.22	52.07	9.72	4.10
960.00	1.31	0.30	50.69	8.10	2.94
970.00	4.04	0.23	12.95	3.49	2.06
980.00	5.31	0.22	7.72	3.28	1.15
990.00	4.17	0.18	12.42	3.20	2.13
1000.00	2.39	0.18	24.14	4.69	2.33
1310.00	2.96	0.04	7.94	1.05	0.85
1317.00	0.55	0.16	114.18	5.98	2.75
1322.00	1.52	0.24	36.97	3.65	2.52
1327.00	2.11	0.24	23.36	2.97	1.93
1332.00	1.98	0.22	24.29	3.16	1.72
1337.00	2.46	0.18	19.80	2.75	1.98
1342.00	2.98	0.12	14.90	2.32	1.74
1347.00	2.81	0.14	17.83	2.54	2.31
1352.00	2.57	0.18	17.63	2.59	1.69
1357.00	3.42	0.13	15.35	2.81	2.47
1367.75	0.60	0.15	111.67	5.63	3.74
1370.50				8.38	5.06

Table 4.2. **SOURCE ROCK EXTRACTION DATA II WELL 7321/9-1** (cont'd)

Depth(m)	TOC (%)	EOM(%)/TOC(%)	SAT(%)/TOC(%)	SAT(%)/ARO(%)	HC/non HC
1377.00				7.03	4.78
1379.00				11.01	8.01
1383.50				10.71	4.21
1389.50				6.60	3.95
1397.75				10.22	3.42
1642.00	0.74	0.24	105.81	8.80	6.81
1777.00	2.70	0.04	12.19	1.65	1.12

HYDRO
Bergen

Rapport/Report

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Sign

Fordeling Distribution

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Oil-source rock correlation of well 7321/9-1 (Hydro)

Arne Steen & Jan Augustson

Resyme/Konklusjon/Anbefaling
Summary Conclusion Recommendation

Emneord/Key words

Oil-source rock correlation, Biomarkers, SMIM, maturity

Emnekategori/Subject category
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EXPERIMENTAL

The SAT-fractions of extracted samples are analyzed by GC/MS. Standard lab procedures of selected metastable ion monitoring are used to detect pre-selected groups of SAT-biomarkers.

List of analyzed metastable transitions:

Group 1 (low molecular weight biomarkers):

a.	360 m/z	-> 191 m/z	=> C_{26}	tricyclic terpanes
b.	346	-> 191	=> C_{25}	-"-
c.	332	-> 191	=> C_{24}	-"-
d.	318	-> 191	=> C_{23}	-"-
e.	304	-> 191	=> C_{22}	-"-
f.	290	-> 191	=> C_{21}	-"-
g.	276	-> 191	=> C_{20}	-"-
h.	316	-> 217	=> C_{23}	steranes
i.	302	-> 217	=> C_{22}	-"-
j.	288	-> 217	=> C_{21}	-"-

Group 2:

k.	454 m/z	-> 191 m/z	=> C_{33}	pentacyclic triterpanes
l.	440	-> 191	=> C_{32}	-"-
m.	426	-> 191	=> C_{31}	-"-
n.	412	-> 191	=> C_{30}	-"-
o.	398	-> 191	=> C_{29}	-"-
p.	384	-> 191	=> C_{28}	-"-
q.	370	-> 191	=> C_{27}	-"-
r.	414	-> 217	=> C_{30}	steranes
s.	400	-> 217	=> C_{29}	-"-
t.	386	-> 217	=> C_{28}	-"-
u.	372	-> 217	=> C_{27}	-"-

Standardized identification of SAT-biomarkers:

Triterpanes:

Numbers from 18 to 35 correspond to the carbon number of the molecule, the subsequent capital letter identifies the stereochemistry and/or the number of rings.

A 17α(H)-hopanes (I) 22S
B 17α(H)-hopanes 22R
C 17β(H)-moretanes (II) 22S
D 17β(H)-moretanes 22R
E 17β(H)-hopanes (III)
F Neohopanes (IV)
G Gammacerane (V)
H Hopenes (VI)
I 25-norhopanes (VII)
L Lupane (VIII)
O 18α(H)-oleanane (IX)
X Tetracyclic terpanes (X)
Y Tricyclic terpanes (XI)
N Unidentified

Steranes:

Numbers from 20 to 30 correspond to the carbon number of the molecules, the subsequent small letter identifies the stereochemistry.

a 13β(H),17α(H)-diasteranes 20S (1)
b 13β(H),17α(H)-diasteranes 20R (2)
c 13α(H),17β(H)-diasteranes 20S (3)
d 13α(H),17β(H)-diasteranes 20R (4)
e 5α(H),14α(H),17α(H)-steranes 20S (5)
f 5α(H),14β(H),17β(H)-steranes 20R (6)
g 5α(H),14β(H),17β(H)-steranes 20S (7)
h 5α(H),14α(H),17α(H)-steranes 20R (8)
i 5β(H),14α(H),17α(H)-steranes (9)
k 4-methylsteranes (10)
n unidentified

Examples: 31B corresponds to 17α(H)-homohopane 22R
29e corresponds to ααα-ethylcholestane 20S

The relative distribution of the analysed SAT-biomarkers are presented in bargraphs,- measured as peak heights and normalized to the most abundant compound:
Data are listed in Appendix Ia.
Bargraphs are presented in Appendix Ib.

This semi-quantitative presentation is strictly related to the analytical method.
The concentration/response-ratio is not necessarily comparable between different type of compounds. A quantitative comparison of biomarker distributions are hence restricted to a narrow range of concentrations.

The analysed SAT-biomarkers, presented in the included bargraphs, are abbreviated accordingly:

Terpanes:

26Y:	C-26 Tri-cyclic terpanes
26YY:	C-26 Tri-cyclic terpanes
25Y:	C-25 Tri-cyclic terpanes
24Y:	C-24 Tri-cyclic terpanes
24XY:	C-24 Tetra-cyclic terpanes
23Y:	C-23 Tri-cyclic terpanes
22Y:	C-22 Tri-cyclic terpanes
21Y:	C-21 Tri-cyclic terpanes
20Y:	C-20 Tri-cyclic terpanes

Low molecular weight steranes:

23a:	C-23 Sterane
23k:	C-23 Sterane
22a:	C-22 Sterane
22k:	C-22 Sterane
21a:	C-21 Sterane
21k:	C-21 Sterane

Triterpanes:

33A: C-33 17α(H),21β(H)-trishomohopane-22S
33B: C-33 17α(H),21β(H)-trishomohopane-22R

32A: C-32 17α(H),21β(H)-bishomohopane-22S
32B: C-32 17α(H),21β(H)-bishomohopane-22R

31A: C-31 17α(H),21β(H)-homohopane-22S
31B: C-31 17α(H),21β(H)-homohopane-22R
31C: C-31 17β(H),21β(H)-homohopane-22S
31D: C-31 17β(H),21β(H)-homohopane-22R

30F: C-30 ?-hopane
30A: C-30 17α(H),21β(H)-hopane
30H: C-30 ?-hopene
30C: C-30 17β(H),21α(H)-moretane

29N: C-29 ?-30-norhopane
29A: C-29 17α(H),21β(H)-30-norhopane
29F: C-29 ?-30-norhopane
29C: C-29 17β(H),21α(H)-30-normoretane

28A: C-28 17α(H),21β(H)-28,30-bisnorhopane + βα-bisnormoretane
28N: C-28 ?-17β(H),21β(H)-28,30-bisnorhopane

27F: C-27 18α(H)-22,29,30-trisnorneohopane (Ts)
27A: C-27 17α(H)-22,29,30-trinorhopane (Tm)

Steranes:

30a: C-30 13β(H),17α(H)-diasterane-20S
b: C-30 13β(H),17α(H)-diasterane-20R
c: C-30 13α(H),17β(H)-diasterane-20S
d: C-30 13α(H),17β(H)-diasterane-20R
e: C-30 5α(H),14α(H),17α-sterane-20S
f: C-30 5α(H),14β(H),17β-sterane-20R
g: C-30 5α(H),14β(H),17β-sterane-20S
h: C-30 5α(H),14α(H),17α-sterane-20R

29a: C-29 13β(H),17α(H)-diasterane-20S
b: C-29 13β(H),17α(H)-diasterane-20R
c: C-29 13α(H),17β(H)-diasterane-20S
d: C-29 13α(H),17β(H)-diasterane-20R
e: C-29 5α(H),14α(H),17α-sterane-20S
f: C-29 5α(H),14β(H),17β-sterane-20R
g: C-29 5α(H),14β(H),17β-sterane-20S
h: C-29 5α(H),14α(H),17α-sterane-20R

28a: C-28 13β(H),17α(H)-diasterane-20S
28aa: C-28 ?-diasterane-20S
b: C-28 13β(H),17α(H)-diasterane-20R
28bb: C-28 ?-diasterane-20R
c: C-28 13α(H),17β(H)-diasterane-20S
d: C-28 13α(H),17β(H)-diasterane-20R
e: C-28 5α(H),14α(H),17α-sterane-20S
f: C-28 5α(H),14β(H),17β-sterane-20R
g: C-28 5α(H),14β(H),17β-sterane-20S
h: C-28 5α(H),14α(H),17α-sterane-20R

27a: C-27 13β(H),17α(H)-diasterane-20S
b: C-27 13β(H),17α(H)-diasterane-20R
c: C-27 13α(H),17β(H)-diasterane-20S
d: C-27 13α(H),17β(H)-diasterane-20R
e: C-27 5α(H),14α(H),17α-sterane-20S
f: C-27 5α(H),14β(H),17β-sterane-20R
g: C-27 5α(H),14β(H),17β-sterane-20S
h: C-27 5α(H),14α(H),17α-sterane-20R

RESULT AND DISCUSSION:

Analysed samples and analytical information are listed below.
Samples labelled 'ST....' are representing an internal lab reference sample in order to document the analytical repeatability and quality.
The analytical quality are indicated on the list. Samples labelled 'N.D.' had not detectable amounts of SAT-biomarkers.

JTEST 50R x 5C

0	Depth, m	1 Sample type	2 Lith.	3 Geochem job #	4 MS-file	5 Status
1	950.00	SWC	SH/MDST	1947	AS16059	OK
2	955.00	SWC	SH/MDST	1947	AS16059	OK
3	960.00	SWC	SH/MDST	1947	AS16059	OK
4	962.50	SWC	SH/MDST	1947	AS16059	OK
5	965.00	SWC	SH/MDST	1947	AS16059	OK
6	967.00	SWC	SH/MDST	1947	AS16059	OK
7	970.00	SWC	SH/MDST	1947	AS16059	OK
8	974.00	SWC	SH/MDST	1947	AS16059	OK
9	975.50	SWC	SH/MDST	1947	AS23059	OK
10	977.00	SWC	SH/MDST	1947	AS19059	OK
11	979.00	SWC	SH/MDST	1947	AS19059	OK
12	982.00	SWC	SH/MDST	1947	AS19059	OK
13	984.00	SWC	SH/MDST	1947	AS19059	OK
14	985.00	SWC	SH/MDST	1947	AS19059	OK
15	987.00	SWC	SH/MDST	1947	AS19059	OK
16	990.00	SWC	SH/MDST	1947	AS23059	OK
17	995.00	SWC	SH.MDST	1947	AS15069	OK
18	1000.00	SWC	SH/MDST	1947	AS23059	OK
19	1302.50	SWC	SH/MDST	1947	AS23059	weak
20	1311.00	SWC	SH/MDST	1947	AS23059	OK
21	1320.00	SWC	SH/MDST	1947	AS23059	OK
22	1328.00	SWC	SH/MDST	1947	AS16059	OK
23	1336.00	SWC	SH/MDST	1947	AS16059	OK
24	1347.00	SWC	SH/MDST	1947	AS16059	OK
25	1356.00	SWC	SH/MDST	1947	AS16059	OK
26	1362.00	SWC	SH/MDST	1947	AS16059	OK
27	1366.20	CORE	SH.MDST	1948	AS26059	weak
28	1367.50	CORE	SL.MDST	1948	AS26059	OK
29	1367.75	CORE	SL.MDST	1978		N.D.
30	1368.50	CORE	MDST/SLST	1948	AS26059	OK
31	1369.82	CORE	MDST/SLST	1948	AS26059	OK
32	1371.50	CORE	MDST/SLST	1948	AS26059	OK
33	1372.50	CORE	MDST/SLST	1948	AS26059	OK
34	1374.10	CORE	MDST/SLST	1948	AS10096	OK
35	1376.52	CORE	MDST/SLST	1948	AS10096	weak
36	1377.50	CORE	MDST/SLST	1948	AS26059	OK
37	1378.50	CORE	MDST/SLST	1948	AS26059	OK
38	1380.00	CORE	SLST	1948	AS26059	OK
39	1382.00	CORE	SLST	1948	AS26059	OK
40	1383.50	CORE	SLST	1978	ES25049	OK
41	1385.25	CORE	SLST	1948	AS26059	OK
42	1397.00	CORE	SLST/SST	1948	AS26059	OK
43	ST10096A				AS10096	OK
44	ST16059A				AS16059	OK
45	ST16059B				AS16059	OK
46	ST16059C				AS16059	OK
47	ST19059A				AS19059	OK
48	ST23059A				AS23059	OK
49	ST25049A				ES25049	OK
50	ST26059A				AS26059	OK

0	Depth start int.	1 Depth end int.	2 Sample type	3 Lith.	4 Well	5 Geochem job #	6 MS-file	7 26Y 360-191/2	8 26YY 360-191/2	9 25Y 346-191	10 24Y 332-191/1
1	950.00	950.00	SWC	SH/MDST	7321/9-1	1947	AS16059	0.01	0.01	0.01	0.86
2	955.00	955.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.37	1.12	1.76	3.14
3	960.00	960.00	SWC	SH/MDST	7321/9-1	1947	AS16059	0.85	0.87	0.92	1.03
4	962.50	962.50	SWC	SH/MDST	7321/9-1	1947	AS16059	5.10	5.18	5.54	8.55
5	965.00	965.00	SWC	SH/MDST	7321/9-1	1947	AS16059	4.72	4.65	4.90	7.64
6	967.00	967.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.38	1.35	0.98	1.96
7	970.00	970.00	SWC	SH/MDST	7321/9-1	1947	AS16059	3.07	3.28	3.12	6.63
8	974.00	974.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.60	1.75	1.57	2.61
9	975.50	975.50	SWC	SH/MDST	7321/9-1	1947	AS23059	1.92	1.73	1.63	3.22
10	977.00	977.00	SWC	SH/MDST	7321/9-1	1947	AS19059	0.58	0.43	0.70	2.47
11	979.00	979.00	SWC	SH/MDST	7321/9-1	1947	AS19059	2.45	3.02	2.39	3.61
12	982.00	982.00	SWC	SH/MDST	7321/9-1	1947	AS19059	2.60	2.41	3.30	6.12
13	984.00	984.00	SWC	SH/MDST	7321/9-1	1947	AS19059	1.93	1.89	2.46	4.66
14	985.00	985.00	SWC	SH/MDST	7321/9-1	1947	AS19059	0.68	0.67	0.70	1.11
15	987.00	987.00	SWC	SH/MDST	7321/9-1	1947	AS19059	1.02	0.98	1.17	1.95
16	990.00	990.00	SWC	SH/MDST	7321/9-1	1947	AS23059	1.02	1.08	1.31	2.93
17	995.00	995.00	SWC	SH.MDST	7321/9-1	1947	AS15069	2.01	1.86	2.31	2.31
18	1000.00	1000.00	SWC	SH/MDST	7321/9-1	1947	AS23059	0.25	0.23	0.48	0.88
19	1302.50	1302.50	SWC	SH/MDST	7321/9-1	1947	AS23059	0.22	0.12	0.01	0.01
20	1311.00	1311.00	SWC	SH/MDST	7321/9-1	1947	AS23059	0.63	0.68	0.82	1.62
21	1320.00	1320.00	SWC	SH/MDST	7321/9-1	1947	AS23059	1.87	2.15	2.85	5.33
22	1328.00	1328.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.80	1.32	2.20	4.41
23	1336.00	1336.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.90	1.84	2.54	4.79
24	1347.00	1347.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.85	1.83	2.11	4.77
25	1356.00	1356.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.28	1.54	2.08	4.36
26	1362.00	1362.00	SWC	SH/MDST	7321/9-1	1947	AS16059	1.36	1.09	2.28	1.77
27	1366.20	1366.20	CORE	SH.MDST	7321/9-1	1948	AS26059	0.01	0.01	0.01	0.01
28	1367.50	1367.50	CORE	SL.MDST	7321/9-1	1948	AS26059	0.01	0.01	0.60	0.60
29	1367.75	1367.75	CORE	SL.MDST	7321/9-1	1978					
30	1368.50	1368.50	CORE	MDST/SLST	7321/9-1	1948	AS26059	0.01	0.01	0.70	0.54
31	1369.82	1369.82	CORE	MDST/SLST	7321/9-1	1948	AS26059	0.01	0.01	0.55	0.29
32	1371.50	1371.50	CORE	MDST/SLST	7321/9-1	1948	AS26059	0.01	0.01	0.49	0.35
33	1372.50	1372.50	CORE	MDST/SLST	7321/9-1	1948	AS26059	0.70	0.73	0.88	0.55
34	1374.10	1374.10	CORE	MDST/SLST	7321/9-1	1948	AS10096	1.23	1.17	2.10	1.47
35	1376.52	1376.52	CORE	MDST/SLST	7321/9-1	1948	AS10096	0.79	0.78	0.89	1.26
36	1377.50	1377.50	CORE	MDST/SLST	7321/9-1	1948	AS26059	0.50	0.64	0.62	0.86
37	1378.50	1378.50	CORE	MDST/SLST	7321/9-1	1948	AS26059	0.28	0.25	0.39	0.46
38	1380.00	1380.00	CORE	SLST	7321/9-1	1948	AS26059	0.58	0.56	0.83	0.95
39	1382.00	1382.00	CORE	SLST	7321/9-1	1948	AS26059	0.63	0.59	0.79	1.07
40	1383.50	1383.50	CORE	SLST	7321/9-1	1978	ES25049	1.31	1.11	2.66	2.12
41	1385.25	1385.25	CORE	SLST	7321/9-1	1948	AS26059	0.81	0.70	0.83	1.90
42	1397.00	1397.00	CORE	SLST/SST	7321/9-1	1948	AS26059	0.33	0.43	0.30	0.57
43	ST10096A						AS10096	0.74	0.64	0.90	1.62
44	ST16059A						AS16059	3.76	3.36	5.37	8.60
45	ST16059B						AS16059	1.09	0.77	1.65	2.56
46	ST16059C						AS16059	0.80	0.63	0.96	1.59
47	ST19059A						AS19059	1.32	1.10	1.75	3.56
48	ST23059A						AS23059	1.09	1.05	1.48	2.35
49	ST25049A						ES25049	2.85	2.50	3.69	5.62
50	ST26059A						AS26059	1.80	1.65	2.01	3.34

0	Depth start	int.	11 24X-Y 332-191/1	12 23Y 318-191	13 22Y 304-191	14 21Y 290-191	15 20Y 276-191	16 23a 316-217/1	17 23k 316-217/2	18 22a 302-217/1	19 22k 302-217/2
1	950.00		0.74	2.22	0.54	0.63	0.89	0.56	0.25	0.92	0.63
2	955.00		1.75	7.85	0.68	3.99	2.93	1.47	0.52	3.16	2.60
3	960.00		0.34	1.47	0.30	0.89	0.54	0.80	0.46	1.07	1.05
4	962.50		1.71	16.70	0.57	5.76	3.56	1.02	1.11	2.73	6.75
5	965.00		2.38	14.58	0.40	4.74	2.01	0.81	1.50	1.49	5.41
6	967.00		0.43	3.53	0.30	0.78	0.85	0.30	0.40	1.08	1.01
7	970.00		3.31	11.31	0.72	8.15	5.74	1.79	1.74	4.93	7.17
8	974.00		1.54	4.77	0.35	4.03	2.87	0.90	0.71	2.33	3.19
9	975.50		2.53	5.30	0.65	3.89	2.51	0.87	1.15	2.44	2.77
10	977.00		1.83	2.99	0.50	2.05	2.02	1.30	0.96	2.11	2.74
11	979.00		3.49	5.89	0.45	4.73	3.42	1.49	1.22	2.95	5.25
12	982.00		5.36	9.93	0.95	6.60	4.58	1.94	1.50	4.31	8.05
13	984.00		2.54	8.04	0.65	5.45	3.55	0.94	1.10	2.68	6.13
14	985.00		0.59	1.82	0.25	0.95	0.52	0.38	0.40	0.64	1.02
15	987.00		2.00	3.88	0.45	2.37	1.91	0.79	0.55	1.81	1.84
16	990.00		2.70	5.60	0.60	2.14	1.38	0.94	0.45	3.54	1.27
17	995.00		2.30	3.80	1.20	2.42	2.05	1.53	0.77	2.50	1.45
18	1000.00		0.71	0.77	0.31	0.69	0.78	0.01	0.01	0.98	0.58
19	1302.50		1.22	0.84	0.01	0.45	0.51	0.01	0.01	0.38	0.30
20	1311.00		0.77	2.46	0.28	0.90	0.43	0.88	0.20	1.40	0.80
21	1320.00		1.84	8.15	1.21	4.87	2.23	2.83	0.78	5.66	4.14
22	1328.00		1.68	6.70	1.86	4.83	2.41	3.46	1.57	6.62	5.68
23	1336.00		2.17	7.43	3.03	5.08	2.81	6.86	2.32	12.64	9.02
24	1347.00		3.11	7.88	3.61	6.33	3.45	7.51	2.23	15.93	10.55
25	1356.00		1.74	5.86	1.73	4.50	2.42	3.68	1.28	7.57	5.95
26	1362.00		4.15	7.80	1.37	3.77	2.61	2.50	1.23	4.62	4.45
27	1366.20		0.01	0.20	0.01	0.22	0.30	0.01	0.01	0.01	0.01
28	1367.50		0.40	0.89	0.01	0.89	0.60	0.62	0.15	1.34	0.36
29	1367.75										
30	1368.50		0.39	1.32	0.01	1.06	0.81	0.52	0.25	1.34	0.38
31	1369.82		0.26	0.90	0.01	0.50	0.67	0.47	0.15	1.22	0.40
32	1371.50		0.22	0.95	0.01	0.65	0.57	0.38	0.18	0.92	0.30
33	1372.50		0.29	1.50	0.01	0.57	0.64	0.39	0.17	0.54	0.45
34	1374.10		1.43	2.99	0.21	1.31	0.75	0.70	0.44	1.38	0.92
35	1376.52		0.85	1.69	0.70	1.11	0.86	0.65	0.60	1.48	0.60
36	1377.50		0.35	1.31	0.40	0.88	2.37	0.70	0.12	1.26	0.38
37	1378.50		0.15	0.53	0.20	0.50	0.31	0.36	0.10	0.60	0.18
38	1380.00		0.20	1.18	0.30	0.67	0.48	0.58	0.10	1.35	0.36
39	1382.00		0.23	1.17	0.37	0.62	0.43	0.65	0.20	1.11	0.48
40	1383.50		1.28	3.34	0.10	1.40	0.70	0.80	0.30	1.51	1.08
41	1385.25		0.71	3.23	0.18	1.16	0.41	0.32	0.11	0.73	0.62
42	1397.00		0.24	0.77	0.26	0.52	0.40	0.29	0.10	0.76	0.26
43	ST10096A		1.74	1.96	0.79	1.37	0.91	2.10	1.06	4.88	4.84
44	ST16059A		4.83	11.34	5.91	8.73	6.88	12.35	6.15	32.30	24.53
45	ST16059B		1.51	3.73	1.11	2.36	1.65	3.64	1.21	7.66	7.02
46	ST16059C		1.53	2.00	1.16	1.95	1.59	2.69	1.29	6.17	5.29
47	ST19059A		3.10	5.39	1.92	3.17	2.08	4.41	1.89	11.06	11.51
48	ST23059A		2.05	3.70	1.01	2.03	1.70	2.74	0.92	6.65	4.58
49	ST25049A		4.05	8.14	3.70	5.57	3.81	6.88	3.10	13.37	12.58
50	ST26059A		1.18	5.06	0.90	1.76	1.17	2.06	1.03	4.88	5.47

0	Depth start	int.	20 21a 288-217/1	21 21k 288-217/2	22 33A 454-191/1	23 33B 454-191/2	24 32A 440-191/1	25 32B 440-191/2	26 31A 426-191/1	27 31B 426-191/2
1	950.00		0.65	2.29	1.36	1.15	3.55	1.92	10.90	6.10
2	955.00		4.49	10.32	3.25	1.98	7.44	4.79	18.17	10.98
3	960.00		0.62	2.98	1.95	1.39	4.22	2.44	10.40	6.07
4	962.50		2.72	15.28	7.95	4.45	13.78	9.81	37.62	25.53
5	965.00		2.66	12.41	4.68	3.14	9.65	7.25	25.89	15.90
6	967.00		0.63	1.99	1.21	0.95	2.24	1.34	4.75	2.85
7	970.00		7.31	24.69	9.07	6.28	18.66	12.35	51.32	35.49
8	974.00		3.67	9.96	3.41	1.99	6.60	4.27	15.00	10.06
9	975.50		3.18	6.97	3.12	2.49	7.17	4.99	15.47	10.72
10	977.00		2.17	9.56	3.40	2.12	6.79	4.60	15.47	10.14
11	979.00		5.09	18.99	4.68	3.26	8.95	6.38	25.11	14.86
12	982.00		6.25	32.56	4.21	2.88	9.37	5.99	22.49	14.52
13	984.00		4.10	24.89	1.74	1.24	3.91	2.48	7.79	5.52
14	985.00		0.75	3.93	0.89	0.67	1.33	0.86	2.39	1.47
15	987.00		2.52	8.10	1.83	1.40	3.96	2.73	8.31	5.57
16	990.00		4.21	4.71	3.00	1.66	5.88	3.83	11.53	7.88
17	995.00		1.90	3.79	3.54	2.26	8.54	5.68	21.17	14.19
18	1000.00		0.70	1.07	0.45	0.35	1.21	0.88	3.10	2.10
19	1302.50		0.35	0.62	1.15	0.60	2.99	1.69	7.42	4.94
20	1311.00		1.34	1.52	0.94	0.63	1.42	1.20	2.64	1.52
21	1320.00		5.41	7.31	3.72	2.20	7.44	4.85	10.88	7.93
22	1328.00		6.71	11.23	4.02	2.48	8.85	6.13	14.13	9.07
23	1336.00		11.13	21.10	6.64	4.25	12.86	8.35	23.10	13.99
24	1347.00		13.61	28.68	9.77	6.22	23.64	14.14	42.03	26.06
25	1356.00		7.10	12.93	3.77	2.34	9.04	6.15	15.37	9.83
26	1362.00		4.14	10.57	3.35	1.87	7.16	4.99	16.16	10.46
27	1366.20		0.15	0.35	0.28	0.21	0.63	0.27	0.87	0.40
28	1367.50		0.42	1.43	0.47	0.28	1.73	1.22	2.28	1.72
29	1367.75									
30	1368.50		0.60	1.45	0.56	0.20	1.64	1.01	2.10	1.47
31	1369.82		0.60	1.08	0.31	0.18	1.56	1.10	1.87	1.29
32	1371.50		0.30	0.93	0.55	0.39	1.16	0.73	1.47	1.10
33	1372.50		0.45	0.70	0.61	0.48	1.96	1.29	3.29	2.12
34	1374.10		0.69	2.45	1.80	1.01	3.39	2.38	5.88	3.99
35	1376.52		1.30	1.54	0.55	0.35	0.96	0.73	1.31	0.94
36	1377.50		0.90	1.75	1.10	0.79	3.06	1.65	4.29	2.66
37	1378.50		0.40	0.54	0.60	0.27	1.32	0.62	1.76	1.10
38	1380.00		0.75	1.11	0.90	0.51	2.24	1.31	3.37	1.94
39	1382.00		0.61	1.59	0.98	0.55	2.42	1.47	4.08	2.47
40	1383.50		1.60	2.64	1.25	1.00	1.71	0.85	3.01	1.75
41	1385.25		0.60	1.58	0.72	0.38	1.54	0.98	3.75	2.27
42	1397.00		0.48	1.04	0.51	0.30	0.97	0.64	1.67	1.02
43	ST10096A		6.08	11.90	4.71	3.00	7.78	5.30	12.42	8.18
44	ST16059A		39.06	71.74	19.29	10.99	36.94	22.14	60.59	40.22
45	ST16059B		9.34	20.66	5.08	2.99	9.04	5.48	15.07	9.23
46	ST16059C		6.91	12.36	4.50	2.68	5.60	3.22	9.68	7.35
47	ST19059A		13.62	35.89	6.91	3.99	12.48	7.81	21.44	13.38
48	ST23059A		7.77	9.51	4.97	3.03	7.57	5.01	12.10	8.31
49	ST25049A		15.77	38.99	12.12	8.28	22.19	13.67	42.60	24.56
50	ST26059A		6.67	16.31	8.80	5.08	15.31	9.05	28.68	15.69

0 Depth start	int.	28 31C 426-191/3	29 31D 426-191/4	30 30F 412-191	31 30A 412-191	32 30H 412-191	33 30C 412-191	3. 29N 398-191	35 29A 398-191	36 29F 398-191
1	950.00	0.50	0.81	0.63	36.63	0.54	2.30	0.30	30.42	7.35
2	955.00	1.73	1.68	1.64	69.32	1.49	4.35	0.25	53.02	17.99
3	960.00	0.68	1.07	0.43	46.75	1.15	3.18	0.46	34.22	6.09
4	962.50	1.29	3.53	1.31	124.34	3.55	9.70	12.84	89.38	22.69
5	965.00	1.52	2.46	1.78	85.57	1.80	6.04	13.09	65.05	14.86
6	967.00	0.55	0.63	0.30	19.30	1.07	0.95	2.75	14.94	2.68
7	970.00	3.15	6.72	0.53	178.78	4.00	17.14	0.87	140.58	39.97
8	974.00	0.66	1.91	1.02	71.14	1.99	5.44	1.17	57.71	9.90
9	975.50	1.46	2.55	1.08	73.33	1.58	6.38	0.50	54.08	11.02
10	977.00	2.87	2.98	0.50	66.33	1.73	5.02	1.12	48.22	9.78
11	979.00	3.33	4.02	3.31	100.51	3.82	8.38	1.00	72.30	15.98
12	982.00	2.44	2.69	1.82	96.06	2.11	7.16	0.26	79.82	19.23
13	984.00	0.47	1.07	1.00	49.32	0.84	3.17	0.25	48.47	8.16
14	985.00	0.32	0.57	0.51	10.42	0.25	0.81	0.14	9.80	2.17
15	987.00	0.91	1.28	1.03	43.47	0.95	3.00	0.50	37.12	9.88
16	990.00	1.45	1.46	1.14	46.53	0.95	3.05	0.45	33.71	10.83
17	995.00	3.50	3.33	2.76	78.39	1.99	7.59	2.47	50.01	21.95
18	1000.00	0.45	0.38	0.35	11.74	0.43	0.97	0.20	8.26	3.19
19	1302.50	0.57	0.74	1.51	19.90	0.67	1.13	0.62	10.94	2.67
20	1311.00	0.25	0.16	0.87	7.57	0.26	0.52	0.48	4.25	1.80
21	1320.00	0.85	1.11	2.50	41.31	2.11	2.24	0.20	11.09	7.74
22	1328.00	0.74	1.03	2.91	54.96	2.55	2.97	0.30	17.08	9.39
23	1336.00	1.60	1.86	5.37	82.93	4.05	4.07	0.70	25.26	15.55
24	1347.00	2.50	2.67	10.02	113.53	6.85	6.23	1.12	36.93	29.77
25	1356.00	1.08	1.22	3.63	60.66	2.48	2.74	1.10	19.20	11.00
26	1362.00	1.70	1.72	4.30	54.42	2.25	4.03	5.48	36.97	10.33
27	1366.20	0.24	0.15	0.56	2.63	0.27	0.38	0.15	1.10	0.59
28	1367.50	0.16	0.15	3.28	10.37	0.36	0.39	0.51	3.03	3.15
29	1367.75									
30	1368.50	0.48	0.30	2.82	9.99	0.30	0.28	0.39	3.29	2.87
31	1369.82	0.36	0.36	2.39	7.79	0.22	0.25	0.42	2.41	2.30
32	1371.50	0.34	0.24	2.37	6.67	0.40	0.37	0.44	2.04	2.25
33	1372.50	0.26	0.23	1.97	10.98	0.62	0.49	2.10	4.60	2.52
34	1374.10	0.98	0.51	2.50	14.17	0.90	0.94	4.61	9.72	6.39
35	1376.52	0.62	0.52	1.44	3.33	0.47	0.44	1.40	1.91	2.12
36	1377.50	0.48	0.53	5.54	18.90	0.59	0.86	0.85	6.70	5.80
37	1378.50	0.32	0.14	2.40	7.28	0.21	0.32	0.40	2.43	2.18
38	1380.00	0.33	0.20	4.30	13.97	0.40	0.49	0.42	4.70	3.90
39	1382.00	0.24	0.26	2.52	16.80	0.46	0.71	0.74	8.99	4.71
40	1383.50	0.50	0.70	1.53	6.69	0.50	0.50	2.48	5.21	2.32
41	1385.25	0.25	0.13	1.31	19.38	0.24	0.78	4.07	14.09	3.77
42	1397.00	0.34	0.10	1.88	6.60	0.13	0.19	0.29	2.31	1.96
43	ST10096A	1.45	1.03	3.20	46.53	1.86	2.48	3.64	15.87	7.05
44	ST16059A	5.39	5.59	11.03	162.05	7.83	9.71	18.61	72.92	36.97
45	ST16059B	1.36	1.46	2.66	51.66	1.59	2.24	4.84	21.96	8.27
46	ST16059C	1.64	1.63	2.94	35.40	0.98	1.35	3.19	12.64	6.43
47	ST19059A	2.10	1.40	4.26	69.62	2.58	3.16	7.71	30.04	11.88
48	ST23059A	1.32	1.11	2.87	45.25	1.91	2.27	4.91	16.05	7.16
49	ST25049A	3.85	3.41	8.04	116.93	7.41	7.03	12.26	53.58	18.84
50	ST26059A	1.35	1.36	4.06	86.19	1.96	3.35	10.22	37.68	11.20

0	Depth start	int.	37 29C 398-191	38 28A 384-191	39 28N 384-191	40 27F 370-191	41 27A 370-191	42 30a 414-217	43 30b 414-217	44 30c 414-217	45 30d 414-217	46 30e 414-217
1	950.00		2.42	0.30	0.16	3.15	3.88	0.01	0.01	0.01	0.01	0.01
2	955.00		6.17	0.60	0.21	14.11	12.07	0.01	0.01	0.01	0.01	0.01
3	960.00		1.91	0.20	0.40	3.80	7.13	0.37	0.20	0.30	0.30	1.14
4	962.50		7.73	4.06	3.82	14.06	30.69	0.98	0.50	0.70	2.09	8.39
5	965.00		6.21	3.96	4.98	10.22	20.81	0.78	0.40	0.30	2.04	8.07
6	967.00		0.63	0.76	0.65	2.34	3.36	0.78	0.53	0.27	0.25	0.64
7	970.00		14.52	1.30	0.40	21.03	44.35	0.92	0.50	0.40	2.38	11.44
8	974.00		4.70	0.77	0.50	6.39	15.68	0.76	1.06	0.84	1.53	3.83
9	975.50		5.07	0.83	0.15	7.03	14.75	0.01	0.01	0.24	1.07	4.77
10	977.00		3.08	0.50	1.41	6.04	13.26	0.75	0.43	0.40	1.70	2.92
11	979.00		7.10	1.59	1.18	11.27	24.31	1.14	0.70	0.50	2.41	6.77
12	982.00		7.03	1.99	0.40	14.32	25.98	0.60	0.36	0.20	1.02	4.45
13	984.00		3.84	1.47	0.16	6.07	11.81	0.36	0.26	0.20	1.00	4.07
14	985.00		0.83	0.41	0.10	1.40	2.70	0.15	0.10	0.10	0.27	1.30
15	987.00		3.11	1.01	0.25	7.47	8.46	0.35	0.20	0.18	0.61	1.24
16	990.00		3.94	0.68	0.15	8.97	8.44	0.37	0.27	0.20	0.22	0.34
17	995.00		6.60	1.96	1.72	11.62	11.37	0.01	0.01	0.01	0.01	0.01
18	1000.00		1.07	0.10	0.10	2.74	2.36	0.01	0.01	0.01	0.01	0.01
19	1302.50		0.55	0.31	0.26	1.52	3.68	0.01	0.01	0.01	0.01	0.01
20	1311.00		0.41	0.23	0.28	2.01	1.12	0.01	0.01	0.01	0.01	0.01
21	1320.00		0.85	0.20	0.19	8.11	2.86	1.22	0.83	0.40	0.54	0.99
22	1328.00		1.20	0.64	0.50	9.69	4.74	2.33	1.46	0.87	0.80	1.20
23	1336.00		1.39	0.71	0.69	15.95	5.67	3.98	2.45	1.99	1.23	1.54
24	1347.00		1.90	1.03	0.58	27.31	8.10	3.46	2.52	1.08	0.67	1.44
25	1356.00		1.12	0.67	0.72	11.60	5.27	1.98	1.34	1.06	0.73	0.83
26	1362.00		2.81	1.09	1.57	12.15	13.03	0.01	0.01	0.01	0.01	0.01
27	1366.20		0.20	0.17	0.10	0.50	0.48	0.01	0.01	0.01	0.01	0.01
28	1367.50		0.46	0.01	0.01	4.48	0.77	0.01	0.01	0.01	0.01	0.01
29	1367.75											
30	1368.50		0.33	0.01	0.01	4.23	0.76	0.01	0.01	0.01	0.01	0.01
31	1369.82		0.32	0.01	0.01	3.20	0.60	0.01	0.01	0.01	0.01	0.01
32	1371.50		0.48	0.01	0.01	3.18	0.62	0.01	0.01	0.01	0.01	0.01
33	1372.50		0.42	0.41	0.61	2.80	1.42	0.01	0.01	0.01	0.01	0.01
34	1374.10		1.13	1.52	1.85	4.51	3.44	1.01	0.56	0.57	0.68	0.53
35	1376.52		1.15	0.79	0.93	2.72	0.95	0.01	0.01	0.01	0.01	0.01
36	1377.50		0.56	0.17	0.23	8.52	1.58	0.92	0.63	0.40	0.18	0.22
37	1378.50		0.31	0.01	0.01	2.67	0.51	0.51	0.27	0.15	0.12	0.20
38	1380.00		0.37	0.01	0.01	4.78	0.73	0.83	0.65	0.16	0.13	0.14
39	1382.00		0.36	0.31	0.22	4.77	1.53	0.71	0.59	0.22	0.16	0.29
40	1383.50		0.58	0.71	0.95	3.71	2.42	0.59	0.01	0.01	0.01	0.01
41	1385.25		0.81	0.71	1.11	6.51	3.89	0.37	0.32	0.28	0.13	0.23
42	1397.00		0.14	0.01	0.01	2.89	0.62	0.51	0.41	0.33	0.24	0.18
43	ST10096A		2.95	8.73	1.84	7.37	5.62	2.01	1.38	0.80	0.56	1.23
44	ST16059A		12.17	43.73	7.88	36.35	25.75	8.99	7.46	4.73	3.90	6.42
45	ST16059B		3.33	10.66	1.28	9.98	6.29	2.25	0.99	0.75	0.68	0.78
46	ST16059C		1.86	7.09	1.27	7.29	5.56	2.01	2.08	1.15	0.83	1.40
47	ST19059A		3.99	14.83	3.30	13.52	9.83	3.30	2.14	1.00	0.88	1.91
48	ST23059A		2.88	8.86	2.42	7.93	6.19	2.15	1.73	1.03	0.75	1.33
49	ST25049A		8.00	25.35	6.39	20.92	14.78	5.94	4.47	2.61	2.44	4.17
50	ST26059A		3.71	13.47	3.23	11.54	8.60	1.75	1.23	0.81	0.61	1.66

0	Depth start	int.	47 30f 414-217	48 30g 414-217	49 30h 414-217	50 29a 400-217	51 29b 400-217	52 29c 400-217	53 29d 400-217	54 29e 400-217	55 29f 400-217	56 29g 400-217
1	950.00		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2	955.00		0.01	0.01	0.01	4.42	2.26	1.47	1.62	4.36	3.63	3.65
3	960.00		0.43	0.56	3.16	1.04	0.94	0.60	1.26	8.79	3.97	2.88
4	962.50		2.18	4.13	16.04	5.21	4.49	3.30	9.66	44.96	22.14	23.95
5	965.00		2.70	5.18	18.42	5.58	5.56	3.94	9.08	36.94	17.88	18.31
6	967.00		0.74	0.80	2.20	0.77	0.87	1.16	1.01	5.59	3.27	3.76
7	970.00		2.15	4.96	27.97	6.06	5.14	3.00	9.58	66.02	26.87	23.99
8	974.00		1.46	1.96	8.84	1.52	1.23	1.16	4.47	27.44	10.08	9.83
9	975.50		1.19	2.71	8.48	2.70	1.93	1.20	4.41	25.51	9.68	8.97
10	977.00		1.06	1.95	5.78	2.26	1.65	1.00	3.07	20.79	9.04	8.06
11	979.00		2.73	4.80	11.93	4.21	3.89	1.50	6.54	40.67	14.55	16.42
12	982.00		1.49	2.61	7.41	4.12	3.26	1.50	4.50	27.19	11.45	12.44
13	984.00		1.31	2.32	6.64	1.96	1.64	0.80	2.75	17.09	7.21	7.36
14	985.00		0.70	0.82	1.80	0.72	0.33	0.20	0.67	4.33	2.21	2.16
15	987.00		0.71	0.89	2.37	1.78	1.22	0.70	1.01	6.11	3.64	3.09
16	990.00		0.46	0.60	0.35	3.79	2.22	1.11	0.98	3.26	2.32	2.51
17	995.00		0.01	0.01	0.01	5.95	3.87	1.15	1.30	5.93	4.46	4.38
18	1000.00		0.01	0.01	0.01	1.08	0.66	0.31	0.24	0.54	0.47	0.65
19	1302.50		0.01	0.01	0.01	1.32	0.68	0.42	0.28	0.43	0.64	0.49
20	1311.00		0.01	0.01	0.01	2.87	1.67	0.82	0.89	1.07	1.54	1.39
21	1320.00		1.47	1.57	0.82	5.25	3.71	1.89	2.40	3.81	5.60	5.80
22	1328.00		1.82	1.90	1.28	9.07	6.38	2.48	3.68	5.17	7.69	7.92
23	1336.00		2.31	2.72	1.54	20.76	12.38	7.13	4.42	6.45	9.03	9.30
24	1347.00		1.81	1.88	0.91	22.48	13.94	7.22	4.25	6.74	9.35	9.50
25	1356.00		1.11	0.92	0.91	10.68	6.76	4.07	2.33	3.51	5.23	4.99
26	1362.00		0.01	0.01	0.01	6.53	3.17	2.15	2.03	4.02	4.40	4.46
27	1366.20		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
28	1367.50		0.01	0.01	0.01	6.24	3.91	0.95	0.68	0.93	1.26	1.20
29	1367.75											
30	1368.50		0.01	0.01	0.01	6.03	3.55	1.02	0.69	0.87	1.10	1.09
31	1369.82		0.01	0.01	0.01	5.26	3.05	0.83	0.62	0.65	1.02	0.93
32	1371.50		0.01	0.01	0.01	4.90	3.19	0.89	0.58	0.49	0.94	0.76
33	1372.50		0.01	0.01	0.01	3.41	2.59	0.63	0.51	1.26	1.95	1.99
34	1374.10		0.91	1.23	0.61	5.19	3.92	1.60	2.40	2.64	3.95	4.25
35	1376.52		0.01	0.01	0.01	3.73	2.71	1.71	1.36	1.17	1.43	1.52
36	1377.50		0.24	0.33	0.15	11.14	6.83	2.18	1.01	1.42	2.30	2.11
37	1378.50		0.25	0.21	0.17	4.56	3.03	0.92	0.51	0.46	0.82	0.81
38	1380.00		0.15	0.33	0.17	9.51	5.30	1.69	0.76	0.67	1.94	1.62
39	1382.00		0.40	0.43	0.22	8.59	5.10	1.65	1.15	1.51	2.64	2.22
40	1383.50		0.01	0.01	0.01	4.03	2.84	1.06	0.98	1.47	2.12	2.45
41	1385.25		0.25	0.31	0.24	3.13	2.14	0.79	0.74	1.07	1.54	1.67
42	1397.00		0.16	0.17	0.14	4.47	2.68	1.11	0.69	0.47	0.71	0.93
43	ST10096A		1.48	1.70	0.98	11.49	8.07	3.91	3.07	4.24	5.42	5.99
44	ST16059A		7.36	8.74	6.33	67.20	49.50	22.24	15.38	21.09	28.44	30.66
45	ST16059B		1.70	2.01	1.27	17.76	11.81	5.02	3.10	5.95	7.42	7.54
46	ST16059C		1.46	1.34	1.31	11.59	8.54	4.78	3.39	3.10	3.87	4.67
47	ST19059A		2.50	2.97	1.91	25.95	18.54	8.30	6.38	8.54	11.49	12.78
48	ST23059A		1.52	1.75	1.12	13.65	9.82	4.97	3.56	4.93	5.78	6.29
49	ST25049A		5.05	6.22	4.21	40.79	27.38	11.40	9.39	11.59	14.95	16.77
50	ST26059A		1.87	2.28	1.44	17.54	10.26	5.02	4.51	7.24	9.75	10.29

0	Depth start	int.	57 29h 400-217	58 28a 386-217	59 28aa 386-217	60 28b 386-217	61 28bb 386-217	62 28c 386-217	63 28d 386-217	64 28e 386-217	65 28f 386-217	66 28g 386-217
1	950.00		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2	955.00		7.42	1.87	2.11	1.21	1.48	0.86	0.85	1.99	3.99	2.98
3	960.00		16.50	0.95	0.77	0.50	0.55	0.30	0.32	3.60	5.28	3.45
4	962.50		65.89	3.02	3.28	3.29	3.84	1.70	2.10	24.23	35.16	22.55
5	965.00		61.99	2.10	2.45	2.60	2.35	1.30	2.25	17.23	29.31	16.25
6	967.00		9.35	0.59	0.62	0.60	0.70	0.43	0.38	2.18	5.45	2.25
7	970.00		110.59	3.41	4.19	2.40	2.60	0.50	0.50	36.99	39.72	21.19
8	974.00		47.50	2.09	2.06	1.34	1.37	0.64	0.91	14.92	16.25	9.23
9	975.50		43.78	1.42	1.77	1.41	1.51	0.80	0.60	12.52	15.39	8.65
10	977.00		33.86	1.50	1.40	1.40	1.70	0.99	1.36	10.74	14.22	8.32
11	979.00		62.73	2.75	2.79	2.44	2.45	1.34	1.50	20.67	28.20	16.33
12	982.00		44.60	2.75	2.90	2.16	2.49	1.43	1.07	16.67	21.64	13.08
13	984.00		30.46	0.85	0.90	1.03	1.20	0.50	0.60	9.92	12.94	8.33
14	985.00		6.46	0.13	0.19	0.01	0.01	0.01	0.01	2.61	3.55	2.43
15	987.00		9.12	0.85	0.76	0.71	0.67	0.33	0.40	3.12	4.83	2.99
16	990.00		4.37	1.84	1.43	0.99	1.50	0.46	0.39	1.12	2.33	1.63
17	995.00		7.55	2.43	3.02	2.71	2.71	1.17	1.75	2.72	4.31	3.58
18	1000.00		0.65	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
19	1302.50		0.24	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
20	1311.00		0.57	1.49	1.67	1.21	1.45	0.83	0.69	0.47	1.29	1.12
21	1320.00		2.67	3.53	4.01	2.27	2.64	1.08	1.24	1.48	5.29	4.33
22	1328.00		3.89	4.76	5.26	3.39	3.98	2.02	1.90	2.20	6.08	5.56
23	1336.00		4.56	9.00	9.25	6.39	7.19	3.71	3.31	2.63	7.45	6.63
24	1347.00		5.01	11.88	12.19	8.12	8.83	3.94	3.80	2.42	7.78	6.91
25	1356.00		1.84	4.55	4.92	3.29	4.00	1.56	1.36	1.38	4.42	3.51
26	1362.00		3.14	3.55	3.99	2.90	3.40	1.66	2.23	2.20	4.83	3.77
27	1366.20		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
28	1367.50		0.46	1.47	1.57	1.07	1.07	0.66	0.72	0.38	0.51	0.57
29	1367.75											
30	1368.50		0.49	1.12	1.36	1.25	1.25	0.70	0.60	0.34	0.75	0.69
31	1369.82		0.46	1.24	1.21	1.13	1.03	0.70	0.40	0.42	0.69	0.90
32	1371.50		0.55	1.17	1.23	1.03	1.03	0.43	0.36	0.33	0.35	0.45
33	1372.50		1.02	0.52	0.84	1.14	1.14	0.57	0.62	0.83	1.73	1.70
34	1374.10		2.11	2.35	2.71	2.69	2.69	1.22	1.66	1.64	3.22	3.25
35	1376.52		0.90	1.57	1.91	1.35	1.41	0.94	1.00	0.44	0.89	0.59
36	1377.50		0.85	2.90	2.97	1.87	2.09	0.89	0.75	0.44	1.36	0.99
37	1378.50		0.51	0.93	0.96	0.80	0.80	0.30	0.37	0.16	0.49	0.45
38	1380.00		0.69	2.47	2.01	2.02	2.02	0.77	0.82	0.38	0.75	0.64
39	1382.00		1.31	2.87	2.58	2.11	2.11	0.71	0.91	0.67	1.57	1.25
40	1383.50		1.02	1.72	1.79	1.29	1.53	0.76	0.68	0.77	2.19	1.88
41	1385.25		0.79	1.02	1.30	0.83	0.95	0.48	0.47	0.43	1.50	1.22
42	1397.00		0.35	1.09	1.08	0.72	0.77	0.40	0.24	0.23	0.51	0.46
43	ST10096A		3.55	6.60	5.83	4.05	4.81	1.52	1.97	1.27	5.37	4.44
44	ST16059A		17.51	36.26	38.11	25.16	29.50	11.52	12.58	9.51	28.62	22.94
45	ST16059B		4.69	8.65	9.08	6.20	7.01	3.19	2.26	1.27	6.78	5.70
46	ST16059C		3.49	6.68	7.50	4.81	5.78	2.89	2.71	1.92	5.24	4.21
47	ST19059A		7.21	12.35	13.35	8.42	9.56	3.88	4.04	3.05	12.12	9.89
48	ST23059A		4.51	7.38	7.99	5.41	6.16	2.36	2.63	2.13	5.99	4.98
49	ST25049A		10.68	18.02	19.76	12.54	14.68	7.58	7.71	6.06	16.15	13.19
50	ST26059A		6.87	7.83	8.99	5.58	6.45	2.40	2.33	2.40	9.77	8.23

0	Depth start	int.	67 28h 386-217	68 27a 372-217	69 27b 372-217	70 27c 372-217	71 27d 372-217	72 27e 372-217	73 27i 372-217	74 27g 372-217	75 27h 372-217	76
1	950.00		0.01	1.45	1.07	0.45	0.50	0.59	0.69	0.99	0.72	
2	955.00		5.78	6.65	3.88	0.78	1.31	4.97	3.56	2.21	8.67	
3	960.00		14.20	2.00	1.31	0.30	0.43	8.41	2.90	2.60	20.26	
4	962.50		57.79	9.54	7.51	1.40	2.41	47.88	27.81	21.95	81.81	
5	965.00		56.24	7.81	7.91	2.05	1.90	37.15	19.90	15.57	73.62	
6	967.00		7.39	1.47	1.45	0.67	0.50	6.71	3.11	3.20	12.72	
7	970.00		92.38	12.19	8.58	3.34	3.34	68.52	24.96	18.98	133.49	
8	974.00		44.75	3.71	2.67	1.26	1.37	29.62	8.89	6.60	56.15	
9	975.50		42.37	4.45	3.52	1.13	0.90	24.42	8.23	6.53	48.71	
10	977.00		32.45	3.52	1.85	0.90	1.10	20.97	8.35	6.73	36.37	
11	979.00		58.52	6.97	4.53	1.50	1.00	39.48	15.70	12.42	67.40	
12	982.00		48.37	7.11	5.15	1.20	0.90	33.75	13.36	10.70	62.27	
13	984.00		32.02	3.30	2.53	1.02	0.90	20.23	8.23	6.93	40.52	
14	985.00		6.37	0.83	0.67	0.36	0.30	4.35	2.14	1.86	7.10	
15	987.00		7.98	2.66	1.62	0.51	0.69	5.63	3.09	2.40	9.34	
16	990.00		2.65	7.15	4.29	0.78	1.12	2.69	2.34	1.97	4.44	
17	995.00		5.90	5.86	4.36	2.37	1.65	4.27	3.29	3.36	6.76	
18	1000.00		0.01	1.56	0.97	0.30	0.47	0.55	0.68	0.40	0.70	
19	1302.50		0.01	1.35	0.71	0.36	0.30	0.30	0.43	0.37	0.38	
20	1311.00		0.55	5.10	2.90	0.73	1.09	0.97	1.43	1.18	0.78	
21	1320.00		1.97	8.98	6.48	1.75	2.18	3.10	5.32	4.80	3.57	
22	1328.00		2.23	12.11	8.02	2.28	2.83	3.63	7.08	6.02	6.88	
23	1336.00		2.86	32.57	17.93	5.20	6.30	5.20	9.18	8.06	5.35	
24	1347.00		3.27	27.74	16.96	4.58	6.06	3.43	7.20	6.72	4.57	
25	1356.00		1.71	14.18	9.25	2.45	2.84	2.32	4.67	3.88	2.63	
26	1362.00		3.67	11.20	7.59	2.01	2.38	4.29	5.21	4.43	5.57	
27	1366.20		0.01	0.49	0.35	0.12	0.11	0.12	0.14	0.21	0.11	
28	1367.50		0.45	3.45	2.54	0.38	0.54	0.55	0.51	0.63	0.62	
29	1367.75											
30	1368.50		0.27	4.06	2.10	0.23	0.55	0.52	0.54	0.62	0.58	
31	1369.82		0.43	2.66	2.09	0.32	0.34	0.52	0.45	0.52	0.50	
32	1371.50		0.40	2.81	2.09	0.63	0.69	0.47	0.52	0.55	0.42	
33	1372.50		0.64	2.60	1.74	0.39	0.45	1.02	1.25	1.28	1.25	
34	1374.10		1.81	4.34	3.50	0.90	1.06	2.51	3.25	2.89	2.48	
35	1376.52		0.53	3.17	2.26	1.17	1.36	0.82	1.01	0.78	0.70	
36	1377.50		0.46	7.84	4.67	0.97	1.68	0.58	0.98	1.02	0.91	
37	1378.50		0.33	2.84	1.93	0.35	0.58	0.19	0.35	0.25	0.42	
38	1380.00		0.23	3.80	3.31	0.86	1.26	0.62	0.79	0.61	0.45	
39	1382.00		0.70	5.18	4.34	0.95	1.45	1.42	1.90	1.55	1.19	
40	1383.50		0.97	4.34	2.99	0.78	1.02	1.36	2.07	2.00	1.77	
41	1385.25		0.69	3.90	2.54	0.55	0.82	0.99	1.58	1.45	1.36	
42	1397.00		0.21	3.65	2.17	0.39	0.65	0.40	0.60	0.54	0.33	
43	ST10096A		2.02	16.52	10.67	2.74	3.68	3.01	5.11	4.07	2.85	
44	ST16059A		11.28	86.20	63.81	14.76	21.58	15.48	24.70	20.20	15.30	
45	ST16059B		2.19	27.14	17.94	4.09	5.54	5.54	7.90	6.54	4.70	
46	ST16059C		1.96	16.45	11.22	3.57	3.82	3.57	5.22	4.44	3.57	
47	ST19059A		4.16	36.90	25.63	5.34	7.82	7.35	11.48	9.61	7.49	
48	ST23059A		2.72	22.07	12.93	3.63	4.81	4.10	5.22	5.01	4.41	
49	ST25049A		7.59	56.51	37.83	8.63	11.23	10.39	13.90	11.75	10.15	
50	ST26059A		3.71	29.24	16.89	3.12	4.62	5.99	9.13	7.42	6.93	

0	Depth start	int.	77 24X 330-191	78	79 %-NORM TRI-CYCL.	80 %-NORM L.M.STE.	81 %-NORM PENTA-CYCL.	82 %-NORM STERANES	83 GROUP SUM
1	950.00		1.14		4	4	86	5	132.30
2	955.00		3.56		7	6	64	23	362.45
3	960.00		1.01		3	3	52	43	258.70
4	962.50		4.26		5	3	40	53	1082.29
5	965.00		4.30		5	3	35	57	870.32
6	967.00		0.84		7	3	39	50	163.63
7	970.00		6.78		3	3	41	53	1478.72
8	974.00		2.52		4	4	37	56	589.50
9	975.50		2.83		4	3	40	53	565.52
10	977.00		1.72		3	4	42	51	486.36
11	979.00		3.37		3	4	38	55	853.06
12	982.00		5.42		5	7	41	47	791.43
13	984.00		2.54		7	9	34	51	467.17
14	985.00		0.52		7	7	35	51	107.70
15	987.00		2.14		6	6	56	32	255.38
16	990.00		3.36		7	6	62	25	251.90
17	995.00		3.79		5	3	67	25	389.73
18	1000.00		0.77		9	6	68	18	59.29
19	1302.50		1.41		4	2	82	11	77.80
20	1311.00		0.74		11	8	36	45	79.14
21	1320.00		2.04		11	9	43	37	278.00
22	1328.00		3.25		8	10	43	40	360.03
23	1336.00		4.20		6	11	41	42	569.65
24	1347.00		6.25		5	11	51	33	722.51
25	1356.00		3.20		7	11	48	34	354.22
26	1362.00		7.68		7	8	55	30	354.41
27	1366.20		0.30		6	4	76	14	13.41
28	1367.50		0.65		5	6	45	44	76.56
29	1367.75								
30	1368.50		0.62		6	6	44	43	74.88
31	1369.82		0.36		5	6	43	46	62.52
32	1371.50		0.45		6	5	42	47	58.43
33	1372.50		0.55		7	3	48	41	80.90
34	1374.10		3.00		8	4	43	46	167.19
35	1376.52		0.70		12	8	31	49	75.24
36	1377.50		0.71		6	4	46	45	142.18
37	1378.50		0.28		5	4	44	46	56.11
38	1380.00		0.50		6	4	43	47	103.43
39	1382.00		0.81		5	4	43	48	125.78
40	1383.50				13	7	36	44	106.86
41	1385.25		1.47		9	3	57	31	116.66
42	1397.00		0.45		7	5	39	49	57.32
43	ST10096A		2.13		3	9	45	43	334.95
44	ST16059A		9.19		3	11	38	47	1684.52
45	ST16059B		2.90		4	11	39	46	445.87
46	ST16059C		2.49		4	11	38	47	319.79
47	ST19059A		3.18		4	12	37	47	654.24
48	ST23059A		2.20		4	9	41	47	375.57
49	ST25049A				4	9	42	45	1022.56
50	ST26059A		2.36		3	7	50	40	559.98

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THE ROBERTSON GROUP plc

REPORT NO. 6511/Ic

PETROLEUM GEOCHEMISTRY OF THE NORSK HYDRO 7321/9-1 BARENTS SEA WELL: MATURITY AND KEROGEN TYPE OF THE INTERVAL 700m TO 1800m

by

A G COLLINS

PROJECT NO. RGPD/890/Ic/21788

NORSK HYDRO CONTRACT NO. K02815-00/UP-U015

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APRIL 1989

Robertson Group

2 INTRODUCTION

This report presents the results obtained from spore colouration, vitrinite reflectivity and visual kerogen type analysis of ditch cuttings samples and one conventional core sample from the interval 700m to 1800mTD in the Barents Sea 7321/9-1 well. The work was submitted by Norsk Hydro, Harstad, under Contract No. K02815-00/UP-U015.

The group of samples comprised 45 washed ditch cuttings and one piece of conventional core, and were received at The Robertson Group's North Wales laboratories on 8th February, 1989. Preliminary results were sent to Norsk Hydro on 11th March and 11th April, 1989 by facsimile messages. The analyses carried out are as follows:

	No. of samples
Sample preparation	46
Kerogen preparation	46
Spore colouration	29
Vitrinite reflectivity	21
Visual kerogen typing	29

Robertson Group personnel involved in the study were:

Alan Collins	-	Project co-ordination, spore colour/kerogen microscopy and report writing
Sandra Martin	-	Vitrinite microscopy
Malcolm Jones	-	Supervision of kerogen preparation

Our contact at Norsk Hydro throughout the project has been Jan Augustson who kindly provided the outline stratigraphy and temperature data used in the report.

COMPANY: NORSK HYDRO WELL: 7321/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil. av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
		LOWER CRETACEOUS									
700	Ctgs	MDST, ol-gy+ 30% MDST, v lt gy, silty		.56(15) .37(2)L .80(9)R 1.15(9)R							
750	Ctgs	MDST, med-dk gy+ mnr DOL, brn-gy		.58(8) .80(6)R 1.12(9)R							
800	Ctgs	MDST, med-dk gy+ mnr DOL, brn-gy		.59(14) .37(9)L .77(18)R 1.02(14)R							
850	Ctgs	MDST, med-dk gy		.59(9) .85(13)R 1.16(6)R							
900	Ctgs	MDST, med-dk gy+ 10% LST, brn-gy+ mnr CALT		.52(2) .77(9)R 1.06(12)R							
950	Ctgs	MDST, med-dk gy, silty+ mnr pyr	6.5 3.0 C	.57(14) .40(21)L .81(13)R 1.08(7)R	70	25	5				
960	Ctgs	MDST, med-dk gy, silty+ tr pyr	6.5		25	35	40				
970	Ctgs	MDST, med-dk gy, silty+ tr pyr	5.5		10	30	60				
980	Ctgs	MDST, med-dk gy, silty	5.0-5.5		5	15	80				
990	Ctgs	MDST, med-dk gy, silty	5.0		5	20	75				
1000	Ctgs	MDST, med-dk gy, silty+ 20% MDST, med gy, silty+ tr pyr	5.0	.58(4) .39(14)L .78(4)R 1.09(5)R	10	55	35				
1035	Ctgs	MDST, med-dk gy, silty+ tr pyr		.63(20) .44(15)L .86(14)R							
1050	Ctgs	MDST, med-dk gy, silty	6.0-6.5		10	70	20				
1100	Ctgs	MDST, med-dk gy, silty+ mnr MDST, brn-gy, silty	5.5	.61(11) .43(28)L .84(11)R 1.05(5)R	15	75	10				
1140	Ctgs	MDST, med-dk gy, silty	7.0 ?		10	70	20				
1150	Ctgs	MDST, med-dk gy, silty+ mnr MDST, brn-gy, silty		.65(23) .44(16)L .90(13)R							

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1A

COMPANY: NORSK HYDRO WELL: 7321/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil. av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
1240	Ctgs	MDST, med-dk gy, slty+ mnr MDST, brn-gy, slty+ tr pyr	6.0		5	70	25				
1245	Ctgs	MDST, med-dk gy, slty+ mnr MDST, brn-gy, slty	6.0-6.5		10	75	15				
1250	Ctgs	MDST, med-dk gy, slty+ 10% SND+ tr LST, lt gy		.70(12) .48(12)L .96(9)R 1.20(19)R							
1282	Ctgs	MDST, dk gy+ mnr SND + tr LST, lt gy	6.5		5	95	Mnr				
1295	Ctgs	MDST, dk gy, slty+ mnr SND+ tr LST, brn-gy	6.5		5	95	Mnr				
1300	Ctgs	MDST, dk gy, slty+ mnr SND+ tr LST, brn-gy		.74(32) .53(4)L 1.04(15)R							
1310	Ctgs	MDST, gy-blk, slty+ mnr SND+ tr MDST, lt brn-gy	6.0		5	95	Mnr				
1317	Ctgs	JURASSIC LST, v lt gy+ 20% MDST, med-dk gy, slty	6.5-7.0		10	90	Mnr				
1322	Ctgs	MDST, gy-blk, slty+ 20% MDST, v lt gy, slty	6.5		5	25	70				
1327	Ctgs	MDST, gy-blk, slty+ 10% MDST, v lt gy, calc	6.5		5	20	75				
1332	Ctgs	MDST, gy-blk, slty+ mnr MDST, v lt gy, calc	6.5		5	20	75				
1337	Ctgs	MDST, gy-blk, slty+ mnr MDST, v lt gy, calc	6.5-7.0		5	30	65				
1342	Ctgs	MDST, gy-blk, slty+ tr MDST, v lt gy, calc	6.5-7.0		10	35	55				
1347	Ctgs	MDST, gy-blk, slty+ tr MDST, v lt gy, calc	6.5-7.0		10	35	55				
1352	Ctgs	MDST, gy-blk, slty+ tr MDST, v lt gy, calc	6.5-7.0		10	15	75				
1357	Ctgs	MDST, gy-blk, slty+ tr MDST, v lt gy, calc	6.5-7.0		10	25	65				

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1B

COMPANY: NORSK HYDRO WELL: 7321/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil. av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
1367.75	Core	SLTST, ol-gy, sndy	7.5-8.0	.68(27) .54(8)L 1.04(18)R	15	80	5				
1400	Ctgs	MDST, dk gy+ 10% SND + 10% CMT		.75(12) .51(17)L 1.03(10)R							
		TRIASSIC									
1425	Ctgs	SST, lt brn-gy, calc + 40% MDST, med-dk gy, slty	7.5		25	65	10				
1450	Ctgs	SST, lt brn-gy, calc + 20% MDST, med-dk gy, slty		.75(44) 1.03(7)R							
1500	Ctgs	SST, lt brn-gy, calc + 20% MDST, med-dk gy, slty		.79(31) 1.05(14)R							
1550	Ctgs	MDST, med-dk gy, slty+ 30% SST, lt brn-gy, calc		.85(13) .62(3)L 1.16(24)R							
1600	Ctgs	SST, lt brn-gy+ 20% MDST, med gy, slty		.92(13) .70(16)L 1.28(16)R 1.58(9)R							
1622	Ctgs	SST, lt brn-gy+ 30% MDST, med gy, slty	8.0		30	40	30				
1642	Ctgs	SST, lt brn-gy+ 30% MDST, med-dk gy, slty	7.5		60	10	30				
1650	Ctgs	SST, lt brn-gy+ 30% MDST, med-dk gy, slty		.93(16) .67(10)L 1.21(27)R							
1700	Ctgs	SST, v lt gy+ 30% MDST, med-dk gy, slty		.94(15) .73(9)L 1.33(26)R							
1777	Ctgs	SST, v lt gy+ 30% MDST, med-dk gy, slty+ 10% MDST, gy-blk, carb	7.0-7.5		15	75	10				
1780	Ctgs	MDST, med gy, slty+ 30% MDST, dk gy, slty+ 30% SST, v lt gy	7.5		15	75	10				
1800	Ctgs	MDST, dk gy, slty+ 20% SST, v lt gy+ 10% MDST, med gy, slty		.92(36) .73(10)L 1.19(7)R							

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1C

COMPANY: NORSK HYDRO WELL: 7321/9-1 LOCATION: BARENTS SEA

Depth (metres)	Palynomorphs	Vitrinite	Inertinite	Amorphous (liptinitic)	Amorphous (humic)	Cuticle	Reworked	Caved
950	5 Di, Sp	25	70					
960	10 Di, Sp	20	25	30	?15	Mnr		
970	Mnr Di, Sp	20	10	60	?10			
980	5 Di, Sp	5	5	75	?10			
990	5 Di, Sp	10	5	70	10			
1000	5 Sp	45	10	30	10			
1050	5 Sp, 5 Di	30	10	10	40			
1100	10 Sp, Mnr Di	60	15	Mnr	15	Mnr		
1140	5 Sp, Mnr Di	20	10	?15	50			
1240	Mnr Sp	10	5	25	60			
1245	Mnr Sp	15	10	15	60			
1282		15	5	?Mnr	80			
1295		20	5	?Mnr	75			
1310		10	5	Mnr	85			
1317	Mnr Sp	20	10	?Mnr	70			
1322	5 Sp, Di	10	5	65	15			
1327	Mnr Sp, Di	10	5	75	10			
1332	Mnr Sp, Di	10	5	75	10			
1337	Mnr Sp	10	5	65	20			
1342	Mnr Sp	10	10	55	25			
1347	Mnr Sp	10	10	55	25			
1352	Mnr Sp	5	10	75	10			
1357	Mnr Sp	10	10	65	15			
1367.75 (core)	5 Sp	60	15		20			
1425	10 Sp	65	25					
1622	10 Sp	15	30	45				
1642	30 Sp	10	60			Mnr		
1777	10 Sp	30	15		45			
1780	10 Sp	15	15		60			
(TD 1800m)								

Abbreviations:

Mnr = Minor (<5%)
Sp = Spores, pollen
Di = Dinocysts

TABLE 2 Detailed Kerogen Composition Data

Time-Temperature Index Calculations

MATURITY CALCULATIONS

COMPANY : NORSK HYDRO PROJECT : 25788
WELL : 7321/9-1
LOCATION : BARENTS SEA HORIZON : A TD (TRIAS)

Temperature degrees C	Time myBP	P-value	TTI-value	VR (P)	VR (TTI)
10	228	****	0	*****	*****
20	216	3.87	0	*****	*****
30	124	6.66	0	*****	*****
40	122	6.70	0	*****	*****
50	112	7.04	1	*****	*****
60	99	7.58	1	*****	*****
70	85	8.23	2	*****	*****
80	75	8.75	3	.36	*****
90	62	9.47	6	.41	.41
100	50	10.14	12	.48	.48
110	40	10.73	22	.54	.57
120	30	11.37	42	.62	.73
130	17	12.17	94	.73	1.06
140	7	12.79	174	.83	1.34
10	0	12.79	174	.83	1.34

Times of reaching key reflectances

VR from P	.50	.55	.75	1.2	VR from TTI	.50	.55	.75	1.2
Time	46	39	15	***	Time	48	42	29	12

MATURITY CALCULATIONS

COMPANY : NORSK HYDRO PROJECT : 25788
WELL : 7321/9-1
LOCATION : BARENTS SEA HORIZON : B TOP KIM

Temperature degrees C	Time myBP	P-value	TTI-value	VR (P)	VR (TTI)
10	150	****	0	*****	*****
20	122	4.72	0	*****	*****
30	113	5.21	0	*****	*****
40	98	6.05	0	*****	*****
50	86	6.69	0	*****	*****
60	75	7.32	1	*****	*****
70	64	7.98	1	*****	*****
80	51	8.74	3	.36	*****
90	40	9.38	6	.41	*****
100	30	10.00	11	.46	.47
110	20	10.66	21	.53	.56
120	7	11.47	47	.63	.76
10	0	11.47	47	.63	.76

Times of reaching key reflectances

VR from P	.50	.55	.75	1.2	VR from TTI	.50	.55	.75	1.2
Time	25	17	***	***	Time	26	21	7	***

TABLE 3

APPENDIX 1
ABBREVIATIONS USED IN ANALYTICAL DATA SHEETS

a/a	-	as above
Ac	-	acritarchs
ADD	-	mud additive
Al	-	algae
Am	-	amorphous
ang	-	angular
ANH	-	anhydrite
aren	-	arenaceous
arg	-	argillaceous
BAS	-	basalt
bd	-	bedded/bedding
B(IT)	-	bitumen/bituminous
bl	-	blue
bld	-	bleached
blk	-	black
bri	-	brilliant
brn	-	brown
calc	-	calcareous
CALT	-	calcite
carb	-	carbonaceous
CGL	-	conglomerate
CHK	-	chalk
CHT	-	chert
CLYST	-	claystone
CMT	-	cement
Comp	-	composite
crs	-	coarse
CSG	-	casing point/shoe
Ctgs	-	ditch cuttings
Cu	-	cuticle
C(vd)	-	caved
decarb	-	decarbonated
Di	-	dinocysts
dk	-	dark
DLT	-	dolerite
DOL/dol	-	dolomite/dolomitic
dsk	-	dusky
Ex	-	exinite
Exs	-	exsudatinite
extr	-	extracted
f	-	fine
fel	-	feldspathic
fer	-	ferruginous
flu	-	fluorescence
fm	-	formation
foss	-	fossils/fossiliferous
fr	-	friable
frac	-	fracture
frags	-	fragments
Fu	-	fusinite
GLC/glc	-	glauconite/glauconitic
gn	-	green
grd	-	graded/grading to
grns	-	grains
gy	-	grey
GYP	-	gypsum
HAL	-	halite
hd	-	hard
hor	-	horizontal
H(RV)	-	high reflecting vitrinite
i-	-	iso-
i/b	-	inter-bedded
IGN	-	igneous rocks
inc	-	including
Inert	-	inertinite
lam	-	laminae/laminated
LCM	-	lost circulation material
LIG/Lig	-	lignite/lignitic
lns	-	lens(es)
L(RV)	-	low reflecting vitrinite
LST	-	limestone
lt	-	light
mass	-	massive
MDST	-	mudstone
med	-	medium
MET	-	metamorphic rocks
mic	-	mica/micaceous
micr	-	micritic
min	-	mineral
mnr	-	minor
mod	-	moderate
mtl	-	mottled
n-	-	normal
NA	-	not available
nod	-	nodule/nodular
NS	-	no sample
occ	-	occasional
ol	-	olive
ool	-	oolitic
orng	-	orange
OS	-	oil stain
P	-	picked lithology
pal	-	pale
Ph	-	phytane
pnk	-	pink
por	-	porous/porosity
pp	-	purple
Pr	-	pristane
pred	-	predominantly
Prt	-	present
PYR/pyr	-	pyrite/pyritic
QTZ(T)	-	quartz(ite)
Re	-	resin
R(ew)	-	reworked
rnd	-	round(ed)
Sap	-	sapropel
sbng	-	subangular
sbrd	-	subrounded
SCI	-	spore colour index
Sf	-	semifusinite
sft	-	soft
SH	-	shale
shly	-	shaly
sil	-	siliceous
sks	-	slickenside surface
SLA	-	slate
SLT(ST)	-	silt(stone)
slty	-	silty
SND	-	sand
sndy	-	sandy
Sp	-	spores
SST	-	sandstone
st	-	stained
stks	-	streaks
suc	-	sucrosic
surf	-	surface
SWC	-	side wall core
TD	-	total depth
TOC	-	total organic carbon
tr	-	trace(s)
trns	-	transparent
v	-	very
vgt	-	variegated
Vit	-	vitrinite
vn	-	vein
VOLC	-	volcanic rocks
VR	-	vitrinite reflectivity
wht	-	white
xln	-	crystalline
yel	-	yellow
-	-	no analysis carried out
*	-	analysed but no data obtaine
gy-gn	-	greyish green
gy/gn	-	grey-green (gradation)
gn-gy	-	greenish grey

Note: (Maturity data tables only). Number in brackets refers to number of reflectivity values averaged to give quoted result. Preferred values for indigenous phytoclasts are listed first.

Robertson Group

APPENDIX 2

ANALYTICAL PROCEDURES AND TECHNIQUES

This appendix summarises the main steps in the analyses carried out in the Robertson Research International Ltd. petroleum geochemistry laboratories. Analytical pathways are shown on the flow chart (Appendix Figure 1) and details of laboratory procedures and techniques are given in the text. These may in certain circumstances be adapted to suit particular samples or conditions. Interpretation guidelines are also defined.

1. Sample Preparation

General

Samples are received into the laboratories in the forms of well-site canned ditch cuttings, bagged ditch cuttings in various stages of preparation from wet, unwashed to dried, washed; sidewall cores, conventional cores, outcrop samples, crude oil samples and gas samples. Each sample is assigned a number which is entered into a computer system to monitor sample selection and progress. Preparation techniques are directed towards obtaining clean samples, free of drilling mud and mud additives, obvious caving contamination and indeterminate fine material. Washing with cold water is standard but further washing with solvent (dichloromethane, DCM) is carried out if oil-based mud is present, after which samples are dried, described and individual lithologies hand-picked where practicable. Samples are rough crushed to approximately pea-sized fragments for kerogen preparation or finely milled for chemical analysis.

Kerogen Preparation

Kerogen concentrates for microscopic examination and elemental analysis are prepared using standard palynological procedures but omitting oxidation or acetolysis. Acid maceration involves the use of hot hydrochloric acid (HCl) to remove carbonates and hot 60% hydrofluoric acid (HF) to remove or break down silicates. Mineral residues are separated from the kerogen by a combination of ultrasonic vibration and zinc bromide flotation. Kerogen samples for spore colour and kerogen typing are mounted on glass slides in glycerin jelly, those for vitrinite reflectivity are dried and mounted in epoxy resin. Kerogen residues are stored in methanol.

2. Maturity Evaluation

The techniques employed for interpreting maturity and thermal history in these laboratories are based mainly on spore colouration and vitrinite reflectivity measurement, supplemented by data obtained from airspace gas and gasoline analysis, pyrolysis Tmax, and hydrocarbon analysis including gas chromatography and gas chromatography-mass spectrometry.

Spore Colouration

Sporomorph colour is assessed using a >20µ sieved kerogen fraction viewed in transmitted light on a standard palynological microscope. Unusual hues are checked using incident blue/UV light fluorescence. Measurement is made by eye against reference sets of single grain spore mounts and trained operators achieve a high degree of accuracy and reproducibility. The 1 to 10 Spore Colour Index (SCI) scale was designed for linearity with increasing depth and temperature and correlates approximately with the following zones of oil generation: 1.0 to 3.5, immature; 3.5 to 5.0, early mature, generation of low gravity oils (28 to 35 °API); 5.0 to 7.0, middle mature, generation of medium gravity oils (35 to 42°API); 7.0 to 8.5, late mature, generation of light oils (>42°API) and condensates; 8.5 to 10, post mature, generation of condensate, wet gas and, ultimately, dry gas. Linearity of scale is of great value in prediction, by extrapolation, of the depth to any part of the oil generation sequence. The value of SCI measurement lies in the objective selection of measured grains, so minimising problems of caving and reworking, and in its more direct correlation against oil generation than vitrinite reflectivity measurement. Limitations in its use concern the difficulty of correlation against other colour scales and the insensitivity of the scale in the late to post mature region. Anomalous colours may result from bleaching or staining during deposition and diagenesis. The correlation of SCI against Thermal Alteration Index (TAI) given on the SCI versus depth plot in the reports was made by direct comparison of Staplin's standard slides with SCI standard slides.

Vitrinite Reflectivity

The majority of preparations examined under reflected light in these laboratories are made using >20µ sieved kerogen, mounted in resin blocks and polished with carborundum and alumina although total kerogen may be used when sample size is

limited. Picked coals, organic-rich shales or limestones containing solid bitumen are mounted directly in resin blocks and polished in the usual way. Measurement is made on a Leitz Orthoplan microscope fitted with an MPV Compact photometer which feeds values direct to a desk top computer for data processing from each sample. The system is calibrated against glass standards and reflectance values are expressed as arithmetic means of measurements taken in oil immersion (R_o or $R_{m\ oil}$). R_{max} and R_{min} may be measured and quoted in certain circumstances but the difference is insignificant below about R_o 1.0%. Some operator selection of particles during measurement is essential and obvious contaminants or non-vitrinitic material are noted but not necessarily quoted. The value quoted on data tables is that which is interpreted as most appropriate, but other possibilities may also be given. Plotted figures assume a logarithmic increase of reflectance with depth. R_o 0.5% is a widely accepted threshold value for the onset of oil generation, although as the kinetics of oil generation may not be identical to those of vitrinite reflectivity development this must be seen only as a general guide. The floor for oil generation is characterised by a reflectance value of about 1.3%. Wet gas generation peaks at a value of about 1% and ceases at the 2% level. Dry gas generation peaks at a reflectance of about 1.5% and ceases at the 3% to 4% level. Correlation of reflectance values with other maturity parameters may not be universal because of time-temperature factors and is best made on a local basis.

Reflectivity measurement is a widely used and versatile tool which may be readily calibrated against easily obtained standards. It is applicable over a wide range of maturity stages from immature to post mature (0.2% to 5% R_o). High surface intercepts on plotted figures and discordances at faults and unconformities can give realistic estimates of the amount of section missing. It is of limited value in Early Palaeozoic sections where land plant material is absent, although a general guide to maturity may be obtained from chitinous organic matter. Even a skilled operator may have difficulty in distinguishing indigenous vitrinite from some forms of inertinite, anomalously reflecting "pseudovitrinite", cavings and reworked fragments.

Airspace Gas Analysis

Wet cuttings are collected at the well site and sealed in partly full cans containing bactericide. In the laboratory, the airspace (headspace) gas is extracted using a can piercer fitted with a septum and analysed by gas chromatography. The proportions of methane, ethane, propane, iso- and n-butane are calculated from integrated peak areas by comparison with a standard mixture of these gases. Methane is the dominant gas in immature and post mature sediments, comprising 90-100% of total gas, falling to 30-70% in mature sediments. The onset of maturity for oil generation (SCI 3.5) is characteristically marked by an increase in wet gas (C_2-C_4) to between 10 and 20% with further increases in maturity indicated by a decrease in the ratio of iso- to n-butane. Ratios of >1.0 are typical for immature sediments and <0.5 are usual in mature sediments. Departures from composition versus depth trends may be useful in indicating migrant gas at faults, unconformities or reservoir rocks but limit the method as a reliable maturity indicator. Airspace gas analysis is an inexpensive and rapidly executed method of screening samples for further maturity and hydrocarbon content determinations.

Gasoline Analysis and Cuttings Gas Analysis

Cuttings samples received wet, preferably in sealed containers, are suitable for gasoline and cuttings gas analysis. A portion of the washed cuttings sample is retained wet, pulverised in a sealed shaker and warmed to expel the C_1 to C_7 hydrocarbon components into the shaker airspace. A sample of this airspace gas is then removed and analysed by gas chromatography either for cuttings gas (C_1 to C_4) or gasolines (C_4 to C_7). Up to 28 hydrocarbon components are identified in the C_4 to C_7 range and their relative proportions calculated from integrated peak areas with reference to standard mixtures. Immature source rocks yield low total abundances and limited numbers of components whereas mature source rocks usually contain a full complement of identified hydrocarbons with the onset of maturity indicated by a rapid rise in total gasoline abundances with depth. Anomalous amounts of gasolines may mark the presence of oil stain. Gasolines may be used in oil to oil or oil to source rock correlations but the concentration of some of the measured components is not only a function of source but also depends on maturity, migration and alteration in the reservoir. Using the most stable compounds, pairs with similar chemical structure and boiling points are reduced to pair ratios and compared with the same pair ratios in other oils or possible source rocks. Gasoline analysis is a valuable tool in that it measures directly the hydrocarbons being generated from a sediment but its sensitivity in detecting traces of oil places constraints on its use as a maturity indicator.

Rock-Eval Pyrolysis, Gas Chromatography (GC) and Gas Chromatography-Mass Spectrometry (GC-MS) in Maturity Analysis

These three analytical processes measure parameters which are functions of both maturity and kerogen type. Data from them may give a general guide to maturity but if the kerogen types are known, more specific conclusions may be drawn. From Rock-Eval data, the temperature of maximum rate of pyrolysis, Tmax, is the most useful datum; gas chromatograms of alkanes, separated from source rock extracts or oils, yield carbon preference indices (CPI) and isoprenoid ratios; GC-MS quantitative fragmentograms provide abundance ratios for specific compounds which are particularly useful in assessing the level of maturity at which source rock hydrocarbons or oils have been generated. All these supplementary data may be used to confirm results from visual analysis or supplant them if poor or unavailable.

3. Source Rock Evaluation

Total Organic Carbon Content (TOC)

Organic carbon values are obtained by treating 0.1g of crushed rock sample with hot, concentrated HCl to remove carbonates. The washed residue is filtered on to a glass fibre pad and ignited in a Leco carbon analyser. For screening purposes, samples are analysed singly but where further analyses, such as pyrolysis or solvent extraction are anticipated, a duplicate sample is run. Blanks and standards are run as routine and where values from duplicated samples do not concur within strict accuracy limits, they are rerun. Where samples are heavily stained with oil, either from natural deposits or drilling mud, TOC is repeated on the dried, solvent extracted sample.

TOC measurement is fundamental in assessing source rock quality since when combined with kerogen type and maturity, a full description of the potential to generate oil may be given. It is found in practice that sediments containing less than 0.3% TOC are unlikely to have any source potential, those containing between 0.3% and 1% may be marginal sources but the better quality sources contain in excess of 1% TOC. Screening by TOC is therefore an inexpensive and rapid method of selection of samples for further analysis in source potential evaluation.

Rock-Eval Pyrolysis

Pyrolysis data are obtained using the IFP-Fina Rock-Eval apparatus. 100 mg of crushed, whole rock either from bulk sample or picked lithology is weighed accurately into a crucible and introduced into a furnace at 250°C. Free hydrocarbons (roughly equivalent to solvent extractable hydrocarbons) are volatilised and quantified by flame ionisation detector (FID) to give Peak 1 (S_1, ppm). The furnace temperature is increased to 550°C at 25°C/minute and within this range, kerogens crack to give hydrocarbons, measured by FID to give Peak 2 (S_2, ppm) and carbon dioxide, measured by thermal conductivity detector (TCD) to give Peak 3 (S_3, ppm). The temperature at the maximum rate of evolution of cracked volatiles (Tmax) is measured automatically but can also be monitored visually. The instrument is calibrated daily using standards both at the beginning of the work period and at regular intervals thereafter and crucible blanks are run as routine. The tabulated data in reports comprise the following parameters:

Tmax °C - temperature of maximum rate of Peak 2 hydrocarbon evolution.

Hydrogen Index (HI) - S_2/TOC (mg/g) or ratio of released hydrocarbon to organic carbon content. This is a measure of the hydrocarbon generating potential remaining in the kerogen as opposed to that of the whole rock.

Oxygen Index (OI) - S_3/TOC (mg/g) or ratio of released carbon dioxide to organic carbon content.

Production Index (PI) - S_1/S_1+S_2, or ratio of the amount of hydrocarbons released in the first stage of heating to the total amount of hydrocarbons released and cracked during pyrolysis.

Potential Yield (PY) - S_2 (ppm) or total of hydrocarbons released during cracking of kerogen compared to original weight of rock.

Tmax, hydrogen index and oxygen index are each functions of both maturity and kerogen type. Using published and empirical data, it has been possible to assemble a model to show the relationships of these factors to maturity as measured by spore colouration and vitrinite reflectivity for a selection of pure kerogen types. The kerogen types used are algal sapropel (type I), waxy sapropel (type II), vitrinite (type IIIA) and inertinite (type IIIB) and a computer program has been devised by which the amounts of these components may be calculated from the HI, OI, Tmax and maturity

data for any sample. These are the values expressed in the "kerogen composition by calculation" columns tabulated in the reports.

The hydrogen index is a measure of the hydrocarbon generating potential of the kerogen and is analogous to the atomic H/C ratio. Immature, organically rich source rocks and oil shales give values above 500, mature oil source rocks give values between 200 and 550. For a given kerogen type, these values progressively diminish with increasing maturity.

The temperature of maximum rate of pyrolysis depends partly on the kerogen type but the transition from immature to mature organic matter is marked by temperatures between 415° and 435°C. The maturity transition from oil and wet gas generation to dry gas generation is marked by temperatures between 455° and 460°C. In practice, greater variation than these ideal temperature ranges may be seen, but they are nevertheless useful as general guides to the level of maturity attained by the sediment.

The production index increases with maturity from values near zero for immature organic matter to maximum values of 0.15 during the late stages of oil generation. Anomalously high values indicate the presence of oil or contaminants. The potential yield is an indication of the predicted yield of hydrocarbons from the source rock at optimum maturity and is a measure of the quality of the source rock. For immature sediments, values of 0 to 2000 ppm of hydrocarbon characterise a poor source rock, 2000 to 6000 ppm fair, 6000 to 20 000 ppm good and above 20 000 ppm very good.

Pyrolysis techniques have in recent years provided a major advance in the assessment of source rock quality and generating potential. Hydrocarbon yields from immature source beds examined on-structure may be translated into actual oil productivity from the same beds in mature basinal, off-structure situations. Models relating maturity and kerogen type may be used to define original source rock quality grades which are of great value in mapping organic facies. Amorphous kerogen types, indistinguishable in microscopic preparations over a wide range of chemical properties, may be readily differentiated by pyrolysis. The problem of analysing bulk samples containing mixed kerogens has been largely overcome by the kerogen type/maturity model and anomalous results arising from the presence of caving contamination and drilling mud additives can usually be explained by inspection. High oxygen indices sometimes occur as a result of the presence of metastable carbonates and in such cases the sample is acid decarbonated and re-run.

Visual Examination of Kerogen Concentrates

All palynological preparations on which SCI determinations are made are also examined for kerogen type. Visual estimations of the relative abundance of the broad groups vitrinite, inertinite and sapropel are made on the total kerogen slide mount but reference is also made to the >20μ sieved fraction to assist in identification. The scheme of identification is shown in Appendix Table 1. Full use is made of incident blue or UV light in distinguishing immature or early mature oil-prone kerogen from gas-prone kerogen.

Extract Analysis

The soluble organic materials present in rocks can be extracted with organic solvents, fractionated and analysed. The type and amount of material extracted depends largely upon the nature of the contained kerogen and its maturity, although the presence of migrant oil or drilling contamination may be the determining factors.

A maximum of 40g of crushed sample is extracted for a minimum of 12 hours in a Soxhlet apparatus using laboratory redistilled DCM. The solvent and the more volatile components (approximately up to $\underline{n}$-C_{15}) are lost by evaporation in an air flow and the resulting total extract is weighed, dissolved in hexane and separated into alkane (saturate) hydrocarbon, aromatic hydrocarbon, resene and asphaltene (polar) fractions by silica adsorption chromatography in the Iatroscan process.

Larger fractions, suitable for further analysis, are obtained by column chromatography. The extract is run through a short glass column packed with silica and alumina and eluted with hexane (to give the saturate fraction), (3:1 hexane: toluene mixture (to give the aromatic fraction) and methanol (to give the polar, or resene and asphaltene, fraction). A small proportion of non-eluted polar compounds usually remains on the column.

The data tabulated in reports comprise the following parameters:

Total extract - soluble organic matter, heavier than about n-C_{15+}, expressed as ppm of weight of rock.

Hydrocarbons - sum of alkane and aromatic hydrocarbons, expressed as ppm of weight of rock.

Extract % of organic carbon (EPOC) - $\frac{\text{total extract ppm}}{\text{TOC} \times 100}$; the extractability.

Hydrocarbons mg/g of organic carbon - total hydrocarbons normalised to 1g of organic carbon.

Hydrocarbons % extract - total hydrocarbons as a proportion of total extract.

Alkanes % hydrocarbons - the proportion of alkanes (saturates) in the total hydrocarbons. The proportion of aromatics is (100 minus this value) expressed as a percentage.

The extractability of oil-prone sapropelic organic matter increases rapidly in the oil generation zone and diminishes to very low values in post mature sediments. Overall the extractability of sapropelic organic matter is greater than that of gas-prone humic organic matter for similar levels of maturity. Samples with extractabilities of greater than 20% generally contain migrant oil or are contaminated with mud additives.

As maturation proceeds in the oil generation zone the proportion of hydrocarbons in the total extract increases from less than 20% to a maximum in the most productive horizons of around 60%. This trend is reversed as the oil-condensate zone is entered. The relative proportions of alkanes to aromatics can be used as a check for low levels of contamination. Fractions of the extract, separated by column chromatography are retained for further analysis by gas chromatography or for stable carbon isotope determination.

Capillary Gas Chromatography of C_{15+} Alkanes

A portion of the Soxhlet extract is eluted with hexane through a short silica column to yield the saturate hydrocarbon fraction. This fraction is evaporated in a stream of dry nitrogen at room temperature. A small portion of the fraction is then taken up in hexane and introduced into a 25 metre, wall-coated, open tubular glass capillary column coated with OV-1, or equivalent, mounted in a Carlo Erba gas chromatograph which is temperature programmed from 70°C to 270°C at 3°C/minute.

C_{15+} chromatograms are inspected for the distributions of n-alkanes, and the presence and abundance of isoprenoids (particularly pristane and phytane), steranes and triterpanes and unresolved envelopes of naphthenic compounds. The ratios pristane:phytane and pristane:n-C_{17} are calculated. Carbon Preference Index (CPI) values quoted are those as defined by Philippi as the ratio $2C_{29}$ to $(C_{28}+C_{30})$ unless otherwise stated. Chromatography may reveal information about the kerogen type of the source rock, its maturity and condition of deposition and, if migrant oil is present, whether this has been water-flushed or biodegraded. Contaminant drilling mud additives may be identified.

Capillary Gas Chromatography of Aromatic and Branched/Cyclic Alkanes

The aromatic portion of the Soxhlet extract is eluted from a short silica/alumina column by a hexane/toluene mixture. The dried fraction is taken up in DCM and introduced into a 25 metre, wall-coated, open tubular glass capillary column coated with OV-1, or equivalent, mounted in a Carlo Erba gas chromatograph which is temperature programmed from 70°C to 270°C at 3°C/ minute.

Branched chain alkanes are separated from normal alkanes by urea adduction and treated as for total alkanes.

Gas Chromatography-Mass Spectrometry

Mass spectrometry is a technique in which molecules are bombarded with high energy electrons causing ionisation and fragmentation of the molecules into ions of varying mass(m) and charge(z). The way in which a molecule fragments into ions of various m/z value is known as its fragmentation pattern, or mass spectrum and is unique. When linked to a gas chromatograph the mass spectrometer can be used in two different modes:

1. Full Scan Mode: A mass spectrum is obtained of each peak eluting from the gas chromatograph and a structural identification of the compound producing that peak can be made.

2. Multiple or Single Ion Monitoring Mode: The mass spectrometer is tuned to certain m/z values to detect whether a compound, eluting from the gas chromatograph, fragments to give an ion at that value. Certain fragmentations are indicative of specific compound types and the most commonly monitored fragment ions used in petroleum geochemistry are those with m/z values of 191, 217 and 259 which are the principal fragment ions obtained from groups of alkanes known as triterpanes, regular steranes and rearranged steranes respectively. These are compounds containing 27 to 35 carbon atoms arranged in a polycyclic, normally 4 or 5 ring, structure, occurring in the $\underline{n}$-C_{26} to $\underline{n}$-C_{35} region of a gas chromatogram. The basic molecular skeletons of these compounds are very similar to those of the original organic matter deposited in the sediment and so these 191, 217 and 259 distribution plots, known as mass fragmentograms or mass chromatograms, form a pattern characteristic of the source material. This technique of "fingerprinting" is also one of the more exact methods of correlating an oil to its source, or to another oil.

Carbon Isotope ($^{13}C/^{12}C$) Ratio Analysis

Carbon has two stable isotopes, the more abundant ^{12}C isotope and the heavier ^{13}C isotope, which in nature forms about 1% of carbon. Deviations from the $^{13}C/^{12}C$ ratio are extremely small and carbon isotope ratios, as measured by mass spectrometry, are expressed as deviations from a standard, the Pee Dee Belemnite carbonate (PDB standard) in parts per thousand (parts per mil; $^{o}/oo$). Positive deviations indicate ^{13}C enrichment and conversely, negative deviations indicate ^{13}C impoverishment.

While the carbon isotope ratios of oils and rock extracts can range from -20 to -32 $^{o}/oo$ depending on the source organic matter type, the difference between a specific oil and its source is small. Measurements are usually made on the C_{15+} alkane and aromatic hydrocarbon fractions separately and there should be no more than 1 $^{o}/oo$ difference between the oil and its source for either fraction. If there is any doubt that the source rock extracts are not indigenous to the source rock kerogen, the carbon isotope ratio of the extracted source rock kerogen can be measured.

Pyrolysis-Gas Chromatography

The hydrocarbon pyrolysate derived from thermal, anhydrous cracking of kerogen is analysed by capillary gas chromatography. A few mg of rock, kerogen or asphaltene is heated to 600°C for 20 seconds in the injector of a gas chromatograph. The chromatograph oven is kept at -30°C during pyrolysis and then raised to 300°C at a programmed rate of 7.5°C/minute. Chromatograms produced this way are often very different from those of source rock extracts or oils in that branched and cyclic isomers are generated freely giving numerous, closely spaced peaks, along with unsaturated, alkene (olefin) hydrocarbons. The "doublet" peaks often observed in these chromatograms comprise alkene-alkane pairs, the first eluting, and usually smaller peak, being the alkene. The chromatograms range from C_1 to C_{30} or above and although variable, are broadly characteristic of source rock type. Gas-prone kerogen cracks to give a more limited molecular weight range of products, concentrated towards the light ends, whereas oil-prone kerogen gives more prominent alkene-alkane doublets in the C_{12} to C_{30} region. The largest peak from both types is usually methane.

Elemental Analysis

Total (unsieved) kerogen is prepared as described in Section 1. The dried material is combusted in oxygen in an elemental analyser and the oxides of carbon, hydrogen, nitrogen and sulphur are measured. The unburnt residue is the ash content. Oxygen is usually calculated by difference but can be determined separately if required. Results are quoted as percentage weights of C, H, O, N, S and Ash with the atomic ratio H/C and O/C calculated and plotted on the standard van Krevelen diagram. The relative amounts of C, H and O present in organic matter are dependent on both source and maturity. At known maturity levels, some measure of source quality may be determined. Limitations of the method in source rock assessment involve the difficulty of obtaining pure kerogen (in particular, free from pyrite) and the lack of a simple, direct determination of oxygen content.

4. Oil Analysis

RRI laboratories offer a wide range of oil analyses both for geochemical purposes and industrial use. Physical property determinations are based mainly on IP methods and are available for lubricating oils, fuels and greases as well as crudes. Frequently measured properties of crude oils presented in geochemistry reports include: API gravity, pour point, viscosity and concents of water, sulphur, wax, asphaltene, nickel, vanadium and other metals. Chemical analysis of oils involves the following:

Whole oil gas chromatography - using split syringe injection and a temperature programme from -20°C or -30°C up to 270°C at 4°C/minute.

Associated gas - if oil has high gas/oil ratio.

Gasoline analysis - as for gasolines in rock samples but a weighed quantity of oil is used.

Topping of the oil - this is equivalent to the removal of the fraction boiling below about 210°C and gives a more standardised product for comparison of gas chromatograms of the C_{15+} fraction.

Column chromatography and gas chromatography - as for solvent extracts. Analysis is carried out on topped oil.

5. Gas Analysis

The hydrocarbon gases, C_1 to C_4, may be collected from the airspace of sealed canned samples or may be received from well-site tests in a special sealed gas cylinder (gas mouse). Chromatographic separation of the C_1 to C_4 gases is effected as described under airspace gas analysis. In addition, the separated gas components may be analysed for stable carbon and hydrogen isocope composition which may provide valuable clues to the origin of the gas.

6. Solid Bitumen Analysis

In some oil fields, problems are encountered where bitumen developments form continuous or patchy layers within reservoirs, dividing the pay zones and acting as barriers to natural fluid movement or inhibiting enhanced oil recovery techniques. Integrated geochemical and sedimentological studies aim to produce geological models capable of predicting the occurrence of bitumen layers and their likely thickness and ability to act as permeability barriers. Of further concern are the past or present relationships between the bitumen and reservoired oil, their source rocks and the timing of bitumen formation.

Analysis schemes involve screening of samples by assessing the amount of bitumen in polished core pieces using reflected light microscopy, followed by solvent extraction of control samples to estimate the proportion of solvent soluble bitumen. Different phases of bitumen formation are differentiated by reflectance measurement as described for vitrinite reflectance measurement. Soluble extracts are fractionated to give alkane, aromatics, asphaltene and resene components. Separated bitumens may be subjected to elemental analysis.

Kerogen Typing Scheme for Transmitted White and Incident Blue/U.V. Light

General Properties	RRI Report Data Tables	Type *
Sapropelic (Oil-prone gas-prone at high maturity)	Algal Sapropel	Type I
	Waxy Sapropel	Type II
Humic (Gas-prone)	Vitrinite	Type IIIA
	Inertinite	Type IIIB

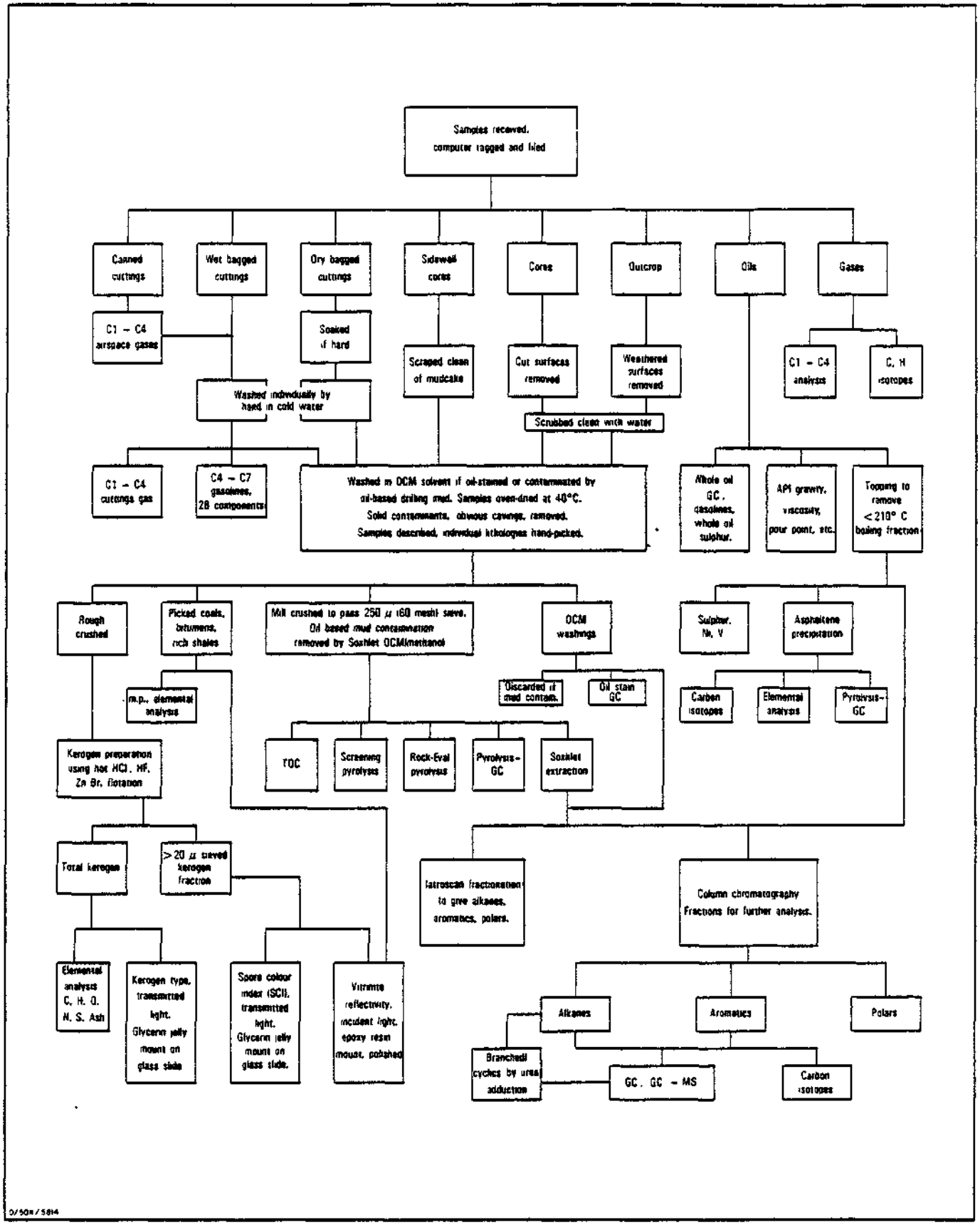
Amorphous		Structured	
Non-Fluorescent	Fluorescent	Non-fluorescent	Fluorescent
Type I/II at high maturity (SCI >7.5)	Type I Sapropel Type II (degraded spores) Soft bitumens	Vitrinite (Type IIIA) brown/black, woody tissue	Cuticle Spores Pollen Dinocysts (Type II)
Type IIIA/B		Inertinite (Type IIIB) very dark brown/black, woody tissue	Resinite Algae (Tasmanites, Botryococcus etc.)
Oil residues (bitumens) Mineral (undigested) Grease contamination Mud additives		Solid bitumen - brown/ black (oil residue) often with crystal imprints	(Type I)
		Microforaminifera, chitinozoa etc. (Not usually important)	
		Spores, cuticle etc. at high maturity levels	
		Mud Additives - walnut etc.	

* Types I, II, III approximately sensu Tissot et al but Type III subdivided into IIIA (vitrinite) and IIIB (inertinite)

APPENDIX TABLE 1

Robertson Group

FLOW CHART FOR GEOCHEMICAL ANALYSIS



APPENDIX FIGURE 1

Robertson Group

L-594

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GEOCHEMICAL SCREENING ANALYSES

WELL 7321/9-1

L.Aakvaag and N.Telnæs

HYDRO

Research Centre

INTRODUCTION

This report comprises the RockEval/TOC results of 295 DC samples from well 7321/9-1, covering the Cretaceous to the Triassic.

The well was spudded 26.10. 1988, and reached TD at 1800 m (RKB) in claystones of Norian age.
The well was dry.

EXPERIMENTAL

The wet cutting samples were washed using a 0.125 mm sieve and dried at 60 °C overnight.
An aliquot of the sample was crushed and analysed using a RockEval/TOC analyser. A standard was analysed approx. every 10 samples to check the reproducibility of the analysis.

The results are presented in terms of:

S_1	: Low temperature oil/gas yield (mgHC/g rock)
S_2	: Pyrolysis yield (mgHC/g rock)
S_3	: CO_2 yield (mg CO_2/g rock)
Tmax	: Temperature at which maximum emission of hydrocarbons occurs
TOC	: Total Organic Carbon
HI	: Hydrogen Index ($100 \times S_2$/TOC)
OI	: Oxygen Index ($100 \times S_3$/TOC)
PI	: Production Index (S_1/S_1+S_2)
PP	: Production Potential (S_1+S_2)

ROCKEVAL/TOC RESULTS
WELL: 7321/9-1

DEPTH m	Tmax	S1 mg/g	S2 mg/g	S3 mg/g	TOC %	HYDROGEN INDEX	PRODUCTION INDEX	OXYGEN INDEX
690	444	0.03	0.24	0.68	0.80	30	0.11	85
700	441	0.03	0.31	0.91	0.75	41	0.09	121
710	440	0.07	0.38		0.78	49	0.16	
720	445	0.06	0.24	0.43	0.73	33	0.20	59
730	442	0.02	0.24	0.54	0.69	35	0.08	78
740	442	0.02	0.22	0.55	0.66	33	0.08	83
750	441	0.04	0.18	0.31	0.63	29	0.18	49
760	442	0.00	0.14	0.37	0.67	21	0.00	55
770	438	0.04	0.19	0.54	0.67	28	0.17	81
780	452	0.02	0.17	0.34	0.65	26	0.11	52
790	456	0.03	0.16	0.33	0.57	28	0.16	58
800	446	0.02	0.17	0.23	0.60	28	0.11	38
810	446	0.03	0.22	0.19	0.57	39	0.12	33
820	446	0.03	0.20	0.10	0.58	34	0.13	17
830	435	0.05	0.19	0.21	0.62	31	0.21	34
840	437	0.05	0.19	0.13	0.58	33	0.21	22
850	437	0.05	0.23	0.12	0.57	40	0.18	21
860	436	0.06	0.19	0.06	0.55	35	0.24	11
870	437	0.08	0.14	0.16	0.51	27	0.36	31
880	449	0.09	0.18	0.19	0.87	21	0.33	22
890	443	0.12	0.20	0.20	0.88	23	0.38	23
900	437	0.38	0.33	0.28	0.62	53	0.58	45
910	441	0.20	0.39	0.45	0.91	43	0.36	49
920	443	0.32	0.54	0.45	1.06	51	0.40	42
930	438	1.58	1.67	0.66	1.44	116	0.51	46
940	440	1.44	1.59	0.68	1.38	115	0.50	49
950	439	1.30	1.74	0.63	1.40	124	0.45	45
960	439	1.20	2.59	0.71	1.50	173	0.33	47
970	436	4.25	19.25	0.47	4.32	446	0.18	11
980	437	4.48	24.60	0.39	5.06	486	0.14	8
990	435	3.77	18.00	0.47	4.19	430	0.17	11
1000	437	1.56	5.04	1.05	2.10	240	0.24	50
1005	439	1.26	2.25	0.98	1.58	142	0.36	62
1010	440	1.11	2.55	1.15	1.53	167	0.30	75
1015	441	0.83	1.60	1.16	1.30	123	0.34	89
1020	444	0.67	1.24	1.01	1.14	109	0.35	89
1025	441	0.83	1.51	1.24	1.24	122	0.35	100
1030	442	0.60	1.28	1.02	1.07	120	0.32	95
1035	442	0.80	2.12	1.04	1.47	144	0.27	71
1040	443	0.68	1.45	0.93	1.28	113	0.32	73
1045	437	0.75	1.56	1.05	1.25	125	0.32	84
1050	438	1.13	1.75	1.17	1.44	122	0.39	81
1055	442	0.96	1.50	1.19	1.30	115	0.39	92
1060	439	0.96	1.41	1.06	1.31	108	0.41	81
1065	439	0.67	1.35	1.06	1.28	105	0.33	83
1070	436	0.96	1.98	1.05	1.50	132	0.33	70
1075	438	0.81	1.61	1.13	1.49	108	0.33	76
1080	440	0.81	1.52	1.07	1.40	109	0.35	76
1085	442	0.67	1.46	0.85	1.35	108	0.31	63
1090	440	0.70	1.40	0.85	1.34	104	0.33	63
1095	439	0.71	1.43	0.93	1.27	113	0.33	73
1100	441	0.77	2.04		1.53	133	0.27	
1105	445	0.61	1.43		1.35	106	0.30	

ROCKEVAL/TOC RESULTS
WELL: 7321/9-1

DEPTH m	Tmax	S1 mg/g	S2 mg/g	S3 mg/g	TOC %	HYDROGEN INDEX	PRODUCTION INDEX	OXYGEN INDEX
1110	444	0.49	1.36		1.32	103	0.26	
1115	444	0.52	1.46		1.37	107	0.26	
1120	445	0.58	1.31		1.28	102	0.31	
1125	445	0.62	1.40		1.33	105	0.31	
1130	444	0.61	1.55		1.45	107	0.28	
1135	445	0.62	1.45		1.47	99	0.30	
1140	443	0.87	1.62		1.46	111	0.35	
1145	444	0.80	1.52		1.42	107	0.34	
1150	444	0.76	1.18		1.30	91	0.39	
1155	445	0.79	1.54		1.40	110	0.34	
1160	445	0.59	1.20		1.23	98	0.33	
1165	439	0.58	1.38		1.35	102	0.30	
1170	445	0.71	1.34		1.37	98	0.35	
1175	444	0.58	1.17		1.21	97	0.33	
1180	445	0.55	1.32		1.32	100	0.29	
1185	446	0.63	1.42		1.31	108	0.31	
1190	445	0.47	1.01		1.18	86	0.32	
1195	445	0.56	0.96		1.09	88	0.37	
1200	438	0.68	1.00		1.12	89	0.40	
1205	445	0.64	1.01		1.12	90	0.39	
1210	445	0.45	0.86		1.08	80	0.34	
1215	434	0.65	1.46		1.27	115	0.31	
1220	439	0.40	0.72		0.95	76	0.36	
1225	442	0.34	0.63		0.87	72	0.35	
1230	444	0.31	0.53		0.99	54	0.37	
1235	446	0.42	1.18	0.75	1.62	73	0.28	46
1240	446	0.64	2.34	0.48	2.60	90	0.23	18
1245	447	0.60	2.12	0.52	2.33	91	0.23	22
1250	446	0.56	1.83	0.60	2.08	88	0.26	29
1252	447	0.46	1.28	1.33	1.55	83	0.28	86
1255	445	0.47	1.38	1.11	1.62	85	0.28	69
1257	445	0.49	1.74	1.10	2.00	87	0.24	55
1260	445	0.47	1.69	0.86	1.94	87	0.24	44
1262	447	0.44	1.56	1.08	1.92	81	0.24	56
1265	447	0.43	1.66	0.95	1.93	86	0.22	49
1267	444	0.47	1.67	1.01	2.01	83	0.24	50
1270	446	0.54	2.61	0.60	2.65	98	0.18	23
1272	448	0.54	2.47	0.58	2.54	97	0.20	23
1275	448	0.42	1.77	0.56	2.01	88	0.21	28
1277	448	0.52	2.37	0.64	2.40	99	0.20	27
1280	447	0.38	2.08	0.48	2.11	99	0.17	23
1282	448	0.39	2.32	0.38	2.22	105	0.16	17
1285	445	0.41	2.18	0.60	2.24	97	0.18	27
1287	448	0.44	2.37	0.50	2.41	98	0.18	21
1290	447	0.38	2.06	0.59	2.14	96	0.18	28
1292	448	0.36	1.82	0.46	1.99	91	0.18	23
1295	448	0.46	2.41	0.35	2.36	102	0.18	15
1297	449	0.42	2.00	0.34	2.14	93	0.19	16
1300	448	0.51	2.45	0.37	2.50	98	0.19	15
1302	450	0.47	2.18	0.38	2.38	92	0.19	16
1305	448	0.54	2.53	0.52	2.69	94	0.19	19
1307	450	0.48	2.34	0.51	2.55	92	0.18	20
1310	452	0.58	3.15	0.44	3.38	93	0.17	13

ROCKEVAL/TOC RESULTS
WELL: 7321/9-1

DEPTH m	Tmax	S1 mg/g	S2 mg/g	S3 mg/g	TOC %	HYDROGEN INDEX	PRODUCTION INDEX	OXYGEN INDEX
1312	453	0.33	1.30	0.69	1.85	70	0.22	37
1315	451	0.27	0.81	0.59	1.11	73	0.27	53
1317	448	0.26	0.69	0.37	0.86	80	0.30	43
1320	447	0.32	0.89	0.29	0.81	110	0.29	36
1322	445	0.93	2.59	0.36	1.43	181	0.30	25
1325	446	1.27	2.55	0.41	1.71	149	0.28	24
1327	445	1.69	4.80	0.39	2.12	226	0.27	18
1330	447	2.06	6.23	0.37	2.45	254	0.25	15
1332	438	1.47	4.43	0.36	2.00	222	0.26	18
1335	448	1.65	4.75	0.37	2.04	233	0.27	18
1337	447	1.84	6.09	0.39	2.46	248	0.24	16
1340	446	2.15	7.12	0.37	2.79	255	0.24	13
1342	447	2.47	8.22	0.38	3.17	259	0.21	12
1345	446	2.03	7.25	0.37	3.02	240	0.23	12
1347	446	1.85	6.94	0.40	2.85	244	0.22	14
1350	448	1.81	6.98	0.41	2.88	242	0.21	14
1352	446	1.69	6.61	0.35	2.75	240	0.21	13
1355	448	1.64	6.33	0.28	2.60	243	0.21	11
1357	449	2.79	10.41	0.32	3.63	287	0.22	9
1360	448	2.61	9.34	0.32	3.40	275	0.22	9
1362	451	2.76	8.29	0.36	3.12	266	0.26	12
1365	448	1.95	5.61	0.43	2.45	229	0.27	18
1367	446	0.38	1.20	0.78	1.33	90	0.27	59
1370	447	0.39	1.15	0.70	1.19	97	0.28	59
1372	446	0.37	0.64		1.09	59	0.36	
1375	443	0.46	0.86		1.23	70	0.35	
1377	436	0.58	1.08		1.07	101	0.35	
1380	447	0.35	0.62		0.97	64	0.36	
1382	440	0.34	0.49		0.72	68	0.41	
1385	446	0.34	0.57		0.79	72	0.38	
1390	432	0.18	0.36		0.83	43	0.33	
1392	442	0.17	0.13		0.85	51	0.28	
1395	444	0.19	0.45		0.82	55	0.30	
1397	442	0.16	0.30		0.64	47	0.35	
1400	442	0.19	0.35		0.62	56	0.35	
1402	448	0.13	0.21		0.62	34	0.38	
1405	445	0.15	0.32		0.64	50	0.33	
1407	445	0.17	0.27		0.47	57	0.39	
1410	445	0.20	0.26		0.41	63	0.43	
1412	445	0.29	0.23		0.27	85	0.56	
1415	445	0.34	0.24		0.29	83	0.59	
1417	449	0.62	0.58		0.62	94	0.52	
1420	451	0.74	0.66		0.71	93	0.53	
1422	452	0.64	0.59		0.61	97	0.52	
1425	455	1.54	1.86		2.07	90	0.45	
1427	457	0.74	0.54		0.78	69	0.58	
1430	454	0.97	0.52		0.69	75	0.66	
1432	452	0.90	0.52		0.78	67	0.63	
1435	453	1.00	0.55		0.75	73	0.65	
1437	453	1.27	0.77		0.98	79	0.62	
1440	454	1.65	1.07		1.25	86	0.61	
1442	454	1.64	1.40		1.53	92	0.54	
1445	456	1.29	1.08		1.32	82	0.55	

ROCKEVAL/TOC RESULTS
WELL: 7321/9-1

DEPTH m	Tmax	S1 mg/g	S2 mg/g	S3 mg/g	TOC %	HYDROGEN INDEX	PRODUCTION INDEX	OXYGEN INDEX
1447	456	1.01	0.84		1.07	79	0.55	
1450	455	0.87	0.75		0.99	76	0.54	
1452	456	0.75	0.65		0.84	77	0.54	
1455	458	0.62	0.52		0.71	73	0.54	
1457	457	0.45	0.43		0.59	73	0.51	
1460	455	0.45	0.41		0.56	73	0.52	
1462	453	0.41	0.43		0.54	80	0.49	
1465	453	0.37	0.34		0.44	77	0.53	
1467	451	0.33	0.29		0.38	76	0.53	
1470	453	0.36	0.35		0.42	83	0.51	
1472	458	0.35	0.23		0.42	55	0.60	
1475	457	0.29	0.28		0.37	76	0.52	
1477	457	0.30	0.25		0.34	74	0.56	
1480	455	0.31	0.27		0.34	79	0.53	
1482	454	0.40	0.34		0.40	85	0.54	
1485	454	0.31	0.23		0.30	77	0.57	
1487	455	0.43	0.32		0.39	82	0.58	
1490	452	0.54	0.33		0.46	72	0.63	
1492	452	0.65	0.41		0.54	76	0.61	
1495	454	0.72	0.40		0.60	67	0.64	
1497	452	0.84	0.54		0.68	79	0.61	
1500	454	0.79	0.69	0.85	0.79	87	0.53	108
1502	448	0.75	0.77	0.81	0.77	100	0.49	105
1505	446	0.76	0.81	0.78	0.81	100	0.49	96
1507	450	0.93	0.99	0.54	0.98	101	0.48	55
1510	451	0.79	0.77	0.62	0.91	85	0.51	68
1512	452	0.63	0.68	0.51	0.78	87	0.48	65
1515	452	0.60	0.87	0.65	0.94	93	0.41	69
1517	453	0.66	0.82	0.52	0.87	94	0.45	60
1520	451	0.63	0.73	0.65	0.85	86	0.46	76
1522	452	0.55	0.73	0.68	0.85	86	0.43	80
1525	452	0.53	0.66	0.73	0.81	81	0.45	90
1527	453	0.50	0.65	0.87	0.79	82	0.44	110
1530	451	0.61	0.59	0.68	0.67	88	0.51	101
1532	450	0.75	0.61	0.56	0.61	100	0.55	92
1535	431	0.85	0.66	0.52	0.59	112	0.57	88
1537	409	0.86	0.64	0.68	0.58	110	0.57	117
1540	408	0.89	0.72	0.64	0.58	124	0.56	110
1542	451	0.70	0.68	0.76	0.67	101	0.51	113
1545	448	0.72	0.77	0.66	0.67	115	0.49	99
1547	441	0.54	0.72	0.81	0.72	100	0.43	113
1550	453	0.45	0.62	0.69	0.71	87	0.42	97
1552	453	0.34	0.60	0.58	0.75	80	0.36	77
1557	453	0.38	0.59	0.55	0.73	81	0.40	75
1560	455	0.25	0.61	0.41	0.82	74	0.29	50
1565	454	0.17	0.53	0.44	0.83	64	0.24	53
1567	455	0.15	0.48	0.40	0.82	59	0.24	49
1570	453	0.17	0.48	0.30	0.84	57	0.27	36
1572	455	0.15	0.41	0.20	0.83	49	0.27	24
1575	455	0.15	0.44	0.28	0.81	54	0.26	35
1577	456	0.15	0.40	0.41	0.70	57	0.28	59
1580	458	0.10	0.24	0.38	0.36	67	0.29	106
1582	454	0.13	0.21	0.34	0.30	70	0.38	113

ROCKEVAL/TOC RESULTS
WELL: 7321/9-1

DEPTH m	Tmax	S1 mg/g	S2 mg/g	S3 mg/g	TOC %	HYDROGEN INDEX	PRODUCTION INDEX	OXYGEN INDEX
1585	457	0.16	0.26	0.52	0.37	70	0.38	141
1587	454	0.23	0.39	0.43	0.48	81	0.37	90
1590	458	0.31	0.39	0.44	0.48	81	0.44	92
1595	455	0.25	0.25	0.58	0.34	74	0.50	171
1600	409	0.54	0.45	0.43	0.41	110	0.55	105
1602	454	0.71	0.60	0.35	0.63	95	0.55	56
1605	455	0.72	0.85	0.36	0.92	92	0.46	39
1607	453	0.71	0.91	0.27	0.92	99	0.44	29
1610	458	0.53	0.60	0.39	0.76	79	0.47	51
1612	454	0.55	0.58	0.26	0.71	82	0.49	37
1615	454	0.65	0.65	0.38	0.75	87	0.50	51
1617	452	0.56	0.66	0.36	0.79	84	0.46	46
1620	454	0.58	1.05	0.42	0.96	109	0.36	44
1622	455	0.57	1.64	0.40	1.08	152	0.25	37
1625	456	0.57	0.78	0.38	0.69	113	0.43	55
1627	451	0.45	0.56	0.31	0.47	119	0.45	66
1630	453	0.48	0.58	0.41	0.47	123	0.45	87
1632	449	0.46	0.58	0.43	0.48	121	0.44	90
1635	454	0.52	0.49	0.25	0.48	102	0.52	52
1637	454	0.55	0.61	0.26	0.57	107	0.47	46
1640	451	0.68	0.54	0.27	0.55	98	0.56	49
1642	451	1.00	0.68	0.35	0.54	126	0.60	65
1645	452	0.86	0.74	0.26	0.63	117	0.54	41
1647	449	0.84	0.67	0.43	0.57	118	0.56	75
1650	454	0.70	0.67	0.36	0.59	114	0.51	61
1652	449	0.45	0.38	0.41	0.45	84	0.55	91
1655	446	0.51	0.34	0.37	0.41	83	0.61	90
1657	442	0.75	0.42	0.51	0.41	102	0.65	124
1660	449	0.73	0.46	0.50	0.41	112	0.62	122
1662	448	0.63	0.42	0.45	0.39	108	0.61	115
1665	445	0.73	0.43	0.37	0.44	98	0.63	84
1667	446	0.78	0.40	0.41	0.44	91	0.66	93
1670	451	0.64	0.35	0.35	0.40	88	0.65	88
1672	408	0.62	0.35	0.33	0.40	88	0.65	83
1677	449	0.47	0.35	0.28	0.43	81	0.57	65
1680	454	0.36	0.30	0.35	0.42	71	0.55	83
1682	452	0.34	0.27	0.30	0.45	60	0.57	67
1685	453	0.11	0.22	0.44	0.40	55	0.34	110
1687	455	0.11	0.21	0.54	0.38	55	0.34	142
1690	453	0.24	0.33	0.26	0.47	70	0.43	55
1692	456	0.24	0.27	0.42	0.46	59	0.48	91
1695	455	0.17	0.28	0.35	0.53	53	0.39	66
1697	457	0.10	0.16	0.38	0.60	27	0.38	63
1700	457	0.10	0.20	0.30	0.40	50	0.33	75
1702	456	0.05	0.16	0.26	0.44	36	0.25	59
1705	457	0.07	0.15	0.25	0.43	35	0.32	58
1707	451	0.04	0.14	0.33	0.42	33	0.22	79
1710	455	0.04	0.16	0.24	0.43	37	0.20	56
1712	453	0.06	0.22	0.28	0.45	49	0.21	62
1717	452	0.06	0.16	0.40	0.36	44	0.26	111
1720	457	0.05	0.14	0.41	0.29	48	0.28	141
1722	453	0.05	0.17	0.43	0.30	57	0.23	143
1725	452	0.07	0.16	0.55	0.34	47	0.32	162

ROCKEVAL/TOC RESULTS
WELL: 7321/9-1

DEPTH m	Tmax	S1 mg/g	S2 mg/g	S3 mg/g	TOC %	HYDROGEN INDEX	PRODUCTION INDEX	OXYGEN INDEX
1727	457	0.05	0.17	0.47	0.32	53	0.23	147
1730	455	0.12	0.26	0.39	0.42	62	0.32	93
1732	455	0.13	0.28	0.25	0.44	64	0.32	57
1735	451	0.07	0.17	0.40	0.36	47	0.29	111
1737	453	0.11	0.14	0.40	0.30	47	0.46	133
1740	455	0.07	0.12	0.35	0.28	43	0.39	125
1742	458	0.06	0.13	0.34	0.29	45	0.33	117
1745	417	0.04	0.08	0.33	0.22	36	0.33	150
1747	457	0.05	0.10	0.41	0.25	40	0.36	164
1750	455	0.07	0.21	0.46	0.36	58	0.25	128
1752	458	0.08	0.17	0.47	0.41	41	0.33	115
1755	461	0.04	0.11	0.29	0.29	38	0.27	100
1757	441	0.06	0.09	0.24	0.21	43	0.43	114
1760	425	0.06	0.11	0.16	0.26	42	0.37	62
1762	419	0.09	0.14	0.21	0.26	54	0.41	81
1765	461	0.14	0.45	0.22	0.66	68	0.24	33
1767	461	0.21	0.63	0.20	0.77	82	0.25	26
1770	459	0.20	0.46	0.20	0.60	77	0.30	33
1772	460	0.16	0.46	0.37	0.66	70	0.26	56
1775	461	0.15	0.40	0.52	0.53	75	0.28	98
1777	451	1.41	11.06	0.55	5.74	193	0.11	10
1780	464	0.35	1.74	0.71	1.90	92	0.17	37
1782	461	0.13	0.50	0.44	0.76	66	0.21	58
1785	460	0.11	0.42	1.08	0.61	69	0.21	177
1787	458	0.07	0.26	2.09	0.45	58	0.22	464
1790	465	0.06	0.32	0.76	0.51	63	0.16	149
1792	460	0.10	0.52	0.70	0.68	76	0.16	103
1795	460	0.11	0.59	0.43	0.82	72	0.16	52
1797	461	0.12	0.59	0.38	0.83	71	0.17	46
1800	462	0.09	0.43	0.56	0.66	65	0.17	85

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Title

THE EFFECT OF HYDROUS PYROLYSIS ON THE STERANE DISTRIBUTION IN SELECTED SOURCE ROCK SAMPLES FROM WELL: 7321/9-1.

Summary/Conclusion/Recommendation

Keywords
Hydrous pyrolysis, biomarkers, diasteranes, source rocks.

Pages-appendix	Amendment no	Revision no	Revision date

Quadrant/Block-well	Project no	Licens no	Date
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INTRODUCTION

Three homogenised drill cutting samples from well 7321/9-1 were subjected to hydrous pyrolysis in steel bombs at three different temperatures. 320^{0}C. 340^{0}C and 360^{0}C. The biomarker composition based on metastable ion monitoring of terpanes and steranes. of the resulting samples were compared with each other and the biomarker compositions in the original extracts.

The three samples investigated were:

970 m
980 m
1357 m

Particularly the conspicuous low original abundance of rearranged steranes in the Barremian samples was studied in detail.

RESULTS AND DISCUSSION

The extraction yields and results of group type separation is given in Table 1.

HYDROUS PYROLYSIS
WELL: 7321/9-1

DEPTH M	TEMP C	EOM ppm	ASPH %	SAT %	ARO %	NSO %
970	0	4983	55	18	9	18
970	320	14692	77	9	6	10
970	340	23239	77	9	8	8
970	360	9311	57	14	17	12
980	0	6815	55	19	11	15
980	320	24748	0	65	12	23
980	340	23879	0	30	30	40
980	360	13881	0	23	32	45
1357	0	2510	58	16	12	14
1357	320	5620	72	11	8	9
1357	340	10500	68	12	10	10
1357	360	8164	60	8	22	10

Table 1: Extraction yields and group type separation.

MINERAL	970 M	980 M	1357 M
	%	%	%
Quartz	17	17	29
Calcite	1	1	0
Dolomite	3	3	7
K-Feldspar	10	10	6
Kaolinite	8	8	3
Illite/Smect.	38	38	45

Table 2: Mineral composition by XRD.

APPENDIX 1

BIOMARKER DISTRIBUTIONS

IDENTIFICATION OF BIOLOGICAL MARKERS

Triterpanes (m/z 191):

Numbers from **18** to **35** corresponds to the carbon number of the molecule. the following capital letter identifies the stereochemistry and/or the number of rings.

A 17α(H)-hopanes (I) 22S
B 17α(H)-hopanes 22R
C 17β(H)-moretanes (II) 22S
D 17β(H)-moretanes 22R
E 17β(H)-hopanes (III)
F Neohopanes (IV)
G Gammacerane (V)
H $\Delta^{13\ 18}$-hopenes (VI)
I 25-norhopanes (VII)
L Lupane (VIII)
O 18α(H)-oleanane (IX)
X Tetracyclic terpanes (X)
Y Tricyclic terpanes (XI)

Steranes (m/z 217):

Numbers from **20** to **30** corresponds to the carbon number of the molecules. the following small letter identifies the stereochemistry.

a 13β(H).17α(H)-diasteranes 20S (1)
b 13β(H).17α(H)-diasteranes 20R (2)
c 13α(H).17β(H)-diasteranes 20S (3)
d 13α(H).17β(H)-diasteranes 20R (4)
e 5α(H).14α(H).17α(H)-steranes 20S (5)
f 5α(H).14β(H).17β(H)-steranes 20R (6)
g 5α(H).14β(H).17β(H)-steranes 20S (7)
h 5α(H).14α(H).17α(H)-steranes 20R (8)
i 5β(H).14α(H).17α(H)-steranes (9)
k 4-methylsteranes (10)

Examples: **31B** corresponds to 17α(H)-homohopane 22R
29e corresponds to ααα-ethylcholestane 20S

APPENDIX 2

BIOMARKER PEAK HEIGHTS

0 Depth start	int.	1 Depth end	int.	2 Sample type	3 Lith.	4 Well	5 Geochem job #	6 MS-file	7 26Y 360-191/2	8 26YY 360-191/2	9 25Y 346-191	10 24Y 332-191/1
1	960	970		UBEHANDLET	MDST	7321/9-1		NS09129	8.05	7.83	11.91	23.83
2	960	970		BOMBE320	MDST	7321/9-1		NS09129	5.77	5.96	7.61	22.05
3	960	970		BOMBE340	MDST	7321/9-1		NS09129	2.45	2.48	3.48	10.43
4	960	970		BOMBE360	MDST	7321/9-1		NS09129	0.01	0.01	0.01	0.10
5												
6	970	980		UBEHANDLET	MDST	7321/9-1		NS09129	5.68	5.62	7.68	18.19
7	970	980		BOMBE320	MDST	7321/9-1		AS08010	0.01	0.01	0.50	0.54
8	970	980		BOMBE340	MDST	7321/9-1		AS08010	0.01	0.01	0.46	0.68
9	970	980		BOMBE360	MDST	7321/9-1		AS08010	0.01	0.01	0.01	0.01
10												
11	1355	1357		UBEHANDLET	MDST	7321/9-1		NS09129	3.30	2.82	4.70	16.74
12	1355	1357		BOMBE320	MDST	7321/9-1		NS09129	1.31	1.09	1.74	7.58
13	1355	1357		BOMBE340	MDST	7321/9-1		NS09129	0.18	0.20	0.44	1.46
14	1355	1357		BOMBE360	MDST	7321/9-1		NS09129	0.01	0.01	0.01	0.01
15												
16	ST08010A			UBEHANDLET				AS08010	0.53	0.50	1.32	1.74
17	ST09129D			UBEHANDLET				NS09129	0.37	0.34	0.88	2.21

0 Depth start	int.	11 24X-Y 332-191/1	12 23Y 318-191	13 22Y 304-191	14 21Y 290-191	15 20Y 276-191	16 23a 316-217/1	17 23k 316-217/2	18 22a 302-217/1	19 22k 302-217/2
1	960	6.50	49.76	0.66	29.97	18.79	1.97	2.16	10.73	20.56
2	960	6.27	47.69	0.53	33.80	27.39	1.23	2.73	6.93	20.61
3	960	4.89	29.62	0.82	24.03	42.12	2.24	1.68	11.03	18.99
4	960	0.07	0.01	0.15	0.48	3.02	0.01	0.01	1.58	0.70
5										
6	970	4.53	40.03	0.76	25.78	15.05	1.90	2.33	9.52	19.56
7	970	0.19	0.73	0.01	1.07	1.64	0.01	0.01	0.65	0.68
8	970	0.79	1.24	0.01	1.50	3.27	0.01	0.01	0.70	0.85
9	970	0.01	0.01	0.01	0.01	0.67	0.01	0.01	0.72	0.59
10										
11	1355	3.94	30.78	3.64	19.61	6.08	16.38	1.85	46.05	29.45
12	1355	2.40	15.13	1.69	11.41	6.48	7.13	1.02	23.97	14.71
13	1355	1.25	4.59	1.24	4.22	7.96	5.43	0.73	19.49	9.43
14	1355	0.01	0.46	0.65	1.26	3.21	0.72	0.04	7.17	0.82
15										
16	ST08010A	1.28	1.60	0.01	1.93	1.90	1.75	1.06	4.71	3.60
17	ST09129D	0.71	3.29	0.95	2.57	1.54	3.98	0.73	11.59	8.35

0 Depth start	int.	20 21a 288-217/1	21 21k 288-217/2	22 33A 454-191/1	23 33B 454-191/2	24 32A 440-191/1	25 32B 440-191/2	26 31A 426-191/1	27 31B 426-191/2
1	960	20.46	68.67	81.44	51.32	153.48	102.58	376.40	267.65
2	960	14.02	79.30	41.25	24.71	88.64	63.28	221.03	160.47
3	960	19.30	103.23	5.65	2.48	19.76	10.18	62.83	42.58
4	960	9.92	54.43	0.01	0.01	0.01	0.01	0.01	0.01
5									
6	970	19.93	68.81	74.40	46.88	133.69	89.03	321.53	224.63
7	970	1.09	1.36	0.68	0.45	0.91	0.60	2.56	1.67
8	970	1.69	4.87	0.56	0.45	0.49	0.33	1.37	0.92
9	970	0.86	2.39	0.01	0.01	0.01	0.01	0.01	0.01
10									
11	1355	46.28	75.13	80.51	32.26	165.06	98.44	254.39	170.08
12	1355	27.96	53.25	26.66	12.70	69.21	39.02	118.69	76.85
13	1355	27.66	53.03	1.36	0.41	6.05	2.79	18.27	10.67
14	1355	29.99	61.19	0.01	0.01	0.01	0.01	0.14	0.11
15									
16	ST08010A	6.37	6.81	3.99	2.90	5.83	4.01	9.00	6.46
17	ST09129D	18.05	32.38	18.34	9.47	31.03	17.83	54.65	32.91

0 Depth start	int.	28 31C 426-191/3	29 31D 426-191/4	30 30F 412-191	31 30A 412-191	32 30H 412-191	33 30C 412-191	34 29N 398-191	35 29A 398-191	36 29F 398-191
1	960	23.91	52.95	14.15	1266.22	31.90	127.48	3.00	928.51	267.74
2	960	9.49	33.80	5.49	793.44	8.58	114.88	1.19	697.46	150.35
3	960	1.35	4.82	1.14	267.93	2.40	31.66	0.10	312.80	63.40
4	960	0.01	0.01	0.01	0.01	0.01	0.01	0.10	0.15	0.10
5										
6	970	16.87	41.86	11.33	1102.03	26.75	106.22	3.20	820.04	225.55
7	970	0.35	0.34	0.44	14.01	0.30	1.13	0.25	11.66	2.51
8	970	0.31	0.40	0.45	7.59	0.55	0.78	0.20	10.57	1.88
9	970	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10										
11	1355	10.09	11.23	54.88	695.96	36.47	34.33	1.00	235.04	177.16
12	1355	1.91	2.75	19.23	373.47	7.46	15.68	0.80	173.91	80.64
13	1355	0.12	0.10	2.76	90.33	0.30	1.96	0.01	65.14	18.68
14	1355	0.50	0.20	0.05	0.76	0.01	0.05	0.01	0.66	0.15
15										
16	ST08010A	0.74	0.49	2.46	38.44	1.57	1.52	3.41	13.04	6.10
17	ST09129D	1.80	1.37	7.72	179.26	3.19	4.75	10.59	70.48	27.53

0 Depth start	int.	37 29C 398-191	38 28A 384-191	39 28N 384-191	40 27F 370-191	41 27A 370-191	42 30a 414-217	43 30b 414-217	44 30c 414-217	45 30d 414-217	46 30e 414-217
1	960	120.19	2.62	0.17	158.69	296.96	0.90	0.64	11.74	3.64	84.80
2	960	124.30	0.97	0.10	88.37	272.31	0.81	1.13	7.18	1.17	24.29
3	960	60.86	0.01	0.01	49.66	149.16	0.22	1.40	1.70	0.20	1.45
4	960	3.67	0.01	0.01	0.20	0.15	0.01	0.01	0.01	0.01	0.01
5											
6	970	100.36	4.66	0.10	132.25	264.03	1.49	0.77	8.63	3.06	69.39
7	970	1.02	0.01	0.01	0.84	3.23	0.01	0.01	0.01	0.01	0.01
8	970	1.14	0.01	0.01	1.94	4.57	0.01	0.01	0.01	0.01	0.01
9	970	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10											
11	1355	21.46	0.14	0.10	166.16	53.18	16.40	8.49	2.88	1.13	4.04
12	1355	21.99	0.10	0.10	82.14	59.64	4.21	1.97	0.70	0.20	0.54
13	1355	8.88	0.01	0.01	29.71	32.43	0.98	0.32	0.18	0.08	0.15
14	1355	5.53	0.01	0.01	0.20	0.25	0.01	0.01	0.01	0.01	0.01
15											
16	ST08010A	2.59	7.91	1.87	7.76	5.42	2.11	1.95	1.42	1.37	1.54
17	ST09129D	6.30	36.82	2.61	32.33	19.61	3.28	1.76	0.85	0.53	1.67

0 Depth start	int.	47 30f 414-217	48 30g 414-217	49 30h 414-217	50 29a 400-217	51 29b 400-217	52 29c 400-217	53 29d 400-217	54 29e 400-217	55 29f 400-217	56 29g 400-217
1	960	12.77	47.06	176.64	31.09	21.76	10.60	59.77	376.17	171.55	155.49
2	960	3.92	13.06	42.18	11.29	23.75	5.19	29.44	151.51	64.41	63.43
3	960	1.36	1.75	0.98	5.71	21.04	13.47	13.10	32.68	21.24	19.17
4	960	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
5											
6	970	9.77	35.34	140.04	27.88	20.23	10.93	52.82	344.48	149.39	148.40
7	970	0.01	0.01	0.01	0.49	0.50	0.68	0.51	1.53	0.75	0.98
8	970	0.01	0.01	0.01	0.42	0.40	0.36	0.44	0.52	0.72	0.59
9	970	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10											
11	1355	7.30	7.84	2.72	144.23	92.45	36.28	17.91	38.84	62.97	65.86
12	1355	1.20	1.37	0.47	63.57	38.53	10.79	5.16	12.45	18.67	16.97
13	1355	0.22	0.21	0.08	18.70	9.81	1.51	1.03	1.39	1.98	1.44
14	1355	0.01	0.01	0.01	0.19	0.10	0.11	0.08	0.18	0.11	0.10
15											
16	ST08010A	1.65	1.92	1.57	10.57	7.81	3.91	2.94	3.26	4.03	5.19
17	ST09129D	2.28	2.95	1.37	56.20	36.25	12.32	6.43	11.61	17.18	18.93

0	Depth start	int.	57 29h 400-217	58 28a 386-217	59 28aa 386-217	60 28b 386-217	61 28bb 386-217	62 28c 386-217	63 28d 386-217	64 28e 386-217	65 28f 386-217	66 28g 386-217
1	960		640.88	11.60	12.85	8.16	9.96	3.54	3.45	210.25	232.57	128.22
2	960		194.29	4.36	6.50	9.24	11.40	3.94	2.56	79.28	105.38	53.69
3	960		13.45	2.79	7.18	11.84	13.11	3.70	10.20	15.98	43.79	26.32
4	960		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
5												
6	970		556.39	13.93	15.51	9.41	11.33	3.82	3.64	206.45	225.22	129.50
7	970		1.44	0.25	0.28	0.47	0.43	0.38	0.30	1.23	1.33	0.77
8	970		0.32	0.50	0.53	0.55	0.53	0.50	0.37	1.07	0.60	0.50
9	970		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10												
11	1355		27.15	61.43	65.29	34.60	41.41	11.66	10.30	5.23	42.44	33.10
12	1355		4.45	22.37	24.52	11.83	14.48	3.40	2.20	1.60	13.55	7.96
13	1355		0.20	6.75	8.06	4.09	4.96	1.07	0.40	0.20	1.83	1.22
14	1355		0.17	0.13	0.18	0.12	0.10	0.05	0.04	0.11	0.21	0.08
15												
16	ST08010A		2.98	5.85	6.94	4.02	4.94	2.13	2.47	1.67	4.19	3.36
17	ST09129D		10.29	23.03	26.40	13.84	17.18	4.78	4.29	2.86	16.44	12.21

0	Depth start	int.	67 28h 386-217	68 27a 372-217	69 27b 372-217	70 27c 372-217	71 27d 372-217	72 27e 372-217	73 27f 372-217	74 27g 372-217	75 27h 372-217	76
1	960		546.18	58.72	35.66	7.03	9.44	394.40	141.43	108.28	720.44	
2	960		181.92	32.84	34.51	5.59	11.77	178.38	68.50	50.74	292.61	
3	960		17.70	33.65	43.51	3.90	18.79	50.38	45.70	31.27	48.23	
4	960		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
5												
6	970		486.98	52.83	33.41	6.88	9.42	345.72	125.33	98.53	595.87	
7	970		1.65	0.61	0.48	0.26	0.38	1.44	0.68	0.50	2.13	
8	970		0.52	0.97	1.07	0.50	0.42	0.77	0.95	0.67	1.03	
9	970		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
10												
11	1355		9.84	191.38	106.34	19.01	28.58	21.13	48.09	39.37	24.92	
12	1355		1.39	91.67	50.60	6.40	8.77	6.95	16.98	10.70	6.55	
13	1355		0.24	45.35	24.31	2.68	3.71	1.12	3.67	2.21	1.17	
14	1355		0.16	1.52	0.22	0.10	0.12	0.19	0.19	0.12	0.16	
15												
16	ST08010A		1.99	15.39	9.31	3.06	3.99	2.50	3.88	2.98	2.72	
17	ST09129D		3.22	82.48	49.82	7.70	11.48	8.65	14.22	10.31	7.18	

0	Depth start	int.	77 24X 330-191	78 Status	79 D-MIX DATE	80 D4-C21 292-221	81 D2-C29 400-193	82 D4-C27 376-221	83	84 %-NORM TRI-CYCL.	85 %-NORM L.M.STE.	86 %-NORM PENTA-CYCL.
1	960		25.99	OK				54.98		2	1	48
2	960		24.54	OK				54.83		3	3	59
3	960		19.69	OK				84.81		6	8	56
4	960		0.01	OK				51.14		5	88	6
5												
6	970		21.27	OK				45.58		2	2	47
7	970		0.44	OK				0.39		7	5	60
8	970		1.22	OK				3.50		12	12	52
9	970		0.40	OK				1.65		13	78	3
10												
11	1355		16.84	OK				69.58		2	5	58
12	1355		9.94	OK				54.20		3	7	64
13	1355		4.88	OK				44.78		4	20	50
14	1355		0.01	OK				67.77		5	84	7
15												
16	ST08010A		1.79	OK						4	8	42
17	ST09129D		2.94	OK						1	6	49

0	Depth start	int.	87 %-NORM STERANES	88 GROUP SUM
1	960		49	9056.89
2	960		36	4952.26
3	960		30	1942.53
4	960		0	75.36
5				
6	970		50	7943.57
7	970		29	72.00
8	970		24	66.52
9	970		6	5.87
10				
11	1355		34	3935.30
12	1355		26	1842.99
13	1355		26	578.62
14	1355		4	119.16
15				
16	ST08010A		46	296.23
17	ST09129D		43	1156.52

U-594

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CONTENTS

WELL : 7321/9-1 CORES

TABLES

1. Gross lithologic descriptions and organic carbon results
2. Standard pyrolysis results - 300°C, 180 secs - unextracted samples
3. Standard pyrolysis results - 300°C, 180 secs - extracted samples
4. Rockeval pyrolysis results - cycle 1 - unextracted samples
5. Rockeval pyrolysis results - cycle 1 - extracted samples
6a. Gas-oil index (1), extracted samples
6b. Gas-oil index (2), extracted samples
7. Kerogen type and maturation
8. Kerogen composition
9. CHNOS analysis
10. Atomic ratios
11. Detailed gasoline (C_4-C_7) analysis - peak areas
12a. TCT (C_4-C_{20}) normalised percentages (1)
12b. TCT (C_4-C_{20}) normalised percentages (2)
13. Concentration (ppm) of extracted C_{15+} material
14. Composition (norm. %) of C_{15+} material
15. Significant ratios (%) of C_{15+} fractions and organic carbon
16. Composition (norm. %) of C_{15+} saturated hydrocarbons
17. Carbon isotope compositions

FIGURES

1. C_4-C_7 chromatograms
2. Programmed pyrolysis-GC, extracted samples
3. C_{15+} paraffin-naphthene chromatograms
4. C_4-C_{20} chromatograms

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	GROSS LITHOLOGIC DESCRIPTION	G S A COLOUR CODE	TOTAL ORGANIC CARBON (Wt.% of Rock)
WELL: 7321/9-1 CORES				
1948-001	1365.35m	A 98% MUDSTONE - fine grained, blocky, mod hard, non-calc, medium grey to olive grey.	N5 - 5Y4/1	
1948-002	1365.50m	A 98% SHALE - fine grained, fissile, mod soft, non-calc, olive grey to medium dark grey.	5Y4/1 - N4	0.33, 0.35
1948-003	1365.70m	A 98% SHALE - as 1948-002A, olive grey to medium dark grey.	5Y4/1 - N4	
1948-004	1365.85m	A 98% SHALE - fine grained, subfissile, mod soft to mod hard, non-calc, dark grey to olive grey.	N3 - 5Y4/1	
1948-005	1366.05m	A 98% SHALE - fine grained, fissile, mod soft to mod hard, non-calc, olive grey to medium dark grey.	5Y4/1 - N4	
1948-006	1366.20m	A 98% SHALE - fine grained, fissile, mod soft to mod hard, non-calc, dark grey to olive black.	N3 - 5Y2/1	
1948-007	1366.40m	A 98% SHALY MUDSTONE - fine grained, sub-fissile to blocky, mod hard, occ fossil fragments, non-calc, medium dark grey to olive grey.	N4 - 5Y4/1	0.61
1948-008	1366.65m	A 98% SHALE - fine grained, fissile, mod soft, non-calc, olive grey to dark grey.	5Y4/1 - N3	
1948-009	1366.90m	A 98% SHALY MUDSTONE - fine grained, sub-fissile, mod soft to mod hard, non-calc, olive grey to olive black.	5Y4/1 - 5Y2/1	
1948-010	1367.50m	A 98% SILTY MUDSTONE - fine grained, blocky to subfissile, mod soft to mod hard, non-calc, brownish grey to dark yellowish brown.	5YR4/1 - 10YR4/2	
1948-011	1368.50m	A 98% MUDDY SILTSTONE - fine grained, subfissile, mod soft, sl micaceous, non-calc, brownish grey.	5YR4/1	0.66
1948-012	1369.55m	A 98% MUDDY SILTSTONE - as 1948-011A, brownish grey.	5YR4/1	

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomite, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	GROSS LITHOLOGIC DESCRIPTION	G S A COLOUR CODE	TOTAL ORGANIC CARBON (Wt.% of Rock)
1948-013	1369.82m	A 98% MUDDY SILTSTONE - fine grained, fissile to subfissile, mod soft to mod hard, sl micaceous, non-calc, brownish grey to light brownish grey.	5YR4/1 - 5YR6/1	
1948-014	1371.50m	A 98% MUDDY SILTSTONE - fine grained, subfissile, mod soft, commonly with sl darker carbonaceous speckles, non-calc, brownish grey.	5YR4/1	
1948-015	1372.50m	A 98% MUDDY SILTSTONE - fine grained, subfissile, mod soft to mod hard, very sl micaceous, non-calc, brownish grey.	5YR4/1	0.69
1948-016	1374.10m	A 98% MUDDY SILTSTONE - as 1948-015A, brownish grey.	5YR4/1	0.76
1948-017	1375.35m	A 98% MUDDY SILTSTONE - fine grained, subfissile, mod soft, commonly with sl darker carbonaceous speckles, non-calc, brownish grey.	5YR4/1	
1948-018	1375.62m	A 98% MUDDY SILTSTONE - fine grained, subfissile, mod soft, non-calc, brownish grey.	5YR4/1	
1948-019	1376.52m	A 98% MUDDY SILTSTONE - as 1948-017A, brownish grey.	5YR4/1	
1948-020	1377.50m	A 98% MUDDY SILTSTONE - fine grained, subfissile, mod soft, brownish grey	5YR4/1	
1948-021	1378.50m	A 98% MUDDY SILTSTONE - as 1948-020A, brownish grey.	5YR4/1	0.88
1948-022	1378.87m	A 98% CONGLOMERATE - rounded pebbles of up to 1.7 cm in a medium to coarse grained non-calc matrix, light olive grey to medium dark grey.	5Y6/1 - N4	
1948-023	1379.50m	A 98% CONGLOMERATE - rounded pebbles of up to 1.4 cm in a medium to coarse grained,non-calc,sl glauconitic matrix, light olive grey to greenish grey.	5Y6/1 - 5GY6/1	
1948-024	1380.00m	A 98% SILTSTONE - medium grained, blocky, mod hard, non-calc, occ with darker carbonaceous speckles, light olive grey to pale yellowish brown.	5Y6/1 - 10YR6/2	

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomite, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	GROSS LITHOLOGIC DESCRIPTION	G S A COLOUR CODE	TOTAL ORGANIC CARBON (Wt.% of Rock)
1948-025	1381.00m	A 98% SILTSTONE - as 1948-024A, light olive grey to pale yellowish brown.	5Y6/1 - 10YR6/2	
1948-026	1382.00m	A 98% SILTSTONE - as 1948-024A, light olive grey to pale yellowish brown.	5Y6/1 - 10YR6/2	
1948-027	1383.00m	A 98% SILTSTONE - medium to coarse grained, sl sandy, mod hard to mod soft, non-calc, light olive grey.	5Y6/1	
1948-028	1384.00m	A 98% SILTSTONE - medium grained, blocky to subfissile, mod soft to mod hard, non-calc, light olive grey to pinkish grey.	5Y6/1 - 5YR8/1	
1948-029	1385.25m	A 98% SILTSTONE - medium grained, blocky, sl sandy, mod hard to mod soft, non-calc, dark yellowish brown to light olive grey.	10YR4/2- 5Y5/2	
1948-030	1386.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, sl sandy, mod hard to mod soft, non-calc, dark yellowish brown to light olive grey	10YR4/2- 5Y6/1	
1948-031	1387.00m	A 98% SILTY SST - med to coarse grained, blocky, mod hard to mod soft, small carbonaceous laminae, occ dull gold F, slow blooming milky C, dark yellowish brown to light olive grey	10YR4/2- 5Y6/1	
1948-032	1388.00m	A 98% SILTY SANDSTONE - as 1948-031A, occasional dull gold F, slow blooming milky cut, dark yellowish brown to light olive grey.	10YR4/2- 5Y6/1	
1948-033	1389.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, v well sorted, non-calc, occ carbonaceous patches, light olive grey to medium dark grey.	5Y6/1 - N4	
1948-034	1390.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, v well sorted, non-calc, common carbonaceous laminae, olive grey to dark grey.	5Y4/1 - N3	
1948-035	1391.00m	A 98% SILTY SANDSTONE - as 1948-034A, very slow blooming milky cut, olive grey to dark grey.	5Y4/1 - N3	

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomite, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	GROSS LITHOLOGIC DESCRIPTION	G S A COLOUR CODE	TOTAL ORGANIC CARBON (Wt.% of Rock)
1948-036	1392.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, non-calc, part with carb lam, v slow blooming milky cut, light grey to light olive grey.	N7 5Y6/1	-
1948-037	1393.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod hard, non-calc, slow blooming milky cut, light olive grey.	5Y6/1	
1948-038	1394.00m	A 98% SILTY SANDSTONE - as 1948-037A, very slow blooming milky cut, light olive grey.	5Y6/1	
1948-039	1395.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, non-calc, very slow blooming milky cut, light olive grey.	5Y6/1	
1948-040	1396.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, non-calc, occ carb speckles, very slow blooming milky cut, light olive grey.	5Y6/1	
1948-041	1397.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, non-calc, common carb streaks, slow blooming milky cut, light olive grey to olive grey.	5Y6/1 5Y4/1	-
1948-042	1398.00m	A 98% SILTY SANDSTONE - medium to coarse grained, blocky, mod hard to mod soft, non-calc, occ carbonaceous streaks, very slow milky cut, light olive grey.	5Y6/1	

Abbreviations = arenaceous, argillaceous, calcareous, Cut, dolomite, Fluorescence, foraminifera, fossiliferous
Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 2
STANDARD PYROLYSIS DATA

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	ORGANIC CARBON (%)	S0 (mg/g)	S1 (mg/g)	S2 (mg/g)	PRODUCTION INDEX	HYDROGEN INDEX	TMAX (°C)
WELL: 7321/9-1 CORES								
1948-002A	1365.50m	0.34	0.02	0.05	0.23	0.17	67.6	421
1948-007A	1366.40m	0.61	0.02	0.10	0.48	0.17	78.7	431
1948-011A	1368.50m	0.66	0.01	0.37	0.74	0.33	112.1	422
1948-015A	1372.50m	0.69	0.02	0.45	0.73	0.38	105.8	438
1948-016A	1374.10m	0.76	0.03	0.61	0.86	0.41	113.2	431
1948-021A	1378.50m	0.88	0.03	0.44	0.88	0.33	100.0	437
UNEXTRACTED SAMPLES								

PRODUCTION INDEX = S1 / (S0 + S1 + S2) HYDROGEN INDEX = 100 x S2 / TOC
S0 : 100°C (180secs) S1 : 300°C (180secs) S2 : 25°C / 10min + 1 min 550°C

TABLE 3
STANDARD PYROLYSIS DATA

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	ORGANIC CARBON (%)	S0 (mg/g)	S1 (mg/g)	S2 (mg/g)	PRODUCTION INDEX	HYDROGEN INDEX	TMAX (°C)
WELL: 7321/9-1 CORES								
1948-002A	1365.50m	0.32	0.01	0.03	0.06	0.30	18.8	433
1948-007A	1366.40m	0.59	0.02	0.08	0.48	0.14	81.4	437
1948-011A	1368.50m	0.56	0.01	0.06	0.40	0.13	71.4	440
1948-015A	1372.50m	0.56	0.03	0.08	0.44	0.15	78.6	442
1948-016A	1374.10m	0.61	0.03	0.12	0.47	0.19	77.0	443
1948-021A	1378.50m	0.72	0.02	0.13	0.54	0.19	75.0	443

EXTRACTED SAMPLES

PRODUCTION INDEX = S1 / (S0 + S1 + S2) HYDROGEN INDEX = 100 x S2 / TOC
S0 : 100°C (180secs) S1 : 300°C (180secs) S2 : 25°C / 10min + 1 min 550°C

TABLE 4
ROCKEVAL PYROLYSIS DATA

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	TOC (%)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PRODUCTION INDEX	HYDROGEN INDEX	OXYGEN INDEX	TMAX (°C)
WELL: 7321/9-1 CORES									
1948-002A	1365.50m	0.34	0.10	0.13	0.24	0.43	38.2	70.6	397
1948-007A	1366.40m	0.61	0.18	0.46	0.11	0.28	75.4	18.0	438
1948-011A	1368.50m	0.66	0.57	0.76	0.15	0.43	115.2	22.7	437
1948-015A	1372.50m	0.69	0.66	0.75	0.22	0.47	108.7	31.9	439
1948-016A	1374.10m	0.76	0.83	1.13	0.27	0.42	148.7	35.5	437
1948-021A	1378.50m	0.88	1.10	0.80	0.29	0.58	90.9	33.0	438
UNEXTRACTED SAMPLES									

PRODUCTION INDEX = S1 / (S1 + S2) HYDROGEN INDEX = 100 x S2 / TOC
OXYGEN INDEX = 100 x S3 / TOC

TABLE 5
ROCKEVAL PYROLYSIS DATA

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	TOC (%)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PRODUCTION INDEX	HYDROGEN INDEX	OXYGEN INDEX	TMAX (°C)
WELL: 7321/9-1 CORES									
1948-002A	1365.50m	0.32	0.06	0.05	0.39	0.55	15.6	121.9	372
1948-007A	1366.40m	0.59	0.12	0.38	0.61	0.24	64.4	103.4	436
1948-011A	1368.50m	0.56	0.29	0.35	0.25	0.45	62.5	44.6	439
1948-015A	1372.50m	0.56	0.10	0.30	0.15	0.25	53.6	26.8	443
1948-016A	1374.10m	0.61	0.12	0.37	0.16	0.24	60.7	26.2	441
1948-021A	1378.50m	0.72	0.18	0.42	0.19	0.30	58.3	26.4	439

EXTRACTED SAMPLES

PRODUCTION INDEX = S1 / (S1 + S2) HYDROGEN INDEX = 100 x S2 / TOC
OXYGEN INDEX = 100 x S3 / TOC

TABLE 6a
PYROLYSIS-GC GAS-OIL INDICES

JOB 1948							INDICES		
GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	% C1	% C2-C5	% C6-C14	% C15+	% nC17	TOLUENE / nC8	% PHENOL	% C1-C5
WELL: 7321/9-1 CORES									
1948-002A	1365.50m	12.39	57.01	30.60	0.00	0.00	3.20	0.03	69.40
1948-007A	1366.40m	19.90	42.81	35.49	1.67	0.13	1.75	0.09	62.71
1948-011A	1368.50m	14.64	42.77	40.07	2.41	0.11	1.65	0.08	57.41
1948-015A	1372.50m	19.35	41.77	37.34	1.33	0.21	1.54	0.13	61.12
1948-016A	1374.10m	17.91	39.92	40.06	1.98	0.13	1.58	0.11	57.83
1948-021A	1378.50m	13.08	40.71	39.81	5.94	0.46	1.46	0.09	53.79

TABLE 6b
PYROLYSIS-GC GAS-OIL INDICES

JOB 1948							INDICES		
GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	% C1	% C2-C6	% C7-C14	% C15+	% nC17	TOLUENE / nC8	% PHENOL	% C1-C6
WELL: 7321/9-1 CORES									
1948-002A	1365.50m	12.39	71.84	15.77	0.00	0.00	3.20	0.03	84.23
1948-007A	1366.40m	19.90	52.47	25.83	1.67	0.13	1.75	0.09	72.37
1948-011A	1368.50m	14.64	48.30	29.87	2.41	0.11	1.65	0.08	62.94
1948-015A	1372.50m	19.35	51.75	27.36	1.33	0.21	1.54	0.13	71.10
1948-016A	1374.10m	17.91	50.93	29.05	1.98	0.13	1.58	0.11	68.84
1948-021A	1378.50m	13.08	49.33	31.19	5.94	0.46	1.46	0.09	62.41

TABLE 7
KEROGEN TYPE AND MATURATION

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION	
		TYPES >35%;10-35%;<10%	REMARKS	RE-WORKED (%)	PARTICLE SIZE	PRESERV-ATION	THERMAL ALTERATION INDEX	1-10 SCALE
WELL: 7321/9-1 CORES								
1948-002A	1365.50m	W-I;-;Al-H-Am	W/I differentiation difficult H at 2+ and 2+ to 3-		F-M	F	2 to 2+(?)	5(?)
1948-007A	1366.40m	W;I-H;Al-Am			F-M	F-G	2 to 2+	5
1948-011A	1368.50m	W-I;H;Al-Am			F-M	F	2 to 2+	5
1948-015A	1372.50m	I-W;H;Al-Am	W/I differentiation difficult		F-M	F	2 to 2+	5
1948-016A	1374.10m	I-W;H;Al-Am	W/I differentiation difficult		F-M	F	2 to 2+	5
1948-021A	1378.50m	W-I;H;Al-Am	W/I differentiation difficult		F-M	F	2 to 2+	5

Algal,Amorphous,Herbaceous,Inertinite,Resin,Wood
preservation = Poor,Fair,Good size = Fine,Medium,Coarse

TAI SCALE	1	1+ to 2-	2-	2	2 TO 2+	2+ TO 3-	3	3+	4	5
1-10 SCALE	1	2	3	4	5	6	7	8	9	10

TABLE 8

KEROGEN COMPOSITION

WELL 7321/9-1

GEOCHEM SAMPLE NUMBER	DEPTH (m)	VISUAL ESTIMATE (%) Am	Al	H	W	I
1948-002A	1365.50	<5	<10	<5	55	35
1948-007A	1366.40	1	<10	15	50	30
1948-011A	1368.50	1	<10	20	40	35
1948-015A	1372.50	1	<5	15	40	45
1948-016A	1374.10	1	<5	10	40	45
1948-021A	1378.50	<5	<5	15	45	35

Table 9

CHNOS ANALYSIS

COMPOSITION W/W %

GEOCHEM SAMPLE NUMBER	CARBON	HYDROGEN	NITROGEN	OXYGEN	SULPHUR
1948-002A	58.01	4.61	0.00	*	*
1948-007A	56.91	3.67	0.42	2.96	1.22
1948-011A	28.44	2.18	0.00	3.25	5.90
1948-021A	27.03	1.93	0.05	3.32	3.55

* insufficient sample for analysis

Table 10

ATOMIC RATIOS

GEOCHEM SAMPLE NUMBER	DEPTH	KEROGEN CONCENTRATE	
		H/C	O/C
1948-002A	1365.50m	0.95	-
1948-007A	1366.40m	0.77	0.039
1948-011A	1368.50m	0.77	0.086
1948-021A	1378.50m	0.86	0.092

TABLE 11
DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-001	1948-002	1948-003	1948-004	1948-005	1948-006
DEPTH	1365.35m	1365.5m	1365.7m	1365.85m	1366.05m	1366.2m
NORMALISED COMPOSITION						
isobutane	3.95	3.20	5.28	0.94	4.15	5.80
n-butane	12.40	10.89	9.94	2.44	5.13	9.04
isopentane	9.48	7.53	7.93	7.56	6.19	5.52
n-pentane	16.75	13.14	12.44	11.93	10.85	11.70
2,2-dimethylB	0.70	1.38	1.07	1.02	0.72	0.77
cyclopentane	0.51	1.36	1.14	1.69	0.58	1.08
2,3-dimethylB	0.07	0.07	0.13	0.98	0.00	0.00
2-methylP	5.71	4.79	3.65	8.56	3.96	2.84
3-methylP	3.06	2.73	1.94	4.70	2.21	1.61
n-hexane	7.10	13.25	8.91	12.52	9.82	9.13
methylCP	3.95	3.47	2.93	5.16	3.42	2.85
2,2-dimethylP	0.55	0.58	0.48	0.72	0.58	0.58
2,4-dimethylP	0.29	0.33	0.29	0.20	0.23	0.36
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	0.49	1.01	0.94	0.53	0.75	0.89
cyclohexane	4.36	5.24	4.48	6.16	5.12	4.65
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	2.90	2.75	3.13	3.99	4.17	3.36
2,3-dimethylP	0.57	0.99	0.73	0.59	0.73	0.90
3-MH	2.82	2.61	3.04	3.09	3.72	3.25
1,c,3-DMCP	0.97	0.76	0.77	0.89	0.97	0.90
1,t,3-DMCP	0.76	0.62	0.89	0.80	0.89	0.67
1,t,2-DMCP	2.18	2.30	2.16	1.61	1.94	2.68
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	4.98	4.24	8.10	5.90	9.55	8.87
methylCH	8.19	10.30	12.36	10.61	15.59	14.76
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	1.81	0.97	1.81	1.96	3.28	2.33
ABUNDANCE	324	117	129	1142	227	153
nC7/C7NAPHTHENES	0.41	0.30	0.50	0.42	0.49	0.47
total MH/DMCP	1.46	1.46	1.62	2.15	2.08	1.56
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	1.80	3.82	3.04	2.43	2.87	3.20
C6-C7 FRACTION						
%n-PARAFFINS	23.69	30.16	29.85	26.70	28.92	29.51
%iso-PARAFFINS	32.69	27.99	25.37	34.57	24.36	22.41
% NAPHTHENES	40.02	39.13	41.39	36.57	41.69	43.46
% AROMATICS	4.51	3.42	4.83	3.61	6.02	5.28

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11
DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-007	1948-008	1948-009	1948-010	1948-011	1948-012
DEPTH	1366.4m	1366.65m	1366.9m	1367.5m	1368.5m	1369.55m
NORMALISED COMPOSITION						
isobutane	1.28	1.11	3.69	6.44	5.07	7.20
n-butane	6.55	2.32	5.79	19.32	12.79	10.22
isopentane	8.55	3.77	4.69	7.85	5.70	6.81
n-pentane	12.60	7.53	8.41	12.47	10.61	17.65
2,2-dimethylB	0.81	0.71	0.78	1.86	1.21	1.55
cyclopentane	2.03	1.16	1.04	1.28	0.92	1.02
2,3-dimethylB	0.00	0.00	0.00	0.00	0.11	0.03
2-methylP	6.51	7.08	5.12	3.38	3.42	2.55
3-methylP	3.77	3.93	2.88	1.98	1.83	1.56
n-hexane	9.60	12.85	10.88	11.85	34.27	32.51
methylCP	5.78	3.79	3.74	2.85	1.88	1.76
2,2-dimethylP	0.53	0.88	0.71	0.44	0.36	0.22
2,4-dimethylP	0.18	0.27	0.30	0.40	0.30	0.21
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	1.74	0.36	0.67	0.96	0.56	0.56
cyclohexane	7.77	5.72	5.49	4.66	2.74	2.64
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	2.96	5.57	4.30	1.92	1.55	0.87
2,3-dimethylP	0.59	0.82	0.91	0.52	0.36	0.28
3-MH	2.35	4.39	3.64	1.69	1.33	0.74
1,c,3-DMCP	0.77	1.09	0.96	0.53	0.38	0.22
1,t,3-DMCP	0.65	0.98	0.78	0.46	0.30	0.20
1,t,2-DMCP	1.42	2.00	1.91	1.04	0.93	0.54
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	4.56	9.37	8.03	3.41	2.56	1.26
methylCH	10.58	16.68	16.37	7.28	4.03	3.14
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	2.98	2.17	3.45	1.94	1.31	0.78
ABUNDANCE	2830	988	253	167	234	189
nC7/C7NAPHTHENES	0.34	0.45	0.40	0.37	0.45	0.31
total MH/DMCP	1.87	2.45	2.18	1.78	1.79	1.68
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	1.66	3.39	2.91	4.16	18.23	18.47
C6-C7 FRACTION						
%n-PARAFFINS	22.48	28.49	27.02	32.47	62.43	66.22
%iso-PARAFFINS	28.10	30.33	26.63	25.94	17.75	15.71
% NAPHTHENES	42.81	38.80	41.79	35.79	17.39	16.67
% AROMATICS	7.50	3.25	5.89	6.18	3.17	2.63

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11
DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-013	1948-014	1948-015	1948-016	1948-017	1948-018
DEPTH	1369.82m	1371.5m	1372.5m	1374.1m	1375.35m	1375.62m
NORMALISED COMPOSITION						
isobutane	7.17	10.19	7.87	7.48	10.59	6.77
n-butane	15.49	21.47	12.41	15.25	18.17	25.57
isopentane	6.62	9.24	7.38	7.28	9.60	7.92
n-pentane	14.32	14.87	15.26	16.44	18.26	12.87
2,2-dimethylB	1.07	1.71	1.67	1.07	1.38	1.24
cyclopentane	1.02	0.52	0.36	1.17	1.31	1.39
2,3-dimethylB	0.03	0.12	0.11	0.07	0.02	0.11
2-methylP	2.69	3.07	3.07	2.87	3.08	3.54
3-methylP	1.55	1.80	1.76	1.71	1.84	2.08
n-hexane	30.29	17.16	25.35	24.13	15.49	8.04
methylCP	1.80	2.41	2.09	2.30	2.12	2.90
2,2-dimethylP	0.24	0.28	0.34	0.32	0.24	0.44
2,4-dimethylP	0.23	0.23	0.33	0.23	0.18	0.41
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	0.72	0.62	0.95	0.78	0.58	1.33
cyclohexane	2.77	3.59	3.18	3.50	3.92	4.32
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	0.94	0.70	1.38	1.12	0.86	1.76
2,3-dimethylP	0.47	0.35	0.37	0.32	0.36	0.48
3-MH	0.73	0.62	1.18	0.93	0.65	1.45
1,c,3-DMCP	0.23	0.25	0.32	0.27	0.23	0.45
1,t,3-DMCP	0.19	0.22	0.27	0.31	0.24	0.40
1,t,2-DMCP	0.70	0.63	0.71	0.69	0.59	1.16
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	1.35	0.56	2.41	1.42	0.78	2.72
methylCH	3.14	3.21	3.99	4.00	3.71	5.64
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	0.74	0.74	1.77	0.84	0.33	1.54
ABUNDANCE	200	197	218	184	178	221
nC7/C7NAPHTHENES	0.32	0.13	0.46	0.27	0.16	0.36
total MH/DMCP	1.49	1.20	1.97	1.61	1.42	1.60
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	16.83	7.12	12.13	10.49	7.31	2.77
C6-C7 FRACTION						
%n-PARAFFINS	64.58	46.64	54.44	55.55	45.20	26.91
%iso-PARAFFINS	16.23	23.37	20.02	18.79	23.92	28.78
% NAPHTHENES	18.03	27.14	20.71	24.07	30.03	37.18
% AROMATICS	2.98	3.58	5.34	3.53	2.53	7.18

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11

DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-019	1948-020	1948-021	1948-022	1948-023	1948-024
DEPTH	1376.52m	1377.5m	1378.5m	1378.87m	1379.5m	1380m
NORMALISED COMPOSITION						
isobutane	5.03	7.12	9.26	15.49	16.49	16.15
n-butane	27.17	16.00	24.62	28.65	29.80	30.32
isopentane	6.80	8.28	8.50	11.81	12.96	12.44
n-pentane	11.37	15.41	10.56	12.91	12.33	12.95
2,2-dimethylB	1.81	0.99	1.39	1.62	0.88	0.71
cyclopentane	1.28	0.51	1.30	0.66	1.44	0.64
2,3-dimethylB	0.10	0.00	0.00	0.00	0.03	0.04
2-methylP	3.39	3.70	3.06	3.64	3.98	4.02
3-methylP	2.02	2.13	1.84	2.02	2.17	2.35
n-hexane	8.37	15.21	14.66	5.76	4.04	4.75
methylCP	2.96	3.00	2.39	2.15	2.36	1.58
2,2-dimethylP	0.44	0.37	0.32	0.26	0.22	0.26
2,4-dimethylP	0.46	0.33	0.37	0.18	0.09	0.12
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	1.68	1.58	0.82	0.26	0.32	0.26
cyclohexane	4.24	4.30	4.07	3.04	2.49	1.57
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	1.68	1.63	1.26	0.76	0.70	1.22
2,3-dimethylP	0.52	0.42	0.41	0.38	0.23	0.14
3-MH	1.54	1.35	1.07	0.58	0.57	1.03
1,c,3-DMCP	0.42	0.42	0.31	0.20	0.23	0.20
1,t,3-DMCP	0.39	0.35	0.29	0.14	0.18	0.19
1,t,2-DMCP	0.89	0.91	0.94	0.54	0.50	0.36
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	3.21	2.71	1.77	0.39	0.31	1.05
methylCH	6.86	5.97	4.36	3.08	2.18	1.96
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	1.91	1.84	0.96	0.02	0.02	0.23
ABUNDANCE	204	293	212	173	1102	932
nC7/C7NAPHTHENES	0.38	0.35	0.30	0.10	0.10	0.39
total MH/DMCP	1.89	1.77	1.51	1.52	1.40	3.00
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	2.83	5.07	6.13	2.68	1.71	3.01
C6-C7 FRACTION						
%n-PARAFFINS	27.58	38.13	41.08	24.61	20.72	26.37
%iso-PARAFFINS	28.48	23.24	24.31	37.77	42.24	44.96
% NAPHTHENES	37.53	31.81	30.91	36.61	37.81	26.64
% AROMATICS	8.55	7.28	4.46	1.13	1.62	2.23

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11

DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-025	1948-026	1948-027	1948-028	1948-029	1948-030
DEPTH	1381m	1382m	1383m	1384m	1385.25m	1386m
NORMALISED COMPOSITION						
isobutane	12.85	13.99	14.55	13.23	13.44	11.50
n-butane	29.14	28.97	25.37	25.91	26.75	24.04
isopentane	10.52	10.77	11.78	11.12	10.93	9.60
n-pentane	11.59	11.95	11.91	11.58	11.81	10.63
2,2-dimethylB	1.72	1.72	0.92	0.98	0.81	1.14
cyclopentane	0.41	1.03	0.60	0.58	1.41	0.41
2,3-dimethylB	0.13	0.15	0.05	0.07	0.07	0.06
2-methylP	3.84	4.14	4.22	4.35	3.97	4.38
3-methylP	2.23	1.97	2.34	2.34	2.19	2.33
n-hexane	5.53	4.71	5.63	5.90	5.72	5.81
methylCP	2.30	2.19	2.70	2.90	2.78	2.77
2,2-dimethylP	0.27	0.32	0.29	0.33	0.32	0.62
2,4-dimethylP	0.30	0.19	0.16	0.16	0.12	0.24
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	0.61	0.70	0.76	0.62	0.67	0.55
cyclohexane	2.42	2.59	2.82	3.13	2.99	2.77
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	1.43	1.05	1.33	1.49	1.44	3.35
2,3-dimethylP	0.27	0.52	0.35	0.35	0.31	0.37
3-MH	1.17	0.91	1.12	1.25	1.24	2.93
1,c,3-DMCP	0.33	0.32	0.36	0.38	0.32	0.51
1,t,3-DMCP	0.26	0.21	0.32	0.29	0.27	0.40
1,t,2-DMCP	0.62	0.61	0.65	0.73	0.63	0.94
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	2.55	1.64	2.05	2.34	2.22	3.52
methylCH	3.13	3.35	3.63	3.97	3.50	5.10
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	0.93	0.53	0.62	0.55	0.62	0.57
ABUNDANCE	546	349	851	764	968	804
nC7/C7NAPHTHENES	0.59	0.37	0.41	0.44	0.47	0.51
total MH/DMCP	2.15	1.72	1.84	1.96	2.20	3.39
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	2.40	2.15	2.09	2.03	2.06	2.10
C6-C7 FRACTION						
%n-PARAFFINS	26.94	23.52	25.61	25.76	26.47	24.56
%iso-PARAFFINS	37.87	40.63	35.94	35.38	34.91	40.58
% NAPHTHENES	30.21	34.34	34.94	35.63	34.97	32.87
% AROMATICS	5.14	4.56	4.61	3.66	4.31	2.95

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11

DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-031	1948-032	1948-033	1948-034	1948-035	1948-036
DEPTH	1387m	1388m	1389m	1390m	1391m	1392m
NORMALISED COMPOSITION						
isobutane	13.99	13.69	11.93	11.79	12.49	15.30
n-butane	24.39	25.58	22.30	21.57	22.67	25.38
isopentane	11.07	10.86	9.46	9.33	9.91	11.38
n-pentane	12.68	11.77	10.36	9.89	10.23	11.29
2,2-dimethylB	1.10	0.88	0.94	0.94	1.11	0.97
cyclopentane	1.32	0.56	0.48	1.17	0.40	1.11
2,3-dimethylB	0.08	0.00	0.07	0.08	0.00	0.07
2-methylP	4.20	4.15	4.29	4.23	4.45	4.27
3-methylP	2.21	2.23	2.28	2.22	2.39	2.25
n-hexane	6.30	5.87	6.57	6.19	6.31	5.53
methylCP	2.51	2.77	2.90	2.54	2.63	2.50
2,2-dimethylP	0.36	0.34	0.52	0.59	0.55	0.33
2,4-dimethylP	0.16	0.16	0.20	0.16	0.19	0.12
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	0.54	0.58	0.72	0.49	0.65	0.53
cyclohexane	2.64	2.99	3.08	2.59	2.93	2.83
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	1.62	1.74	2.81	3.50	2.68	1.53
2,3-dimethylP	0.30	0.31	0.38	0.41	0.48	0.31
3-MH	1.39	1.41	2.29	2.83	2.21	1.24
1,c,3-DMCP	0.34	0.39	0.47	0.46	0.48	0.34
1,t,3-DMCP	0.38	0.38	0.40	0.35	0.46	0.32
1,t,2-DMCP	0.59	0.66	1.09	0.95	0.91	0.64
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	2.53	2.91	4.93	6.63	4.61	2.19
methylCH	3.22	3.68	5.32	5.13	5.22	3.52
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	0.61	0.61	0.73	0.51	0.57	0.57
ABUNDANCE	1019	702	762	534	397	408
nC7/C7NAPHTHENES	0.56	0.57	0.68	0.96	0.65	0.45
total MH/DMCP	2.30	2.20	2.60	3.60	2.64	2.13
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	2.51	2.12	2.27	2.44	2.40	2.21
C6-C7 FRACTION						
%n-PARAFFINS	28.49	27.44	29.49	32.06	28.74	25.74
%iso-PARAFFINS	36.84	35.07	35.34	37.41	37.01	36.97
% NAPHTHENES	31.23	33.97	34.01	30.06	33.24	33.84
% AROMATICS	3.71	3.72	3.72	2.51	3.22	3.67

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11
DETAILED GASOLINE RANGE (C_4-C_7) COMPOSITION

GEOCHEM SAMPLE NUMBER	1948-037	1948-038	1948-039	1948-040	1948-041	1948-042
DEPTH	1393m	1394m	1395m	1396m	1397m	1398m
NORMALISED COMPOSITION						
isobutane	13.42	15.26	15.16	14.09	10.53	24.32
n-butane	25.73	22.21	23.03	29.42	19.97	26.28
isopentane	11.41	11.68	11.29	10.65	9.30	10.03
n-pentane	11.56	13.26	13.75	12.26	10.76	11.10
2,2-dimethylB	0.96	1.67	2.18	1.86	1.15	1.03
cyclopentane	1.38	0.57	1.22	0.61	1.30	1.27
2,3-dimethylB	0.05	0.08	0.21	0.00	0.05	0.05
2-methylP	4.23	4.24	4.07	3.76	5.14	3.55
3-methylP	2.28	2.27	2.17	2.04	2.80	1.92
n-hexane	5.56	5.75	5.48	5.02	7.40	4.95
methylCP	2.82	2.64	2.37	2.31	3.13	2.35
2,2-dimethylP	0.29	0.31	0.38	0.28	0.51	0.24
2,4-dimethylP	0.13	0.24	0.28	0.22	0.21	0.13
2,2,3-trimethylB	0.00	0.00	0.00	0.00	0.00	0.00
benzene	0.65	0.54	0.62	0.48	0.39	0.57
cyclohexane	3.04	2.94	2.66	2.54	3.46	2.69
3,3-dimethylP	0.00	0.00	0.00	0.00	0.00	0.00
1,1-dimethylCP	0.00	0.00	0.00	0.00	0.00	0.00
2-MH	1.47	1.47	1.31	1.21	2.53	1.11
2,3-dimethylP	0.32	0.32	0.40	0.33	0.53	0.55
3-MH	1.23	1.19	1.19	1.03	2.11	1.00
1,c,3-DMCP	0.40	0.36	0.33	0.31	0.56	0.33
1,t,3-DMCP	0.36	0.32	0.27	0.24	0.44	0.26
1,t,2-DMCP	0.82	0.70	0.66	0.65	1.01	0.65
3-ethylP	0.00	0.00	0.00	0.00	0.00	0.00
n-heptane(nC7)	2.15	2.27	1.97	1.88	4.17	1.99
methylCH	3.61	3.69	2.97	2.89	6.70	3.14
1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
toluene	0.63	0.56	0.54	0.45	0.39	0.49
ABUNDANCE	696	199	143	197	485	479
nC7/C7NAPHTHENES	0.41	0.45	0.47	0.46	0.48	0.45
total MH/DMCP	1.71	1.93	1.98	1.87	2.31	1.70
1,t,2-/1,c,2-DMCP	0.00	0.00	0.00	0.00	0.00	0.00
nC6/methylCP	1.97	2.18	2.31	2.17	2.36	2.11
C6-C7 FRACTION						
%n-PARAFFINS	24.88	25.88	24.84	25.56	27.55	25.71
%iso-PARAFFINS	35.36	38.04	40.64	39.75	35.79	35.49
% NAPHTHENES	35.65	34.36	30.87	33.12	36.43	34.89
% AROMATICS	4.13	3.55	3.87	3.45	1.86	3.93

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 12a

THERMAL BITUMEN COMPOSITION (NORM. %) AND ABUNDANCE

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	% CX-C5	% C6-C14	% C15+	% nC17	ABUNDANCE (ppm)
WELL: 7321/9-1 CORES						
1948-002	1365.50	36.91	58.33	4.77	0.17	191
1948-007	1366.40	23.91	69.14	6.96	0.41	156
1948-011	1368.50	11.96	69.05	18.99	2.36	819
1948-015	1372.50	2.89	50.57	46.53	5.21	1078
1948-016	1374.10	17.79	41.24	40.97	2.54	2001
1948-021	1378.50	12.84	34.11	53.05	3.22	749

TABLE 12b
THERMAL BITUMEN COMPOSITION (NORM. %) AND ABUNDANCE

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	% CX-C6	% C7-C14	% C15+	% nC17	ABUNDANCE (ppm)
WELL: 7321/9-1 CORES						
1948-002	1365.50m	41.30	53.94	4.77	0.17	191
1948-007	1366.40m	30.58	62.46	6.96	0.41	156
1948-011	1368.50m	18.67	62.34	18.99	2.36	819
1948-015	1372.50m	5.91	47.55	46.53	5.21	1078
1948-016	1374.10m	20.73	38.31	40.97	2.54	2001
1948-021	1378.50m	13.56	33.39	53.05	3.22	749

TABLE 13

CONCENTRATION (PPM) OF EXTRACTED C_{15+} MATERIAL IN ROCK

JOB 1948	LITHO			HYDROCARBONS			NON HYDROCARBONS			
GEOCHEM SAMPLE NUMBER		DEPTH/ IDENTITY	TOTAL EXTRACT	Saturates	Aromatics	TOTAL	Preciptd. Asphaltenes	Eluted NSO's	Non-Eluted NSO's	TOTAL
WELL: 7321/9-1 CORES										
1948-001A		1365.35m	182	44	15	59	24	98	2	123
1948-002A		1365.50m	380	129	29	158	89	129	4	222
1948-003A		1365.70m	347	71	34	105	133	106	3	242
1948-004A		1365.85m	303	108	59	167	38	96	2	136
1948-005A		1366.05m	236	85	24	109	38	86	3	127
1948-006A		1366.20m	513	174	75	248	112	149	3	265
1948-007A		1366.40m	232	74	38	112	58	60	1	120
1948-008A		1366.65m	390	129	66	195	75	117	2	194
1948-009A		1366.90m	309	87	49	135	72	99	2	173
1948-010A		1367.50m	635	439	52	492	45	97	2	143
1948-011A		1368.50m	1038	689	82	770	154	112	2	268
1948-012A		1369.55m	1294	946	95	1041	140	110	3	254
1948-013A		1369.82m	991	724	68	793	130	66	2	198
1948-014A		1371.50m	1238	815	77	892	238	105	3	346
1948-015A		1372.50m	1427	954	90	1044	270	106	7	383
1948-016A		1374.10m	2164	1527	184	1711	240	204	9	453
1948-017A		1375.35m	1538	1053	161	1214	137	181	5	324
1948-018A		1375.62m	1309	988	114	1103	99	103	4	207
1948-019A		1376.52m	1890	1359	166	1525	224	135	6	364
1948-020A		1377.50m	1911	1375	192	1567	203	134	7	344
1948-021A		1378.50m	779	609	62	672	54	50	4	107
1948-022A		1378.87m	928	723	84	807	58	59	4	121
1948-023A		1379.50m	959	757	68	826	74	56	3	133
1948-024A		1380.00m	2878	2239	231	2470	215	186	6	408
1948-025A		1381.00m	511	364	45	409	45	54	3	102
1948-026A		1382.00m	1064	767	101	868	73	119	5	196
1948-027A		1383.00m	423	274	28	302	85	34	2	121
1948-028A		1384.00m	429	305	33	337	54	36	2	92
1948-029A		1385.25m	1394	1058	111	1169	50	169	5	225
1948-030A		1386.00m	507	352	39	391	53	61	3	116
1948-031A		1387.00m	359	257	33	290	31	36	2	69
1948-032A		1388.00m	473	323	42	364	47	59	2	109

S-shale, SS-sandstone, L-limestone, D-dolomite, M-mixed, see Table 1.

TABLE 13

CONCENTRATION (PPM) OF EXTRACTED C_{15+} MATERIAL IN ROCK

JOB 1948	L I T H O			HYDROCARBONS			NON HYDROCARBONS			
GEOCHEM SAMPLE NUMBER		DEPTH/ IDENTITY	TOTAL EXTRACT	Saturates	Aromatics	TOTAL	Preciptd. Asphaltenes	Eluted NSO's	Non-Eluted NSO's	TOTAL
1948-033A		1389.00m	740	474	80	555	94	89	3	185
1948-034A		1390.00m	567	384	36	421	96	48	2	146
1948-035A		1391.00m	701	514	47	562	80	58	2	139
1948-036A		1392.00m	892	674	69	742	62	84	3	150
1948-037A		1393.00m	890	670	65	735	66	87	1	155
1948-038A		1394.00m	735	587	55	642	33	58	2	93
1948-039A		1395.00m	833	646	55	702	63	67	2	131
1948-040A		1396.00m	692	548	47	594	45	51	2	97
1948-041A		1397.00m	868	664	60	724	78	64	2	144
1948-042A		1398.00m	868	649	64	713	99	55	1	156

S-shale, SS-sandstone, L-limestone, D-dolomite, M-mixed, see Table 1.

TABLE 14

COMPOSITION (NORMALISED %) OF C_{15+} MATERIAL

JOB 1948 GEOCHEM SAMPLE NUMBER	LITHO	DEPTH/ IDENTITY	HYDROCARBONS		NON HYDROCARBONS		
			Saturates	Aromatics	Precipitd. Asphaltenes	Eluted NSO's	Non-Eluted NSO's
WELL: 7321/9-1 CORES							
1948-001A		1365.35m	24.04	8.17	12.98	53.85	0.96
1948-002A		1365.50m	33.94	7.58	23.47	33.94	1.08
1948-003A		1365.70m	20.44	9.75	38.36	30.50	0.94
1948-004A		1365.85m	35.64	19.50	12.58	31.66	0.63
1948-005A		1366.05m	36.16	9.96	16.24	36.53	1.11
1948-006A		1366.20m	33.89	14.53	21.89	29.05	0.63
1948-007A		1366.40m	31.83	16.56	24.95	26.02	0.65
1948-008A		1366.65m	33.09	17.03	19.34	30.05	0.49
1948-009A		1366.90m	28.07	15.80	23.43	32.15	0.55
1948-010A		1367.50m	69.17	8.25	7.03	15.28	0.28
1948-011A		1368.50m	66.32	7.87	14.85	10.81	0.15
1948-012A		1369.55m	73.10	7.31	10.85	8.53	0.22
1948-013A		1369.82m	73.12	6.91	13.11	6.66	0.20
1948-014A		1371.50m	65.87	6.21	19.23	8.46	0.23
1948-015A		1372.50m	66.87	6.29	18.92	7.41	0.51
1948-016A		1374.10m	70.56	8.52	11.09	9.42	0.40
1948-017A		1375.35m	68.48	10.47	8.91	11.80	0.35
1948-018A		1375.62m	75.48	8.74	7.58	7.86	0.34
1948-019A		1376.52m	71.92	8.80	11.83	7.14	0.31
1948-020A		1377.50m	71.94	10.06	10.62	7.04	0.34
1948-021A		1378.50m	78.22	8.01	6.93	6.39	0.45
1948-022A		1378.87m	77.91	9.07	6.24	6.35	0.43
1948-023A		1379.50m	78.95	7.14	7.75	5.85	0.31
1948-024A		1380.00m	77.79	8.03	7.49	6.47	0.23
1948-025A		1381.00m	71.22	8.83	8.83	10.52	0.60
1948-026A		1382.00m	72.07	9.48	6.84	11.16	0.45
1948-027A		1383.00m	64.76	6.63	20.03	8.13	0.45
1948-028A		1384.00m	70.98	7.64	12.56	8.29	0.52
1948-029A		1385.25m	75.92	7.97	3.62	12.13	0.37
1948-030A		1386.00m	69.41	7.71	10.41	11.95	0.51
1948-031A		1387.00m	71.47	9.21	8.77	9.96	0.59
1948-032A		1388.00m	68.17	8.77	10.03	12.53	0.50
1948-033A		1389.00m	64.09	10.87	12.63	12.02	0.38
1948-034A		1390.00m	67.80	6.42	16.95	8.47	0.36
1948-035A		1391.00m	73.39	6.72	11.37	8.27	0.26
1948-036A		1392.00m	75.52	7.70	6.97	9.45	0.36
1948-037A		1393.00m	75.24	7.36	7.44	9.81	0.16
1948-038A		1394.00m	79.78	7.53	4.44	7.93	0.32
1948-039A		1395.00m	77.57	6.65	7.50	8.00	0.28
1948-040A		1396.00m	79.16	6.76	6.52	7.32	0.24
1948-041A		1397.00m	76.53	6.88	9.04	7.35	0.20
1948-042A		1398.00m	74.72	7.33	11.45	6.35	0.14

S-shale, SS-sandstone, L-limestone, D-dolomite, M-mixed, see Table 1.

TABLE 15
SIGNIFICANT C_{15+} RATIOS

JOB 1948 GEOCHEM SAMPLE NUMBER	LITHO	DEPTH/ IDENTITY	TOC (%)	mg/g TOC TOTAL EXTRACT	SATURATES	AROMATICS	TOTAL HYDROCARBONS	ELUTED NSO's	ASPHALTENES	HYDROCARBONS % TOTAL EXTRACT	SATURATES / AROMATICS
WELL: 7321/9-1 CORES											
1948-001A		1365.35m	0.23	78.98	18.99	6.46	25.44	42.53	10.25	32.21	2.94
1948-002A		1365.50m	0.32	118.74	40.30	9.00	49.30	40.30	27.86	41.52	4.48
1948-003A		1365.70m	0.60	57.80	11.81	5.63	17.45	17.63	22.17	30.19	2.10
1948-004A		1365.85m	0.79	38.36	13.67	7.48	21.15	12.14	4.83	55.14	1.83
1948-005A		1366.05m	0.64	36.92	13.35	3.68	17.03	13.49	5.99	46.13	3.63
1948-006A		1366.20m	0.64	80.15	27.17	11.64	38.81	23.29	17.55	48.42	2.33
1948-007A		1366.40m	0.59	39.31	12.51	6.51	19.02	10.23	9.81	48.39	1.92
1948-008A		1366.65m	0.50	77.99	25.81	13.28	39.09	23.43	15.09	50.12	1.94
1948-009A		1366.90m	0.53	58.24	16.34	9.20	25.55	18.73	13.65	43.87	1.78
1948-010A		1367.50m	0.54	117.61	81.35	9.70	91.05	17.97	8.27	77.41	8.39
1948-011A		1368.50m	0.56	185.39	122.96	14.59	137.54	20.04	27.54	74.19	8.43
1948-012A		1369.55m	0.47	275.42	201.32	20.12	221.44	23.49	29.88	80.40	10.01
1948-013A		1369.82m	0.40	247.65	181.09	17.10	198.19	16.49	32.47	80.03	10.59
1948-014A		1371.50m	0.49	252.66	166.43	15.69	182.12	21.38	48.58	72.08	10.61
1948-015A		1372.50m	0.56	254.84	170.42	16.03	186.44	18.89	48.22	73.16	10.63
1948-016A		1374.10m	0.61	354.78	250.35	30.23	280.57	33.43	39.35	79.08	8.28
1948-017A		1375.35m	0.73	210.72	144.30	22.06	166.36	24.86	18.77	78.95	6.54
1948-018A		1375.62m	0.61	214.67	162.03	18.77	180.80	16.86	16.28	84.22	8.63
1948-019A		1376.52m	0.59	320.31	230.37	28.17	258.55	22.87	37.90	80.72	8.18
1948-020A		1377.50m	0.77	248.20	178.56	24.98	203.54	17.46	26.36	82.00	7.15
1948-021A		1378.50m	0.72	108.21	84.64	8.67	93.31	6.92	7.50	86.23	9.76
1948-022A		1378.87m	0.21	441.77	344.18	40.08	384.25	28.05	27.58	86.98	8.59
1948-023A		1379.50m	0.11	872.06	688.53	62.25	750.78	50.98	67.62	86.09	11.06
1948-024A		1380.00m	0.30	959.33	746.27	77.01	823.28	62.08	71.82	85.82	9.69
1948-025A		1381.00m	0.18	283.78	202.11	25.05	227.16	29.85	25.05	80.05	8.07
1948-026A		1382.00m	0.22	483.85	348.71	45.86	394.57	54.00	33.11	81.55	7.60
1948-027A		1383.00m	0.08	529.34	342.79	35.08	377.87	43.05	106.03	71.39	9.77
1948-028A		1384.00m	0.08	536.41	380.77	41.00	421.76	44.47	67.40	78.63	9.29
1948-029A		1385.25m	0.17	819.81	622.39	65.30	687.70	99.46	29.64	83.88	9.53
1948-030A		1386.00m	0.08	633.14	439.45	48.83	488.28	75.68	65.92	77.12	9.00
1948-031A		1387.00m	0.08	448.91	320.84	41.36	362.19	44.69	39.35	80.68	7.76
1948-032A		1388.00m	0.11	430.28	293.32	37.74	331.07	53.92	43.14	76.94	7.77

S-shale, SS-sandstone, L-limestone, D-dolomite, M-mixed, see Table 1.

TABLE 15
SIGNIFICANT C_{15+} RATIOS

JOB 1948 GEOCHEM SAMPLE NUMBER	LITHO	DEPTH/ IDENTITY	TOC (%)	mg/g TOC						HYDROCARBONS % TOTAL EXTRACT	SATURATES / AROMATICS
				TOTAL EXTRACT	SATURATES	AROMATICS	TOTAL HYDROCARBONS	ELUTED NSO's	ASPHALTENES		
1948-033A		1389.00m	0.29	255.30	163.62	27.76	191.38	30.69	32.25	74.96	5.89
1948-034A		1390.00m	0.14	404.94	274.54	25.98	300.52	34.32	68.63	74.21	10.57
1948-035A		1391.00m	0.17	412.40	302.64	27.71	330.35	34.10	46.89	80.10	10.92
1948-036A		1392.00m	0.21	424.71	320.72	32.69	353.41	40.15	29.60	83.21	9.81
1948-037A		1393.00m	0.23	387.02	291.18	28.48	319.66	37.97	28.78	82.59	10.23
1948-038A		1394.00m	0.14	525.20	418.99	39.57	458.56	41.65	23.32	87.31	10.59
1948-039A		1395.00m	0.16	520.71	403.89	34.64	438.53	41.64	39.06	84.22	11.66
1948-040A		1396.00m	0.16	432.32	342.24	29.22	371.45	31.65	28.17	85.92	11.71
1948-041A		1397.00m	0.16	542.35	415.08	37.30	452.38	39.86	49.01	83.41	11.13
1948-042A		1398.00m	0.19	457.06	341.51	33.51	375.03	29.04	52.34	82.05	10.19

S-shale, SS-sandstone, L-limestone, D-dolomite, M-mixed, see Table 1.

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	001A	002A	003A	004A	005A	006A
DEPTH	1365.35m	1365.5m	1365.7m	1365.85m	1366.05m	1366.2m
SAMPLE TYPE						
nC15	12.39	8.44	6.83	7.79	6.60	8.61
nC16	8.67	6.20	6.58	7.71	5.61	7.27
nC17	6.40	5.21	7.68	7.41	4.75	6.93
nC18	5.93	4.96	5.94	7.95	4.98	7.88
nC19	3.98	4.22	5.79	7.58	4.79	7.10
nC20	3.43	4.22	6.23	7.61	5.20	6.67
nC21	3.58	3.97	5.54	6.84	5.16	7.28
nC22	3.14	3.97	6.23	6.62	5.07	7.25
nC23	3.74	4.47	6.68	6.63	6.20	6.54
nC24	4.43	4.47	6.28	6.58	6.92	6.32
nC25	4.09	5.46	6.33	5.76	7.37	5.64
nC26	4.06	5.21	6.68	5.06	8.41	5.10
nC27	5.40	6.20	7.28	4.95	7.78	4.31
nC28	10.20	11.66	6.13	3.97	6.56	3.38
nC29	5.72	7.69	4.39	3.08	4.93	2.97
nC30	3.85	4.22	2.54	1.75	3.66	1.87
nC31	4.22	4.22	1.74	1.30	2.26	2.31
nC32	2.45	1.49	0.85	0.52	1.63	0.83
nC33	2.08	1.49	0.70	0.51	1.04	0.92
nC34	1.27	0.50	0.40	0.26	0.72	0.47
nC35	0.98	0.00	0.30	0.14	0.36	0.35
Paraffin	37.81	15.73	45.77	43.45	23.09	40.46
Isoprenoid	4.77	1.77	4.39	3.06	1.97	4.31
Naphthene	58.04	82.49	54.72	53.49	75.41	55.21
CPI 1 Index	0.94	0.96	1.02	1.01	1.01	1.01
CPI 2 Index	0.90	0.98	1.07	1.10	0.99	1.14
CPI 3 Index	0.76	0.74	1.14	1.10	1.04	1.02
Prist/Phytane	1.45	1.85	2.14	3.10	2.08	2.11
Prist/nC17	0.39	0.61	0.37	0.45	0.47	0.51
Phytane/nC18	0.29	0.35	0.22	0.13	0.21	0.21

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	007A	008A	009A	010A	011A	012A
DEPTH	1366.4m	1366.65m	1366.9m	1367.5m	1368.5m	1369.55m
SAMPLE TYPE						
nC15	9.41	8.93	13.73	6.59	7.01	4.29
nC16	8.07	7.25	11.05	6.38	8.02	5.95
nC17	7.00	7.46	8.90	5.91	7.69	6.56
nC18	6.80	7.42	8.15	6.18	6.99	7.03
nC19	6.93	6.72	7.54	7.56	7.98	8.92
nC20	6.03	6.71	7.12	6.70	7.91	8.21
nC21	7.10	6.32	7.05	7.23	7.45	8.08
nC22	5.76	7.08	6.67	7.93	7.41	8.83
nC23	6.93	6.69	5.43	7.40	6.99	7.25
nC24	5.69	6.84	4.53	7.01	6.66	6.71
nC25	6.26	6.47	4.83	6.60	5.79	6.33
nC26	6.66	5.47	3.90	5.68	4.54	5.23
nC27	5.39	5.05	3.37	4.83	4.32	4.86
nC28	3.98	3.85	2.24	3.93	3.16	3.40
nC29	3.82	3.43	2.08	3.27	2.72	2.82
nC30	2.08	1.76	1.30	2.22	1.80	1.85
nC31	0.67	1.30	0.95	1.67	1.29	1.36
nC32	0.57	0.48	0.43	1.03	0.77	0.83
nC33	0.47	0.45	0.39	0.84	0.66	0.67
nC34	0.23	0.22	0.21	0.61	0.48	0.48
nC35	0.17	0.11	0.12	0.42	0.35	0.34
Paraffin	39.90	38.69	57.77	43.17	38.44	38.23
Isoprenoid	3.06	5.99	3.50	4.29	4.64	4.39
Naphthene	57.04	55.32	38.73	52.52	56.90	57.37
CPI 1 Index	1.11	1.00	1.06	1.01	1.03	1.01
CPI 2 Index	1.05	1.16	1.18	1.07	1.12	1.13
CPI 3 Index	1.01	1.08	1.10	1.01	1.12	1.13
Prist/Phytane	2.42	2.72	2.15	1.59	1.59	1.47
Prist/nC17	0.48	0.38	0.43	0.58	0.49	0.53
Phytane/nC18	0.20	0.14	0.22	0.35	0.33	0.33

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	013A	014A	015A	016A	017A	018A
DEPTH	1369.82m	1371.5m	1372.5m	1374.1m	1375.35m	1375.62m
SAMPLE TYPE						
nC15	8.61	6.06	7.51	8.26	5.83	6.79
nC16	7.68	6.02	7.61	7.60	6.77	6.83
nC17	7.87	6.42	7.70	8.23	7.13	7.56
nC18	8.17	6.83	7.90	7.81	6.56	6.73
nC19	8.00	7.82	7.72	7.31	7.17	7.81
nC20	7.42	7.39	8.00	7.15	8.19	7.56
nC21	7.82	8.30	7.86	7.99	7.87	7.29
nC22	7.29	8.02	7.89	7.65	7.26	7.63
nC23	7.54	7.92	6.93	6.81	7.62	8.07
nC24	6.23	6.74	5.61	6.32	6.64	5.91
nC25	5.34	5.94	5.99	5.45	7.17	6.62
nC26	4.23	5.23	4.61	4.35	5.50	5.18
nC27	3.83	4.08	3.85	4.53	4.73	5.04
nC28	2.56	3.15	3.01	3.23	3.38	3.34
nC29	2.39	2.50	2.50	2.58	2.98	2.84
nC30	1.68	1.88	1.70	1.80	1.79	1.73
nC31	1.22	1.53	1.29	1.27	1.35	1.19
nC32	0.76	1.17	0.82	0.65	0.77	0.73
nC33	0.60	1.09	0.67	0.52	0.61	0.54
nC34	0.45	0.99	0.50	0.32	0.41	0.38
nC35	0.30	0.91	0.34	0.16	0.24	0.21
Paraffin	38.57	39.46	38.72	27.62	39.40	37.13
Isoprenoid	4.82	4.38	4.73	3.43	4.39	4.23
Naphthene	56.60	56.14	56.53	68.93	56.20	58.62
CPI 1 Index	1.09	1.05	1.05	1.06	1.10	1.13
CPI 2 Index	1.13	1.03	1.13	1.13	1.18	1.20
CPI 3 Index	1.13	0.97	1.01	1.20	1.07	1.18
Prist/Phytane	1.51	1.57	1.46	1.52	1.63	1.47
Prist/nC17	0.50	0.59	0.52	0.51	0.53	0.47
Phytane/nC18	0.32	0.35	0.34	0.35	0.35	0.36

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	019A	020A	021A	022A	023A	024A
DEPTH	1376.52m	1377.5m	1378.5m	1378.87m	1379.5m	1380m
SAMPLE TYPE						
nC15	5.66	6.27	2.70	7.23	4.85	4.26
nC16	7.02	7.21	4.36	6.90	5.32	6.22
nC17	7.85	6.89	5.73	6.35	6.83	6.63
nC18	8.00	7.33	6.85	7.97	7.71	7.77
nC19	7.56	7.86	7.82	7.38	7.82	8.43
nC20	8.43	7.45	8.41	8.24	9.02	7.76
nC21	8.06	7.54	7.44	7.23	8.41	8.08
nC22	8.06	7.74	7.89	7.58	8.52	8.71
nC23	7.56	7.66	7.82	7.63	7.57	8.59
nC24	6.97	7.21	7.56	6.42	7.07	7.05
nC25	6.04	6.24	6.56	6.66	5.80	6.27
nC26	4.62	5.08	6.04	5.07	4.73	4.93
nC27	4.56	4.70	5.59	4.79	4.44	4.68
nC28	3.04	3.22	4.43	3.18	3.20	3.18
nC29	2.44	2.69	3.46	2.64	2.75	2.76
nC30	1.60	1.57	2.56	1.74	1.94	1.89
nC31	1.17	1.24	1.89	1.18	1.47	1.31
nC32	0.58	0.74	1.14	0.66	0.91	0.62
nC33	0.42	0.62	0.85	0.53	0.73	0.47
nC34	0.25	0.44	0.54	0.38	0.53	0.27
nC35	0.12	0.30	0.38	0.25	0.37	0.14
Paraffin	37.73	35.18	36.03	34.60	38.36	27.78
Isoprenoid	4.30	4.82	2.94	4.05	4.76	2.10
Naphthene	57.95	60.00	61.01	61.34	56.87	70.10
CPI 1 Index	1.04	1.04	0.99	1.07	1.00	1.06
CPI 2 Index	1.16	1.14	1.04	1.18	1.10	1.15
CPI 3 Index	1.19	1.13	1.07	1.16	1.12	1.15
Prist/Phytane	1.67	1.60	1.27	1.26	1.38	1.33
Prist/nC17	0.56	0.47	0.51	0.53	0.53	0.46
Phytane/nC18	0.31	0.28	0.33	0.33	0.34	0.29

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	025A	026A	027A	028A	029A	030A
DEPTH	1381m	1382m	1383m	1384m	1385.25m	1386m
SAMPLE TYPE						
nC15	5.34	4.96	5.52	2.44	4.57	4.04
nC16	4.96	6.62	6.26	3.64	5.47	5.81
nC17	5.54	6.89	6.60	4.71	6.41	6.24
nC18	7.10	7.92	7.58	5.54	6.14	6.42
nC19	7.56	8.66	7.85	6.78	6.60	7.71
nC20	8.79	9.27	8.73	7.20	6.94	8.13
nC21	8.51	8.30	8.29	7.47	6.03	8.34
nC22	8.81	8.47	7.48	7.91	5.85	8.43
nC23	8.53	8.21	7.30	8.25	5.90	8.11
nC24	7.79	6.35	6.49	8.07	5.34	7.12
nC25	7.43	5.14	6.39	7.75	5.13	6.74
nC26	4.80	4.66	5.54	6.17	5.55	5.06
nC27	5.01	4.37	4.59	6.37	5.42	4.83
nC28	3.14	3.17	3.29	4.89	5.15	3.35
nC29	2.76	2.72	3.21	4.19	4.81	2.88
nC30	1.51	1.69	1.85	2.68	3.82	2.05
nC31	1.10	1.16	1.31	2.16	3.44	1.54
nC32	0.51	0.59	0.73	1.29	2.38	1.04
nC33	0.41	0.46	0.52	1.10	2.14	0.89
nC34	0.26	0.27	0.31	0.81	1.66	0.71
nC35	0.13	0.14	0.15	0.60	1.26	0.53
Paraffin	29.17	26.07	26.92	35.90	22.07	39.55
Isoprenoid	2.76	2.92	2.22	2.58	2.45	3.57
Naphthene	68.05	70.99	70.85	61.50	75.48	56.87
CPI 1 Index	1.09	1.03	1.05	1.06	0.99	1.07
CPI 2 Index	1.29	1.08	1.13	1.15	1.03	1.15
CPI 3 Index	1.26	1.12	1.04	1.15	1.01	1.15
Prist/Phytane	1.52	1.38	1.52	1.24	1.58	1.40
Prist/nC17	0.58	0.57	0.57	0.62	0.51	0.52
Phytane/nC18	0.30	0.36	0.32	0.42	0.32	0.36

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	031A	032A	033A	034A	035A	036A
DEPTH	1387m	1388m	1389m	1390m	1391m	1392m
SAMPLE TYPE						
nC15	2.85	3.54	4.65	3.83	2.25	3.70
nC16	4.75	4.62	4.69	4.63	2.84	4.38
nC17	5.44	5.80	6.19	5.53	4.04	5.41
nC18	6.91	6.53	6.65	6.52	5.61	6.19
nC19	7.29	8.09	7.71	8.03	7.14	7.22
nC20	8.38	8.52	8.19	8.32	8.01	8.04
nC21	8.07	8.87	8.87	8.33	8.70	8.47
nC22	7.70	10.15	10.06	8.99	8.22	8.04
nC23	7.82	8.69	8.65	8.22	9.57	8.32
nC24	8.44	7.15	7.04	7.39	8.34	8.22
nC25	6.73	6.51	6.43	6.79	7.40	7.29
nC26	6.33	5.11	4.91	5.49	6.25	6.12
nC27	5.42	4.60	4.82	4.61	5.27	5.80
nC28	4.12	3.11	3.51	3.53	4.27	4.06
nC29	3.63	3.00	2.83	2.76	3.71	3.17
nC30	2.37	1.79	1.80	1.46	2.59	2.13
nC31	1.64	1.44	1.31	1.56	2.00	1.42
nC32	0.85	0.86	0.68	1.32	1.31	0.78
nC33	0.65	0.73	0.52	1.14	1.08	0.60
nC34	0.39	0.52	0.31	0.83	0.82	0.39
nC35	0.23	0.36	0.17	0.70	0.59	0.25
Paraffin	26.20	43.64	29.10	33.01	40.09	37.24
Isoprenoid	2.02	3.68	2.38	2.92	2.58	3.61
Naphthene	71.78	52.67	68.50	64.05	57.31	59.14
CPI 1 Index	0.98	1.03	1.04	1.01	1.07	1.06
CPI 2 Index	1.05	1.17	1.15	1.11	1.07	1.11
CPI 3 Index	1.04	1.12	1.14	1.02	1.00	1.14
Prist/Phytane	1.41	1.31	1.50	1.36	1.23	1.46
Prist/nC17	0.56	0.49	0.47	0.50	0.55	0.55
Phytane/nC18	0.31	0.33	0.29	0.31	0.32	0.28

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 16

COMPOSITION (NORMALISED %) OF C_{15+} SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	037A	038A	039A	040A	041A	042A
DEPTH	1393m	1394m	1395m	1396m	1397m	1398m
SAMPLE TYPE						
nC15	4.97	6.58	3.71	3.73	3.86	4.46
nC16	5.60	7.11	4.41	4.89	4.98	5.19
nC17	6.74	8.51	6.22	5.88	6.18	6.18
nC18	7.26	9.53	6.23	6.21	6.95	6.55
nC19	7.83	8.51	8.06	7.98	7.63	7.74
nC20	8.51	8.60	7.77	7.69	8.72	8.28
nC21	9.85	8.31	8.77	7.10	8.21	6.83
nC22	8.91	7.82	8.12	8.27	7.84	7.33
nC23	8.93	7.35	8.31	7.71	7.66	7.99
nC24	7.08	5.95	7.15	6.51	7.51	7.57
nC25	5.72	5.86	6.45	6.85	6.53	6.71
nC26	4.98	4.49	5.29	5.61	5.17	5.58
nC27	3.98	3.82	5.29	4.98	5.15	5.49
nC28	2.97	3.01	3.87	4.27	3.49	4.02
nC29	2.51	1.70	3.22	3.49	3.11	3.51
nC30	1.64	1.22	2.25	2.61	2.26	2.44
nC31	1.16	0.61	1.65	2.16	1.72	1.84
nC32	0.61	0.50	1.10	1.37	1.07	0.90
nC33	0.45	0.32	0.92	1.16	0.85	0.73
nC34	0.27	0.15	0.68	0.89	0.64	0.44
nC35	0.05	0.05	0.51	0.63	0.45	0.23
Paraffin	32.51	28.97	41.43	33.29	40.34	30.77
Isoprenoid	2.53	4.58	3.67	3.45	3.50	3.01
Naphthene	64.94	66.44	54.89	63.26	56.15	67.02
CPI 1 Index	1.08	1.07	1.10	1.01	1.04	1.02
CPI 2 Index	1.06	1.06	1.11	1.09	1.14	1.13
CPI 3 Index	1.00	1.02	1.16	1.01	1.19	1.14
Prist/Phytane	1.45	1.66	1.40	1.25	1.36	1.46
Prist/nC17	0.57	0.57	0.53	0.62	0.50	0.59
Phytane/nC18	0.37	0.31	0.38	0.46	0.33	0.37

Job Number : 1948

$$C.P.I.\ 1 = \frac{1}{2}\left(\frac{C21 + C23 + C25 + C27}{C20 + C22 + C24 + C26} + \frac{C21 + C23 + C25 + C27}{C22 + C24 + C26 + C28}\right)$$

$$C.P.I.\ 2 = \frac{1}{2}\left(\frac{C25 + C27 + C29 + C31}{C24 + C26 + C28 + C30} + \frac{C25 + C27 + C29 + C31}{C26 + C28 + C30 + C32}\right)$$

$$C.P.I.\ 3 = \frac{2x\ (C27)}{C26 + C28}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 17
CARBON ISOTOPE COMPOSITIONS (‰,PDB)

JOB 1948 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	TOTAL EXTRACT WHOLE OIL	SATURATES	AROMATICS	NSO	ASPHALTENES	KEROGEN	PYROLYSATE (S2)
WELL: 7321/9-1 CORES								
1948-001A	1365.35m	-27.78	-28.27	-27.42	-27.78	-26.41		
1948-002A	1365.50m	-27.41	-28.01	-27.52	-27.50	-26.82	-26.36	
1948-003A	1365.70m	-27.08	-28.43	-27.47	-27.26	-28.30*		
1948-004A	1365.85m	-26.98	-27.87	-27.24	-27.32	-26.69		
1948-005A	1366.05m	-27.58	-28.11	-27.35	-27.36	-27.03		
1948-006A	1366.20m	-27.11	-27.87	-27.02	-27.51	-26.89		
1948-007A	1366.40m	-27.03	-27.94	-27.41	-27.70	-26.41	-26.14	
1948-008A	1366.65m	-27.05	-28.09	-27.49	-29.09*	-26.57		
1948-009A	1366.90m	-27.00	-28.63	-27.27	-27.73	-26.73		
1948-011A	1368.50m	-28.75	-29.60	-27.44	-28.06	27.25	-26.23	
1948-013A	1369.82m	-28.91	-29.53	-27.35	-28.82	-26.60		
1948-014A	1371.50m	-28.89	-29.69	-27.54	-27.66	-28.15		
1948-015A	1372.50m	-28.90	-29.74	-27.46	-27.55	-27.16		
1948-016A	1374.10m	-28.82	-29.39	-27.96	-28.56	-26.89		
1948-019A	1376.52m	-29.04	-29.78	-28.12	-27.82	-27.57		
1948-021A	1378.50m	-29.10	-29.29	-29.77*	-35.99*	-26.92	-25.59	
1948-022A	1378.87m	-29.07	-29.46	-27.53	-27.64	-26.41		
1948-024A	1380.00m	-29.42	-29.85	-28.01	-28.70*	-27.59		
1948-026A	1382.00m	-29.46	-29.72	-27.65	-28.45	-27.47		
1948-029A	1385.25m	-28.96	-29.48	-27.67	-27.55	-27.63		
1948-033A	1389.00m	-29.16	-29.75	-27.84	-31.09*	-27.55		
1948-036A	1392.00m	-29.14	-29.74	-27.64	-27.77	-27.31		
1948-041A	1397.00m	-29.32	-29.58	-27.77	-28.17	-27.74		

* small sample weight, treat data with caution