OPERATOR STATOIL

WELL NO. 7119/12-3

MATERIAL CONSUMPTION & COST ANALYSIS

36" HOLE DRILLED TO 303.5 Meters ~~Feet~~ 30" CASING SET AT 302 Meters ~~Feet~~

ACTUAL AMOUNT OF HOLE DRILLED 63.5 Meters ~~Feet~~ DAYS ON INTERVAL 4

DRILLING FLUID SYSTEM SPUD MUD

MATERIAL	UNIT SIZE	PROG.	USED	VARIANCE ±	US$ COST
BENTONITE	M/T	28	41	+ 13	15,580.00
CAUSTIC	25 KG	29	29	0	580.00
SODA ASH	50 KG	5	14	+ 9	294.00
CALCIUM CHLORIDE	50 KG	0	9	+ 9	270.00
BARITE	M/T	0	25	+25	3,700.00

COST/DAY US$ 5,106.00 TOTAL COST FOR INTERVAL US$ 20,424.00

COST/Mt. ~~KKK~~ US$ 321.64 PROG. COST FOR INTERVAL US$ 11,325.00

ENGR. COST US$ 3,300.00 COST VARIANCE FOR INTERVAL US$ 9,009.00

OPERATOR STATOIL

WELL NO. 7119/12-3

MATERIAL CONSUMPTION & COST ANALYSIS

26" HOLE DRILLED TO 716 Meters Feet 20" CASING SET AT 700 Meters Feet

ACTUAL AMOUNT OF HOLE DRILLED 411 Meters Feet DAYS ON INTERVAL 6

DRILLING FLUID SYSTEM GEL/SEAWATER

MATERIAL	UNIT SIZE	PROG.	USED	VARIANCE ±	US$ COST
BENTONITE	M/T	40	23	- 17	8,740.00
BENTONITE SXS	50 KG	0	435	+ 435	7.830.00
CAUSTIC	25 KG	50	110	+ 60	2,200.00
SODA ASH	50 KG	10	10	0	210.00
ANCO DETERGENT	200 LIT	3	0	- 3	-
SPERCELL C	25 KG	20	0	- 20	-
BARITE	M/T	0	277	+ 277	40,996.00

COST/DAY US$ 9,996.00

TOTAL COST FOR INTERVAL US$ 59,976.00

COST/Mt. US$145.93

PROG. COST FOR INTERVAL US$ 18,285.00

ENGR. COST US$ 4,950.00

COST VARIANCE FOR INTERVAL US$+41,691.00

OPERATOR STATOIL

WELL NO. 7119/12-3

MATERIAL CONSUMPTION & COST ANALYSIS

17 1/2" HOLE DRILLED TO 1618 Meters 13 3/8" CASING SET AT 1603 Meters

ACTUAL AMOUNT OF HOLE DRILLED 902 Meters DAYS ON INTERVAL 13

DRILLING FLUID SYSTEM GYP/POLYMER

MATERIAL	UNIT SIZE	PROG.	USED	VARIANCE ±	COST
BARITE	M/T	310	259	-51	38,332.00
SPERCELL C	25 KG	100	100	-	1,950.00
CAUSTIC	25 KG	60	94	+ 34	1,880.00
SODA ASH	50 KG	25	0	- 25	-
GYPSUM	40 KG	410	334	- 76	4,408.80
XC POLYMER *	25 KG	45	90	+ 45	35,550.00
DRISPAC REG.	25 KG	40	88	+ 48	13,552.00
DRISPAC SUP.	25 KG	70	146	+ 76	24,090.00
BENTONITE SXS	50 KG	0	130	+130	2,340.00
BENTONITE	M/T	0	4	+ 4	1,520.00
BICARBONATE	50 KG	0	2	+ 2	48.00
DRILLING DETERGENT	200 LIT	0	10	+ 10	4,950.00
DEFOAMER	25 LIT	0	1	+ 1	118.00
* XC POLYMER = 75	mil. pol-302 = 15				

COST/DAY US$ 9,902.98

TOTAL COST FOR INTERVAL US$ 128,738.80

COST/Mt. US$ 142.73

PROG. COST FOR INTERVAL US$ 90,452.00

ENGR. COST US$ 10,725.00

COST VARIANCE FOR INTERVAL US$+38,286.80

OPERATOR STATOIL

WELL NO. 7119/12-3

MATERIAL CONSUMPTION & COST ANALYSIS

12 1/4" HOLE DRILLED TO 3144 Meters 9 5/8" CASING SET AT 3136 Meters

ACTUAL AMOUNT OF HOLE DRILLED 1526 Meters DAYS ON INTERVAL 41

DRILLING FLUID SYSTEM GEL/LIGNO

MATERIAL	UNIT SIZE	PROG.	USED	VARIANCE ±	US$ COST
BARITE	M/T	350	765	+ 415	113,220.00
BENTONITE	M/T	0	52	+ 52	19,760.00
BENTONITE	50 KG	300	0	- 300	-
SPERCELL C	25 KG	300	857	+ 557	16,711.50
DESCO	25 LBS	0	124	+ 124	4,712.00
CAUSTIC	25 KG	90	500	+ 410	10,000.00
SODA ASH	50 KG	20	2	- 18	42
BICARBONATE	50 KG	22	37	+ 15	888.00
CMC LV	25 KG	320	304	- 16	19,760.00
CMC HV	25 KG	20	76	+ 56	5,094.00
MIL POL 302	25 KG	0	5	+ 5	1,975.00
DEFOAMER	25 LIT	0	53	+ 53	6,254.00
AL. STEARATE	25 KG	0	8	+ 8	712.00
LUBRICANT	200 L	0	13	+ 13	10,335.00
SOLTEX	50 LBS	0	102	+ 102	8,670.00
DRISPAC REG.	50 LBS	0	1	+ 1	154.00

COST/DAY US$ 5,324.00

TOTAL COST FOR INTERVAL US$ 218.287.50

COST/Mt. US$ 143.00

PROG. COST FOR INTERVAL US$ 87,872.00

ENGR. COST US$ 33,825.00

COST VARIANCE FOR INTERVAL US$+130,415.00

OPERATOR STATOIL

WELL NO. 7119/12-3

MATERIAL CONSUMPTION & COST ANALYSIS

8 1/2" HOLE DRILLED TO 3314 Meters | 7" CASING SET AT 3294 Meters

ACTUAL AMOUNT OF HOLE DRILLED 170 Meters | DAYS ON INTERVAL 46*

DRILLING FLUID SYSTEM GEL/LIGNO

MATERIAL	UNIT SIZE	PROG.	USED	VARIANCE ±	US$ COST
BARITE	M/T	200	224	+ 24	33,152.00
BENTONITE	M/T	0	29	+ 29	11,020.00
BENTONITE	50 KG	216	-	- 216	-
SPERCELL C	25 KG	220	119	- 101	2,320.50
DESCO	25 LBS	0	50	+ 50	1,900.00
CAUSTIC	25 KG	70	60	- 10	1,200.00
BICARBONATE	50 KG	0	46	+ 46	1,104.00
SODA ASH	50 KG	20	0	- 20	-
CMC LV	25 KG	200	137	- 63	8,905.00
CMC HV	25 KG	0	24	+ 24	1,560.00
XC POLYMER	50 LBS	0	2	+ 2	790.00
CHROME LIGNITE	25 KG	120	0	- 120	-
DEFOAMER	25 LIT	0	7	+ 7	826.00
$CaCl_2$	50 KG	0	8	+ 8	240.00
* INCLUDES TESTING AND ABANDING					

COST/DAY US$ 1,369.95 | TOTAL COST FOR INTERVAL US$ 63,017.50

COST/Mt. US$ 370.69 | PROG. COST FOR INTERVAL US$ 56,438.00

ENGR. COST US$ 30,250.00 | COST VARIANCE FOR INTERVAL US$ + 6,579.50

OPERATOR STATOIL

WELL NO. 7119/12-3

TOTAL CONSUMPTION & COST ANALYSIS

TOTAL DEPTH 3314 Meters

TOTAL HOLE DRILLED 3074 Meters

TOTAL DAYS 111

MATERIAL	UNIT SIZE	PROG.	USED	VARIANCE ±	US$ COST
BARITE	M/T	860	1550	+ 690	229,400.00
BENTONITE	M/T	68	149	+ 81	56,620.00
BENTONITE SXS	50 KG	516	565	+ 49	10,170.00
CAUSTIC	25 KG	299	793	+ 494	15,860.00
SODA ASH	50 KG	80	26	- 54	546.00
BICARBONATE	50 KG	22	85	+ 63	2,040.00
GYPSUM	40 KG	410	334	- 76	4,408.80
CMC HV	25 KG	20	100	+ 80	6,700.00
CMC LV	25 KG	520	441	- 79	28,619.00
DRISPAC REG.	25 KG	40	89	+ 49	13,706.00
DRISPAC SUP.	25 KG	70	146	+ 76	24,090.00
XC POLYMER	50 LBS	45	77	+ 32	30,415.00
SPERCELL C	25 KG	640	1076	+ 436	20,982.00
DESCO	25 LBS	0	174	+ 174	6,612.00
SOLTEX	25 KG	0	102	+ 102	8,670.00
AL.STEARATE	25 KG	0	8	+ 8	712.00
DEFOAMER	25 LIT	0	61	+ 61	7,198.00
LUBRICANT	200 LIT	0	13	+ 13	10,335.00
DRILLING DETERGENT	200 LIT	3	10	+ 7	4,950.00
MIL POL 302	25 KG	0	20	+ 20	7,900.00
$CaCl_2$	50 KG	0	17	+ 17	510.00

COST/DAY US$ 4,418.41

TOTAL COST WELL US$ 490,443.80

COST/Mt. US$ 159.55

PROG. COST WELL US$ 264,372.00

ENGR. COST SU$ 83,050.00

COST VARIANCE WELL US$ + 226,071.80

ANCHOR DRILLING FLUIDS AS

OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

WELL NAME 7119/12-3 AREA TROMSØFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

MUD SYSTEM

ENGINEERS

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: M³ LOSSES SUB SURFACE	M³ LOSSES SURFACE	M³ VOLUME MUD BUILT	BULK MATERIALS: M/T BARITE	M/T BENTONITE	SACK MATERIALS: BENTONITE	MATERIALS ADDED TO CONTROL PROPERTIES: SPERCELL C	THINNERS: DESCO	POLYMERS: DRISPAC REG.	DRISPAC SL	XC POLYMER	MIL POL 302	CMC LV	CMC HV	OTHERS: CAUSTIC SODA	SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
1	19.05							A N C H O R H A N D L I N G																	
2	20.05			100		14										8	2								
3	21.05	72		151	12	9										10	3								
4	22.05	159		165	8	11										5	4								
5	23.05	118		138	5	7										6	5							9	
6	24.05		2	210		3	75									8	2								
7	25.05	5	41	28	21	1										36									
8	26.05	3	85	147	4	2	50									18	2								
9	27.05	3	75	200	36	8										34	2								
10	28.05	190	10	20	60											6									
11	29.05	556	90	250	156	9	310									8	4								
12	30.05			385	59	2				77	22	35				2			1		6		133		
13	31.05		8	27	37																				
14	01.06		16	30							34	10				1							60		
FORWARD																									
ESTIMATED TOTALS		1106	327	1851	398	66	435			77	56	45				142	24		1				193	9	

REMARKS:

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM GYP/POLYMER

WELL NAME 7119/12-3 AREA TROMSØFLAKET
OPERATOR STATOIL RIG. DYVI DELTA
ENGINEERS WRIGHT/AARSETH

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: M³ LOSSES SUB SURFACE	M³ LOSSES SURFACE	M³ VOLUME MUD BUILT	BULK MATERIALS: M/T BARITE	M/T BENTONITE	SACK MATERIALS: BENTONITE		MATERIALS ADDED TO CONTROL PROPERTIES: THINNERS: SPERCELL C	DESCO			POLYMERS: DRISPAC REG.	DRISPAC SL	XC POLYMER	MIL POL 302	CMC LV	CMC HV	OTHERS: CAUSTIC	SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
15	02.06	20	5	50	8		14							26	16				3					4		20		
16	03.06	6	10	69			55								14				10							10		
17	04.06	18	18	28	5		20						8	10		4			13							25		
18	05.06		40	60	54									22		11			14							10		
19	06.06		46	45		2							3	14					21							28		
20	07.06		12	5	40									18					9							24		
21	08.06		3	20	42														2							24		
22	09.06		25	5			41												2									
23	10.06	85	40	0	14				100										17									
24	11.06		55	0																	2							
25	17.06		NIL																									
26	18.06		NIL																									
27	19.06		NIL																									
28	20.06		136	159	55	24			9												13							
FORWARD		1106	327	1851	398	66	435						77	56	45				142	24		1		6		193	9	
ESTIMATED TOTALS		1235	717	2292	616	92	565		109				88	146	75	15			233	24	15	1		10		334	9	

REMARKS

ANCHOR DRILLING FLUIDS AS

OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM GYP/POLYMER TRANSFERRED TO GEL/LIGNO

WELL NAME 7119/12-3 AREA TROMSØFLAKET

OPERATOR STATOIL RIG DYVI DELTA

ENGINEERS SUNDE/VAAGA

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: M³ LOSSES SUB SURFACE	M³ LOSSES SURFACE	M³ VOLUME MUD BUILT	BULK MATERIALS: M/T BARITE	M/T BENTONITE	SACK MATERIALS: BENTONITE		MATERIALS ADDED TO CONTROL PROPERTIES: SPERCELL C	THINNERS: DESCO			POLYMERS: DRISPAC REG.	DRISPAC SL	XC POLYMER	MIL POL 302	CMC LV / CMC HV	CAUSTIC	OTHERS: SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
29	21.06		1	65	95*	5			65								2 / 19		1	13	1						
30	22.06	1	2	5	15												9 / 19			11		2					
31	23.06		5	2.5													19 / 0	4				5					
32	24.06		2	2	6				24								9 / 0	15			4						
33	25.06		1	10	17				28								3 / 0	3									
34	26.06		5	2					3								10 / 0	19			2						
35	27.06		13	47	5	5			45								2 / 0	8			0						
36	28.06		11	4	11				22								/	17				4					
37	29.06		7	34	5	5			26								/	3			5	2					
38	30.06		15	10					11								8 / 0	10									
39	01.07		25	26	8				26								36 / 0	17			1						
40	02.07		40	32	34				63								0 / 10	24									
41	03.07		27.5	75	56	4			42							5	/	2									
42	04.07		0	7	6				2																		
FORWARD		1235	717	2292	616	92	565		109				88	146	75	15	/	233	24	15	1		10		334	9	
ESTIMATED TOTALS		1236	867	2613.5	874	111	565		466				88	146	75	20	98 / 48	355	25	39	14	13	10		334	9	

REMARKS

ANCHOR DRILLING FLUIDS AS

OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM GEL/LIGNO

WELL NAME 7119/12-3 AREA TROMSØFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

ENGINEERS AARSETH/WRIGHT/WERSLAND/VAAGA

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: LOSSES SUB SURFACE M³	LOSSES SURFACE M³	VOLUME MUD BUILT M³	BULK MATERIALS: BARITE M/T	BENTONITE M/T	SACK MATERIALS: BENTONITE	SPERCELL C	THINNERS: DESCO	POLYMERS: DRISPAC REG.	DRISPAC SL	XC	POLYMER	MIL POL 302	CMC LV / CMC HV	OTHERS: CAUSTIC	SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
43	05.07		47	30	27			24							9 / 22	29			6						
44	06.07		29.5	67	34	4		24							12 / 6	21									4
45	07.07		17.5	40	10			14		1						23						52			4
46	08.07		18	4	24											6			3			50			
47	09.07		25	90	79	3		19							36 / 0	17	1								
48	10.07		70.5	44	40			44							34 / 0	33			7						
49	11.07		43.5	43	14			27							27 / 0	27			4						
50	12.07		40	40	52			94							21 / 0	30									
51	13.07		8	15	11			30							21 / 0	30									
52	14.07									NIL USAGE															
53	15.07		12	13				32							24 / 0	26			3						
54	16.07		47*	40	20	2		22							2 / 0	9									
55	17.07		63	73	45			60							17 / 0	26			4						
56	18.07		34	14	2			16	10							16			3						
FORWARD		1236	867	2613.5	874	111	565	466			88	146	75	20	98 / 48	355	25	39	14	13	10	334	9		
ESTIMATED TOTALS		1236	1322	3126.5	1232	120	565	872	10		89	146	75	20	276 / 76	648	26	39	44	13	10	334	9	8	

REMARKS

*HAD TO CORRECT ON RESERVE VOLUME FROM REPORT NO. 47

ANCHOR DRILLING FLUIDS AS

OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM: GEL/LIGNO

WELL NAME: 7119/12-3 AREA: TROMSØFLAKET

OPERATOR: STATOIL RIG: DYVI DELTA

ENGINEERS: VAAGA/WERSLAND/SUNDE/WRIGHT

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: LOSSES SUB SURFACE (M³)	LOSSES SURFACE (M³)	VOLUME MUD BUILT (M³)	BULK MATERIALS: BARITE (M/T)	BENTONITE (M/T)	SACK MATERIALS: BENTONITE	SPERCELL C	THINNERS: DESCO	POLYMERS: DRISPAC REG.	DRISPAC SL	XC POLYMER	MIL POL 302	CMC LV / CMC HV	OTHERS: CAUSTIC	SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
57	19.07		61	34	3			18	46						24			4						
58	20.07		33	26	57			24	25					3 / 3.0	10			3						
59	21.07		20	18	7			20	19					13 / 0	14			2						
60	22.07		34	13	9			23	19					6 / 0	15			1						
61	23.07		29	17	12										17									
62	24.07		1	14	6				5						5									
63	25.07		17		NIL	U S A G E																		
64	26.07		1		NIL	U S A G E																		
65	27.07				NIL	U S A G E																		
66	28.07		77	29		5									2									
67	29.07			9	10	9								14			20							
68	30.07			20		2								30			8							
69	31.07		25	10										21 / 17				1						
70	01.08		18		4	2		10						32 / 2	3			1						
FORWARD		1236	1322	3126.5	1232	120	565	872	10	89	146	75	20	276 / 76	648	26	39	44	13	10	102			
ESTIMATED TOTALS			1638	3316.5	1340	138	565	967	124	89	146	75	20	395 / 101	738	26	67	56	13	10	102			

REMARKS

ANCHOR DRILLING FLUIDS AS

OSLO – STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM: GEL/LIGNO

WELL NAME: 7119/12-3 AREA: TROMSØFLAKET

OPERATOR: STATOIL RIG: DYVI DELTA

ENGINEERS: SUNDE/WRIGHT/AARSETH/VAAGA

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: Losses sub surface (M)	Losses surface (M)	Volume mud built (M)	BULK MATERIALS: Barite (M/T)	Bentonite (M/T)	SACK MATERIALS: Bentonite		MATERIALS ADDED TO CONTROL PROPERTIES: Spercell C		Thinners: Desco		Polymers: Drispac Reg.	Drispac SL	XC	Polymer	Mil Pol 302	CMC LV	CMC HV	Others: Caustic	Soda Ash	Bicarb.	Defoamer	Lub.	Drilling Detergent	Soltex	Gyp	$CaCl_2$	Al. Stearate
71	02.08			21														14										
72	03.08		18	5																2								
73	04.08		17	5	19															6								
74	05.08		10	23	81																							
75	06.08		20	10	15						10									5		1						
76	07.08				3				21		15							9		12		5	2					
77	08.08			1	7				29											9			1					
78	09.08		7	3					12											6								
79	10.08			4	1				25											9			2					
80	11.08								4											2								
81	12.08			NIL USAGE																								
82	13.08			NIL USAGE																								
83	14.08			NIL USAGE																								
84	15.08	47*	2						14		9									4		2						
FORWARD		1236	1638	3316.5	1340	138	565		967		134		89	146	75	20	396	101		738	26	67	56	13	10	102		
ESTIMATED TOTALS		1283	1712	3388.5	1465	138	565		1072		158		89	146	75	20	418	101		793	26	75	61	13	10	102		

REMARKS

* LEFT BEHIND 7" CASING

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM: GEL/LIGNO

WELL NAME: 7119/12-3 AREA: TROMSØFLAKET

OPERATOR: STATOIL RIG: DYVI DELTA

ENGINEERS: SUNDE/WRIGHT/AARSETH/VAAGA

Day No.	DATE 1983	ESTIMATED DAILY MUD VOLUMES: LOSSES SUB SURFACE M³	LOSSES SURFACE M³	VOLUME MUD BUILT M³	BULK MATERIALS: BARITE M/T	BENTONITE M/T	SACK MATERIALS: BENTONITE	SPERCELL C	THINNERS: DESCO	POLYMERS: DRISPAC REG.	DRISPAC SL	XC POLYMER	MIL POL 302	CMC LV	CMC HV	OTHERS: CAUSTIC	SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
85	16.08		47						2									3							
86	17.08		NIL	C H A N G E																					
87	18.08		NO	C H A N G E																					
88	19.08		2					4		14						2		7							
89	20.08		1		26																				
90	21.08			10		1																			
91	22.08				2										5										
92	23.08																								
93	24.08				6																				
94	25.08				13																				
95	26.08						NIL	U S A G E																	
96	27.08						NIL	U S A G E																	
97	28.08						NIL	U S A G E																	
98	29.08						NIL	U S A G E																	
FORWARD		1283	1712	3388.5	1465	138	565		1072		158		89	146	75	20	424 101	793	26	75	61	13	10	102		
ESTIMATED TOTALS		1283	1762	3399	1512	139	565		1076		174		89	146	75	20	424 106	795	26	85	61	13	10	102		

REMARKS

ANCHOR DRILLING FLUIDS AS

OSLO — STAVANGER

Drilling Fluid & Material Consumption Report

MUD SYSTEM: GEL/LIGNO

WELL NAME: 7119/12-3 AREA: TROMSØFLAKET

OPERATOR: STATOIL RIG: DYVI DELTA

ENGINEERS: SUNDE

Day No	DATE 1983	ESTIMATED DAILY MUD VOLUMES: LOSSES SUB SURFACE M³	LOSSES SURFACE M³	VOLUME MUD BUILT M³	BULK MATERIALS: BARITE M/T	BENTONITE M/T	SACK MATERIALS: BENTONITE	SPERCELL C	THINNERS: DESCO	POLYMERS: DRISPAC REG.	DRISPAC SL	XC POLYMER	MIL POL 302	CMC LV	CMC HV	OTHERS: CAUSTIC SODA	SODA ASH	BICARB.	DEFOAMER	LUB.	DRILLING DETERGENT	SOLTEX	GYP	$CaCl_2$	AL. STEARATE
99	30.08							NIL USAGE																	
100	31.08		1					NIL USAGE							12										
101	01.09		1		17	10																			
102	02.09							NIL USAGE																	
103	03.09							NIL USAGE																	
104	04.09		1					NIL USAGE																	
105	05.09		2		8										5										
106	06.09							NIL USAGE																	
107	07.09							NIL USAGE																	
108	08.09							NIL USAGE																	
109	09.09				13																				
110	10.09		8									2												8	
111	11.09		330																						
112	12.09																								
FORWARD		1283	1762	3399	1512	139	565	1076	174	89	146	75	20	424 100	793	26	85	61	13	10	102	334	9	8
ESTIMATED TOTALS		1283	2105	3399	1550	149	565	1076	174	89	146	77	20	441 100	793	26	85	61	13	10	102	334	17	8

REMARKS

DAY NO. 111: PULL BOP

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Mud Properties Record

WELL NAME 7119/12-3 AREA TROMSOFLAKET
OPERATOR STATOIL RIG. DYVI DELTA
MUD SYSTEM SPUD MUD ENGINEERS SUNDE/VAAGA

Day No.	DATE 1983	DEPTH FEET ☐ METERS ☐ METER	MUD PROPERTIES: DENSITY PPG ☐ SG ☐ SG	VISCOSITY sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0/10	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis Cl ppm X 1000	Ca. ++ ppm T.H.	Pf	RETORT % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
1	19/ 5																							
2	20/ 5																							
3	21/ 5																							
4	22/ 5																							
5	23/ 5																							
6	24/ 5	335	1.04	40	15.3	3.0	25.0	15/15				9.9	11	200	.10		3.00		16.00			.15	12.12	
7	25/ 5	715	1.05	41	18.5	3.0	31.0	17/18				10.0	16	400	.10		3.00		15.00			.12	16.96	
8	26/ 5		1.07	40	16.0	3.0	26.0	15/15				10.0	17	260	.10		3.00		17.00			.14	12.91	
9	27/ 5	415	1.10	42	22.0	4.0	36.0	18/18				9.7	18	320	.10		4.00		19.00			.14	18.27	
10	28/ 5	716	1.25	45		8.0	36.0	15/15				10.3	18									.24	11.14	
11	29/ 5	716																						
12	30/ 5	716	1.15	80	25.0	15.0	20.0	4/6	11.5	3		9.3	20	2300	.15		4.50					.51	1.86	
13	31/ 5	719	1.15	45	27.5	16.0	23.0	4/4	8.0	2		10.2	20	2300	.10		4.50	1.00				.50	2.31	
14	1/ 6	960	1.15	46	28.0	17.0	22.0	4/4	6.0	1		9.3	20	2300	.05		5.00		4.00			.52	1.99	

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Mud Properties Record

WELL NAME 7119/12-3 AREA TROMSOFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

MUD SYSTEM GYP/POLYMER ENGINEERS AARSETH/WRIGHT/SUNDE/VAAGA

Day No.	DATE 1983	DEPTH FEET ☐ METERS ☐ METER	MUD PROPERTIES: SG DENSITY PPG ☐ SG ☐	VISCOSITY: sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0 / 10 min	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis: Cl⁻ ppm X 1000	Ca ++ ppm T.H.	Pf	RETORT: % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
15	2/ 6	1126	1.16	44	23.0	13.0	20.0	6/6	6.8	1		9.5	20	2550	.05		5.00		6.50			.48	2.15	
16	3/ 6	1287	1.15	47	27.0	15.0	25.0	7/14	7.2	1		9.3	20	2250	.05		5.50		9.00			.46	2.92	
17	4/ 6	1399	1.16	47	28.0	15.0	23.0	7/16	7.8	1		9.8	20	2250	.05		6.00		12.50			.48	2.46	
18	5/ 6	1510	1.15	50	32.0	19.0	25.0	8/26	8.5	1		9.2	19	2000	.05		8.00		15.00			.52	2.30	
19	6/ 6	1618	1.25	50	29.0	17.0	24.0	9/32	9.8	1		9.3	19	2200	.05		8.00		17.50			.50	2.37	
20	7/ 6	1618	1.30	52	32.0	25.0	25.0	8/32	9.5	1		9.3	19	2300	.05		11.00		20.00			.58	1.78	
21	8/ 6	1618	1.35	57	39.0	26.0	26.0	8/34	9.2	1		9.4	19	2400	.05		13.00		19.00			.58	1.85	
22	9/ 6	1618	1.35	54	38.0	23.0	22.0	9/35	9.5	1		9.6	19	2600	.05		13.00		18.00			.60	1.51	
23	10/ 6	1618	1.35	49	32.0	24.0	16.0	5/17	8.2	1		9.4	19	2200	.10		13.50		18.00			.68	.84	
24	11/ 6	1618	1.35	53	35.0	25.0	20.0	6/23	10.0	1		11.0	19	2300	.20		13.50		18.00			.64	1.19	
25	17/ 6	1618	1.34	40	33.0	25.0	16.0	5/10	10.0	1		10.8	19	2300	.20		13.50		18.00			.69	.82	
26	18/ 6	1618	1.34	41	33.0	25.0	16.0	5/10	10.0	1		10.8	19	2300	.20		13.00		18.00			.69	.82	
27	19/ 6	1618	1.34	41	33.0	25.0	16.0	5/10	9.9	1		10.7	19	2300	.20		13.00		17.00			.69	.82	
28	20/ 6	1619	1.35	46	26.5	17.0	19.0	10/25	18.0	2		12.3	17	1440	1.00		13.00		14.00			.56	1.50	

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Mud Properties Record

MUD SYSTEM GYP/POLYMER

WELL NAME 7119/12-3 AREA TROMSOFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

ENGINEERS SUNDE/VAAGA

Day No.	DATE 1983	DEPTH FEET ☐ METERS ☐ METER	MUD PROPERTIES																						OPERATION REMARKS
			DENSITY PPG ☐ SG ☐		VISCOSITY sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0 / 10	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis Cl⁻ ppm X 1000	Ca ++ ppm T.H.	PI	RETORT % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	
			SG																						
29	21/ 6	1648	1.35	47	26.5	19.0	15.0	5/26	12.0	2		11.3	14	1180	.20		13.00		17.00				.64	.88	
30	22/ 6	1720	1.35	46	26.0	19.0	14.0	5/26	9.2	1		10.8	14	1200	.10		13.00		18.00				.66	.78	
31	23/ 6	1765	1.35	50	25.0	18.0	14.0	5/31	8.2	1		10.1	145	1280	.10		13.50		18.50				.64	.82	
32	24/ 6	1860	1.35	51	21.5	15.0	13.0	5/34	7.9	1		10.4	14	1120	.15		13.50		18.50				.62	.82	
33	25/ 6	1959	1.38	48	24.0	17.0	14.0	4/35	7.8	1		9.7	15	1040	.15		14.50		20.00				.63	.85	
34	26/ 6	1980	1.39	48	23.0	17.0	12.0	4/38	7.9	2	22.0	9.7	15	860	.10		14.50		19.50				.67	.65	
35	27/ 6	2033	1.38	46	21.0	16.0	10.0	4/27	7.3	1	18.0	10.2	15	700	.20		14.50		22.00				.69	.50	
36	28/ 6	2075	1.38	47	21.5	16.0	11.0	4/28	7.3	1	30.0	10.2	16	600	.20		15.00		22.00				.67	.59	
37	29/ 6	2146	1.38	47	22.0	16.0	12.0	4/32	7.2	1	16.5	10.5	15	580	.20		15.00		22.00				.65	.68	
38	30/ 6	2182	1.38	49	22.5	16.0	13.0	4/30	7.3	1	27.0	10.4	15	400	.25		15.00		23.50				.63	.78	
39	1/ 7	2240	1.38	49	23.5	16.0	13.0	4/34	7.6	1	27.6	10.2	15	430	.20		15.50		25.00				.63	.78	
40	2/ 7	2298	1.42	53	27.0	19.0	17.0	5/28	6.3	1	22.5	10.2	15	420	.20		17.50		23.50				.61	1.10	
41	3/ 7	2375	1.47	52	24.5	20.0	16.0	4/24	6.9	1	25.0	10.5	16	300	.40		19.00		23.50				.64	.95	
42	4/ 7	2372	1.47	52	27.0	20.0	18.0	5/26	6.8	1	25.0	9.9	16	300	.30		19.00		23.50				.61	1.17	

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Mud Properties Record

MUD SYSTEM GEL/LIGNO

WELL NAME 7119/12-3 AREA TROMSOFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

ENGINEERS AARSETH/WRIGHT/WERSLAND/VAAGA

Day No.	DATE 1983	DEPTH FEET ☐ METERS ☐ METER	MUD PROPERTIES																							OPERATION REMARKS
			DENSITY PPG ☐ SG ☐		VISCOSITY			GELS	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis			RETORT		% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	
			SG		sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	10 min				X 1000 Cl⁻ ppm	T.H. Ca. ++ ppm	Pf	% OIL	% SOLIDS CORR.								
43	5/ 7	2430	1.47	53	26.5	19.0	15.0	4/21	7.2	2	28.0	10.4	16	240	.50		19.50		21.50			.64	.88		
44	6/ 7	2497	1.47	55	28.0	21.0	16.0	3/21	7.0	2	27.0	10.0	16	260	.50		19.50		21.00			.65	.92		
45	7/ 7	2566	1.47	53	25.0	19.0	12.0	3/24	8.0	2	28.5	10.0	16	280	.50		19.50		21.00			.69	.61		
46	8/ 7	2274	1.47	52	24.0	18.0	12.0	3/29	8.0	2	24.0	10.0	16	180	.60		19.00		21.00			.68	.63		
47	9/ 7	2600	1.60	59	33.0	24.0	19.0	5/31	7.0	2	23.0	10.4	16	160	.80		21.50		20.00			.64	1.12		
48	10/ 7	2673	1.60	58	29.0	21.0	16.0	6/37	6.8	2	30.0	10.6	16	80	1.20		21.50		20.00			.65	.92		
49	11/ 7	2742	1.60	59	34.5	25.0	19.0	6/40	6.9	1	21.0	10.2	16	60	1.20		21.00		20.00			.65	1.09		
50	12/ 7	2800	1.65	51	27.5	20.0	15.0	4/29	6.6	2	14.6	10.0	17	60	1.00		22.00		20.00			.65	.85		
51	13/ 7	2857	1.65	55	32.5	23.0	16.0	5/32	6.8	2	15.0	10.1	18	100	1.00		23.00		20.00			.67	.86		
52	14/ 7	2865	1.65	55	33.0	25.0	17.0	4/32	6.8	2	15.0	10.0	18	100	1.00		23.50		20.00			.67	.90		
53	15/ 7	2901	1.65	54	32.5	24.0	17.0	5/38	6.4	2	14.8	10.3	19	60	1.60		23.00		20.00			.66	.93		
54	16/ 7	2908	1.65	66	33.0	24.0	18.0	5/36	6.2	2	14.7	10.2	20	40	1.50		23.50		20.00			.65	1.02		
55	17/ 7	2919	1.65	58	33.0	25.0	16.0	5/33	6.2	1	14.7	10.2	20	40	1.40		23.50		20.00			.69	.82		
56	18/ 7	3005	1.65	56	34.0	25.0	18.0	5/30	6.8	1	15.1	10.0	20	40	1.20		23.50		20.00			.66	.99		

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO – STAVANGER

Drilling Mud Properties Record

WELL NAME 7119/12-3 AREA TROMSØFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

MUD SYSTEM GEL/LIGNO ENGINEERS VAAGA/WERSLAND/SUNDE

Day No.	DATE 1983	DEPTH FEET □ METERS □ METER	MUD PROPERTIES: DENSITY PPG □ SG □	VISCOSITY: sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0 / 10 min	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis: Cl⁻ ppm X 1000	Ca ++ ppm T.H.	PI	RETORT: % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
57	19/ 7	3058	1.65	50	28.5	21.0	15.0	4/30	6.9	1	15.8	10.5	20	40	1.60		23.50		18.50				.66	.82	
58	20/ 7	3085	1.72	53	30.5	23.0	15.0	4/29	6.7	1	15.8	10.5	21	60	1.70		23.50		18.00				.68	.78	
59	21/ 7	3112	1.72	49	31.5	23.0	17.0	4/26	6.0	1	15.0	10.3	21	50	1.70		24.50		17.50				.65	.95	
60	22/ 7	3128	1.72	48	33.5	26.0	15.0	5/28	6.2	1	15.0	10.7	21	40	2.10		24.50		17.50				.71	.72	
61	23/ 7	3142	1.72	50	30.5	23.0	15.0	6/30	6.2	1	15.3	10.8	21	30	2.10		24.50		17.50				.68	.78	
62	24/ 7	3144	1.72	49	30.5	23.0	15.0	4/29	6.2	1	15.8	10.5	21	40	1.80		24.50		17.50				.68	.78	
63	25/ 7	3144	1.72	58	30.5	23.0	15.0	4/29	6.3	1	15.8	10.4	21	40	1.70		24.50		17.50				.68	.78	
64	26/ 7	3144	1.72	60	30.0	23.0	14.0	4/30	6.4	1	16.0	10.4	21	30	1.70		24.50		17.50				.70	.69	
65	27/ 7	3144																							
66	28/ 7	3144																							
67	29/ 7	3144	1.36	50	30.0	13.0	11.0	5/50	9.8	2	17.0	11.3	14	60	1.20		17.00		24.00				.62	.68	
68	30/ 7	3145	1.36	50	21.5	16.0	11.0	4/33	7.8	1	16.8	10.9	15	60	1.10		17.00		20.00				.67	.59	
69	31/ 7	3149	1.36	62	25.0	19.0	12.0	4/33	6.3	1	15.6	10.8	17	50	.60		17.00		24.00				.69	.61	
70	1/ 8	3156	1.36	66	23.5	21.0	15.0	5/32	5.5	1	14.2	10.5	17	80	.60		17.50		20.00				.66	.82	

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Mud Properties Record

MUD SYSTEM GEL/LIGNOSULPHONATE

WELL NAME 7119/12-3 AREA TROMSØFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

ENGINEERS WRIGHT/SUNDE/AARSETH/WERSLAND/VAAGA

Day No.	DATE 1983	DEPTH FEET ☐ METERS ☐ METER	MUD PROPERTIES: DENSITY PPG ☐ SG ☐ SG	VISCOSITY sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0 / 10 min	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis Cl⁻ ppm X 1000	Ca. ++ ppm T.H.	Pf	RETORT % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
71	2/ 8	3166	1.36	66	33.5	24.0	19.0	5/32	5.2	1	13.5	10.2	18	60	.45		17.50		20.00			.64	1.12	
72	3/ 8	3169	1.36	68	32.5	24.0	14.0	5/34	5.1	1	13.2	10.3	18	40	.45		17.50		20.00			.71	.68	
73	4/ 8	3138	1.53	71	34.5	26.0	17.0	7/48	5.3	1	13.6	11.1	18	40	.80		20.00		20.00			.68	.88	
74	5/ 8	3149	1.57	75	34.5	25.0	17.0	6/48	5.1	1	13.2	10.2	18	40	.65		21.00		20.00			.67	.90	
75	6/ 8	3207	1.57	65	34.0	25.0	18.0	6/47	5.3	1	13.5	9.9	18	140	.60		20.50		20.00			.66	.99	
76	7/ 8	3225	1.57	60	32.0	24.0	16.0	6/34	4.8	1	12.0	10.0	18	50	1.10		21.00		18.00			.68	.84	
77	8/ 8	3248	1.57	58	38.0	23.0	15.0	4/30	4.8	1	12.5	10.1	18	60	1.20		21.50		17.50			.68	.78	
78	9/ 8	3267	1.57	60	39.0	23.0	16.0	5/32	4.8	1	12.5	10.0	18	60	1.30		21.00		17.50			.67	.86	
79	10/ 8	3304	1.57	58	31.0	24.0	14.0	5/27	4.7	1	14.8	10.4	18	160	1.50		21.00		17.50			.71	.68	
80	11/ 8	3314	1.57	56	30.0	25.0	14.0	5/28	4.7	2	15.0	10.2	18	160	1.20		21.00		17.50			.71	.66	
81	12/ 8	3314	1.57	61	26.5	20.0	13.0	4/24	4.6	1	15.0	9.8	18	60	1.30		21.00		17.50			.68	.67	
82	13/ 8	3314	1.57	65	30.0	23.0	14.0	4/27	4.6	1	15.0	9.9	18	60	1.30		21.00		17.00			.70	.69	
83	14/ 8	3314	1.57	68	31.0	24.0	14.0	4/28	4.7	1	15.0	9.7	18	60	1.30		21.00		17.00			.71	.68	
84	15/ 8	3314	1.57	65	27.5	21.0	13.0	4/23	4.6	1	15.0	9.8	18	70	1.20		21.00		17.00			.69	.65	

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO – STAVANGER

Drilling Mud Properties Record

MUD SYSTEM GEL/LIGNO

WELL NAME 7119/12-3 AREA TROMSØFLAKET
OPERATOR STATOIL RIG. DYVI DELTA
ENGINEERS SUNDE /WRIGHT/AARSETH/VAAGA/WERSLAND

Day No.	DATE 1983	DEPTH FEET □ METERS □ METER	MUD PROPERTIES: DENSITY PPG □ SG □ SG	VISCOSITY: sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0 / 10 min	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis: Cl⁻ ppm X 1000	Ca ++ ppm T.H.	Pf	RETORT: % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
85	16/ 8	3314	1.56	64	28.0	22.0	12.0	4/32	4.8	1	15.6	9.8	18	40	1.30		21.00		17.00			.72	.56	
86	17/ 8		1.56	64	28.0	22.0	12.0	4/33	4.8	1	15.6	9.8	18	50	1.30		21.00		17.00			.72	.56	
87	18/ 8		1.56	65	27.0	21.0	12.0	4/33	4.8	1		9.7	18	50	1.20		21.00		17.00			.71	.57	
88	19/ 8	3316	1.57	58	22.5	17.0	11.0	4/31	5.4	1	17.4	11.5	18	60	1.50		21.00		16.00			.68	.57	
89	20/ 8	3316	1.57	55	21.0	16.0	10.0	3/23	5.1	1	16.2	11.6	18	60	1.70		20.00		16.00			.69	.50	
90	21/ 8		1.57	56	21.0	16.0	10.0	3/21	5.2	1	16.4	11.6	18	60	1.70		20.00		16.00			.69	.50	
91	22/ 8		1.57	58	23.0	18.0	10.0	4/26	5.5	1	17.0	11.5	18	60	1.20		20.00		15.00			.72	.47	
92	23/ 8		1.57	59	23.0	18.0	10.0	4/29	4.8	1	15.4	11.6	18	60	1.40		20.00		16.00			.72	.47	
93	24/ 8		1.57	59	23.0	18.0	10.0	3/24	5.1	1	16.6	11.7	18	60	1.40		20.00		16.00			.72	.47	
94	25/ 8		1.57	60	24.0	19.0	10.0	4/27	4.9	1	16.2	11.5	18	60	1.30		20.00		16.00			.73	.46	
95	26/ 8		1.57	61	25.0	20.0	10.0	4/25	4.8	1	16.0	11.4	18	60	1.20		20.00		16.00			.74	.45	
96	27/ 8		1.57	58	24.5	20.0	9.0	4/24	5.0	1	16.2	11.3	18	60	1.20		20.00		16.00			.76	.39	
97	28/ 8		1.57	57	24.5	20.0	9.0	3/23	5.0	1	16.2	11.1	18	60	1.10		20.00		16.00			.76	.39	
98	29/ 8		1.57	57	23.5	19.0	9.0	3/24	5.1	1	16.4	11.2	18	80	1.10		20.00		16.00			.75	.40	

REMARKS

ANCHOR DRILLING FLUIDS AS
OSLO — STAVANGER

Drilling Mud Properties Record

WELL NAME 7119/12-3 AREA TROMSØFLAKET

OPERATOR STATOIL RIG. DYVI DELTA

MUD SYSTEM GEL/LIGNO ENGINEERS SUNDE

Day No.	DATE 1983	DEPTH FEET □ METERS □ METER	MUD PROPERTIES: DENSITY SG / PPG □ SG □	VISCOSITY: sec/qt	A.V. cps	P.V. cps	Y.P. #/100 sq.ft.	GELS 0 / 10	FLUID LOSS 30 Min cc's	CAKE 32 nds	H.T.H.P. cc's	pH	Filtrate Analysis: Cl⁻ ppm X 1000	Ca ++ ppm T.H.	Pf	RETORT: % OIL	% SOLIDS CORR.	% SAND	BENTONITE #/BBL	POTASH #/BBL	POLYMER #/BBL	"N"	"K"	OPERATION REMARKS
99	30/ 8	3314	1.57	57	23.5	19.0	9.0	3/23	5.1	1	16.4	11.2	18	80	1.10		20.00		16.00			.75	.40	
100	31/ 8		1.57	60	23.5	19.0	9.0	3/23	5.2	1	16.5	11.2	18	80	1.10		20.00		16.00			.75	.40	
101	1/ 9		1.57	59	24.0	19.0	10.0	3/23	5.2	1	16.5	11.2	18	80	1.10		20.00		16.00			.73	.46	
102	2/ 9		1.57	59	24.0	19.0	10.0	3/24	5.2	1	16.5	11.2	18	80	1.10		20.00		16.00			.73	.46	
103	3/ 9		1.57	58	24.0	19.0	10.0	3/23	5.2	1	16.5	11.2	18	80	1.10		20.00		16.00			.73	.46	
104	4/ 9		1.57	56	23.0	18.0	10.0	3/22	5.4	1	16.8	11.0	18	80	1.00		20.00		16.00			.72	.47	
105	5/ 9		1.57	58	24.0	19.0	10.0	3/22	5.6	1	17.2	10.8	18	80	.80		20.00		16.00			.73	.46	
106	6/ 9		1.57	57	24.0	19.0	10.0	3/22	5.7	1	17.2	10.7	18	80	.80		20.00		16.00			.73	.46	
107	7/ 9		1.57	57	23.0	18.0	10.0	3/22	5.9	1	17.8	10.6	18	80	.60		20.00		20.00			.72	.47	
108	8/ 9		1.57	60	23.0	18.0	10.0	4/25	5.8	1		10.8	18	80	.70		20.00		16.00			.72	.47	
109	9/ 9		1.57	63	21.0	16.0	10.0	4/28	6.0	1		11.2	18	80	1.00		20.00		16.00			.69	.50	
110	10/ 9		1.58	60	21.5	16.0	11.0	5/31	5.8	1		11.4	18	80	1.10		20.00		16.00			.67	.59	
111	11/ 9																							

REMARKS

2 RFT-sampling

One segregated sample was taken at 3187 m RKB. The 2 3/4 gallon chamber was bled off on the rig. It had an opening pressure of 37.9 barg and contained 0.226 m^3 of gas and 9.5 l of mudfiltrate with a condensate film on the top of the filtrate. The 1 gallon chamber was drained onshore and had an opening pressure of 53 barg. at 17°C. It contained 22.2 l of gas and 3.525 l mudfiltrate.

3 Testing

One drill stem test was performed in the Jurassic sandstone. Perforated interval 3185-3195 m RKB.

Table V 4

SUMMARY OF TEST RESULTS, DST 1 A

Permeability height (kh)	= 240.05 mD m
Permeability (k)	= 17.4 mD (0.0172 um^2)
Skin s	= 5.2
dp skin	= 4101 kPa
Drainage radius (rd)	= 307 m

INPUT PARAMETERS (measured data and correllations)

Producing interval	: 13.8 m
Perforated interval	: 10.0 m
Average porosity	: 5.3%
Average water saturation	: 28.9%
Formation water salinity	: 85 000 ppm NaCl
Formation temperature	: 131.3^{o}C
Relative density of reservior fluid	: 0.718
z-factor at reservoir conditions	: 1.1511
E (formation expansion factor)	: 294.1 Sm^3/m^3
Viscosity ug at reservoir conditions	: 3.09x10^{-5}Pa s
Total isothermal compressibility	: 9.967x$10^{-6}kPa^{-1}$
Wellbore radius	: 0.1080 m
Estimated cumulative flow	: 515 400 Sm^3
Average final flow rate	: 956 900 Sm^3/D
Effective flowing time	: 13.12 hr
Final flowing pressure, Pwf	: 36 970 kPa
Plhour	: 46 382 kPa
Reservoir pressure P*	: 47 435 kPa
Slope of Horner straight line	: 915.7 kPa/log

GEOCHEMICAL SERVICE REPORT

Prepared for

STATOIL

GEOCHEMICAL EVALUATION OF THE STATOIL 7119/12-3 WELL

TROMS CONCESSION, NORWEGIAN SEA

October 1983

CHESTER STREET · CHESTER CH4 8RD · ENGLAND

GEOCHEMICAL EVALUATION OF THE STATOIL 7119/12-3 WELL TROMS CONCESSION, NORWEGIAN SEA

SUMMARY

The section between 420 metres and 3314 metres has been evaluated.

Tertiary mudstones between 420± metres and 990± metres are immature and have a minimal potential for gas.

Sediments of Cretaceous age extend from 990 metres down to 3030± metres. Above 2300± metres the dominant mudstones and medium dark grey shales are immature and a potentially poor source for gas and associated liquids. The underlying silty mudstones and medium dark grey shales achieve "oil window" maturity at 3000± metres but, because their organic matter is of poor quality, the volumes of gas and condensate generated will be negligable.

Jurassic mudstones and shales overlie a sandstone unit which occupies the basal 150± metres of the section. Although mature these mudstones and shales are poor source rocks, with minor fair (possibly good) interbeds. They are, consequently, generating minor volumes of gas.

Shows of gas, wet gas/condensate plus traces of crude oil occur widely within the analysed section and are discussed in more detail in the "Conclusions". The presence of these migrated hydrocarbons suggests, since the analysed sediments are poor, the proximity of good mature source rocks.

M.J. Sauer

M.J. Sauer
GEOCHEM LABORATORIES (UK) LIMITED

INTRODUCTION

This report presents a geochemical evaluation of the section between 420 metres and 3314 metres in the Statoil 7119/12-3 well, drilled in the Troms Concession, Norwegian Sea.

The study was designed to evaluate the hydrocarbon potential of the section in terms of richness, maturity and potential for oil or gas. Tests were performed to detect and characterise migrated hydrocarbons.

This project was authoried by Dr. H. Irwin.

A Analytical

A total of one hundred and two (102) canned samples composited over 30 metre intervals and twenty two sidewall cores were received from the 308-3314 metres interval. The samples were assigned the Geochem job number 794.

The cuttings samples below 900± metres emitted an oily smell and grease was present in the samples below 2010± metres (moderately heavy contamination at 2880-3314± metres).

Caving, often severe, is widespread in the section. The interval betwwen 2180 metres and 2865 metres was turbodrilled (communication from client).

The sediments were screened using the light hydrocarbons (C_1-C_7) and the organic carbon analyses. Samples for further analysis were selected on the basis of the screen results. A total of one hundred light hydrocarbons analyses, ninety five organic carbon determinations, forty visual kerogen analyses, thirty vitrinite reflectance determinations, sixteen extractions with chromatography, sixteen paraffin naphthene analyses, twelve Rockeval pyrolysis analyses, twenty pyrolysis-GC analyses were performed in this study.

The data are presented in tables 1 to 8 and presented graphically in figures 1 to 8. A brief description of the methods employed is included in the back of this report.

B. General Information

Ten (10) copies of this report have been forwarded to Dr. H. Irwin, Statoil together with the kerogen slides. A copy of the data has been retained by Geochem for future consultation with authorised Statoil personnel.

The remaining samples material will be handled as directed.

The results of this study are proprietary to Statoil.

RESULTS AND DISCUSSION

Each of the parameters relevant to the evaluation of 420-3314 metres interval will be considered in turn and then combined to form the "Conclusions".

Canned cuttings samples within the turbodrilled interval (2180-2865 metres) have been supplemented by sidewall cores. A relatively high proportion of caved material is present in the cuttings samples has complicated the interpretation of this section.

References to stratigraphic units are derived from a prognosis supplied by the client.

A. ZONATION

This zonation is based upon formation tops and breaks in the geochemical data. A total of five (5) zones are recognised.

Zone A (420-990± metres) in a sequence of (Tertiary) mudstones and, above 510± metres, sandstones. Down to 720± metres the mudstones are medium olive grey to light olive grey but below this depth they are uniformly light grey.

The gaseous C_1-C_4 hydrocarbons range from 2472 ppm up to 20844 ppm and commonly exceed 10000 ppm. They are very dry (1.9-16.6% C_{2+} hydrocarbons) above 480± metres but gas wetness (31.9-65.3%) increases irregularly with depth in the underlying sediments. Gasoline range (C_5-C_7) hydrocarbons are sparse (41 ppm) at 420-450± metres but become richer with depth; reaching a maximum of 10076 ppm at 960-990± metres. Isobutane to normal butane ratios decrease from 1.92 (at 450-480± metres) to 0.45(at 930-960± metres). The combined light hydrocarbon data indicate that migrated hydrocarbons have diffused into this zone.

Zone B[1] 990± metres to 1710± metres corresponds to the upper part of the Cretaceous (990-3060± metres). Medium light grey to light grey mudstones resembling those in basal Zone A occur above 1170± metres. They overlie an interval of medium grey mudstones and shaly mudstones which extends down to 1500± metres. Medium dark grey to medium grey shales predominate below 1500± metres

although significant interbeds of medium light grey to medium grey mudstone are also present.

The C_1-C_4 gases are leaner than those in Zone A; ranging from (934)2977 ppm up to 17262 ppm although samples containing more than 10000 ppm are few. Gas wetness ranges erratically between 40.2% (marginally wet) and 84.9% (very wet) whilst the isobutane ratios are relatively low at 0.44-0.89. The C_5-C_7 hydrocarbons (270-8984 ppm, generally greater than 1000 ppm) follow the distribution of the C_1-C_4 fraction; peaking at 1080-1110± metres and at 1500-1560± metres.

Zone B^2 (1710-2270± metres) is, lithologically similar to Zone B^1 consisting of interbedded medium dark grey shales and medium grey mudstones.

The gas and gasoline fractions are comparable in abundance - (682)1113-9351 ppm and 561-10084 ppm respectively - to those in Zone B^1 but a marginal increase in gas wetness overall (39.1-89.1% C_{2+} hydrocarbons) is apparent. The isobutane to normal butane ratios (0.38-0.96) differ little from those in Zone B^1.

Zone B^3 lies between 2220± metres and 3030± metres. The cuttings samples contain a high proportion of medium dark grey to brownish grey (silty) mudstones (which appear to be turbodrilled) and medium dark grey shales (heavily caved). Both of these lithologies are present in sidewall core samples and the cuttings are, therefore, believed to be representative of this interval. Minor sandstones are also present in the basal 90± metres.

Above 2370± metres the gases are comparable in abundance (3244-9149 ppm) to those in Zone B^2 but below this depth they are, apart from a leaner interval at 2910-3000± metres, significantly richer at (9072) 11247-23458 ppm. The C_1-C_4 hydrocarbons are dry to marginally wet down to 2550± metres (19.2-49.3% C_{2+} hydrocarbons) but in the underlying sediments gas wetness commonly exceeds 50% rising to a maximum of 85.8%. The richest and wettest intervals being 2550-2670±

metres, 2760-2910± metres and below 3000± metres. Gasoline range hydrocarbons improve to 5758-17629 ppm at 2400-2910± metres and below 3000± metres; elsewhere they are less than 2658 ppm. The low isobutane to normal butane ratios (0.25-0.64, generally less than 0.5) in conjunction with the abundance and wetness of the light hydrocarbons are strongly suggestive of migrated hydrocarbons at 2400-2910± metres and at 3000-3030± metres.

Zone C extends from 3030± metres down to the deepest sample at 3314± metres and is composed of Jurassic sediments. Dark brownish grey and brownish grey silty mudstones are interbedded with dark grey to medium dark grey shales above 3160± metres. They overlie a fine grained sandstone unit.

A pale milky cut, but no fluorescence, was detected in the sands at 3270-3314± metres.

A fairly strong show (30774-34889 ppm) of wet gas (74.1-89.4%) was detected above 3120± metres and of somewhat drier gas (10134-10997 ppm, 20.2-31.8%) in the basal 50± metres. The intervening sediments are leaner (1137-6930 ppm) in gas which is dry to marginally wet (19.1-46.9%) or, at 3120-3150± metres, wet (70.8%). The gasoline fraction is sparse 196-692 ppm at 3150-3300± metres but improves to 1739-7320 ppm above and below this interval. Isobutane to normal butane ratios are higher than hitherto at 0.49-0.82.

B. AMOUNT AND TYPE OF ORGANIC MATTER

The amount of organic matter within a sediment is measured by its organic carbon content. Average shales contain approximately one percent organic carbon, and this is the standard to which these samples will be compared.

Organic matter type influences not only source richness but also the character of the hydrocarbon product (oil, gas) and the response of the organic matter to thermal maturation. Richness and oiliness decrease in the order: amorphous-algal-herbaceous-woody. Wood has a primary (but not exclusive) potential for gas whilst inertinitic (oxidised, mineral charcoal) material has only a limited hydrocarbon potential.

Organic carbon contents peak at 600-690± metres (1.31-1.88%) but are generally below 'average' (0.26-0.93%) in the Zone A mudstones. Similar values (0.33-0.82%) apply to the Zone B^1 mudstones above 1500± metres but the underlying shales and mudstones are slightly richer at (0.36) 0.75-1.03%. Organic carbon values change little in Zone B^2 shales (0.69-1.22%) and mudstones 0.71-1.06%. A modest improvement is, however, apparent in the silty mudstones and shales of Zone B^3 wherein the organic carbon contents (0.85-2.65%) are generally above 'average'. The Zone C shales are also of above average (1.16-1.80% organic carbon) richness but the interbedded dark brownish grey mudstones are richer still with values of 1.38-4.58%, 9.08% at 3100± metres.

Organic matter in the Zone A mudstones chiefly consist of woody, inertinitic and herbaceous debris, with minor amounts of algal and amorphous kerogen. The same type of organic matter is present in the Zone B^1 mudstones although inertinite is generally dominant and the amorphous material, which occasionally reaches significant proportions, is disseminated, of poor quality and not necessarily oil prone. Below 1400± metres the 'amorphous' material resembles drilling introduced contamination. A mixture of wood and inertinite, with significant herbaceous and minor to significant amorphous kerogen is present in the shales and shaly mudstones of Zone B^2, and down to 2300± metres in Zone B^3. The amorphous fraction, slightly more abundant in the cuttings samples, resembles that found in overlying sediments. Sidewall cores representing the shales and silty mudstones down to 3000± metres in Zone B^3 contain organic matter which consists mainly of woody debris. Significant proportion of inertinitic and herbaceous kerogen are present but the 'amorphous' fraction is sparse and largely unrecognisable. Assessment of the corresponding cuttings samples is complicated by the presence of caved material and by the effects of turbodrilling. Their organic matter appears to be a mixture of woody, inertinitic, amorphous (degraded, poor quality) and herbaceous material. The silty mudstones and shales at 3000-3150± metres differ in one respect from those above 3000± metres in Zone B^3, in that they contain significant amounts of degraded amorphous organic matter.

Overall the organic matter in the analysed sediments is of poor quality. The woody kerogen is reworked and the amorphous material is disseminated and degrded in appearance - it is not oil prone. These observations are compatible with the minimal hydrocarbon potenital measured by the pyrolysis analysis (see Section D).

C. LEVEL OF THERMAL MATURITY

Thermal maturity has been evaluated using the visual kerogen (spore colour) and vitrinite reflectance techniques.

Assessments of maturity by the first method were complicated by the paucity of herbaceous material in the cuttings generally and by the effects of turbodrilling in the sediments at 2180-2865± metres. Numerous sidewall cores within this interval alleviate the latter problem. Maturation indices, based upon spore colour, range from 1+ at the top of the section to 2- at 1700± metres, reach 2 at 2300± metres, 2 to 2+ at 2422± metres (possibly by 2400± metres) and a maximum value of 2+ at 3000± metres. The effects of caving at 2400-2800± metres, are apparent when the values for cuttings (commonly at 2) and the sidewall cores (at 2 to 2+) are compared. The interval of significant maturity (i.e. 2 up to 2 to 2+) is unusually narrow and may be due to an unconformity between 2300± metres and 2400± metres. The combined effects of caving, turbodrilling and reworking will aso contribute to the concertainty associated with the level of maturity in this interval. Herbaceous kerogen at a higher maturation level than that believed to be the present maturity of the sediments was found in many of the samples (including the sidewall cores). This organic matter is most probably reworked.

Bitumen staining, resulting in depressed reflectance readings, and reworking of the woody organic matter were commonly observed during the measurements of vitrinite reflectances. Organic matter reworked from older, more mature, sediments is suggested by the presence of several, often high reflectance, vitrinite populations and is confirmed by the appearance of the woody material under the microscope. Mean reflectance (% Ro) range from 0.37 up to a maximum of 5.27 which, when plotted against depth, fall into two groups. The first, and larger group contains vitrinite in excess of 1% Ro which is believed to be reworked material. Within the second group there is a tenuous trend through the low maturity vitrinite populations ranging from 0.38-0.41% Ro above 1200± metres to 0.45% between 1400± metres and 1700± metres, achieving 0.53% Ro at approximately 2200-2300± metres and 0.79-0.81% at 2400-2500± metres. Few readings were obtained from the turbodrilled cuttings at 2180-2865± metres, which appear to be barren. The scattered measurements from the cuttings in this interval have values of 0.6-0.68% Ro and may represent caved material. Reflectances of 0.79% Ro at 2422 metres and 0.81% at 2499 metres are believed to be reliable but the deeper sidewall cores gave values exceeding 1% Ro - suggesting that the woody organic matter could be totally reworked. The

maturation trend below 2400± metres is therefore less clearly defined than that in the shallower sediments.

Maturation indices of 2-, 2 and 2 to 2+ normally correlate with vitrinite reflectances of 0.45%, 0.53% and 0.72% Ro respectively. There is, thus, an acceptable agreement between the two methods above 2400± metres although both techniques are adversely affected by the quality of the organic matter. On balance, the visual kerogen data are believed to be more reliable and will be adopted in this study.

Rockeval pyrolysis Tmax values increase irregularly with depth and grossly correlate with the maturation levels determined by the above methods.

Amorphous, herbaceous and algal kerogen types become marginally mature (minor hydrocarbon generation) at an index of 2-, significant generation commences at 2 and the top of the oil window occurs at 2 to 2+; for woody kerogen the corresponding values are 2, 2 to 2+ and 2+. Wood, and inertinite, is relatively abundant and, therefore, dictates the effective maturity of the sediments. They are, thus, totally immature above 2300± metres, marginally mature at 2300-2400± metres, realising a significant proportion of their ultimate hydrocarbon potential below 2400± metres and enter the oil window at 3000± metres.

D. SOURCE RICHNESS

Preliminary assessments of present and potential source richness are normally based upon the abundance of light hydrocarbons and of organic carbon.

In this well section, however, the C_1-C_4 hydrocarbons are commonly wet to very wet (suggesting that the indigenous species have been enhanced by out of place hydrocarbons) and their abundance cannot, therefore, be used as a measure of source richness.

Organic carbon contents indicate that Zones A and B^1 (down to 1500± metres) have a poor to fair occasionally good hydrocarbon potential whereas Zones B^1 (below 1500± metres), B^2 and B^3 are generally good. Zone C is rated as a good to very good, with rich interbeds, source. Wood and inertinite, common in the analysed sediments, have a relatively poor hydrocarbon potential and the organic carbon based ratings are, therefore, optimistic.

Source richness may be deduced from the abundance of indigenous C_{15+} hydrocarbons. In Zone A the C_{15+} hydrocarbons amount to 102-190 ppm, suggesting a fair potential, but the substantial baseline hump in the C_{15+} paraffin naphthene chromatograms indicates enhancement if the indigenous hydrocarbons by drilling mud additives. The indigenous fraction, estimated to be less than 100 ppm, corresponds to a poor rating. Source indigenous paraffins displaying a marked odd carbon preference are prominant in the extracts from Zones B^1 and B^2 although they too are contaminated. The hydrocarbon to total extract ratios (37.7-58.3%) are higher than expected from immature sediments and confirm the presence of non indigenous hydrocarbons. Allowing for this contamination Zones B^1 and B^2 are a poor, or at best fair (less than 200 ppm) hydrocarbon source rather than the fair to very good rating suggested by their C_{15+} hydrocarbon yield (131-742 ppm). The (silty) mudstones and shales of Zone B^3, which yielded (158) 408-855 (1882) ppm C_{15+} hydrocarbons appear to be good to very good, possibly rich source rocks. However, hydrocarbon to total extract ratios commonly exceed 40% (37.7-67.9%) and enhancement of the indigenous species by out of place hydrocarbons has occured. Chromatograms of the C_{15+} paraffin-naphthene fraction have a baseline hump (due to contamination from the mud system) and perceptable odd carbon paraffin preference (source indigenous hydrocarbons?). The shape of the paraffin envelope suggests that traces of crude oil may also be present (see Section E). Indigenous hydrocarbons are <u>estimated</u> to be less than 250 ppm - corresponding to a fair rating for Zone B^3. Zone C is affected by traces of condensate or light oil at 3060-3090± metres (see Section E) and by contamination (diesel?). The hydrocarbon potential of these mudstones and shales cannot, therefore, be evaluated by this parameter.

Source richness at optimum maturity is measured by the pyrolysate yield (S2 peak). With one exception (3.18 mg/g at 3100± metres) the analysed mudstones and shales yielded less than 2.0 mg/g pyrolysate and are, therefore, poor source rocks. Furthermore, if the yield of the richest dark brownish grey silty mudstones at 3100± metres is related to the organic carbon content (9.08%) then they too have a relatively poor (production index 35.02) hydrocarbon potential.

Potential hydrocarbon products (gas, condensate or oil) may be identified from the pyrolysis-GC traces. Gas prone source rocks generate a strong methane peak and a limited number of light, chiefly aromatic, hydrocarbons in the gas/gasoline range. An extension of the hydrocarbon range, to approximately nC_{15}, indicates a potential for gas and condensate. From an inspection of the

pyrolysis-GC traces it is evident that the richest mudstones in Zone A have a poor potential for gas but Zone B^1 is lean and no analyses were performed in this interval. Analyses of sidewall cores from the shales at 1835-2700± metres indicate a potential for gas and condensate whereas the cuttings samples within this interval appear to be gas prone. This discrepancy is attributed to the affects of turbodrilling on the cuttings samples. The extended series of alkanes visible in the pyrolysis-GC traces from the sidewall cores between 2186± metres and 2700± metres does not indicate a potential for oil; oil prone sediments normally generate a series of alkene-alkane double peaks and not isolated alkanes. Persistant contamination, possibly from the sidewall core bullets, is suspected. The dominant silty mudstones and shales occuring below 2700± metres have a primary potential for gas. They are, to a large extent, realising this limited potential below 3000± metres.

To summarise:

- Tertiary mudstones occuring within Zone A (420-990± metres) have a poor potential for gas

- the Cretaceous (990-3030± metres) mudstones, shales and silty mudstones of Zones B^1-B^3 also have a poor potential - for gas and condensate at 1835-2700± metres and for gas elsewhere

- poor silty mudstones and shales, with minor fair (possibly good at 3100 ±metres) interbeds, of Jurassic age are present at 3030-3180± metres in Zone C.

E. MIGRATED HYDROCARBONS

The abundant of light hydrocarbons, particularly in Zones A, B^3 and C, is greater than normally associated with poor source rocks - out of place migrated hydrocarbons are suspected. This conclusion is supported by the abnormally high, for immature and marginally mature sediments, gas wetness values above 2400± metres. Below this depth gas wetness is non diagnostic since the sediments are approaching "oil window" maturity. Low isobutane to normal butane ratios, especially in Zone B^3 are also compatible with migrated hydrocarbons. Thus, the light hydrocarbons data suggest shows of dry to marginally wet gas in Zone A (420-900± metres), intermittant kicks of wet gas in Zone B^1 (990-1710± metres) and further traces in Zone B^2 (1710-2220± metres). Fairly strong shows of wet gas/condensate were observed, in a

mudstone shale sequence, in Zone B^3 at 2370-2910± metres and in the shales and minor sands below 3000± metres, extending down to 3120± metres in Zone C. Shows of dry to marginally wet gas were detected in the sands at 3270-3314± metres.

The C_{15+} hydrocarbons (131-742 ppm) extracted from the mudstones and shales of Zones B^1-B^2 are more abundant than expected from poor source rocks. Their hydrocarbon to total extract ratios generally exceed 40% (37.7-58.3%), confirming that the indigenous hydrocarbons have been enhanced by non indigenous species. Chromatograms of the C_{15+} paraffin-naphthene fraction although they show the odd carbon paraffin preferance, characterisic of indigenous hydrocarbons also display the substantial baseline humps normally associated with drilling introduced contaminants or the biodegraded residue of a crude oil. Zone B^3 is richer in C_{15+} hydrocarbons yielding (158) 408-1882 ppm. The hydrocarbon to total extract ratios however, (37.7-67.9%) are anomalously high for source indigenous species. Paraffin naphthene traces are grossly similar to those in Zones B^1 and B^2 but display a greater abundance of n-paraffins. These traces lack the flat baseline and mature paraffin profile normally assoicated with a crude oil. The hydrocarbons are, however, out of place and since their distribution appears to be uncorrelated with that of the light hydrocarbons are believed to be a dead stain. There is some uncertainty associated with the identity of these hydrocarbons since traces of drilling introduced species are also suspected. An exception to this generalisation are the silty mudstones at 3060-3090± metres wherein the C_{15+} hydrocarbons (463 ppm, 57.8% of the total extract) produced a chromatogram which has a flat baseline and smooth paraffin distribution, terminating at nC_{30}; a show of condensate or light oil is suggested. At 3100± metres and at 3300-3314± metres, however, the C_{15+} hydrocarbons are drilling introduced (diesel and naphthene type mud additives).

Shows of wet gas and condensate, plus traces of crude oil, occur widely within the analysed sediments - suggesting a proximity to good mature source rocks. The analysed sediments, although they reach optimum maturity for hydrocarbon generation, below 3000± metres, lack the necessary richness to be effective source rocks. It would appear, therefore, that rich and mature source rocks lie within the drainage area of this structure.

To summarise:

- shows of moderately wet gas were detected in Zone A (420-990± metres)

and intermittant kicks of similar hydrocarbons are present in Zone B^1 (990-1710± metres)

- traces of wet gas/condensate have diffused into the Zone B^2 shales, notably at 1740-1860± metres

- somewhat stronger shows of wet gas and condensate are present in Zone B^3 at 2400-2910± metres and in the basal 30± metres.

- traces of crude oil, believed to be a dead stain, are suspected in Zone B^3 but their identification is hindered by drilling introduced contamination

- a fairly strong show of wet gas/condensate, (plus light crude oil at 3060-3090± metres) was detected at 3030-3120± metres

- the source of these shows is not represented in the analysed sediments.

F. CONCLUSIONS

The section between 420 metres and 3314 metres has been evaluated and, for the purposes of this study, has been divided into five (5) zones. Prognosed formation tops were supplied by the client.

Zone A (420-990± metres) corresponds to the Tertiary and consists of mudstones with interbedded sandstones (above 510± metres). The mudstones generally light brownish grey or medium light grey to light grey have organic carbon contents of 1.31-1.88% at 600-690± metres but are generally of below average (0.26-0.93% organic carbon) richness. Their organic matter consisting mainly of wood and inertinite is immature and, furthermore, has a minimal potential for gas. Zone A lacks effective source rocks.

The sediments between 990± metres and 3030± metres are understood to be of Cretaceous age. This interval has been divided into three zones.

Zone B^1 lies between 990± metres and 1710± metres. Medium light grey to light grey mudstones pass, below 1170± metres to an interval of medium grey mudstones and darker coloured shales. The sediments generally have below average (0.33-1.03% organic carbon) contents of organic matter which chiefly consists of inertinite and wood with lesser amounts of amorphous, herbaceous

and algal debris. With very few exceptions the "amorphous" organic matter in this well section is disseminated, largely unrecognisable and of poor quality. Zone B^1, therefore, has a negligible hydrocarbon potential.

Zone B^2, 1710± metres down to 2220± metres, consisting of interbedded medium dark grey shales and medium grey mudstones, is lithologically similar to Zone B^1. At 0.69-1.22% the organic carbon contents are slightly higher than hitherto whilst the organic matter, mainly consists of wood and inertinite, in equal proportions. The minor to significant amorphous, herbaceous and algal fraction is marginally mature (minor hydrocarbon generation) but the predominant wood and inertinite is immature and determines the effective maturity of these sediments. They have a poor potenital for gas and associated liquids. Zone B^2 is, therefore, rated as an immature and potentially poor gas/condensate source.

Zone B^3 (2220-3030± metres) is a sequence of medium dark grey to brownish grey silty mudstones and medium dark grey shales with minor sands in the basal 60± metres. Organic carbon contents improve to 0.86-2.65% but the organic matter, consisting mainly of reworked wood plus significant amounts of inertinitic and herbaceous kerogen, differs little from that in the overlying sediments. The mudstones and shales within Zone B^3 consequently have a poor hydrocarbon potential. Generation of gas/condensate has been initiated above 2400± metres. Between 2400± metres and 3000± metres the sediments achieve a significant proportion of their ultimate hydrocarbon potential and reach optimum maturity below 3000± metres. The poor quality of the organic matter will however limit hydrocarbon generation to minor volumes of gas and associated liquids above 2700± metres and of gas below this depth.

Zone C corresponds to the Jurassic and extends from 3030± metres down to 3314± metres. Dark brownish grey to brownish grey silty mudstones and dark grey to medium dark grey shales overlie, at 3160± metres, a fine grained sandstone unit. The mudstones have a good to very good (1.38-4.58%) organic carbon contents, with rich (9.08% at 3100± metres) interbeds. Somewhat lower values (1.16-1.80%) apply to the shales. Despite these high organic carbon contents the organic matter (consisting mainly of woody with significant herbaceous, amorphous and inertinitic, kerogen) has a minimal potential for gas. This inability to generate more than traces of hydrocarbons is attributed to the reworked nature of the woody material and to the degraded state of the amorphous fraction. Thus, the mudstones and shales of Zone C although they are in the maturation oil window are only generating minor volumes of gas.

Shows of moderately wet gas were detected below 510± metres in the Zone A mudstones and kicks of similar hydrocarbons are present in Zone B^1. Significant traces of wet gas and condensate have diffused into Zone B^2 (1710-2220± metres) but the shows in Zone B^3 are stronger, notably at 2400-2900± metres. In addition to gas and associated liquids traces of crude oil (dead stain?) are suspected below 2400± metres in Zone B^3. Identification of the latter was, however, hindered by the presence of drilling introduced contaminants. Fairly strong shows of wet gas/condensate and light crude oil (at 3060-3090± metres) were detected in the silty mudstones at 3030-3120± metres. A show of dry to marginally wet gas was detected in the sands at 3270-3314± metres.

The presence of these shows suggests, since the analysed sediments are generally poor source rocks, that good and mature source rocks (possibly coals) lie within the drainage area of the structure nonetheless.

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-005	420-450m	A 75% Mudstone, blocky, soft, non-calc., minor to sig. cavings, medium light grey	N6	0.68
		B 25% Sand, unconsolidated, medium grained, rounded to subrounded, poorly sorted, clear, white	N9	
		Minor basalt		
794-006	450-480m	A 70% Mudstone, as 794-005A, sig. cavings	N6	0.60
		B 15% Mudstone, blocky, soft, sl. shaly, non-calc., sig. cavings, light olive grey	5Y6/1	0.69
		C 15% Sand, as 794-005B	N9	
		Minor basalt		
		Minor LCM		
794-007	480-510m	A 85% Mudstone, as 794-006B, sig. to abundant cavings	5Y6/1	0.71
		B 10% Mudstone, as 794-005A, sig. cavings	N6	0.85
		C 5% Sand, as 794-005B	N9	
794-008	510-540m	A 98% Mudstone, blocky to platy, shaly in part, soft, non-calc., sig. to abundant cavings, light olive grey	5Y6/1	0.71,0.73
		Minor sand and other mudstone		
794-009	540-570m	A 98% Mudstone, as 794-008A, sig. to abundant cavings	5Y6/1	0.93
		Minor sand and other mudstone		
794-010	570-600m	A 98% Mudstone, as 794-008A, abundant cavings	5Y6/1	0.93
		Minor other mudstone		
794-011	600-630m	A 60% Mudstone, blocky, soft, non-calc., minor to sig. cavings, medium light grey to light olive grey	N6-5Y6/1	1.49
		B 40% Mudstone, as 794-008A, abundant to dominant cavings	5Y6/1	0.73
794-012	630-660'	A 90% Mudstone, as 794-011A, sig. cavings	N6-5Y6/1	1.88
		B 10% Mudstone, as 794-008A, dominant cavings	5Y6/1	0.86,0.84
794-013	660-690'	A 85% Mudstone, as 794-011A, sig. cavings	N6-5Y6/1	1.31
		B 10% Mudstone, shaly subfissile, non-calc., light olive grey	5Y6/1	0.79
		C 5% Mudstone, as 794-008A, dominant cavings	5Y6/1	0.79
		Minor other mudstone		
794-014	690-720'	A 98% Mudstone, blocky, shaly in part, soft to mod. hard, non-calc., sig. cavings, light grey to light olive grey	N7-5Y6/1	0.79
		Minor other mudstone - mostly caved		
794-015	720-750'	A 98% Mudstone, blocky, soft to mod. hard, non-calc., abundant cavings, light grey	N7	0.26

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

TABLE 1
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GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-016	750-780m	A 98% Mudstone, blocky, soft to mod. hard, non-calc., abundant cavings, light grey	N7	0.30
794-017	780-810m	A 98% Mudstone, as 794-016A, abundant to dominant cavings	N7	0.51,0.50
794-018	810-840m	A 98% Mudstone, as 794-016A, abundant cavings	N7	0.50
794-019	840-870m	A 98% Mudstone, as 794-016A, abundant cavings	N7	0.53
794-020	870-900m	A 98% Mudstone, blocky, soft to mod. hard, non-calc., abundant cavings, light grey Minor other mudstone	N7	0.54
794-021	900-930m	A 98% Mudstone, blocky, soft to mod. hard, non-calc., abundant cavings, medium light grey to light grey Minor other mudstone	N6-7	0.81
794-022	930-960m	A 98% Mudstone, as 794-021A, abundant cavings	N6-7	0.80
794-023	960-990m	A 98% Mudstone, as 794-021A, abundant cavings	N6-7	0.88,0.92
794-024	990-1020m	A 98% Mudstone, as 794-021A, abundant cavings	N6-7	0.55
794-025	1020-1050m	A 98% Mudstone, blocky, becoming shaly in part, soft to mod. hard, non-calc., sig. cavings, medium light grey	N6	0.66
794-026	1050-1080m	A 98% Mudstone, blocky, shaly in part, soft to mod. hard, non-calc., sig. to abundant cavings, medium light grey to light grey Minor other mudstone	N6-7	0.38
794-027	1080-1110m	A 98% Mudstone, as 794-026A, sig. to abundant cavings Minor other mudstone	N6-7	0.37
794-028	1110-1140m	A 98% Mudstone, as 794-026A, sig. cavings Minor other mudstone	N6-7	0.43
794-029	1140-1170m	A 98% Mudstone, as 794-026A, sig. to abundant cavings Minor other mudstone	N6-7	0.53,0.53
794-030	1170-1200m	A 60% Shaly mudstone, blocky to platy, soft to mod. hard, non-calc., sig. cavings, medium grey	N5	0.75
		B 40% Mudstone, blocky, soft to mod. hard, non-calc., sig. to abundant cavings, medium light grey to light grey	N6-7	0.42

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Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-031	1200-1230m	A 98% Shaly mudstone, blocky to platy, soft to mod. hard, non-calc., sig. cavings, medium grey Minor other mudstone and glauconite	N5	0.88
794-032	1230-1260m	A 98% Shaly mudstone, as 794-031A, sig. cavings Minor other mudstone	N5	0.56
794-033	1260-1290m	A 98% Shaly mudstone, as 794-031A, sig. cavings Minor other mudstone	N5	0.36
794-034	1290-1320m	A 98% Mudstone, blocky, soft to mod. hard, non-calc., sig. cavings, medium grey Minor limestone (caved?) and other mudstone	N5	0.47,0.47
794-035	1320-1350m	A 98% Mudstone, as 794-034A, sig. cavings Minor other mudstone and limestone	N5	0.72
794-036	1350-1380m	A 98% Mudstone, as 794-034A, sig. cavings Minor dolomite? and other mudstone	N5	0.76
794-037	1380-1410m	A 98% Mudstone, as 794-034A, sig. cavings Minor other mudstone and limestone	N5	0.74
794-038	1410-1440m	A 98% Mudstone, platy to blocky, shaly in part, mod. hard, non-calc., sig. cavings, medium grey Minor limestone, other mudstone and glauconite	N5	0.74
794-039	1440-1470m	A 98% Mudstone, as 794-038A, sig. cavings Minor limestone, pyrites and shell fragments	N5	0.75
794-040	1470-1500m	A 98% Mudstone, as 794-038A, sig. cavings Minor limestone and shell fragments (sponge spicules)	N5	0.79,0.83
794-041	1500-1530m	A 60% Shale, platy to subfissile, soft to mod. hard, non-calc., sig. cavings, medium dark grey to medium grey	N4-5	0.36
		B 35% Mudstone, blocky, soft, sl. silty, non-calc., sig. cavings, medium grey	N5	0.85
		C 5% Silty mudstone, blocky, soft, calc., minor cavings, very light brownish grey	5YR7/1	0.66
794-042	1530-1560m	A 65% Shale, as 794-041A, sig. cavings	N4-5	0.75
		B 35% Mudstone, as 794-041B, sig. cavings Minor other mudstone	N5	0.86
794-043	1560-1590m	A 75% Shale, as 794-041A, abundant cavings	N4-5	0.67,0.66
		B 25% Mudstone, as 794-041B, sig. cavings Minor other mudstone	N5	1.03
794-044	1590-1620m	A 65% Shale, platy to subfissile, mod. hard, non-calc., abundant cavings, medium dark grey	N4	0.91

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Lost Circulation Material, moderately, occasionally, slightly, very

TABLE 1
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GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-044	1590-1620m	B 35% Mudstone, blocky, soft, sl. silty, non-calc., sig. cavings, medium grey Minor siltstone, glauconite and pyrites	N5	0.96
794-045	1620-1650m	A 40% LCM - cement		
		B 30% Shale, platy to subfissile, mod. hard, non-calc., sig. cavings, medium dark grey	N4	1.02
		C 30% Mudstone, blocky, soft, non-calc., sig. cavings, medium light grey	N6	0.80
794-046	1650-1680m	A 80% Shale, platy, mod. hard, non-calc., sig. to abundant cavings, medium grey	N5	0.87,0.82
		B 20% Mudstone, as 794-045C, sig. cavings Minor limestone and other mudstone	N6	0.77
794-047	1680-1710m	A 95% Shale, as 794-046A, sig. to abundant cavings, medium grey	N5	0.90
		B 5% Mudstone, as 794-045C, abundant cavings Minor limestone	N6	
794-103 SWC	1714m	A 98% Shaly mudstone, subfissile, mod. hard, non-calc., medium dark grey to medium grey	N4-5	0.97
794-048	1710-1740m	A 98% Shale, platy, mod. hard, non-calc., sig. cavings, medium dark grey Minor mudstone and limestone	N4	1.22
794-049	1740-1770m	A 70% Shale, as 794-048A, sig. to abundant cavings	N4	1.18
		B 30% Mudstone, blocky, soft to mod. hard, non-calc., sig. cavings, medium grey Minor limestone	N5	0.92
794-104 SWC	1772m	A 98% Shaly mudstone, blocky to subfissile, soft, non-calc., minor banding, medium dark grey to medium grey	N4-5	0.93
794-050	1770-1800m	A 80% Shale, as 794-048A, sig. cavings	N4	1.19,1.20
		B 20% Mudstone, as 794-049B, sig. cavings	N5	0.75
794-051	1800-1830m	A 80% Shale, as 794-048A, sig. cavings	N4	1.00
		B 20% Mudstone, as 794-049B, sig. cavings	N5	0.87
794-105 SWC	1835m	A 98% Shale, platy to subfissile, soft to mod. hard, non-calc., medium grey to medium light grey	N5-6	1.03
794-052	1830-1860m	A 60% Shale, platy, mod. hard, non-calc., sig. cavings, medium dark grey	N4	1.02
		B 40% Mudstone, blocky, soft, sl. silty, non-calc., minor to sig. cavings, medium grey	N5	0.88
794-053	1860-1890m	A 60% Shale, as 794-052A, sig. cavings	N4	1.06,1.09
		B 40% Mudstone, as 794-052B, minor to sig. cavings	N5	0.90

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

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-054	1900m	M U D S A M P L E		
794-055	1890-1920m	A 60% Shale, platy, mod. hard, non-calc., sig. cavings, medium dark grey	N4	1.08
		B 40% Mudstone, blocky, soft, sl. silty, non-calc., minor to sig. cavings, medium grey	N5	0.71
794-056	1920-1950m	A 75% Shale, as 794-055A, sig. to abundant cavings	N4	1.02
		B 25% Mudstone, as 794-055B, sig. cavings	N5	0.97
794-057	1950-1980m	A 70% Shale, platy to subfissile, mod. hard, non-calc., sig. to abundant cavings, medium dark grey	N4	1.13,1.16
		B 30% Mudstone, blocky, sl. silty, soft, non-calc., sig. cavings, medium grey	N5	0.86
794-058	1980-2010m	A 70% Shale, as 794-057A, sig. cavings	N4	1.05
		B 30% Mudstone, as 794-057B, sig. to abundant cavings	N5	0.98
794-059	2010-2040m	A 90% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	1.07
		B 10% Mudstone, as 794-057B, dominant cavings	N5	
794-060	2040-2070m	A 70% Shale, as 794-059A, sig. cavings	N4	0.87
		B 30% Mudstone, platy to blocky, sl. silty, non-calc., sig. cavings, medium grey	N5	0.95,0.92
794-106 SWC	2075m	A 98% Shale, platy, soft to mod. hard, non-calc., medium dark grey	N4	0.75
794-061	2070-2100m	A 80% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey	N4	0.88
		B 20% Mudstone, as 794-060B, minor to sig. cavings	N5	0.95
794-107 SWC	2110m	A 98% Shale, as 794-106A	N4	0.68,0.69
794-062	2100-2130m	A 85% Shale, as 794-061A, sig. cavings	N4	0.77
		B 15% Mudstone, as 794-060B, minor cavings	N5	0.87
794-063	2130-2160m	A 65% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	0.83
		B 35% Mudstone, blocky, silty, mod. hard, non-calc., abundant cavings, medium grey Minor other mudstone	N5	0.99,1.00
794-064	2160-2190m	A 60% Shale, platy to thinly fissile, mod. hard, non-calc., sig. cavings, medium dark grey	N4	0.94
		B 40% Mudstone, sl. silty, blocky, soft to mod. hard, minor to sig. cavings, medium grey	N5	1.06

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Lost Circulation Material, moderately, occasionally, slightly, very

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GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-108 SWC	2186m	A 98% Shale, fissile to platy, soft to mod. hard, non-calc., medium dark grey	N4	1.22
794-065	2190-2220m	A 70% Shale, platy to thinly fissile, mod. hard, non-calc., sig. to abundant cavings, medium dark grey	N4	0.98
		B 30% Mudstone, sl. silty, blocky, soft to mod. hard, sig. cavings, medium grey	N5	0.95
794-109 SWC	2230m	A 98% Shale, subfissile, soft to mod. hard, non-calc., medium dark grey	N4	1.21
794-066	2220-2250m	A 60% Silty mudstone, blocky, hard, non-calc., turbodrilled, medium dark grey to brownish grey	N4-5YR4/1	1.21
		B 25% Shale, as 794-065A, abundant to dominant cavings	N4	0.96,0.98
		C 15% Mudstone, as 794-065B, abundant cavings	N5	1.27
794-067	2250-2280m	A 50% Silty mudstone, as 794-066A, turbo-drilled	N4-5YR4/1	1.20
		B 25% Shale, as 794-065A, abundant to dominant cavings	N4	1.19
		C 25% Mudstone, as 794-065B, dominant cavings	N5	0.92
794-110 SWC	2275m	A 98% Shale, as 794-109A	N4	1.39
794-068	2280-2310m	A 70% Silty mudstone, as 794-066A, turbo-drilled	N4-5YR4.1	1.23
		B 15% Shale, as 794-065A, dominant cavings	N4	1.20,1.21
		C 15% Mudstone, as 794-065B, dominant cavings	N5	0.97
794-111 SWC	2305m	A 98% Shale, as 794-109A	N4	1.40
794-069	2310-2340m	A 80% Silty mudstone, blocky, mod. hard, non-calc., turbodrilled, minor cavings, medium dark grey to brownish grey	N4-5YR4/1	1.21
		B 15% Shale, platy to thinly fissile, mod. hard, non-calc., abundant? cavings, medium dark grey	N4	1.42
		C 5% Mudstone, as 794-065B, dominant cavings	N5	
794-070	2340-2370m	A 60% Silty mudstone, as 794-069A, turbo-drilled, minor? cavings	N4-5YR4/1	1.32
		B 25% Shale, as 794-069B, abundant? cavings	N4	1.26
		C 15% Mudstone, as 794-065B, dominant cavings	N5	1.19,1.12
794-071	2370-2400m	A 45% Shale, platy to thinly fissile, mod. hard, non-calc., abundant? cavings, medium dark grey	N4	1.55

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Lost Circulation Material, moderately, occasionally, slightly, very

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GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-071	2370-2400m	B 40% Silty mudstone, blocky, mod. hard, non-calc., turbodrilled, medium dark grey to brownish grey	N4-5YR4/1	1.60
		C 15% Mudstone, blocky, soft to mod. hard, non-calc., abundant cavings, medium grey	N5	0.96
794-072	2400-2430m	A 80% Silty mudstone, as 794-071B, turbo-drilled, minor? cavings	N4-5YR4/1	1.64
		B 20% Shale, platy to thinly fissile, mod. hard, non-calc., dominant cavings, medium dark grey Minor other mudstone - caved	N4	1.65
794-112 SWC	2422m	A 98% Shale, thinly fissile, soft, non-calc., medium dark grey	N4	2.79,2.51
794-073	2430-2460m	A 80% Silty mudstone, as 794-071B, turbo-drilled, minor? cavings	N4-5YR4.1	1.47
		B 20% Shale, as 794-072B, abundant cavings Minor mudstone - caved	N4	1.74,1.71
794-113 SWC	2464.5m	A 98% Shale, subfissile to blocky, soft, sl. silty, non-calc., medium dark grey to brownish grey	N4-5YR4/1	2.14
794-074	2460-2490m	A 80% Silty mudstone, as 794-071B, turbo-drilled, minor? cavings	N4-5YR4/1	1.54
		B 20% Shale, as 794-072B, dominant cavings Minor other mudstone - caved	N4	1.54
794-114 SWC	2499m	A 98% Shale, as 794-113A	N4-5YR4/1	2.45
794-075	2490-2570m	A 55% Silty mudstone, blocky, mod. hard, non-calc., turbodrilled, minor? cavings, medium dark grey to brownish grey	N4-5YR4/1	1.76
		B 30% Shale, platy to thinly fissile, mod. hard, non-calc., abundant? cavings, medium dark grey	N4	1.26
		C 15% Mudstone, blocky, soft to mod. hard, sl. silty, non-calc., sig.? to abundant cavings, medium grey	N5	1.19,1.20
794-115 SWC	2526.5m	A 98% Shale, blocky to subfissile, soft, sl. silty, non-calc., brownish grey	5YR4/1	2.01
794-076	2520-2550m	A 70% Silty mudstone, as 794-075A, turbo-drilled, minor? cavings	N4-5YR4/1	1.63
		B 15% Shale, as 794-075B, dominant? cavings	N4	1.27
		C 15% Mudstone, as 794-075C, dominant cavings	N5	0.95
794-077	2550-2580m	A 55% Silty mudstone, as 794-075A, turbo-drilled, minor? to sig.? cavings	N4-5YR4/1	1.60
		B 35% Shale, as 794-075B, abundant cavings	N4	1.31
		C 10% Mudstone, as 794-075C, dominant cavings	N5	1.13,1.14

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

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	GSA Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-116 SWC	2578m	A 98% Shale, blocky to subfissile, soft, sl. silty, non-calc., brownish grey	5YR4/1	2.01
794-078	2580-2610m	A 60% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	1.75,1.74
		B 25% Mudstone, blocky, sl. silty, mod. hard, non-calc., abundant cavings, medium grey	N5	1.10
		C 15% Silty mudstone, blocky, mod. hard, non-calc., turbodrilled, sig.? cavings, medium dark grey to brownish grey	N4-5YR4/1	1.24
794-079	2610-2640m	A 85% Silty mudstone, as 794-078C, turbo-drilled	N4-5YR4/1	1.63
		B 15% Shale, as 794-078A, abundant to dominant cavings Minor other mudstone - caved	N4	1.51
794-080	2640-2670m	A 98% Silty mudstone, as 794-078C, turbo-drilled, minor cavings Minor caved shale and mudstone	N4-5YR4/1	1.65
794-081	2670-2700m	A 98% Silty mudstone, as 794-078C, turbo-drilled, minor cavings Minor caved shale and mudstone	N4-5YR4/1	1.33,1.38
794-117 SWC	2700m	A 98% Silty mudstone, blocky, soft, non-calc., brownish grey	5YR4/1	1.23,1.24
794-082	2700-2730m	A 98% Silty mudstone, as 794-078C, turbo-drilled, minor cavings Minor caved shale and mudstone	N4-5YR4/1	1.28
794-083	2730-2760m	A 85% Silty mudstone, as 794-078C, turbo-drilled, minor cavings	N4-5YR4/1	1.75
		B 15% Shale, platy, mod. hard, non-calc., abundant to dominant cavings, medium dark grey	N4	1.39
794-118 SWC	2766.5m	A 98% Shale, blocky to subfissile, mod. hard, non-calc., medium dark grey	N4	2.74
794-084	2760-2790m	A 85% Silty mudstone, as 794-078C, turbo-drilled, minor cavings	N4-5YR4/1	2.17
		B 15% Shale, as 794-083B, dominant cavings	N4	1.44
794-085	2790-2820m	A 90% Silty mudstone, blocky, mod. hard, non-calc., turbodrilled, minor cavings, brownish grey	5YR4/1	1.99,2.01
		B 10% Shale, platy, mod. hard, non-calc., abundant cavings, medium dark grey	N4	1.55
794-119 SWC	2815m	A 98% Silty shale, blocky, mod. hard, non-calc., medium dark grey to brownish grey	N4-5YR4/1	1.83
794-086	2820-2850m	A 98% Silty mudstone, as 794-085A, turbo-drilled Minor caved shale and mudstone	5YR4/1	1.50

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

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-120 SWC	2865m	A 98% Silty shale, blocky, mod. hard, non-calc., dark brownish grey	5YR3/1	1.62
794-087	2850-2880m	A 85% Silty mudstone, blocky, mod. hard, non-calc., turbodrilled, brownish grey	5YR4/1	1.76
		B 15% Shale, platy, mod. hard, non-calc., abundant to dominant cavings, medium dark grey	N4	1.52
794-088	2880-2910m	A 50% Shale, platy, mod. hard, non-calc., abundant? cavings, medium dark grey	N4	1.68
		B 40% Mudstone, blocky, mod. hard, non-calc., dominant cavings, medium grey	N5	1.18,1.17
		C 10% Silty mudstone, as 794-087A, turbo-drilled, dominant cavings, brownish grey	5YR4/1	
794-089	2910-2940m	A 80% Shale, as 794-088A, cavings	N4	1.38
		B 20% Mudstone, as 794-088B, sig. cavings Minor silty mudstone	N5	1.09
794-121 SWC	2939.5m	A 98% Shale, blocky, mod. hard, sl. silty, non-calc., dark grey to medium grey	N3-4	0.85
794-090	2940-2970m	A 85% Shale, as 794-088A, abundant cavings	N4	1.66
		B 15% Mudstone, as 794-088B, sig. cavings	N5	1.05
794-122 SWC	2964.5m	A 98% Shale, as 794-121A	N3-4	1.05,1.04
794-091	2970-3000m	A 75% Shale, as 794-088A, abundant cavings	N4	1.82
		B 15% Mudstone, as 794-088B, sig. cavings	N5	1.13,1.15
		C 10% Sandstone, mostly unconsolidated, fine grained, well sorted, white Minor pyrites	N9	
794-092	3000-3030m	A 65% Shale, as 794-088A, sig. to abundant cavings	N4	1.36
		B 20% Mudstone, as 794-088B, sig. cavings	N5	1.02
		C 15% Sandstone, as 794-091C Minor pyrites	N9	
794-123 SWC	3029m	A 98% Shale, blocky to subfissile, soft to mod. hard, non-calc., medium dark grey to brownish grey	N4-5YR4/1	2.23
794-093	3030-3060m	A 55% Silty mudstone, blocky, soft to mod. hard, non-calc., minor cavings, brownish grey to dark brownish grey	5YR4/1-5YR3/1	2.19
		B 45% Shale, as 794-088A, abundant cavings	N4	2.03
794-094	3060-3090m	A 85% Silty mudstone, as 794-093A, minor cavings	5YR4/1-5YR3/1	3.33
		B 15% Shale, as 794-088A, sig. cavings	N4	1.45,1.44
794-124 SWC	3100m	A 98% Silty shale, blocky to subfissile, soft to mod. hard, non-calc., sl. micaceous, dark grey to dark brownish grey	N3-5YR3/1	9.08

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

TABLE 1
ORGANIC CARBON RESULTS AND GROSS LITHOLOGIC DESCRIPTIONS

GEOCHEM SAMPLE NUMBER	DEPTH	GROSS LITHOLOGIC DESCRIPTION	G S A Colour Code	TOTAL ORGANIC CARBON (Wt. % of Rock)
794-095	3090-3120m	A 60% Silty mudstone, blocky, soft to mod. hard, non-calc., minor cavings, brownish grey to dark brownish grey	5YR4/1-5YR3/1	4.58
		B 40% Shale, platy, mod. hard, non-calc., sig. to abundant cavings, medium dark grey	N4	1.45
794-096	3120-3150m	A 50% Shale, platy, mod. hard, non-calc., sig. cavings, medium dark grey to dark grey	N4-3	1.80
		B 30% Silty mudstone, as 794-095A, minor cavings	5YR4/1-5YR3/1	1.38
		C 20% LCM - paint and cement Minor sandstone		
794-097	3150-3180m	A 65% Sandstone, blocky, fine grained, sub-angular, well sorted, non-calc. matrix, very pale yellowish brown	10YR7/2	
		B 20% Shale, as 794-096A, sig. cavings	N4-3	1.16
		C 15% LCM - paint, cement and grease		
794-098	3180-3210m	A 98% Sandstone, as 794-097A, minor cavings Minor LCM	10YR7/2	
794-099	3210-3240m	A 98% Sandstone, as 794-097A, minor cavings Minor shale and LCM	10YR7/2	
794-100	3240-3270m	A 98% Sandstone, as 794-097A, minor cavings Minor LCM	10YR7/2	
794-101	3270-3300m	A 98% Sandstone, as 794-097A, minor cavings, pale milky cut Minor LCM	10YR7/2	
794-102	3300-3314m	A 98% Sandstone, as 794-097A, minor cavings, pale milky cut Minor shale	10YR7/2	

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

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-001	308-330	1480	8	3	1	2	1494	14	0.9	9	0.38
794-002	330-360	2647	8	3	1	2	2660	14	0.5	15	0.40
794-005	420-450	1004	7	2	1	0	1013	9	0.9	2	2.08
794-006	450-480	6225	81	76	20	8	6411	185	2.9	37	2.71
794-007	480-510	6378	395	395	135	131	7434	1056	14.2	130	1.02
794-008	510-540	793	209	202	60	69	1331	539	40.5	44	0.86
794-009	540-570	5383	966	964	267	367	7947	2564	32.3	275	0.73
794-010	570-600	1982	909	811	132	139	3973	1991	50.1	74	0.95
794-011	600-630	5713	2038	1023	124	120	9018	3306	36.7	76	1.03
794-012	630-660	3794	1705	890	119	116	6625	2830	42.7	52	1.03
794-013	660-690	5283	1980	1576	365	459	9663	4379	45.3	403	0.80
794-014	690-720	1258	198	289	107	134	1987	729	36.7	158	0.80
794-015	720-750	5371	1531	1036	277	438	8654	3282	37.9	641	0.63
794-016	750-780	1723	751	759	340	494	4068	2344	57.6	747	0.69
794-017	780-810	3192	1461	1508	509	764	7435	4243	57.1	879	0.67
794-018	810-840	2633	1255	1233	475	614	6210	3577	57.6	464	0.77
794-019	840-870	2150	557	564	146	232	3651	1501	41.1	348	0.63
794-020	870-900	1606	759	740	189	279	3572	1966	55.1	243	0.68
794-021	900-930	195	42	41	10	13	301	105	35.0	12	0.78
794-022	930-960	128	54	55	15	19	270	143	52.7	24	0.77
794-023	960-990	6404	2129	2044	530	921	12027	5623	46.8	1995	0.58
794-024	990-1020	2476	1186	1095	309	490	5555	3080	55.4	528	0.63
794-025	1020-1050	1517	664	677	207	339	3404	1887	55.4	637	0.61
794-026	1050-1080	2009	573	477	130	231	3421	1411	41.3	619	0.56
794-027	1080-1110	4730	1066	1361	502	898	8556	3826	44.7	3654	0.56
794-028	1110-1140	1883	694	876	321	483	4257	2374	55.8	702	0.66
794-029	1140-1170	1615	602	816	310	448	3791	2176	57.4	615	0.69
794-030	1170-1200	2547	438	558	175	233	3951	1404	35.5	266	0.75
794-031	1200-1230	378	53	72	23	30	556	178	32.1	57	0.76
794-032	1230-1260	1417	295	544	260	296	2812	1395	49.6	497	0.88

TABLE 2A

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-033	1260-1290	1897	397	550	216	236	3295	1399	42.4	247	0.91
794-034	1290-1320	2311	486	689	195	195	3875	1565	40.4	182	1.00
794-035	1320-1350	2088	943	1063	247	183	4525	2436	53.8	77	1.35
794-036	1350-1380	973	420	481	103	98	2075	1102	53.1	41	1.06
794-037	1380-1410	3252	760	1066	242	349	5669	2417	42.6	417	0.69
794-038	1410-1440	74	21	49	15	18	178	104	58.4	13	0.83
794-039	1440-1470	2392	801	1222	290	472	5177	2785	53.8	591	0.61
794-040	1470-1500	1068	439	613	223	339	2681	1614	60.2	593	0.66
794-041	1500-1530	195	33	79	34	44	385	190	49.4	67	0.76
794-042	1530-1560	5592	1319	2617	829	1341	11698	6105	52.2	2732	0.62
794-043	1560-1590	1559	752	1050	419	531	4311	2752	63.8	671	0.79
794-044	1590-1620	1411	312	617	241	303	2884	1473	51.1	553	0.79
794-045	1620-1650	15	6	19	11	18	68	54	78.6	76	0.62
794-046	1650-1680	1358	551	789	309	266	3274	1916	58.5	291	1.16
794-047	1680-1710	2954	1113	2313	1144	1096	8621	5666	65.7	1349	1.04
794-048	1710-1740	1344	393	937	603	695	3972	2628	66.2	2253	0.87
794-049	1740-1770	1876	571	1519	1046	1218	6231	4355	69.9	2753	0.86
794-050	1770-1800	1238	302	826	578	680	3623	2385	65.8	1504	0.85
794-051	1800-1830	49	24	128	101	108	410	361	88.1	193	0.94
794-052	1830-1860	318	106	284	182	239	1130	811	71.8	719	0.76
794-053	1860-1890	899	491	635	591	591	3207	2309	72.0	1023	1.00
794-054	1900	1211	134	184	88	78	1695	484	28.5	262	1.13
794-055	1890-1920	7	5	38	32	40	122	115	94.1	157	0.80
794-056	1920-1950	7	1	12	18	18	55	48	87.8	50	1.02
794-057	1950-1980	912	447	752	339	297	2746	1834	66.8	472	1.14
794-058	1980-2010	286	118	251	90	78	823	537	65.2	160	1.16
794-059	2010-2040	228	104	127	27	36	522	294	56.4	55	0.76
794-060	2040-2070	7	3	4	2	3	19	13	64.6	23	0.76
794-061	2070-2100	752	360	483	107	141	1843	1091	59.2	199	0.76
794-062	2100-2130	2875	1277	2122	598	939	7811	4936	63.2	2111	0.64

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-063	2130-2160	2238	1097	1258	297	407	5297	3059	57.7	952	0.73
794-064	2160-2190	1344	524	705	235	310	3118	1775	56.9	823	0.76
794-065	2190-2220	1678	526	651	255	434	3544	1866	52.7	1156	0.59
794-066	2220-2250	739	161	282	108	199	1489	750	50.4	478	0.54
794-067	2250-2280	1396	502	684	197	307	3088	1691	54.8	617	0.64
794-068	2280-2310	916	257	294	96	144	1708	792	46.4	228	0.67
794-069	2310-2340	995	155	108	24	47	1329	335	25.2	149	0.51
794-070	2340-2370	1959	631	454	118	156	3319	1360	41.0	385	0.76
794-071	2370-2400	2235	1224	663	140	166	4428	2193	49.5	410	0.84
794-072	2400-2430	3403	1653	2213	751	1759	9780	6377	65.2	3684	0.43
794-073	2430-2460	1570	720	755	237	508	3790	2220	58.6	1240	0.47
794-074	2460-2490	1684	891	1144	414	1010	5142	3458	67.3	1591	0.41
794-075	2490-2520	1452	794	955	386	782	4370	2917	66.8	1701	0.49
794-076	2520-2550	321	86	127	36	71	640	319	49.9	136	0.51
794-077	2550-2580	1944	1103	2034	526	1320	6927	4983	71.9	4398	0.40
794-078	2580-2610	519	309	384	134	259	1604	1086	67.7	425	0.52
794-079	2610-2640	1286	404	663	145	372	2870	1584	55.2	838	0.39
794-080	2640-2670	2121	589	918	251	798	4676	2555	54.6	2702	0.31
794-081	2670-2700	1597	398	411	92	286	2784	1187	42.6	967	0.32
794-082	2700-2730	3074	844	1032	236	766	5953	2879	48.4	2711	0.31
794-083	2730-2760	418	242	290	126	285	1361	944	69.3	108	0.44
794-084	2760-2790	2437	1564	2050	632	1580	8262	5825	70.5	2911	0.40
794-085	2790-2820	1025	597	726	212	512	3072	2047	66.6	1107	0.41
794-086	2820-2850	590	326	356	101	228	1601	1011	63.2	511	0.44
794-087	2850-2880	1280	1109	1407	317	576	4689	3409	72.7	1572	0.55
794-088	2880-2910	479	393	472	169	257	1771	1292	73.0	505	0.66
794-089	2910-2940	294	200	131	17	18	660	366	55.5	41	1.00
794-090	2940-2970	2412	2961	1296	94	98	6862	4450	64.9	189	0.95
794-091	2970-3000	364	693	296	26	25	1405	1040	74.1	51	1.03
794-092	3000-3030	2732	2422	3456	1000	1736	11346	8614	75.9	4920	0.58

TABLE 2A
CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN AIR SPACE GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-093	3030-3060	1619	1478	1620	775	1119	6611	4991	75.5	1110	0.69
794-094	3060-3090	1688	1390	1442	681	802	6004	4315	71.9	674	0.85
794-095	3090-3120	5851	4535	3691	698	642	15417	9566	62.0	409	1.09
794-096	3120-3150	686	235	85	16	15	1037	351	33.9	46	1.01
794-097	3150-3180	1688	344	51	10	8	2101	413	19.7	60	1.20
794-099	3210-3240	225	36	14	5	6	286	61	21.4	77	0.93
794-100	3240-3270	210	108	66	10	16	410	200	48.8	71	0.66
794-101	3270-3300	2546	437	65	7	10	3064	518	16.9	45	0.75
794-102	3300-3314	6776	769	296	76	101	8018	1242	15.5	669	0.75

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-001	308-330	767	17	11	6	12	813	46	5.6	109	0.48
794-002	330-360	1062	25	13	4	14	1117	55	5.0	68	0.28
794-005	420-450	1421	20	11	3	4	1459	38	2.6	38	0.59
794-006	450-480	1420	24	15	3	5	1467	47	3.2	41	0.71
794-007	480-510	2288	189	279	104	96	2956	668	22.6	132	1.09
794-008	510-540	1754	278	439	185	288	2944	1190	40.4	473	0.64
794-009	540-570	2372	501	791	297	522	4482	2111	47.1	599	0.57
794-010	570-600	2353	667	917	270	491	4699	2347	49.9	837	0.55
794-011	600-630	2431	992	1455	263	322	5463	3032	55.5	128	0.82
794-012	630-660	4860	2535	2024	259	292	9968	5109	51.2	142	0.89
794-013	660-690	2556	980	2101	625	909	7171	4615	64.4	503	0.69
794-014	690-720	565	146	394	196	347	1647	1082	65.7	302	0.56
794-015	720-750	4521	472	453	157	269	5873	1352	23.0	755	0.59
794-016	750-780	2969	369	361	114	240	4052	1084	26.7	984	0.48
794-017	780-810	4138	745	883	296	591	6653	2515	37.8	2091	0.50
794-018	810-840	2451	525	749	252	538	4516	2065	45.7	1007	0.47
794-019	840-870	4033	975	1669	598	1221	8495	4463	52.5	2309	0.49
794-020	870-900	3205	917	1269	359	786	6536	3331	51.0	1348	0.46
794-021	900-930	1363	564	864	259	570	3620	2257	62.3	1298	0.45
794-022	930-960	6615	3130	4878	1412	3121	19155	12540	65.5	6852	0.45
794-023	960-990	4937	1005	1326	457	1092	8817	3880	44.0	8082	0.42
794-024	990-1020	3198	712	856	244	606	5616	2418	43.1	2221	0.40
794-025	1020-1050	2502	568	785	258	624	4738	2235	47.2	2447	0.41
794-026	1050-1080	1472	279	326	91	236	2404	932	38.8	1524	0.39
794-027	1080-1110	1822	365	498	166	378	3228	1407	43.6	2655	0.44
794-028	1110-1140	974	257	453	177	479	2339	1366	58.4	4079	0.37
794-029	1140-1170	1922	561	1136	448	1021	5088	3167	62.2	1514	0.44
794-030	1170-1200	1267	261	587	276	544	2935	1668	56.8	1236	0.51
794-031	1200-1230	941	221	561	243	456	2421	1481	61.2	1814	0.53
794-032	1230-1260	599	182	344	208	392	1725	1126	65.3	2911	0.53

TABLE 2B
CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-033	1260-1290	847	140	220	83	142	1432	585	40.9	436	0.58
794-034	1290-1320	546	172	398	176	327	1618	1072	66.3	4708	0.54
794-035	1320-1350	1574	423	722	204	279	3202	1627	50.8	319	0.73
794-036	1350-1380	1152	475	979	246	342	3195	2043	64.0	229	0.72
794-037	1380-1410	425	245	845	283	549	2347	1922	81.9	711	0.52
794-038	1410-1440	425	278	1086	405	946	3139	2714	86.5	1637	0.43
794-039	1440-1470	1318	398	1086	371	839	4013	2694	67.1	1672	0.44
794-040	1470-1500	1441	492	1462	601	1448	5443	4002	73.5	5057	0.41
794-041	1500-1530	1230	365	1144	520	1222	4482	3251	72.5	5530	0.43
794-042	1530-1560	1397	375	1451	714	1628	5564	4168	74.9	6252	0.44
794-043	1560-1590	1056	430	1296	519	1173	4476	3419	76.4	3174	0.44
794-044	1590-1620	489	180	686	309	697	2361	1872	79.3	2265	0.44
794-045	1620-1650	398	125	187	76	80	866	468	54.0	486	0.95
794-046	1650-1680	381	262	679	305	579	2206	1825	82.7	1322	0.53
794-047	1680-1710	294	203	741	579	1045	2862	2568	89.7	2634	0.55
794-048	1710-1740	117	61	163	111	209	662	545	82.3	2536	0.53
794-049	1740-1770	302	143	551	535	1032	2563	2261	88.2	5564	0.52
794-050	1770-1800	164	86	298	340	659	1546	1383	89.4	5782	0.52
794-051	1800-1830	346	169	717	719	1278	3229	2883	89.3	7045	0.56
794-052	1830-1860	187	109	678	751	1371	3097	2909	93.9	9365	0.55
794-053	1860-1890	1425	628	1522	802	1175	5551	4127	74.3	6371	0.68
794-054	1900	450	109	215	122	140	1035	585	56.5	895	0.87
794-055	1890-1920	132	32	240	220	477	1102	970	88.0	7190	0.46
794-056	1920-1950	155	67	191	291	585	1289	1133	87.9	4790	0.50
794-057	1950-1980	507	346	1004	399	638	2894	2387	82.5	628	0.63
794-058	1980-2010	87	30	68	36	70	291	203	70.0	923	0.51
794-059	2010-2040	259	221	356	82	169	1087	828	76.2	506	0.48
794-060	2040-2070	312	120	94	37	100	663	351	52.9	713	0.37
794-061	2070-2100	588	353	663	158	341	2103	1514	72.0	1126	0.46
794-062	2100-2130	329	209	468	116	418	1540	1210	78.6	4173	0.28

TABLE 2B
CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-063	2130-2160	874	504	905	252	582	3118	2243	72.0	3506	0.43
794-064	2160-2190	586	261	496	172	418	1933	1347	69.7	4210	0.41
794-065	2190-2220	383	109	184	71	211	958	575	60.0	2040	0.34
794-066	2220-2250	956	139	233	99	328	1755	799	45.5	1509	0.30
794-067	2250-2280	2784	430	595	189	427	4423	1639	37.1	2041	0.44
794-068	2280-2310	2285	308	351	102	320	3366	1082	32.1	1548	0.32
794-069	2310-2340	5539	631	340	70	176	6757	1217	18.0	1125	0.40
794-070	2340-2370	4229	614	536	119	331	5830	1601	27.5	1178	0.36
794-071	2370-2400	3567	1367	1223	276	576	7009	3441	49.1	1614	0.48
794-072	2400-2430	11694	1457	1342	355	1485	16333	4639	28.4	7712	0.24
794-073	2430-2460	12116	1610	1368	404	1462	16960	4844	28.6	7165	0.28
794-074	2460-2490	10021	1079	1249	378	1430	14157	4136	29.2	9459	0.26
794-075	2490-2520	13969	1559	1463	473	1623	19088	5119	26.8	9971	0.29
794-076	2520-2550	724	83	91	40	190	1129	405	35.9	5623	0.21
794-077	2550-2580	6529	1637	2855	748	2161	13930	7402	53.1	10960	0.35
794-078	2580-2610	3176	1345	3631	1047	3152	12350	9174	74.3	12310	0.33
794-079	2610-2640	1867	523	1496	505	1811	6201	4334	69.9	9560	0.28
794-080	2640-2670	2666	627	1499	513	2048	7353	4687	63.7	11278	0.25
794-081	2670-2700	10257	1215	843	277	1085	13676	3419	25.0	12052	0.25
794-082	2700-2730	5155	499	621	262	1242	7779	2624	33.7	14919	0.21
794-083	2730-2760	7397	1556	2825	888	3014	15680	8283	52.8	13437	0.29
794-084	2760-2790	1659	692	2175	871	2914	8310	6651	80.0	12800	0.30
794-085	2790-2820	4252	1571	3822	1223	3840	14708	10455	71.1	12135	0.32
794-086	2820-2850	3928	1006	1801	696	2216	9646	5718	59.3	14666	0.31
794-087	2850-2880	1713	1010	2357	810	2008	7897	6184	78.3	10801	0.40
794-088	2880-2910	1765	1910	5131	1714	3557	14077	12313	87.5	14147	0.48
794-089	2910-2940	401	563	569	64	155	1753	1352	77.1	1027	0.41
794-090	2940-2970	193	890	801	45	118	2047	1854	90.6	424	0.38
794-091	2970-3000	300	847	816	89	170	2223	1922	86.5	557	0.53
794-092	3000-3030	515	367	983	527	1371	3763	3248	86.3	9226	0.38

TABLE 2B

CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS IN CUTTING GAS

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-093	3030-3060	2013	6406	10063	4448	8339	31269	29256	93.6	7660	0.53
794-094	3060-3090	2005	6314	9468	4530	6569	28886	26881	93.1	6646	0.69
794-095	3090-3120	2130	5750	5007	1017	1453	15357	13227	86.1	1718	0.70
794-096	3120-3150	1339	1515	1795	489	754	5893	4554	77.3	1692	0.65
794-097	3150-3180	3169	509	147	27	48	3900	731	18.7	503	0.55
794-098	3180-3210	969	90	50	11	17	1137	169	14.8	196	0.65
794-099	3210-3240	1802	145	75	18	31	2070	268	13.0	551	0.56
794-100	3240-3270	1419	410	489	109	229	2657	1238	46.6	621	0.48
794-101	3270-3300	4370	2166	440	34	60	7070	2700	38.2	225	0.57
794-102	3300-3314	1996	422	286	78	197	2979	983	33.0	1482	0.40

TABLE 2C
TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-001	308-330	2248	25	14	6	14	2307	59	2.6	119	0.46
794-002	330-360	3708	33	16	5	16	3777	69	1.8	83	0.29
794-005	420-450	2425	27	12	3	5	2472	47	1.9	41	0.70
794-006	450-480	7646	105	91	24	12	7878	232	2.9	78	1.92
794-007	480-510	8665	584	674	239	227	10390	1724	16.6	263	1.05
794-008	510-540	2547	486	640	244	357	4275	1729	40.4	517	0.68
794-009	540-570	7754	1467	1755	564	889	12429	4675	37.6	874	0.63
794-010	570-600	4335	1577	1728	402	630	8672	4338	50.0	911	0.64
794-011	600-630	8144	3030	2478	387	442	14481	6337	43.8	204	0.87
794-012	630-660	8654	4240	2913	378	407	16593	7939	47.8	193	0.93
794-013	660-690	7839	2960	3676	990	1368	16834	8995	53.4	906	0.72
794-014	690-720	1824	344	684	303	481	3635	1811	49.8	459	0.63
794-015	720-750	9893	2003	1489	434	707	14527	4634	31.9	1396	0.61
794-016	750-780	4692	1120	1120	454	734	8120	3428	42.2	1731	0.62
794-017	780-810	7330	2206	2392	805	1356	14088	6758	48.0	2971	0.59
794-018	810-840	5084	1780	1983	727	1152	10725	5641	52.6	1470	0.63
794-019	840-870	6183	1533	2233	745	1453	12146	5963	49.1	2658	0.51
794-020	870-900	4810	1676	2009	548	1065	10108	5297	52.4	1590	0.51
794-021	900-930	1559	606	904	269	583	3921	2362	60.2	1310	0.46
794-022	930-960	6743	3183	4933	1427	3140	19426	12683	65.3	6876	0.45
794-023	960-990	11341	3134	3370	986	2012	20844	9503	45.6	10076	0.49
794-024	990-1020	5673	1898	1951	553	1096	11171	5498	49.2	2749	0.50
794-025	1020-1050	4019	1231	1462	465	963	8141	4122	50.6	3084	0.48
794-026	1050-1080	3481	853	803	221	467	5824	2343	40.2	2143	0.47
794-027	1080-1110	6552	1430	1859	668	1276	11785	5233	44.4	6309	0.52
794-028	1110-1140	2857	951	1329	498	962	6596	3740	56.7	4781	0.52
794-029	1140-1170	3536	1163	1952	758	1469	8879	5343	60.2	2129	0.52
794-030	1170-1200	3815	699	1145	451	777	6886	3072	44.6	1502	0.58
794-031	1200-1230	1318	275	633	266	486	2977	1659	55.7	1871	0.55
794-032	1230-1260	2016	477	888	468	688	4537	2521	55.6	3408	0.68

TABLE 2 C
TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-033	1260-1290	2743	538	770	299	378	4728	1984	42.0	683	0.79
794-034	1290-1320	2857	657	1087	371	522	5493	2637	48.0	4890	0.71
794-035	1320-1350	3663	1366	1785	451	462	7726	4064	52.6	396	0.98
794-036	1350-1380	2125	895	1460	350	440	5270	3145	59.7	270	0.79
794-037	1380-1410	3677	1005	1911	525	898	8016	4340	54.1	1127	0.59
794-038	1410-1440	499	299	1134	420	964	3317	2818	84.9	1650	0.44
794-039	1440-1470	3711	1199	2307	661	1312	9190	5479	59.6	2263	0.50
794-040	1470-1500	2509	931	2075	824	1786	8125	5615	69.1	5649	0.46
794-041	1500-1530	1425	397	1224	554	1267	4867	3442	70.7	5597	0.44
794-042	1530-1560	6989	1694	4067	1543	2968	17262	10273	59.5	8984	0.52
794-043	1560-1590	2615	1182	2346	938	1705	8786	6171	70.2	3845	0.55
794-044	1590-1620	1901	492	1304	550	1000	5246	3345	63.8	2818	0.55
794-045	1620-1650	413	131	205	87	98	934	521	55.8	562	0.89
794-046	1650-1680	1739	814	1468	614	845	5480	3741	68.3	1613	0.73
794-047	1680-1710	3249	1315	3055	1723	2141	11483	8234	71.7	3983	0.80
794-048	1710-1740	1461	454	1099	714	905	4633	3172	68.5	4789	0.79
794-049	1740-1770	2178	714	2070	1582	2250	8794	6616	75.2	8318	0.70
794-050	1770-1800	1402	388	1124	917	1339	5170	3768	72.9	7286	0.68
794-051	1800-1830	395	193	844	821	1386	3639	3244	89.1	7238	0.59
794-052	1830-1860	506	215	962	933	1610	4226	3721	88.0	10084	0.58
794-053	1860-1890	2323	1119	2157	1393	1766	8758	6435	73.5	7394	0.79
794-054	1900	1662	243	399	210	218	2730	1069	39.1	1156	0.96
794-055	1890-1920	139	38	278	252	517	1224	1085	88.6	7347	0.49
794-056	1920-1950	162	68	202	309	603	1343	1181	87.9	4841	0.51
794-057	1950-1980	1418	792	1756	738	935	5640	4222	74.9	1100	0.79
794-058	1980-2010	373	148	319	126	148	1113	740	66.5	1083	0.85
794-059	2010-2040	487	325	483	109	205	1609	1122	69.7	561	0.53
794-060	2040-2070	319	123	98	39	103	682	364	53.3	735	0.38
794-061	2070-2100	1340	713	1145	265	482	3945	2605	66.0	1325	0.55
794-062	2100-2130	3204	1486	2590	714	1356	9351	6147	65.7	6284	0.53

TABLE 2 C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-063	2130-2160	3113	1602	2163	549	989	8415	5302	63.0	4458	0.56
794-064	2160-2190	1930	786	1201	407	727	5051	3121	61.8	5033	0.56
794-065	2190-2220	2061	635	835	326	645	4502	2441	54.2	3197	0.51
794-066	2220-2250	1695	300	515	207	527	3244	1549	47.7	1987	0.39
794-067	2250-2280	4180	932	1279	386	734	7511	3331	44.3	2658	0.53
794-068	2280-2310	3200	565	646	198	465	5074	1874	36.9	1776	0.43
794-069	2310-2340	6534	786	448	94	223	8086	1552	19.2	1274	0.42
794-070	2340-2370	6188	1246	990	238	487	9149	2961	32.4	1563	0.49
794-071	2370-2400	5802	2591	1886	415	742	11437	5634	49.3	2024	0.56
794-072	2400-2430	15097	3109	3555	1107	3244	26113	11015	42.2	11395	0.34
794-073	2430-2460	13686	2330	2123	641	1970	20750	7064	34.0	8405	0.33
794-074	2460-2490	11704	1970	2393	792	2440	19299	7595	39.4	11050	0.32
794-075	2490-2520	15422	2353	2418	859	2405	23458	8036	34.3	11673	0.36
794-076	2520-2550	1045	169	218	77	261	1769	724	40.9	5758	0.29
794-077	2550-2580	8473	2740	4890	1274	3481	20857	12384	59.4	15358	0.37
794-078	2580-2610	3694	1654	4015	1180	3410	13954	10260	73.5	12735	0.35
794-079	2610-2640	3153	927	2158	651	2183	9072	5919	65.2	10398	0.30
794-080	2640-2670	4787	1216	2417	764	2845	12029	7242	60.2	13980	0.27
794-081	2670-2700	11854	1612	1253	369	1371	16460	4606	28.0	13019	0.27
794-082	2700-2730	8229	1344	1654	497	2008	13732	5503	40.1	17629	0.25
794-083	2730-2760	7815	1798	3115	1014	3299	17041	9226	54.1	13545	0.31
794-084	2760-2790	4097	2255	4225	1503	4494	16573	12476	75.3	15711	0.33
794-085	2790-2820	5277	2168	4548	1435	4352	17780	12502	70.3	13242	0.33
794-086	2820-2850	4518	1332	2157	797	2444	11247	6729	59.8	15178	0.33
794-087	2850-2880	2992	2119	3764	1127	2584	12585	9593	76.2	12373	0.44
794-088	2880-2910	2243	2303	5603	1884	3814	15848	13604	85.8	14652	0.49
794-089	2910-2940	695	764	699	82	173	2413	1718	71.2	1067	0.47
794-090	2940-2970	2605	3852	2097	139	217	8909	6304	70.8	613	0.64
794-091	2970-3000	665	1540	1112	116	196	3628	2963	81.7	608	0.59
794-092	3000-3030	3247	2789	4439	1527	3107	15109	11862	78.5	14146	0.49

TABLE 2 C

TOTAL CONCENTRATION (VOL. PPM OF ROCK) OF C_1 - C_7 HYDROCARBONS (2A + 2B)

GEOCHEM SAMPLE NUMBER	DEPTH	C_1 Methane	C_2 Ethane	C_3 Propane	iC_4 Isobutane	nC_4 Butane	TOTAL C_1 - C_4	TOTAL C_2 - C_4	% GAS WETNESS	TOTAL C_5 - C_7	$\frac{iC_4}{nC_4}$
794-093	3030-3060	3632	7884	11683	5222	9458	37879	34247	90.4	8769	0.55
794-094	3060-3090	3693	7704	10910	5211	7372	34889	31196	89.4	7320	0.71
794-095	3090-3120	7981	10284	8698	1715	2096	30774	22793	74.1	2127	0.82
794-096	3120-3150	2025	1751	1880	504	770	6930	4905	70.8	1739	0.66
794-097	3150-3180	4857	853	198	37	57	6001	1144	19.1	563	0.64
794-098	3180-3210	969	90	50	11	17	1137	169	14.8	196	0.65
794-099	3210-3240	2026	180	89	23	37	2356	330	14.0	628	0.62
794-100	3240-3270	1629	518	555	120	245	3067	1438	46.9	692	0.49
794-101	3270-3300	6916	2602	505	41	69	10134	3218	31.8	270	0.59
794-102	3300-3314	8772	1191	582	154	298	10997	2225	20.2	2150	0.52

TABLE 3
KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION INDEX
		TYPES 40%; 10–40%; 10%	REMARKS	REWORKED (%)	PARTICLE SIZE	PRESERV-ATION	
794-108A	2186m SWC	W-I;H;Al-Am	close to 2.	80	M-C	G	2- to 2
794-109A	2230m SWC	W-I;Am*-H;Al	*unrecognisable, poor quality.	70	M	F	2- to 2/2
794-066A	2220-250m	-;I-Am*-W;H-Al	*degraded, not prime quality. Caving.	50	F-M	F	2- to 2/2
794-111A	2305m SWC	W-I;H;Am-Al		80	M	G	2- to 2/2
794-072A	2400-430m	W-I;Am*-H;Al	*as 066A. Frequent caving.	60	F-C	F	2(?)
794-112A	2422m SWC	W;H-I;Am-Al	sapropelisation.	30	M-C	G	2/2 to 2+
794-114A	2499m SWC	W;H**-I-Am*;-	*unrecognisable, not typically oil prone, includes incompletely developed material. **includes material apparently passing to Am.	40	M	F-G	2 to 2+
794-077A	2550-580m	Am*;I-W;H-Al	*dark, degraded, poor quality.	30	F-M	P-F	2
794-116A	2578m SWC	W;H-I-Am*;Al	*unrecognisable, frequently disseminated, not typically oil prone.	40	M-C	G	2 to 2+
794-080A	2640-670m	Am*;I-W;H-Al	*as 077A.	30	F-M	P-F	2
794-082A	2700-730m	-;W-Am*-H-I;Al	*as 077A. Material at 2 to 2+.	30	F-M/C	F	2(?)
794-118A	2766.5m SWC	W;H-I-Am*;-	*unrecognisable, disseminated, poor quality. Material at 3- and 3.	80	F-M	F	2+(?)
794-085A	2790-820m	-;Am*-W-I;H-Al	*as 077A. Cavings. Material at 2.	50	F-M/C	P-F	2 to 2+
794-120A	2865m SWC	W;H-I;Am	trace of H at 3+.	50	M-C	G	2 to 2+/2+
794-088A	2880-910m	W-I;H;Am*-Al	*unrecognisable, poor quality, frequent caving.	60	F-M	F	2 to 2+ max
794-121A	2939.5m SWC	W;I;H-Am		80	F-M/C	G	2+
794-092A	3000-030m	W-I;Am*-H;Al	*as 088A, frequent caving.	60	M	F	2 to 2+
794-123A	3029m SWC	W;H**-Am*-I;-	*degraded, includes incompletely developed material, not typically oil prone. **includes material apparently passing to Am.	50	F-M	F-G	2+(?)

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

postscript = coarse, cuticle, cysts, degraded, fine, other,. structured, spore-pollen, thick-walled, unstructured

TABLE 3
KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION INDEX
		TYPES 40%; 10--40%; 10%	REMARKS	REWORKED (%)	PARTICLE SIZE	PRESERV-ATION	
794-005A	308-330m	-;W-I-H;Al	disseminated Am-like contamination.	60	M	F-G	1+
794-011A	600-630m	W-H;I;Al-Am	dominant H marginally mature.	30	F-M/C	F-G	1+ to 2-
794-014A	690-720m	W-I;H;Am-Al	dominant H marginally mature.	75	F-M	F	1+
794-018A	810-840m	I;W-H-Al;-	H at 2- to 2 and 2. Disseminated Am-like contamination.	80	F-M/C	F	1+ to 2-
794-023A	960-990m	I;W-H;Am-Al	frequent H at 2- to 2 and 2, trace of 1+ to 2-. Foram linings.	80	M	F-G	2-(?)
794-027A	1080-110m	W-I;-;H-Al	lean. Dominant H at 2- to 2 and 2.	85	F-M	F	2-(??)
794-030A	1170-200m	I;W-H;Al-Am	dominant H marginally mature. Am-like contamination.	85	F-M	F	1+ to 2-
794-035A	1320-350m	I;W-Am*;H-Al	*unrecognisable, disseminated, poor quality.	85	F-M	F	1+ to 2-
794-038A	1410-440m	I;W;Am*-H-Al	*as 035A. Contamination.	80	F-M	F	1+ to 2-(?)
794-042B	1530-560m	I-W;Am*-H;Al	*as 035A. H at 2- through 2.	70	F-M	F-G	1+ to 2-(?)
794-047A	1680-710m	W-I;Am*;H-Al	*as 035A.	70	F-M	F	2-
794-103A	1714m SWC	W-I;H;Al-Am		70	M	G	2-
794-104A	1772m SWC	W-I;H;Am-Al	H at 2- to 2 and 2.	80	M	G	2-
794-105A	1835m SWC	W;H-I;Am-Al	H at 2- to 2 and 2.	50	F-C	F	2-
794-052A	1830-860m	W-I;H-Am*;Al	H at 2- to 2 and 2. *Generally disseminated, poor quality.	65	F-M	F-G	2-
794-056A	1920-950m	-;I-W-H-Am*-Al-	*atypical, unrecognisable, poor quality. H at 2- to 2.	45	F-M/C	F	2-
794-059A	2010-040m	I;W-Am*-W;Al	*as 056A. H at 2- to 2 and 2.	70	M	F	2-
794-106A	2075m SWC	W-I;Am*;H-Al	*disseminated, unrecognisable, poor quality.	80	F-M	F	2- to 2
794-062A	2100-130m	W-I;Am*-H;Al	*includes poor quality material. H at 2.	65	F-C	F-G	2- to 2

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

postscript = coarse, cuticle, cysts, degraded, fine, other,. structured, spore-pollen, thick-walled, unstructured

TABLE 3
KEROGEN TYPE AND MATURATION

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC MATTER DESCRIPTION					THERMAL MATURATION INDEX
		TYPES 40%; 10–40%; 10%	REMARKS	REWORKED (%)	PARTICLE SIZE	PRESERV-ATION	
794-094A	3060-090m	Am*-W;H-I;Al	*degraded, includes incompletely developed material - not typically oil prone.	40	F-M	F	2+(?)
794-124A	3100m SWC	W;Am*-H**;I	*degraded, unrecognisable, incompletely developed - not typically oil prone. **as 123A.		F-M/C	F-G	2+(?)
794-096A	3120-150m	W;I-Am*-H;Al	*as 088A. Material at 2+.	60	M	F	2 to 2+

Algal, Amorphous, Herbaceous, Inertinite, Resin, Wood

postscript = coarse, cuticle, cysts, degraded, fine, other,. structured, spore-pollen, thick-walled, unstructured

TABLE 4
VITRINITE REFLECTANCE DATA

GEOCHEM SAMPLE NUMBER	DEPTH	SAMPLE TYPE	AVERAGE REFLECTIVITY Ro (%), (NUMBER OF PARTICLES)				REMARKS
			1	2	3	4	
794-005A	420-450m	WR	0.41(4)	0.53(3)	0.79(5)*	-	
794-011A	600-630m	WR	0.38(12)	0.82(4)	-	-	
794-023A	960-990m	WR	0.31(3)	1.04(24)*	-	-	
794-030A	1170-1200m	WR	0.40(2)	1.15(18)*	-	-	
794-038A	1410-1440m	WR	0.46(1)	0.71(1)*	1.10(10)*	-	
794-103A SWC	1714m	KC	0.46(14)	1.08(23)*	-	-	
794-105A SWC	1835m	WR	0.49(11)	0.66(1)	1.03(13)*	-	
794-056A	1920-1950m	WR	0.45(1)	1.22(24)*	-	-	
794-106A SWC	2075m	WR	1.17(5)	1.52(2)*	-	-	
794-062A	2100-2130m	WR	1.02(1)	1.48(13)*	-	-	
794-108A SWC	2186m	KC	0.75(15)	1.14(25)*	-	-	
794-109A SWC	2230m	KC	0.55(2)	1.21(48)*	-	-	
794-066A	2220-2250m	WR	1.24(7)	-	-	-	
794-111A SWC	2305m	KC	0.52(5)	0.76(2)	1.20(53)*	-	
794-072A	2400-2430m	WR	0.97(1)	1.26(19)*	-	-	
794-112A SWC	2422m	KC	0.79(51)	1.19(8)*	-	-	
794-114A SWC	2499m	KC	0.81(53)	1.17(7)*	-	-	
794-077A	2550-2580m	WR	1.30(4)*	3.65(4)*	5.27(1)*	-	
794-116A SWC	2578m	WR	1.21(30)*	-	-	-	
794-117A SWC	2700m	WR	0.94(7)	1.37(16)*	-	-	
794-082A	2700-2730m	WR	0.60(1)	4.50(1)*	-	-	
794-118A SWC	2766.5m	WR	1.18(10)*	1.62(1)*	-	-	
794-085A	2790-2820m	WR	1.42(7)*	3.34(2)*	-	-	
794-120A SWC	2865m	WR	1.39(25)*	-	-	-	
794-088A	2880-2910m	WR	0.68(4)	1.19(16)*	-	-	
794-121A SWC	2939.5m	WR	1.25(1)*	1.69(19)*	-	-	
794-092A	3000-3030m	WR	1.35(20)*	-	-	-	
794-094A	3060-3090m	KC	0.38(3)	1.01(5)*	1.31(3)*	-	

CT—ditch cuttings; CO—core; WR—whole rock; KC—kerogen concentrate. Colours — spore fluorescence. *Reworked

TABLE 4
VITRINITE REFLECTANCE DATA

GEOCHEM SAMPLE NUMBER	DEPTH	SAMPLE TYPE	AVERAGE REFLECTIVITY Ro (%), (NUMBER OF PARTICLES)				REMARKS
			1	2	3	4	
794-124A SWC	3100m	KC	1.15(1)*	1.57(69)*	-	-	
794-096A	3120-3150m	WR	0.82(2)	1.26(18)*	-	-	

CT–ditch cuttings; CO–core; WR–whole rock; KC–kerogen concentrate. Colours – spore fluorescence. *Reworked

TABLE 5a
CONCENTRATION (PPM) OF EXTRACTED C_{15+} MATERIAL IN ROCK

GEOCHEM SAMPLE NUMBER	DEPTH	TOTAL EXTRACT	HYDROCARBONS			NON HYDROCARBONS			
			Paraffin - Naphthenes	Aromatics	TOTAL	Precipitd. Asphaltenes	Eluted NSO's	Non-eluted NSO's	Sulphur
794-011A	600-630	517	117	73	190	222	64	36	5
794-023A	960-990	311	67	36	102	146	34	24	5
794-042	1530-1560	438	133	57	190	148	45	51	5
794-047A	1680-1710	858	222	127	349	298	99	99	14
794-052	1830-1860	1272	512	229	742	392	104	31	4
794-062	2100-2130	347	95	36	131	154	26	36	0
794-072	2400-2430	2058	405	450	855	684	378	141	0
794-077	2550-2580	419	82	76	158	211	32	15	3
794-080	2640-2670	1082	277	233	509	350	178	37	7
794-118A	2766.5	2773	1237	645	1882	600	167	84	40
794-085A	2790-2820	1166	286	243	529	470	123	40	4
794-088	2880-2910	909	379	196	575	172	120	31	12
794-092	3000-3030	754	262	146	408	240	80	19	7
794-094	3060-3090	801	299	164	463	245	65	28	0
794-124A	3100	1918	480	415	895	725	155	104	40
794-102	3300-3314	412	44	61	104	278	20	10	0

TABLE 5b

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

GEOCHEM SAMPLE NUMBER	DEPTH	HYDROCARBONS		NON HYDROCARBONS			
		Paraffin – Naphthenes	Aromatics	Preciptd. Asphaltenes	Eluted NSO's	Non eluted NSO's	Sulphur
794-011A	600-630	22.54	14.14	43.03	12.30	6.97	1.02
794-023A	960-990	21.41	11.50	46.96	10.86	7.67	1.60
794-042	1530-1560	30.33	13.11	33.68	10.28	11.57	1.03
794-047A	1680-1710	25.84	14.83	34.69	11.48	11.48	1.67
794-052	1830-1860	40.29	18.03	30.80	8.16	2.40	0.32
794-062	2100-2130	27.34	10.34	44.33	7.64	10.34	0.00
794-072	2400-2430	19.68	21.85	33.24	18.35	6.87	0.00
794-077	2550-2580	19.64	18.06	50.42	7.64	3.64	0.61
794-080	2640-2670	25.57	21.50	32.40	16.46	3.44	0.63
794-118A	2766.5	44.61	23.27	21.65	6.03	3.01	1.43
794-085A	2790-2820	24.52	20.85	40.28	10.58	3.46	0.31
794-088	2880-2910	41.71	21.52	18.91	13.23	3.36	1.28
794-092	3000-3030	34.67	19.38	31.87	10.62	2.51	0.93
794-094	3060-3090	37.38	20.45	30.59	8.15	3.43	0.00
794-124A	3100	25.02	21.61	37.82	8.06	5.40	2.09
794-102	3300-3314	10.60	14.71	67.46	4.86	2.37	0.00

TABLE 6
SIGNIFICANT RATIOS (%) OF C_{15+} FRACTIONS AND ORGANIC CARBON

GEOCHEM SAMPLE NUMBER	DEPTH	ORGANIC CARBON (wt. %)	HYDROCARBONS / TOTAL EXTRACT	HYDROCARBONS / ORG. CARBON	TOTAL EXTRACT / ORG. CARBON	P-NAPHTHENES / AROMATICS
794-011A	600-630	1.04	36.68	1.82	4.97	1.59
794-023A	960-990	0.72	32.91	1.42	4.32	1.86
794-042	1530-1560	0.66	43.44	2.88	6.64	2.31
794-047A	1680-1710	1.09	40.67	3.20	7.87	1.74
794-052	1830-1860	0.89	58.32	8.33	14.29	2.24
794-062	2100-2130	0.84	37.68	1.56	4.13	2.64
794-072	2400-2430	1.57	41.53	5.45	13.11	0.90
794-077	2550-2580	1.45	37.70	1.09	2.89	1.09
794-080	2640-2670	1.47	47.08	3.46	7.36	1.19
794-118A	2766.5	2.01	67.88	9.37	13.80	1.92
794-085A	2790-2820	1.96	45.37	2.70	5.95	1.18
794-088	2880-2910	1.45	63.23	3.96	6.27	1.94
794-092	3000-3030	1.18	54.06	3.45	6.39	1.79
794-094	3060-3090	2.70	57.83	1.72	2.97	1.83
794-124A	3100	8.68	46.64	1.03	2.21	1.16
794-102	3300-3314	0.61	25.31	1.71	6.75	0.72

TABLE 7

ROCKEVAL PYROLYSIS DATA

GEOCHEM SAMPLE NUMBER	DEPTH	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	HYDROGEN INDEX	PRODUCTION INDEX	TMAX (°C)
794-005A	420-450m	0.09	0.43	0.64	63.23	0.17	425
794-006A	450-480m	0.45	1.75	0.57	291.67	0.20	422
794-007B	480-510m	0.14	0.57	0.91	67.06	0.20	426
794-008A	510-540m	0.09	0.54	1.28	75.00	0.14	429
794-009A	540-570m	0.08	0.28	0.72	30.11	0.22	431
794-010A	570-600m	0.09	0.59	1.08	63.44	0.13	433
794-011A	600-630m	0.07	1.04	1.48	69.80	0.06	436
794-012A	630-660m	0.10	1.40	1.37	74.47	0.07	435
794-013B	660-690m	0.09	0.16	0.63	20.25	0.36	483
794-014A	690-720m	0.14	0.50	1.84	63.29	0.22	431
794-015A	720-750m	0.11	0.20	0.87	76.92	0.35	425
794-016A	750-780m	0.08	0.18	0.32	60.00	0.31	426
794-017A	780-810m	0.11	0.42	0.53	82.35	0.21	427
794-018A	810-840m	0.07	0.37	0.63	74.00	0.16	433
794-019A	840-870m	0.08	0.41	0.53	77.36	0.16	433
794-020A	820-900m	0.07	0.42	0.56	77.78	0.14	432
794-021A	900-930m	0.10	0.75	0.53	92.59	0.12	432
794-022A	930-960m	0.21	1.37	0.64	171.25	0.13	417
794-023A	960-990m	0.10	0.48	0.58	53.33	0.17	441
794-024A	990-1020m	0.05	0.19	0.48	34.54	0.21	436
794-025A	1020-1050m	0.04	0.24	0.39	36.36	0.14	430
794-026A	1050-1080m	0.06	0.18	0.45	47.37	0.25	439
794-027A	1080-1110m	0.05	0.18	0.50	48.65	0.22	460
794-028A	1110-1140m	0.04	0.14	0.33	32.56	0.22	435
794-029A	1140-1120m	0.05	0.20	0.44	37.73	0.20	434
794-030A	1120-1200m	0.06	0.24	0.51	32.00	0.20	432
794-031A	1200-1230m	0.09	0.35	0.53	39.77	0.20	430
794-032A	1230-1260m	0.07	0.23	0.70	41.07	0.23	430
794-033A	1260-1290m	0.08	0.18	0.55	50.00	0.31	494
794-034A	1290-1320m	0.09	0.36	0.20	76.51	0.20	423
794-035A	1320-1350m	0.07	0.35	0.58	48.61	0.17	437
794-036A	1350-1380m	0.07	0.37	0.37	48.68	0.16	433
794-037A	1380-1410m	0.06	0.37	0.53	50.00	0.14	433
794-038A	1410-1440m	0.06	0.34	0.56	45.94	0.15	433
794-039A	1440-1470m	0.06	0.45	0.35	60.00	0.12	430
794-040A	1420-1500m	0.08	0.51	0.29	62.96	0.13	430
794-041B	1500-1530m	0.07	0.67	0.26	78.82	0.09	436
794-042B	1530-1560m	0.11	0.88	0.38	102.32	0.11	437
794-043A	1560-1590m	0.10	0.44	0.32	65.67	0.18	434
794-044A	1590-1620m	0.09	0.59	0.38	64.83	0.13	433
794-045C	1620-1650m	0.06	0.80	0.45	0.94	56.25	0.12	437
794-046A	1650-1680m	0.10	0.85	0.60	0.25	70.59	0.14	434
794-047A	1680-1710m	0.13	0.90	0.81	0.33	90.00	0.14	435
794-048A	1710-1740m	0.13	1.22	1.24	0.47	101.64	0.09	437
794-103A SWC	1744m	0.11	0.97	0.63	0.15	64.95	0.15	435
794-049B	1740-1770m	0.17	1.22	1.39	0.23	151.08	0.11	438
794-050A	1770-1800m	0.20	1.20	1.38	0.73	115.97	0.13	435
794-104A SWC	1772m	0.13	0.93	0.78	0.33	83.87	0.14	438

TABLE 7

ROCKEVAL PYROLYSIS DATA

GEOCHEM SAMPLE NUMBER	DEPTH	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	HYDROGEN INDEX	PRODUCTION INDEX	TMAX (°C)
794-051A	1800-1830m	0.22	0.22	1.40	22.00	0.50	438
794-052A	1830-1860m	0.16	1.30	0.34	127.45	0.11	441
794-105A SWC	1835m	0.23	1.17	0.59	113.60	0.16	438
794-053B	1860-1890m	0.21	1.68	0.26	186.67	0.11	441
794-055B	1890-1920m	0.27	1.66	0.37	233.80	0.14	438
794-056A	1920-1950m	0.19	1.49	0.22	146.08	0.11	440
794-057A	1950-1980m	0.19	1.65	0.41	144.74	0.10	442
794-058B	1980-2010m	0.14	1.17	0.41	119.39	0.11	441
794-059A	2010-2040m	0.12	1.08	0.44	100.93	0.10	442
794-060B	2040-2070m	0.20	1.37	0.43	147.31	0.12	444
794-061A	2070-2100m	0.08	0.50	0.27	56.82	0.14	440
794-106A SWC	2075m	0.06	0.32	0.69	42.67	0.16	445
795-062A	2100-2130m	0.09	0.39	0.30	50.65	0.19	439
795-107A SWC	2110m	0.07	0.24	0.19	35.30	0.22	488
794-063B	2130-2160m	0.14	1.17	0.34	118.18	0.11	440
794-064A	2160-2190m	0.12	0.71	0.28	75.53	0.15	442
794-108A SWC	2186m	0.13	0.69	0.46	56.56	0.16	443
794-065B	2190-2220m	0.14	0.96	0.39	101.05	0.13	443
794-066B	2220-2250m	0.31	0.56	0.57	46.28	0.36	-
794-109A SWC	2230m	0.09	0.57	0.43	47.11	0.14	445
794-067A	2250-2280m	0.11	0.22	0.34	18.33	0.33	370
794-110A SWC	2275m	0.11	0.68	0.34	48.92	0.14	446
794-068A	2280-2310m	0.11	0.28	0.44	22.76	0.28	436
794-111A SWC	2305m	0.25	1.08	0.20	77.14	0.19	447
794-069A	2310-2340m	0.11	0.16	0.31	13.22	0.41	420
794-070A	2340-2370m	0.11	0.25	0.44	18.94	0.30	440
794-071A	2370-2400m	0.17	1.26	0.42	81.29	0.12	447
794-072A	2400-2430m	0.16	0.25	0.28	15.24	0.39	430
794-112A SWC	2422m	0.45	1.93	1.11	72.83	0.19	449
794-073A	2430-2460m	0.17	0.25	0.29	17.01	0.40	436
794-074B	2460-2490m	0.23	1.35	0.34	87.66	0.14	446
794-113A SWC	2464.5m	0.46	1.78	1.40	83.18	0.20	449
794-075A	2490-2570m	0.26	0.54	0.49	30.68	0.32	444
794-114A SWC	2499m	0.55	1.94	2.45	79.18	0.22	452
794-076A	2520-2550m	0.13	0.22	0.33	13.50	0.37	370
794-115A SWC	2526.5m	0.57	1.72	1.22	85.57	0.25	451
794-077A	2550-2580m	0.19	0.60	0.66	37.50	0.24	439
794-116A SWC	2578m	0.36	1.37	0.92	68.16	0.21	453

TABLE 7

ROCKEVAL PYROLYSIS DATA

GEOCHEM SAMPLE NUMBER	DEPTH	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	HYDROGEN INDEX	PRODUCTION INDEX	TMAX (°C)
794-078A	2580-2610m	0.14	1.03	0.44	58.86	0.12	448
794-079A	2610-2640m	0.13	0.52	0.65	31.90	0.20	445
794-080A	2640-2670m	0.17	0.71	0.72	43.03	0.19	444
794-081A	2670-2700m	0.16	0.49	0.60	36.03	0.25	446
794-082A	2700-2730m	0.11	0.32	0.39	25.00	0.25	439
794-117A SWC	2700m	0.28	0.96	1.14	78.05	0.22	457
794-083B	2730-2760m	0.15	0.93	0.44	66.90	0.14	446
794-084A	2760-2790m	0.21	0.44	0.65	20.28	0.32	444
794-118A SWC	2766.5m	0.79	1.87	0.36	68.25	0.30	454
794-085A	2790-2820m	0.21	0.44	0.55	22.00	0.32	449
794-119A SWC	2815m	0.60	1.79	1.19	97.81	0.25	486
794-086A	2820-2850m	0.11	0.14	0.34	9.33	0.44	456
794-087A	2850-2880m	0.21	0.56	0.49	31.82	0.27	451
794-120A SWC	2865m	0.53	1.38	0.64	85.18	0.28	465
794-088A	2880-2910m	0.17	0.95	0.44	56.55	0.15	450
794-089A	2910-2940m	0.17	0.75	0.27	54.35	0.18	451
794-121A SWC	2939.5m	0.11	0.43	0.14	50.59	0.20	482
794-090A	2940-2970m	0.21	1.07	0.38	64.46	0.16	447
794-122A SWC	2964.5m	0.09	0.55	0.31	52.38	0.14	499
794-091A	2970-3000m	0.16	0.85	0.31	46.70	0.16	454
794-092A	3000-3030m	0.12	0.74	0.30	54.41	0.14	449
794-123A SWC	3029m	0.42	1.38	0.25	61.88	0.23	470
794-093B	3030-3060m	0.29	0.96	0.29	47.29	0.23	453
794-094B	3060-3090m	0.54	1.36	0.51	93.79	0.28	452
794-095A	3090-3120m	0.46	1.74	0.28	37.99	0.21	469
794-124A SWC	3100m	0.96	3.18	0.22	35.02	0.23	480
794-096A	3120-3150m	0.30	1.21	0.25	67.22	0.20	450
794-097B	3150-3180m	0.09	0.44	0.18	37.93	0.17	470

TABLE 8

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

GEOCHEM SAMPLE NUMBER	-011A	-023A	-042	-047A	-052	-062
DEPTH	600-630m	960-990m	1530-1560m	1680-1710m	1830-1860m	2100-2130m
SAMPLE TYPE						
nC_{15}	6.36	5.65	8.46	5.57	6.97	5.32
nC_{16}	10.95	12.85	12.19	12.20	7.36	11.67
nC_{17}	11.48	14.06	10.83	15.21	8.54	12.32
nC_{18}	9.72	11.18	8.01	13.01	7.83	10.27
nC_{19}	7.60	10.41	7.92	10.69	7.75	7.94
nC_{20}	6.01	8.31	7.64	8.83	8.46	8.96
nC_{21}	6.54	7.97	7.92	6.85	8.54	8.03
nC_{22}	5.30	8.08	7.01	5.92	6.97	7.10
nC_{23}	6.36	7.42	7.46	5.81	6.73	7.94
nC_{24}	4.95	5.76	6.55	4.18	6.11	7.00
nC_{25}	12.72	4.54	5.91	3.72	6.19	5.14
nC_{26}	3.71	1.44	3.91	2.79	5.09	3.55
nC_{27}	1.59	0.78	2.91	2.09	4.62	1.59
nC_{28}	2.30	0.44	1.46	1.16	3.76	1.12
nC_{29}	1.77	0.22	0.73	0.93	2.58	0.93
nC_{30}	1.06	0.22	0.45	0.35	1.02	0.37
nC_{31}	0.53	0.22	0.18	0.23	0.70	0.19
nC_{32}	0.35	0.11	0.18	0.12	0.39	0.19
nC_{33}	0.35	0.11	0.09	0.12	0.16	0.19
nC_{34}	0.18	0.11	0.09	0.12	0.16	0.09
nC_{35}	0.18	0.11	0.09	0.12	0.08	0.09
PARAFFIN	9.85	25.29	39.17	14.89	29.24	29.86
ISOPRENOID	2.33	5.49	4.28	3.11	4.19	3.26
NAPHTHENE	87.82	69.22	56.56	82.00	66.57	66.88
CPI INDEX A	1.52	1.10	1.12	1.08	1.08	1.03
CPI INDEX B	1.81	1.67	1.20	1.20	1.13	1.08
PRISTANE/PHYTANE	1.79	1.61	2.24	2.00	1.95	2.66
PRISTANE/nC_{17}	1.32	0.95	0.70	0.92	1.11	0.64

TABLE 8

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

GEOCHEM SAMPLE NUMBER	072	-077	-080	-118A	-085A	-088
DEPTH	2400-2480m	2550-2580m	2640-2670m	2767m	2790-2820m	2880-2910m
SAMPLE TYPE						
nC_{15}	9.77	4.66	10.68	2.49	8.57	10.49
nC_{16}	8.20	8.91	11.10	6.86	9.24	10.92
nC_{17}	11.89	10.05	10.10	10.13	10.32	7.25
nC_{18}	8.11	10.78	10.10	10.29	9.46	9.81
nC_{19}	8.66	10.29	9.27	9.35	9.09	8.57
nC_{20}	7.93	8.99	8.43	8.89	9.53	8.11
nC_{21}	6.73	8.82	7.01	7.79	8.94	6.66
nC_{22}	6.18	8.01	5.76	7.72	7.69	6.06
nC_{23}	5.99	7.27	5.59	7.01	6.65	5.63
nC_{24}	4.98	7.03	4.43	6.24	5.99	4.95
nC_{25}	4.70	5.80	5.51	5.07	5.76	4.44
nC_{26}	4.42	4.17	3.26	4.91	4.43	3.92
nC_{27}	4.06	2.37	3.42	3.35	2.51	3.58
nC_{28}	2.76	1.31	1.84	3.59	1.26	2.22
nC_{29}	2.40	0.57	1.59	2.81	0.44	1.79
nC_{30}	1.47	0.33	1.00	1.48	0.30	0.85
nC_{31}	0.83	0.16	0.33	0.86	0.22	0.51
nC_{32}	0.37	0.16	0.25	0.47	0.15	0.34
nC_{33}	0.28	0.16	0.17	0.39	0.15	0.17
nC_{34}	0.18	0.08	0.08	0.16	0.07	0.09
nC_{35}	0.09	0.08	0.08	0.16	0.07	0.09
PARAFFIN	40.67	35.64	32.20	41.41	35.62	39.43
ISOPRENOID	4.39	3.61	3.76	2.32	2.98	4.68
NAPHTHENE	54.93	60.75	64.04	56.26	61.40	55.89
CPI INDEX A	1.04	1.02	1.20	0.94	1.05	1.03
CPI INDEX B	1.10	1.09	1.37	0.95	1.10	1.14
PRISTANE/PHYTANE	2.25	2.02	2.59	1.40	2.05	1.40
PRISTANE/nC_{17}	0.63	0.67	0.83	0.32	0.59	0.67

TABLE 8

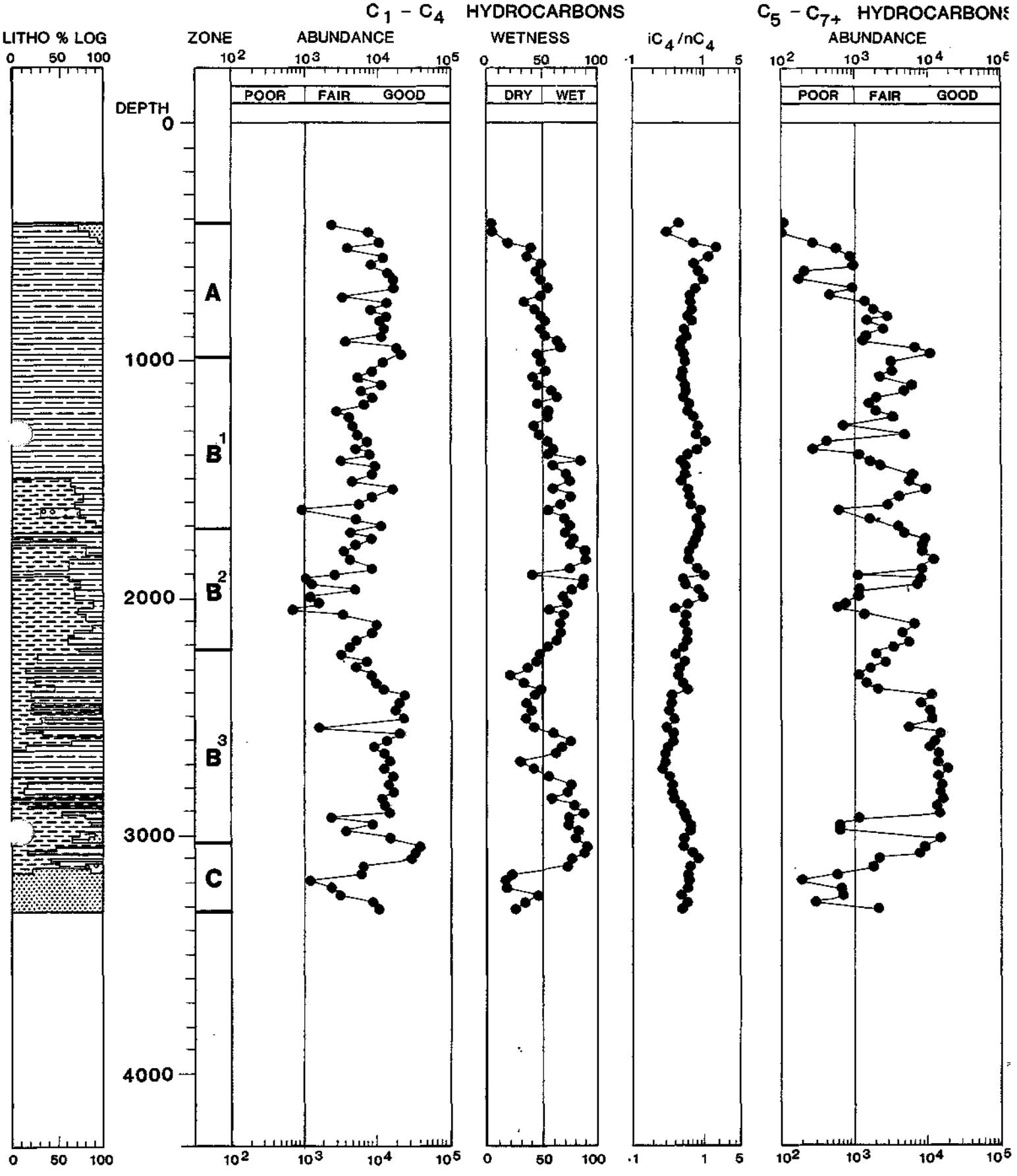
COMPOSITION (NORMALISED %) OF C_{15+} PARAFFIN – NAPHTHENE HYDROCARBONS

GEOCHEM SAMPLE NUMBER	-092	-094	-124A	-102
DEPTH	3000-3030m	3060-3090m	3100m	3300-3314m
SAMPLE TYPE				
nC_{15}	10.13	8.08	3.49	2.71
nC_{16}	10.21	12.02	9.57	6.87
nC_{17}	7.25	13.20	14.19	10.10
nC_{18}	8.73	11.90	15.32	13.54
nC_{19}	8.57	10.94	12.73	13.96
nC_{20}	7.25	8.77	11.37	11.77
nC_{21}	8.65	7.59	8.00	10.31
nC_{22}	6.31	6.70	7.21	9.06
nC_{23}	6.08	5.22	5.63	7.60
nC_{24}	5.61	4.24	4.17	6.15
nC_{25}	5.38	3.15	3.04	3.96
nC_{26}	4.75	2.36	1.80	2.08
nC_{27}	3.90	2.07	1.35	0.62
nC_{28}	2.96	1.58	0.56	0.21
nC_{29}	2.03	0.79	0.45	0.31
nC_{30}	1.01	0.49	0.34	0.21
nC_{31}	0.62	0.30	0.23	0.10
nC_{32}	0.23	0.20	0.23	0.10
nC_{33}	0.16	0.20	0.11	0.10
nC_{34}	0.08	0.10	0.11	0.10
nC_{35}	0.08	0.10	0.11	0.10
PARAFFIN	37.98	48.70	32.05	38.76
ISOPRENOID	4.03	5.18	2.31	2.30
NAPHTHENE	57.99	46.11	65.64	58.94
CPI INDEX A	1.11	1.01	1.02	1.03
CPI INDEX B	1.08	1.04	1.23	1.25
PRISTANE/PHYTANE	2.09	2.48	1.21	1.38
PRISTANE/nC_{17}	0.99	0.57	0.28	0.34

FIGURE 1

$C_1 - C_7$ HYDROCARBONS

WELL 7119/12-3



LIMESTONE
DOLOMITE
SHALE
MUDSTONE/ CLAYSTONE
COAL
SILTSTONE
SANDSTONE
EVAPORITE
IGNEOUS
L.C.M.

iC_4 - ISOBUTANE

nC_4 - NORMAL BUTANE

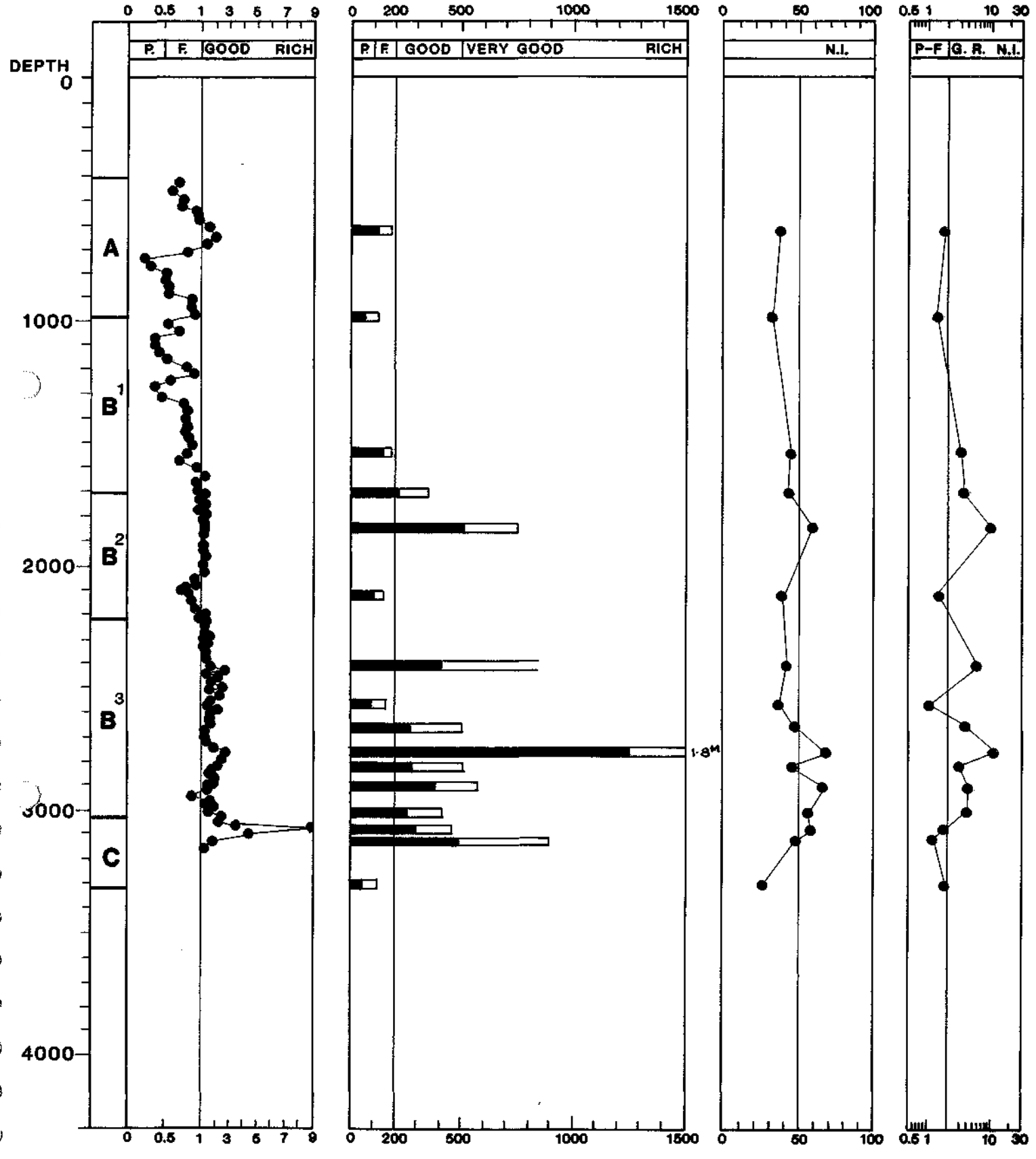
ABUNDANCE - VOLUME PPM OF ROCK

WETNESS - % C_2-C_4 IN C_1-C_4

FIGURE 2

RICHNESS

WELL 7119/12-3



● SHALE / MUDSTONE
○ OTHER LITHOLOGIES

P – N – PARAFFIN – NAPHTHENES
AROM – AROMATICS
HC – C_{15+} HYDROCARBONS
OC – ORGANIC CARBON
TE – TOTAL C_{15+} EXTRACT

P – POOR
F – FAIR
G – GOOD
R – RICH
N.I. – NON-INDIGENOUS HYDROCARBONS

FIGURE 3

ROCKEVAL DATA

WELL 7119/12-3

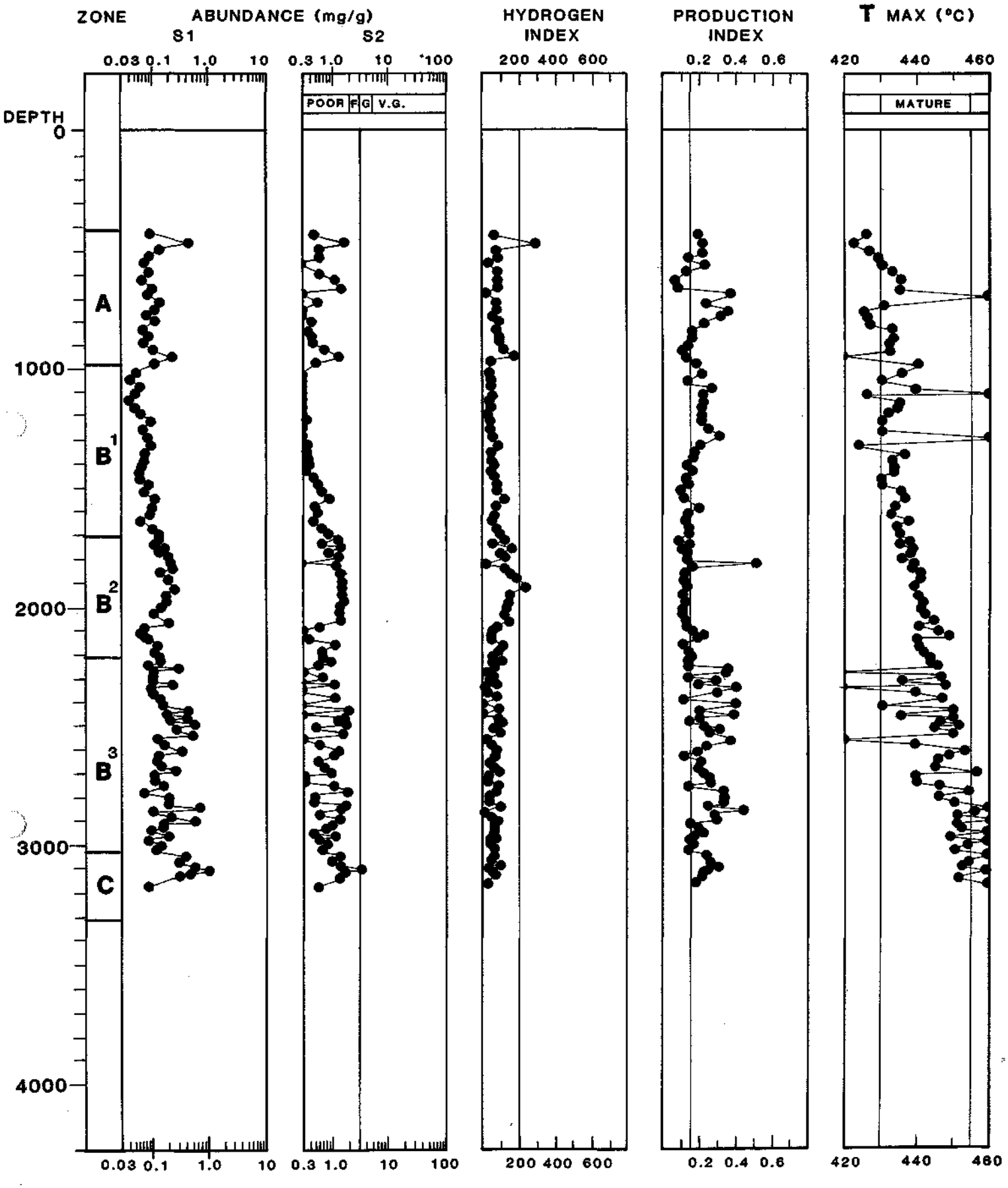
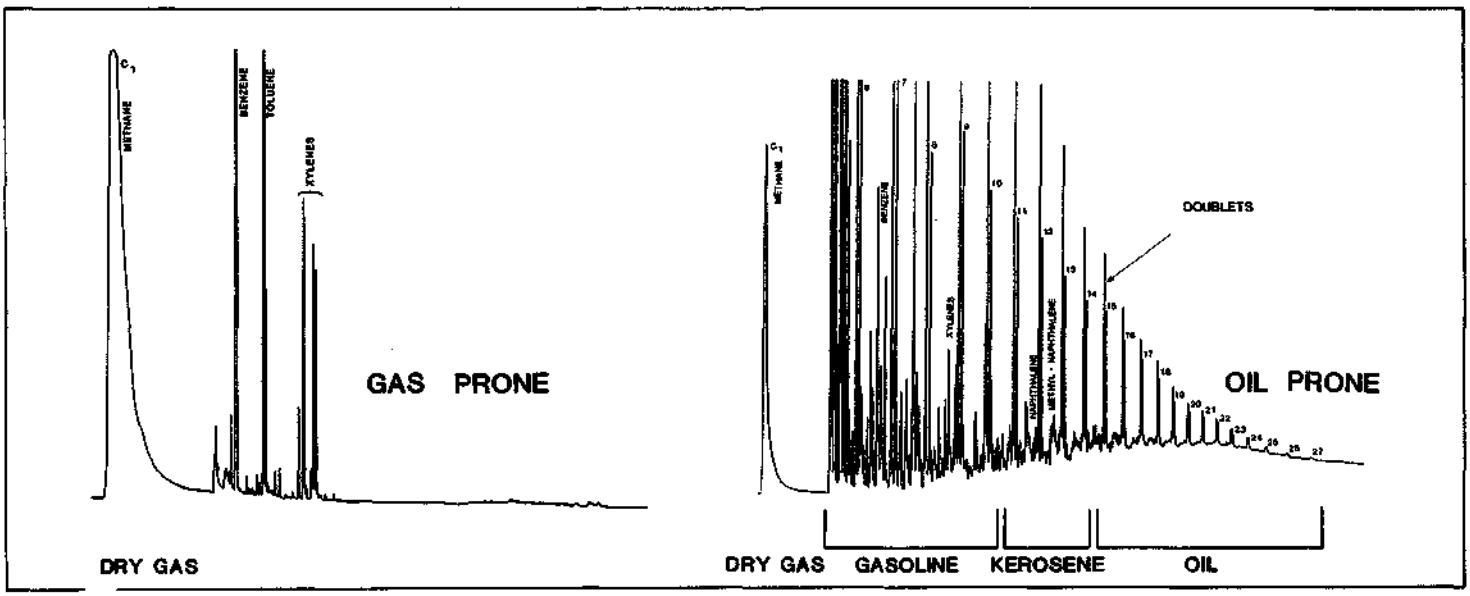
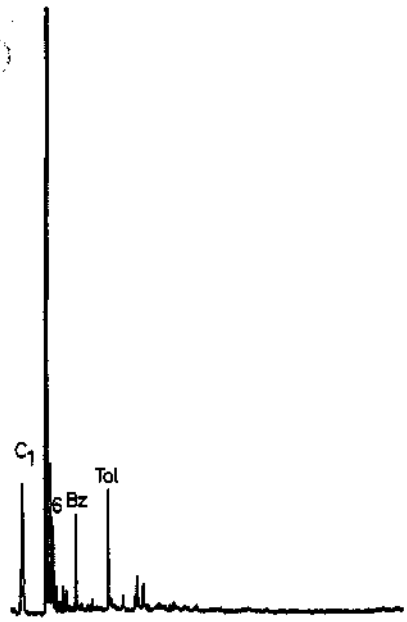
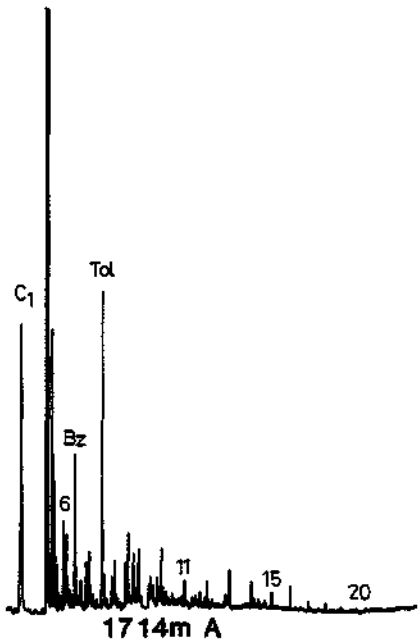


FIGURE 4a **PYROLYSIS GC** WELL 7119/12-3

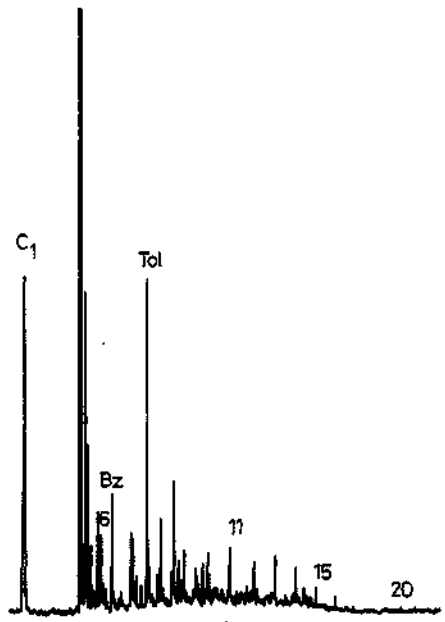




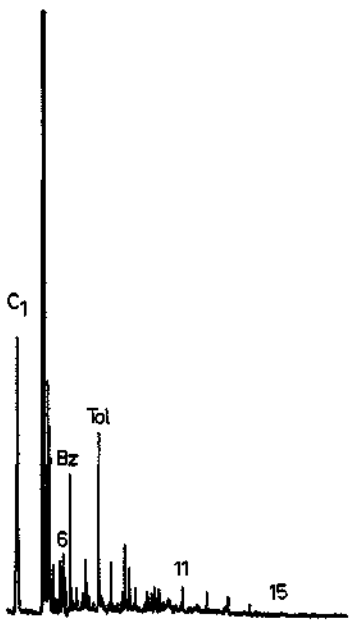
600–630m A



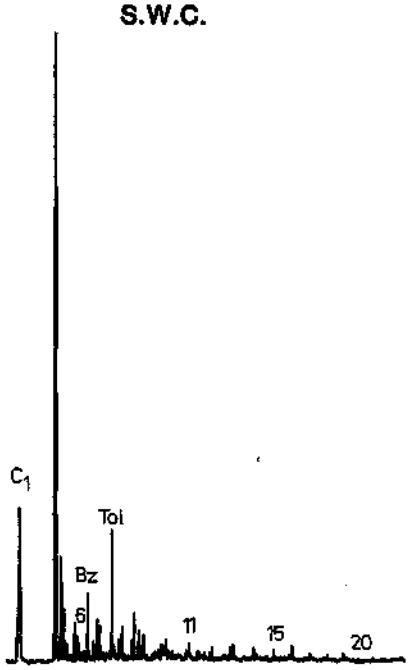
1714m A
S.W.C.



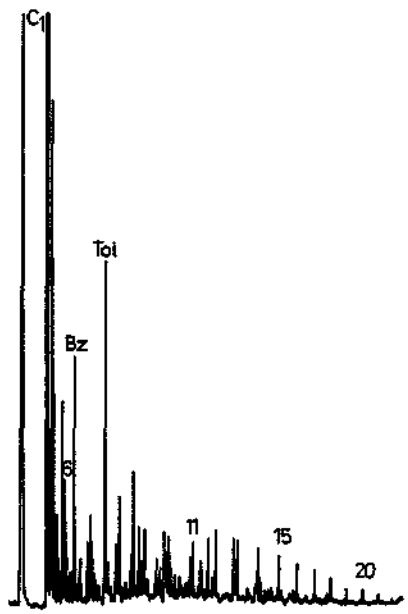
1835m A
S.W.C.



1920–1950m A



2186m A
S.W.C.

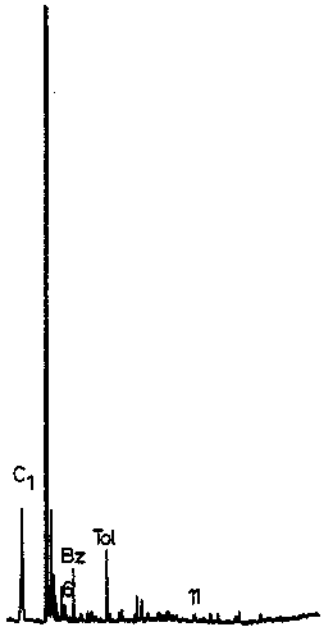


2230m A
S.W.C.

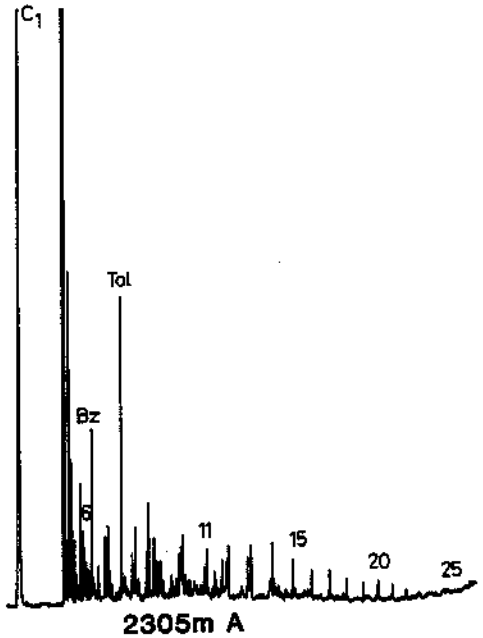
FIGURE 4b

PYROLYSIS GC

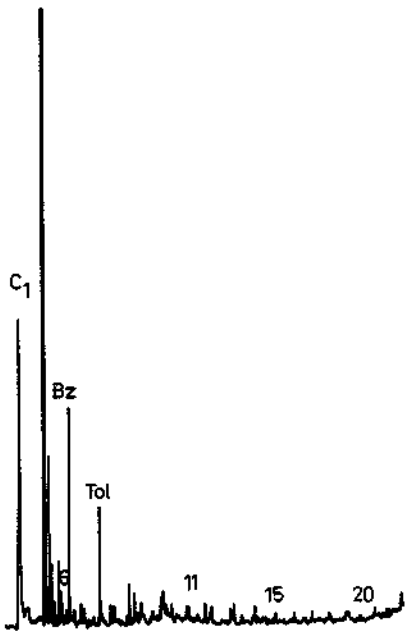
WELL 7119/12-3



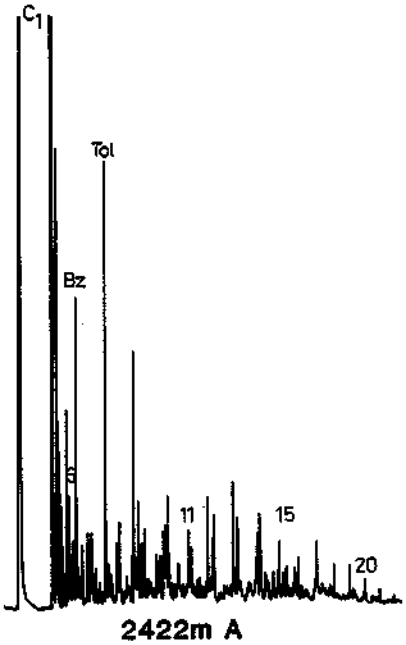
2220–2250m A



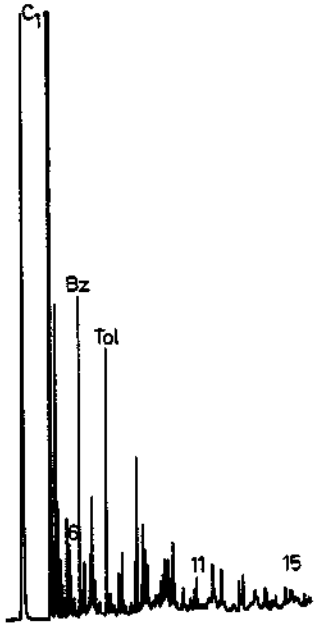
2305m A
S.W.C.



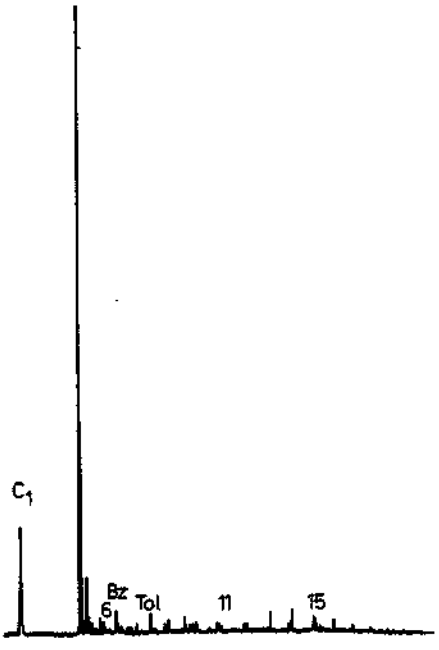
2400–2430m A



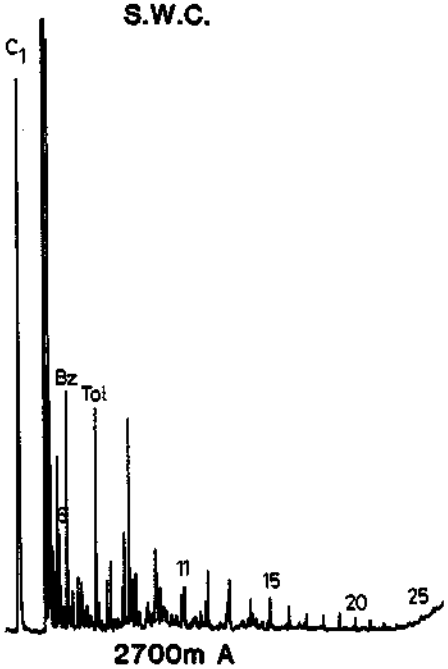
2422m A
S.W.C.



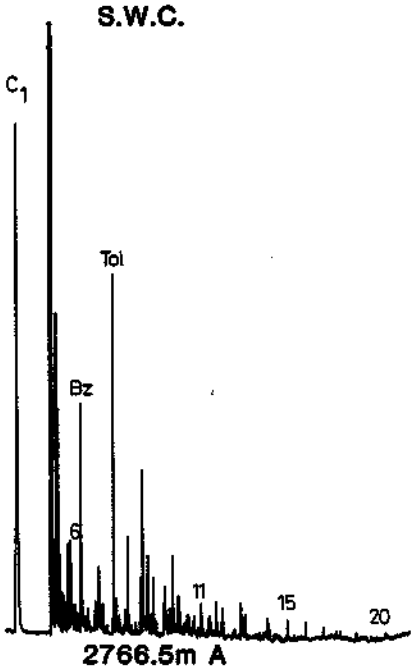
2499m A
S.W.C.



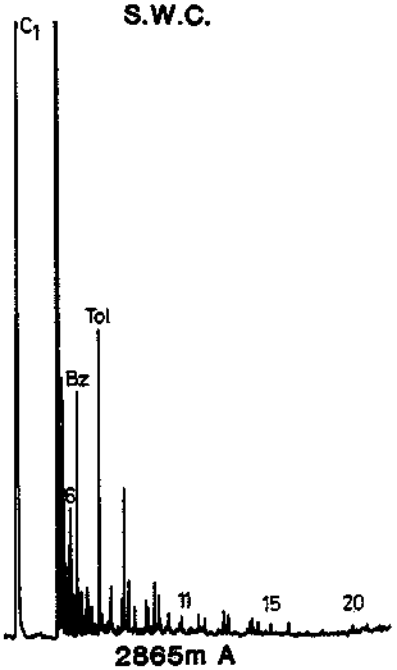
2578m A
S.W.C.



2700m A
S.W.C.



2766.5m A
S.W.C.

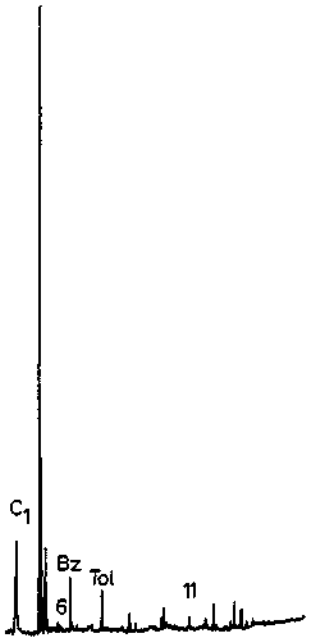


2865m A
S.W.C.

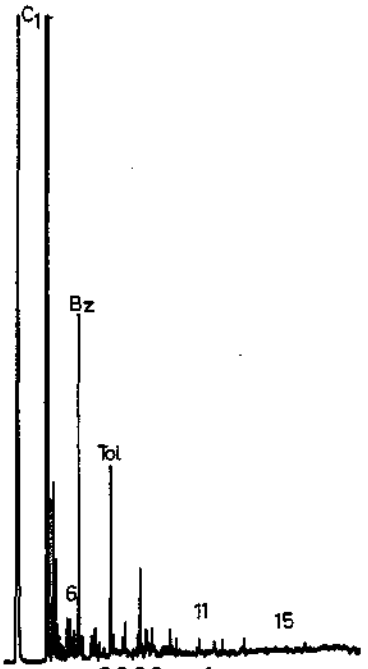
FIGURE 4c

PYROLYSIS GC

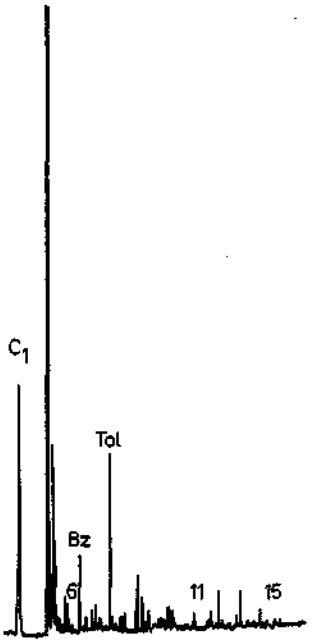
WELL 7119/12-3



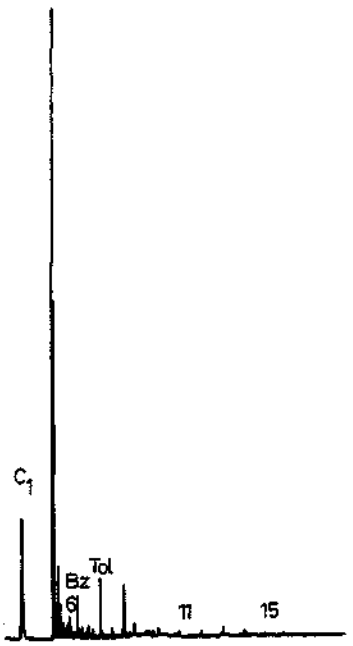
2964.5m A
S.W.C.



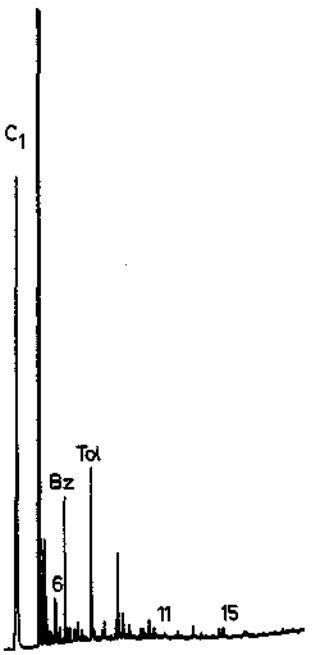
3029m A
S.W.C.



3060-3090m A

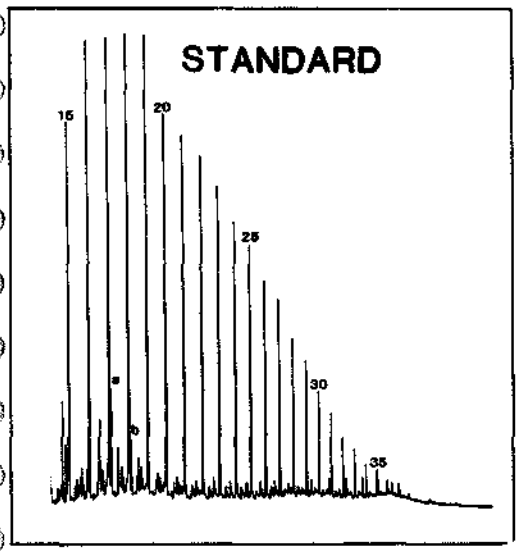


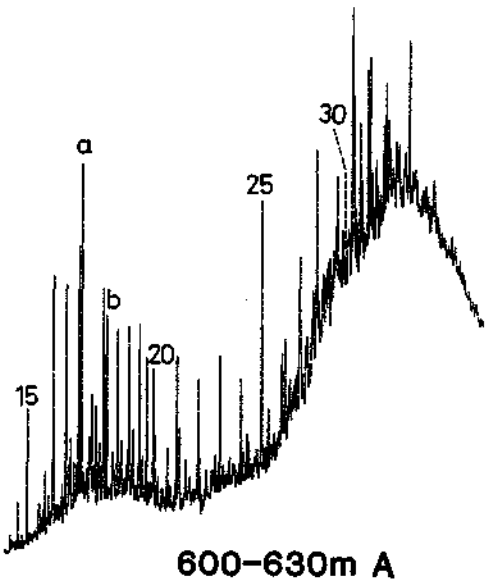
3100m A
S.W.C.



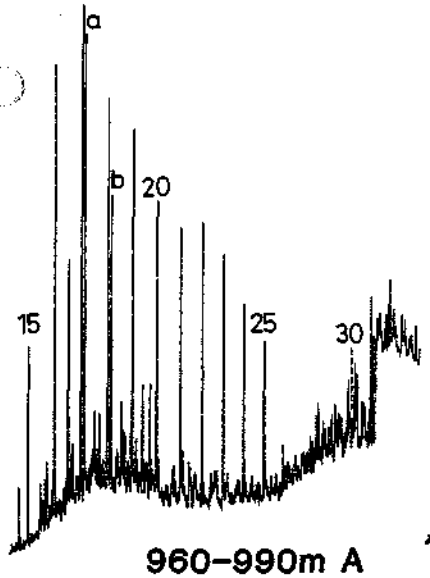
3090-3120m A

FIGURE 5a C_{15+} PARAFFIN-NAPHTHENES WELL 7119/12-3

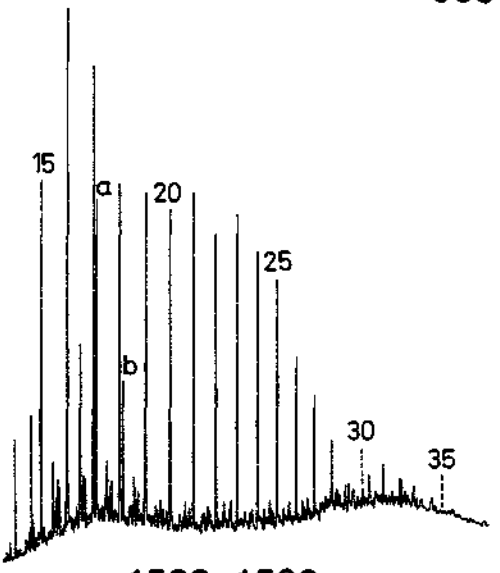




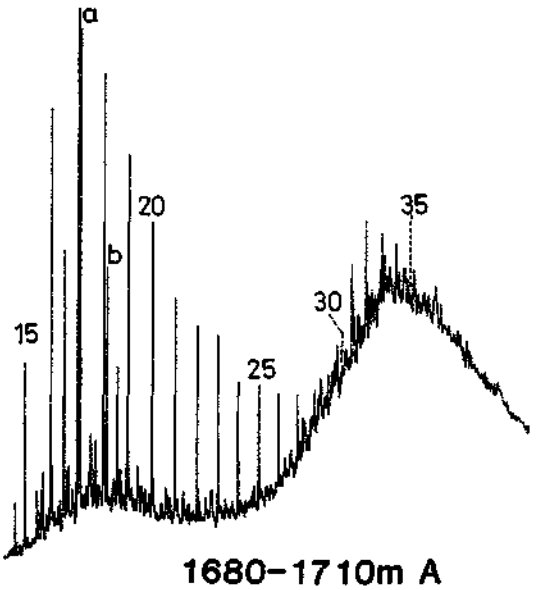
600-630m A



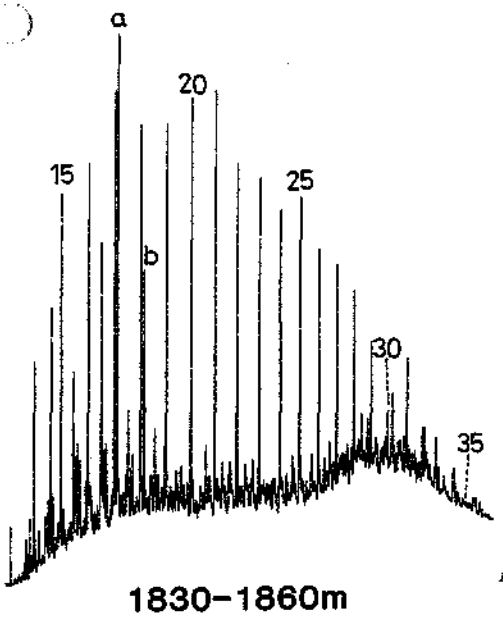
960-990m A



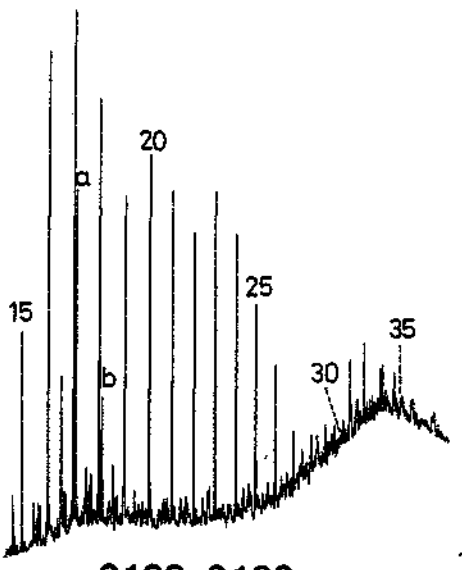
1530-1560m



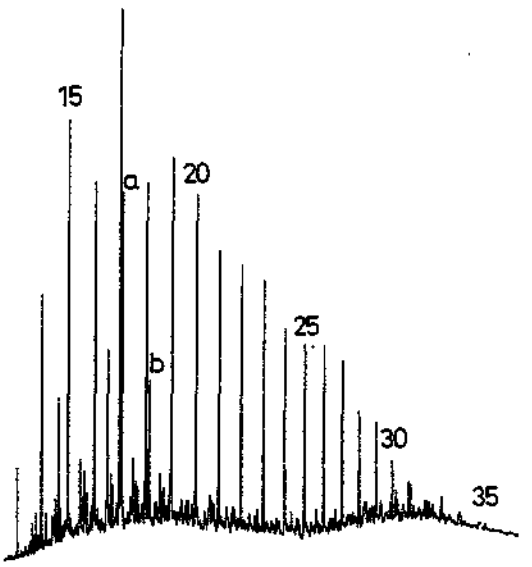
1680-1710m A



1830-1860m



2100-2130m

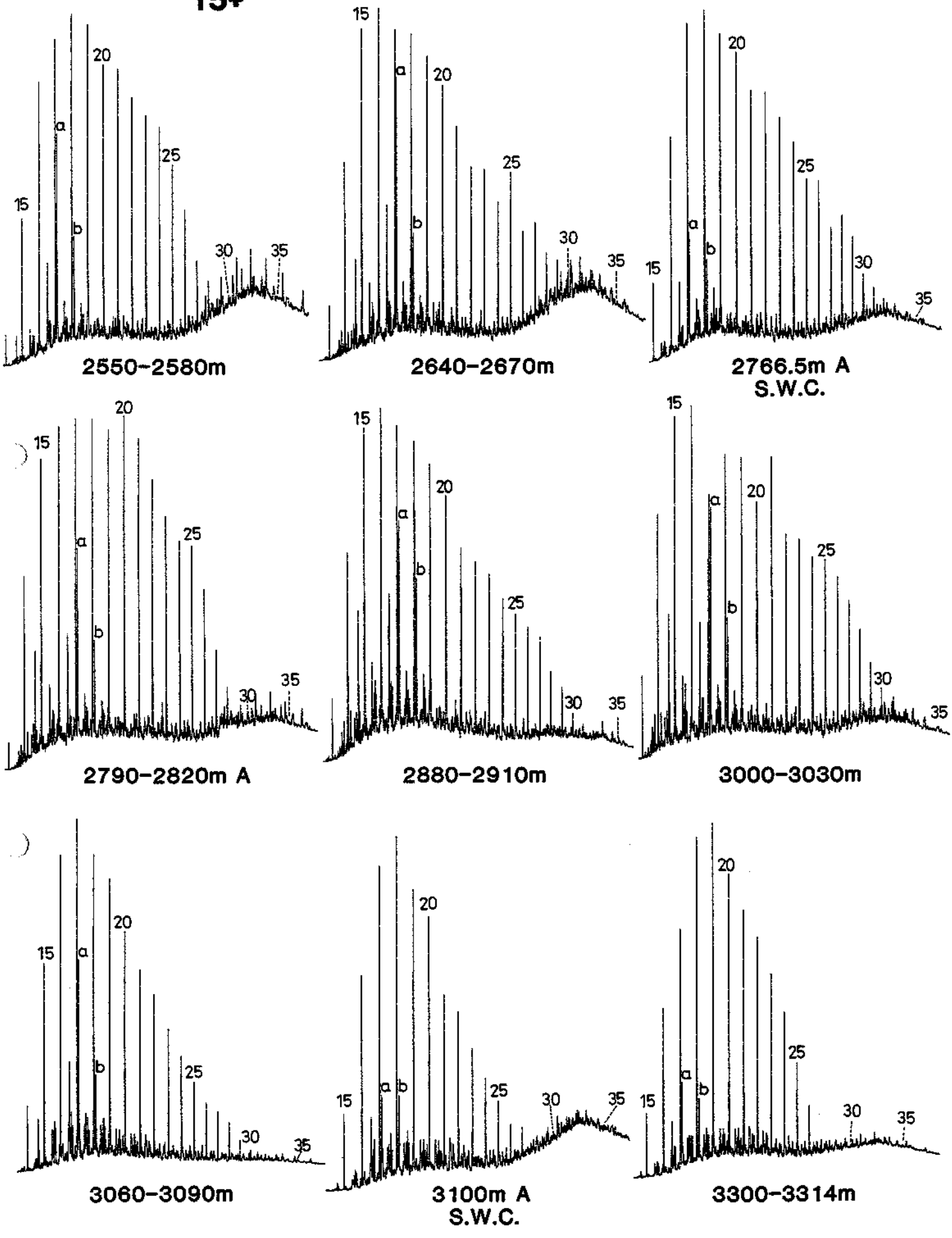


2400-2430m

a - PRISTANE
b - PHYTANE

CARBON NUMBERS OF NORMAL PARAFFINS INDICATED (20 - nC_{20})

FIGURE 5b C_{15+} PARAFFIN-NAPHTHENES WELL 7119/12-3



a - PRISTANE
b - PHYTANE

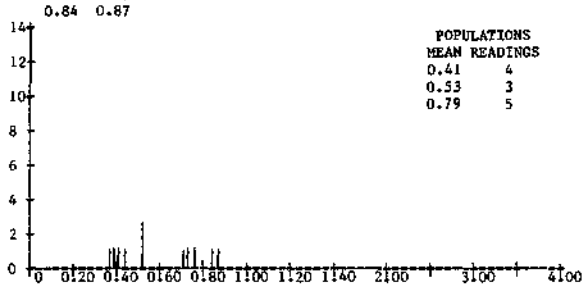
CARBON NUMBERS OF NORMAL PARAFFINS INDICATED (20 - nC_{20})

FIGURE 6a VITRINITE REFLECTANCE WELL 7119/12-3

SAMPLE 794-005A DEPTH 420 VITRINITE REFLECTANCE VALUES

0.37 0.39 0.41 0.44 0.52 0.52 0.53 0.71 0.73 0.76
0.84 0.87

POPULATIONS
MEAN READINGS
0.41 4
0.53 3
0.79 5

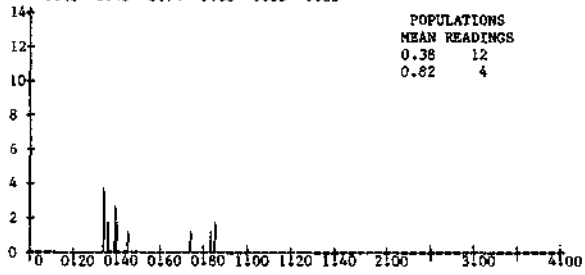


REMARKS LEAN. SCATTERED INERTINITE PARTICLES PLUS OCCASIONAL SMALL, UNRELIABLE VITRINITE PARTICLES OF VARIABLE REFLECTANCE. POOR SAMPLE.

SAMPLE 794-011A DEPTH 600 VITRINITE REFLECTANCE VALUES

0.34 0.34 0.35 0.35 0.36 0.37 0.39 0.39 0.39 0.40
0.40 0.45 0.74 0.83 0.85 0.85

POPULATIONS
MEAN READINGS
0.38 12
0.82 4

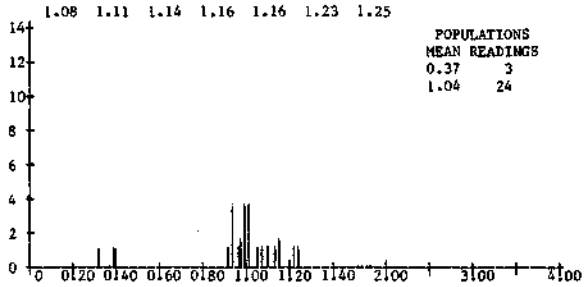


REMARKS CHIEFLY BITUMEN STAINING. OCCASIONAL SMALL VITRINITE PARTICLES.

SAMPLE 794-023A DEPTH 960 VITRINITE REFLECTANCE VALUES

0.32 0.39 0.40 0.92 0.94 0.94 0.94 0.95 0.97 0.98
0.98 1.00 1.01 1.01 1.01 1.02 1.02 1.03 1.03 1.06
1.08 1.11 1.14 1.16 1.16 1.23 1.25

POPULATIONS
MEAN READINGS
0.37 3
1.04 24

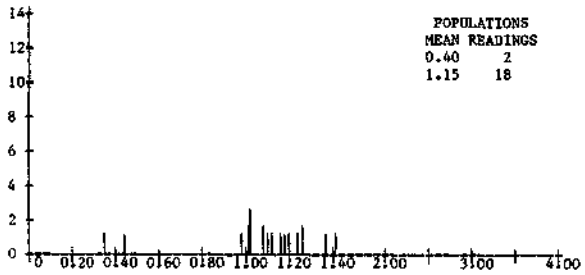


REMARKS SCATTERED PARTICLES OF VITRINITE AND INERTINITE. VITRINITE GENERALLY REWORKED.

SAMPLE 794-030A DEPTH 1170 VITRINITE REFLECTANCE VALUES

0.35 0.44 0.98 1.01 1.01 1.02 1.02 1.02 1.08 1.09
1.10 1.12 1.16 1.18 1.20 1.24 1.26 1.27 1.37 1.43

POPULATIONS
MEAN READINGS
0.40 2
1.15 18

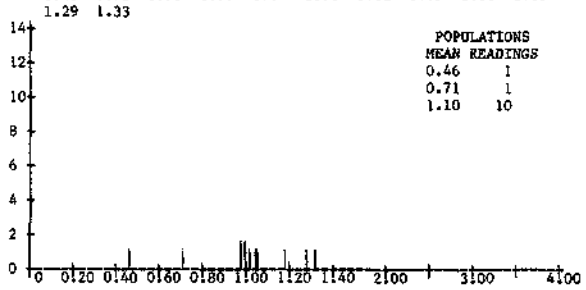


REMARKS SMALL SCATTERED PARTICLES OF REWORKED VITRINITE AND INERTINITE. TWO SMALL, UNRELIABLE VITRINITE PARTICLES OF LOWER REFLECTANCE ALSO PRESENT. POOR SAMPLE.

SAMPLE 794-038A DEPTH 1410 VITRINITE REFLECTANCE VALUES

0.46 0.71 0.98 0.99 1.00 1.01 1.02 1.05 1.06 1.19
1.29 1.33

POPULATIONS
MEAN READINGS
0.46 1
0.71 1
1.10 10

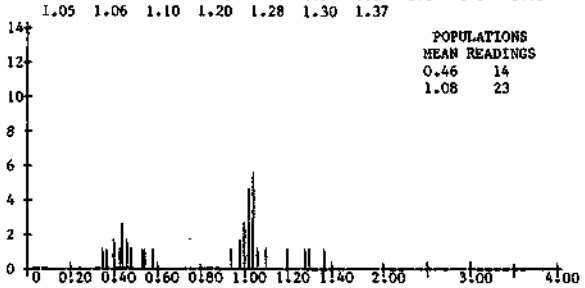


REMARKS SCATTERED PARTICLES OF VITRINITE (GENERALLY REWORKED) AND INERTINITE PLUS BITUMEN STAINING. FEW MEASUREMENTS POSSIBLE. POOR SAMPLE.

SAMPLE 794-103A DEPTH 1714 VITRINITE REFLECTANCE VALUES

0.35 0.37 0.40 0.41 0.43 0.44 0.44 0.44 0.46 0.47
0.48 0.53 0.54 0.58 0.94 0.98 0.99 1.00 1.00 1.01
1.02 1.02 1.03 1.03 1.03 1.04 1.04 1.04 1.04 1.05
1.05 1.06 1.10 1.20 1.28 1.30 1.37

POPULATIONS
MEAN READINGS
0.46 14
1.08 23

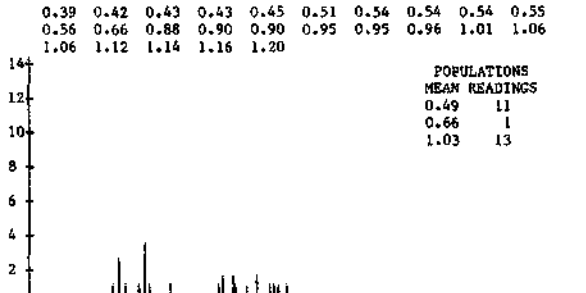


REMARKS CHIEFLY VITRINITE PARTICLES, LARGELY REWORKED OCCASIONAL PARTICLES OF LOWER REFLECTANCE PLUS INERTINITE.

SAMPLE 794-105A DEPTH 1835 VITRINITE REFLECTANCE VALUES

0.39 0.42 0.43 0.43 0.45 0.51 0.54 0.54 0.54 0.55
0.56 0.66 0.88 0.90 0.90 0.95 0.95 0.96 1.01 1.06
1.06 1.12 1.14 1.16 1.20

POPULATIONS
MEAN READINGS
0.49 11
0.66 1
1.03 13

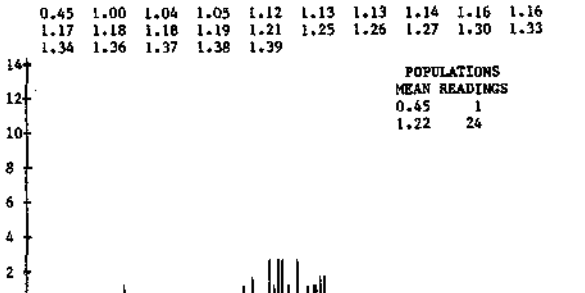


REMARKS FAIRLY LEAN. SMALL PARTICLES OF INERTINITE AND VITRINITE – LATTER OF VARIABLE REFLECTANCE, FREQUENTLY REWORKED.

SAMPLE 794-056A DEPTH 1920 VITRINITE REFLECTANCE VALUES

0.45 1.00 1.04 1.05 1.12 1.13 1.13 1.14 1.16 1.16
1.17 1.18 1.18 1.19 1.21 1.25 1.26 1.27 1.30 1.33
1.34 1.36 1.37 1.38 1.39

POPULATIONS
MEAN READINGS
0.45 1
1.22 24



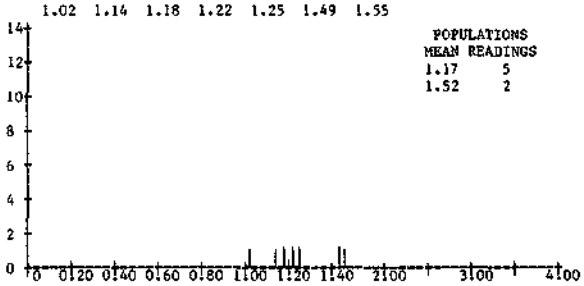
REMARKS PARTICLES OF VITRINITE (DOMINANTLY REWORKED) AND INERTINITE PLUS BITUMEN STAINING. POOR SAMPLE.

FIGURE 6b VITRINITE REFLECTANCE WELL 7119/12-3

SAMPLE 794-106A DEPTH 2075 VITRINITE REFLECTANCE VALUES

1.02 1.14 1.18 1.22 1.25 1.49 1.55

POPULATIONS
MEAN READINGS
1.17 5
1.52 2

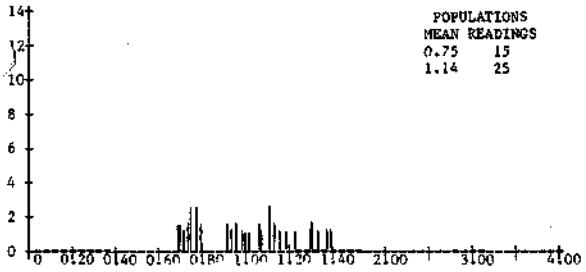


REMARKS SCRAPS AND TINY PARTICLES OF REWORKED VITRINITE AND INERTINITE. A FEW UNRELIABLE REWORKED PARTICLES MEASURED
POOR SAMPLE.

SAMPLE 794-108A DEPTH 2186 VITRINITE REFLECTANCE VALUES

0.69	0.69	0.70	0.71	0.72	0.74	0.74	0.75	0.76	0.77
0.78	0.79	0.79	0.80	0.80	0.92	0.93	0.94	0.96	0.96
0.99	1.00	1.02	1.07	1.07	1.08	1.12	1.12	1.13	1.14
1.15	1.17	1.20	1.24	1.31	1.32	1.33	1.35	1.39	1.42

POPULATIONS
MEAN READINGS
0.75 15
1.14 25

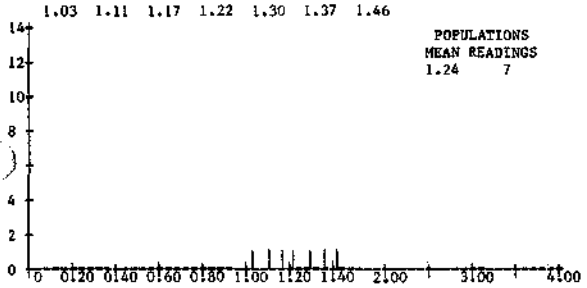


REMARKS CHIEFLY VITRINITE PARTICLES OF VERY VARIABLE REFLECTANCE. FREQUENT INERTINITE.

SAMPLE 794-066A DEPTH 2220 VITRINITE REFLECTANCE VALUES

1.03 1.11 1.17 1.22 1.30 1.37 1.46

POPULATIONS
MEAN READINGS
1.24 7

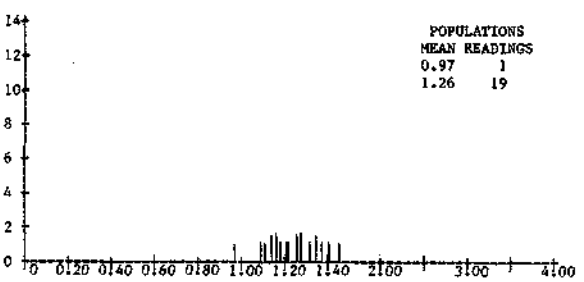


REMARKS DOMINANTLY TURBODRILLED AND APPARENTLY BARREN. A FEW SMALL, POOR, APPARENTLY REWORKED PARTICLES IN SEVERAL UNAFFECTED CUTTINGS POOR SAMPLE.

SAMPLE 794-072A DEPTH 2400 VITRINITE REFLECTANCE VALUES

0.97	1.09	1.11	1.14	1.15	1.16	1.16	1.18	1.21	1.22
1.26	1.26	1.28	1.29	1.32	1.35	1.35	1.38	1.43	1.55

POPULATIONS
MEAN READINGS
0.97 1
1.26 19

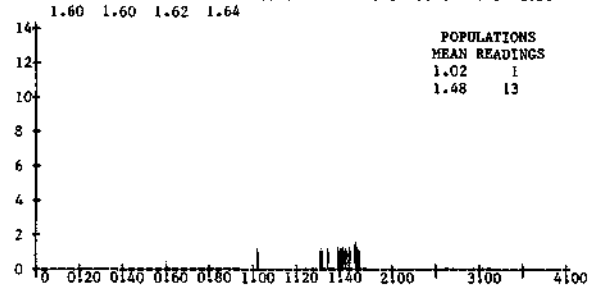


REMARKS AS 794-066A

SAMPLE 794-062A DEPTH 2100 VITRINITE REFLECTANCE VALUES

1.02	1.31	1.32	1.35	1.40	1.43	1.45	1.46	1.49	1.53
1.60	1.60	1.62	1.64						

POPULATIONS
MEAN READINGS
1.02 1
1.48 13

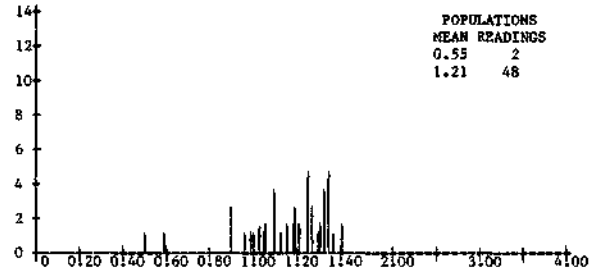


REMARKS FAIRLY LEAN. SMALL SCATTERED PARTICLES OF POOR QUALITY REWORKED VITRINITE AND INERTINITE. POOR SAMPLE.

SAMPLE 794-109A DEPTH 2230 VITRINITE REFLECTANCE VALUES

0.50	0.59	0.90	0.91	0.91	0.96	0.99	1.00	1.03	1.03
1.05	1.06	1.07	1.10	1.11	1.11	1.11	1.13	1.16	1.16
1.19	1.19	1.20	1.20	1.21	1.22	1.23	1.26	1.26	1.27
1.27	1.27	1.28	1.28	1.29	1.31	1.32	1.33	1.34	1.34
1.35	1.35	1.36	1.36	1.37	1.37	1.37	1.38	1.45	1.45

POPULATIONS
MEAN READINGS
0.55 2
1.21 48

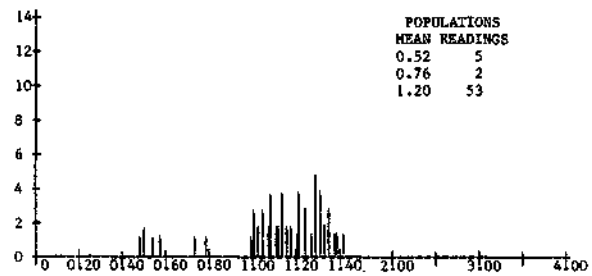


REMARKS FREQUENTLY UNRECOGNISABLE, POSSIBLY FINELY COMMINUTED WOOD. SMALL PARTICLES OF HIGH R_o VITRINITE AND INERTINITE.

SAMPLE 794-111A DEPTH 2305 VITRINITE REFLECTANCE VALUES

0.48	0.50	0.50	0.54	0.57	0.73	0.78	0.99	1.00	1.00
1.00	1.02	1.03	1.04	1.04	1.05	1.07	1.07	1.08	1.08
1.09	1.09	1.11	1.11	1.12	1.13	1.14	1.15	1.15	1.15
1.16	1.17	1.18	1.18	1.21	1.22	1.22	1.23	1.23	1.25
1.26	1.26	1.28	1.30	1.31	1.31	1.31	1.31	1.32	1.32
1.32	1.33	1.34	1.35	1.36	1.37	1.37	1.39	1.40	1.48

POPULATIONS
MEAN READINGS
0.52 5
0.76 2
1.20 53

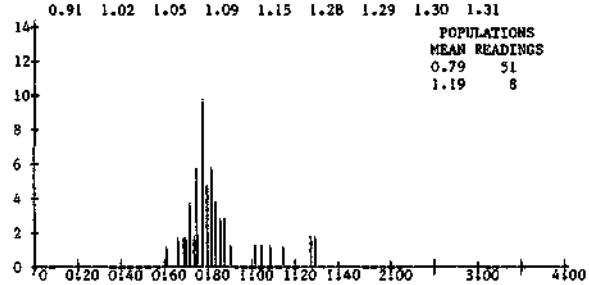


REMARKS VERY DOMINANTLY PARTICLES OF HIGH REFLECTANCE VITRINITE PLUS INERTINITE. OCCASIONAL PARTICLES OF LOWER R_o. MINOR EXINITE.

SAMPLE 794-112A DEPTH 2422 VITRINITE REFLECTANCE VALUES

0.61	0.66	0.66	0.69	0.69	0.70	0.71	0.72	0.72	0.72
0.73	0.74	0.74	0.75	0.75	0.76	0.76	0.77	0.77	0.78
0.78	0.78	0.78	0.79	0.79	0.79	0.79	0.79	0.79	0.80
0.80	0.80	0.80	0.81	0.82	0.82	0.82	0.83	0.83	0.83
0.84	0.84	0.85	0.85	0.86	0.87	0.87	0.88	0.89	0.89
0.91	1.02	1.05	1.09	1.15	1.28	1.29	1.30	1.31	

POPULATIONS
MEAN READINGS
0.79 51
1.19 8

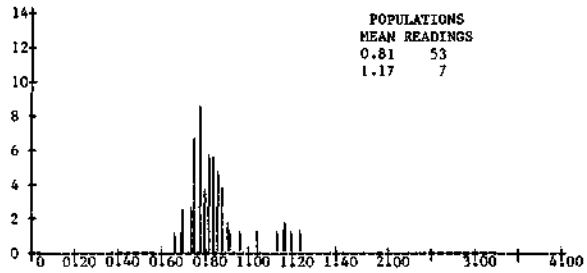


REMARKS CHIEFLY VITRINITE PARTICLES SIGNIFICANT INERTINITE AND FINE GRAINED UNRECOGNISABLE MATERIAL.

FIGURE 6c VITRINITE REFLECTANCE WELL 7119/12-3

SAMPLE 794-114A DEPTH 2499 VITRINITE REFLECTANCE VALUES

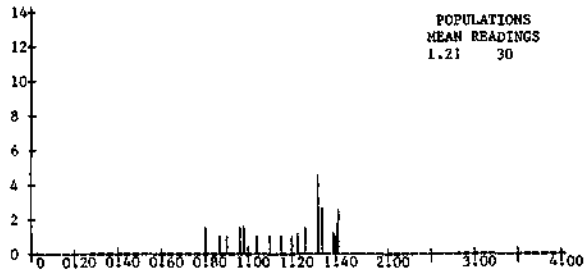
0.66 0.69 0.70 0.70 0.71 0.74 0.74 0.74 0.75 0.75
0.75 0.75 0.76 0.76 0.77 0.78 0.78 0.78 0.78 0.78
0.78 0.79 0.79 0.79 0.80 0.81 0.81 0.81 0.82 0.82
0.82 0.83 0.83 0.83 0.84 0.84 0.84 0.84 0.85 0.85
0.86 0.86 0.86 0.87 0.87 0.88 0.88 0.88 0.89 0.91
0.91 0.92 0.97 1.05 1.14 1.17 1.18 1.19 1.21 1.25



REMARKS AS 794-112A

SAMPLE 794-116A DEPTH 2578 VITRINITE REFLECTANCE VALUES

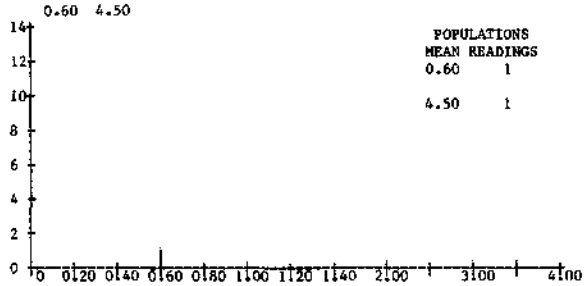
0.80 0.81 0.87 0.90 0.96 0.96 0.98 0.99 1.04 1.10
1.15 1.20 1.23 1.26 1.26 1.32 1.32 1.32 1.33 1.33
1.34 1.34 1.35 1.39 1.40 1.43 1.43 1.44 1.45 1.45



REMARKS AS 794-108A

SAMPLE 794-082A DEPTH 2700 VITRINITE REFLECTANCE VALUES

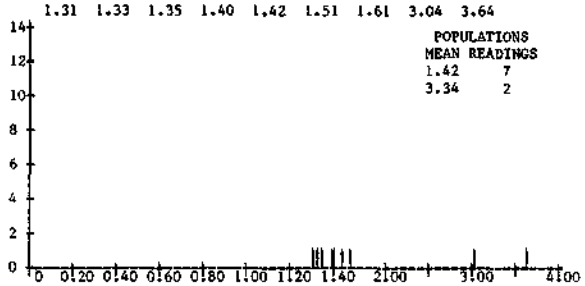
0.60 4.50



REMARKS TURBODRILLED. VIRTUALLY BARREN. MEASUREMENTS LIMITED TO A SINGLE SMALL VITRINITE PARTICLE AND A GRAPHITE PARTICLE. POOR SAMPLE.

SAMPLE 794-085A DEPTH 2790 VITRINITE REFLECTANCE VALUES

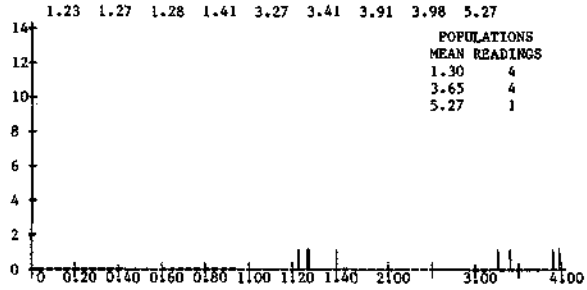
1.31 1.33 1.35 1.40 1.42 1.51 1.61 3.04 3.64



REMARKS AS 794-066A. UNAFFECTED CUTTINGS MAY BE CAVED

SAMPLE 794-077A DEPTH 2550 VITRINITE REFLECTANCE VALUES

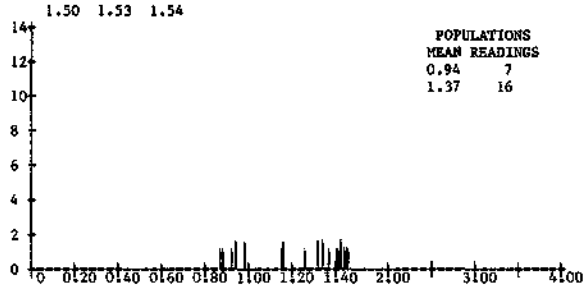
1.23 1.27 1.28 1.41 3.27 3.41 3.91 3.98 5.27



REMARKS ALMOST EXCLUSIVELY TURBODRILLED AND APPARENTLY BARREN APART FROM SEVERAL PARTICLES RESEMBLING GRAPHITE. TRACE OF REWORKED VITRINITE LIMITED TO MINOR UNAFFECTED (CAVED?) SEDIMENT. POOR SAMPLE.

SAMPLE 794-117A DEPTH 2700 VITRINITE REFLECTANCE VALUES

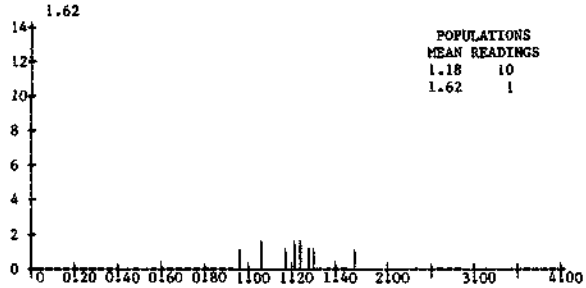
0.87 0.88 0.92 0.94 0.95 0.98 0.98 1.15 1.16 1.17
1.26 1.32 1.33 1.34 1.35 1.37 1.41 1.43 1.46 1.47
1.50 1.53 1.54



REMARKS SCATTERED PARTICLES OF HIGH REFLECTANCE VITRINITE PLUS INERTINITE.

SAMPLE 794-118A DEPTH 2766.5 VITRINITE REFLECTANCE VALUES

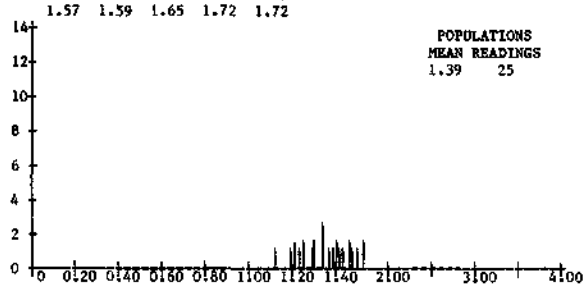
0.96 1.06 1.06 1.17 1.21 1.21 1.24 1.24 1.28 1.30
1.62



REMARKS SCATTERED VITRINITE PARTICLES AND WISPS OF HIGH REFLECTIVITY, FREQUENTLY UNRELIABLE/UNSUITABLE FOR REFLECTANCE DETERMINATION PLUS INERTINITE. POOR SAMPLE.

SAMPLE 794-120A DEPTH 2865 VITRINITE REFLECTANCE VALUES

1.12 1.19 1.21 1.21 1.23 1.25 1.25 1.29 1.30 1.30
1.34 1.34 1.34 1.37 1.39 1.41 1.41 1.44 1.48 1.56
1.57 1.59 1.65 1.72 1.72

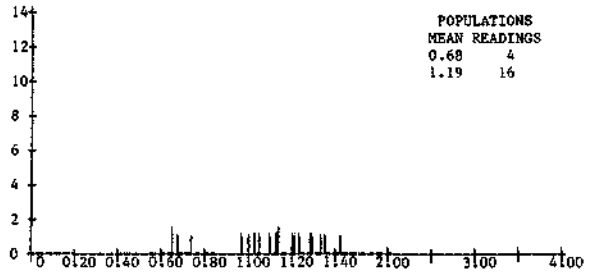


REMARKS SMALL PARTICLES OF HIGH R_o VITRINITE PLUS INERTINITE AND BITUMEN STAINING.

FIGURE 6d VITRINITE REFLECTANCE WELL 7119/12-3

SAMPLE 794-088A DEPTH 2880 VITRINITE REFLECTANCE VALUES

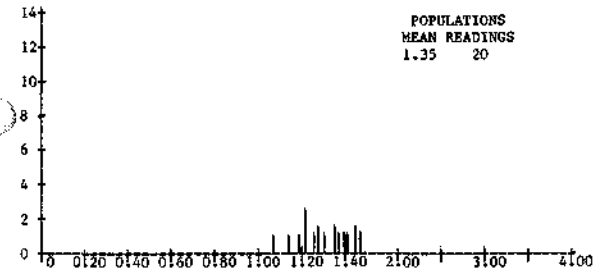
0.65 0.65 0.68 0.74 0.97 1.00 1.03 1.05 1.10 1.13
1.14 1.15 1.21 1.22 1.24 1.29 1.30 1.34 1.36 1.48



REMARKS FAIRLY LEAN. PARTICLES OF INERTINITE PLUS VITRINITE - LATTER FREQUENTLY OF HIGH R_o, APPARENTLY REWORKED.

SAMPLE 794-092A DEPTH 3000 VITRINITE REFLECTANCE VALUES

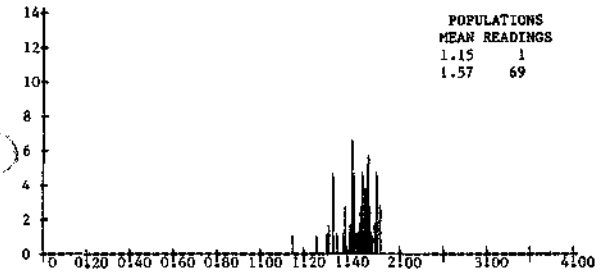
1.07 1.14 1.19 1.22 1.23 1.23 1.26 1.28 1.29 1.31
1.36 1.36 1.38 1.41 1.43 1.45 1.54 1.55 1.59 1.60



REMARKS FAIRLY LEAN. SMALL VITRINITE PARTICLES (REWORKED ?) PLUS INERTINITE.

SAMPLE 794-124A DEPTH 3100 VITRINITE REFLECTANCE VALUES

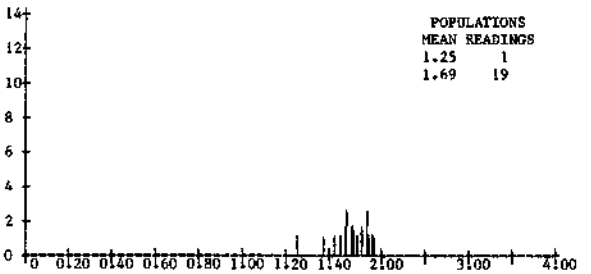
1.15 1.26 1.31 1.32 1.32 1.34 1.34 1.34 1.35 1.35
1.36 1.39 1.40 1.40 1.41 1.45 1.46 1.47 1.48 1.48
1.48 1.48 1.49 1.49 1.49 1.50 1.50 1.51 1.51 1.51
1.53 1.55 1.57 1.57 1.58 1.59 1.59 1.60 1.60 1.60
1.61 1.61 1.63 1.63 1.63 1.63 1.64 1.64 1.64 1.65
1.66 1.66 1.67 1.67 1.67 1.67 1.68 1.69 1.69 1.70
1.74 1.74 1.76 1.77 1.77 1.77 1.77 1.80 1.80 1.81



REMARKS CHIEFLY VITRINITE PARTICLES OF CONSISTENTLY HIGH REFLECTANCE PLUS FINELY DIVIDED MATERIAL (POSSIBLY VITRINITE). OCCASIONAL INERTINITE. NO SUGGESTION OF LOWER RANK VITRINITE.

SAMPLE 794-121A DEPTH 2939.5 VITRINITE REFLECTANCE VALUES

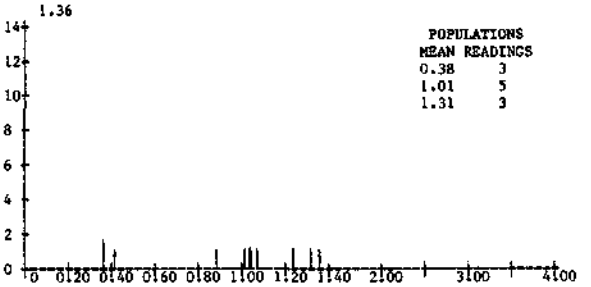
1.25 1.37 1.45 1.52 1.58 1.58 1.59 1.65 1.65 1.66
1.66 1.71 1.76 1.77 1.82 1.82 1.82 1.84 1.88 1.90



REMARKS SMALL PARTICLES OF HIGH R_o VITRINITE AND INERTINITE - DIFFERENTIATION DIFFICULT. NO VITRINITE OF LOWER R_o SEEN.

SAMPLE 794-094A DEPTH 3060 VITRINITE REFLECTANCE VALUES

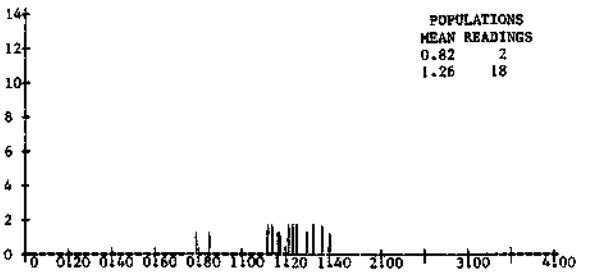
0.36 0.37 0.41 0.88 1.01 1.03 1.04 1.07 1.24 1.32
1.36



REMARKS MAINLY AMORPHOUS. SCATTERED INERTINITE. MINOR VITRINITE INCLUDING SEVERAL SMALL PARTICLES OF ANOMALOUSLY LOW REFLECTANCE.

SAMPLE 794-096A DEPTH 3120 VITRINITE REFLECTANCE VALUES

0.79 0.85 1.12 1.13 1.14 1.14 1.17 1.18 1.22 1.22
1.24 1.24 1.26 1.26 1.31 1.34 1.35 1.38 1.39 1.44



REMARKS SMALL VITRINITE PARTICLES OF HIGH REFLECTANCE (PROBABLY REWORKED) PLUS INERTINITE. FREQUENT BITUMEN STAINING.

FIGURE 7 **ORGANIC FACIES & MATURITY** WELL 7119/12-3

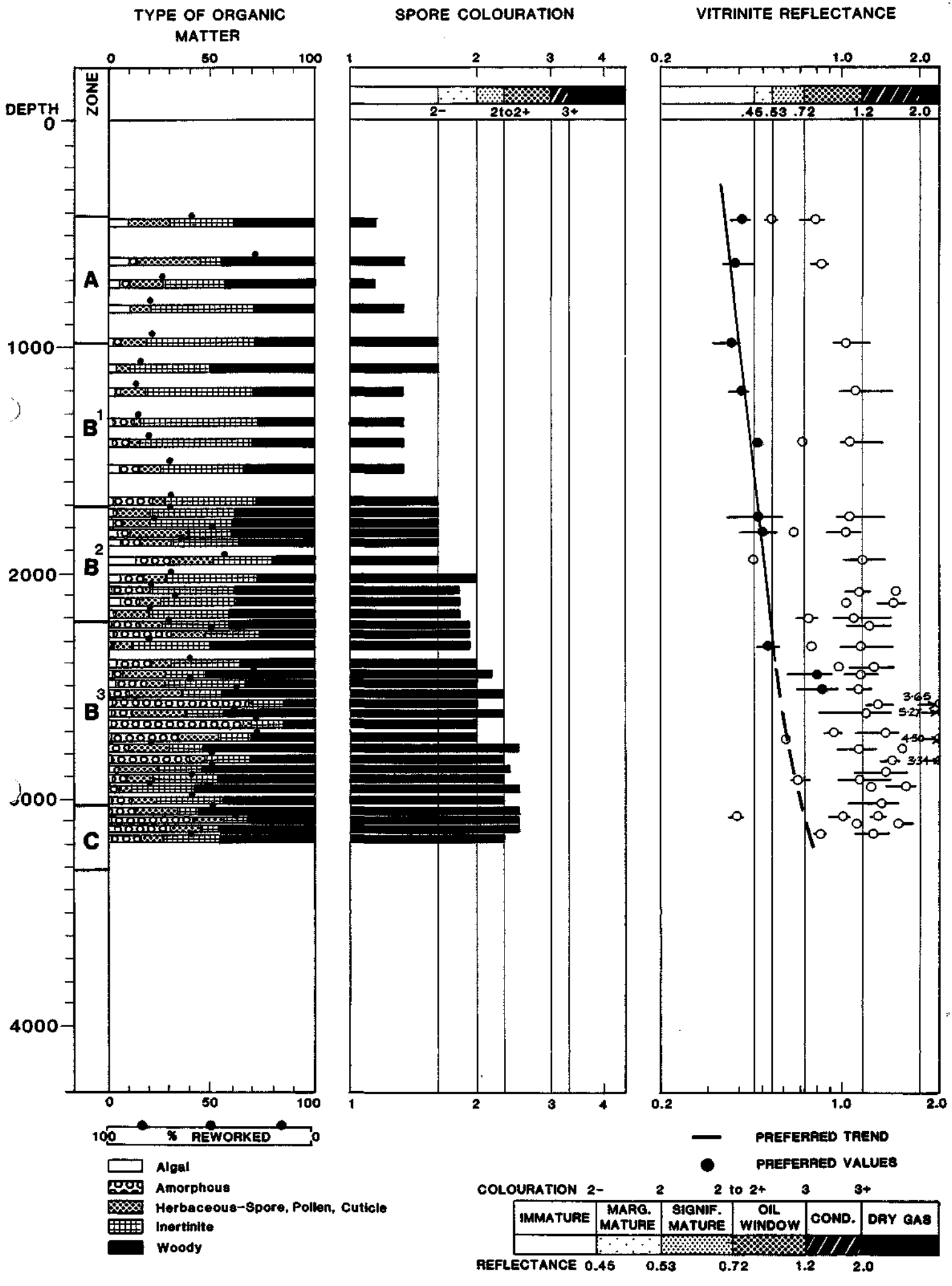
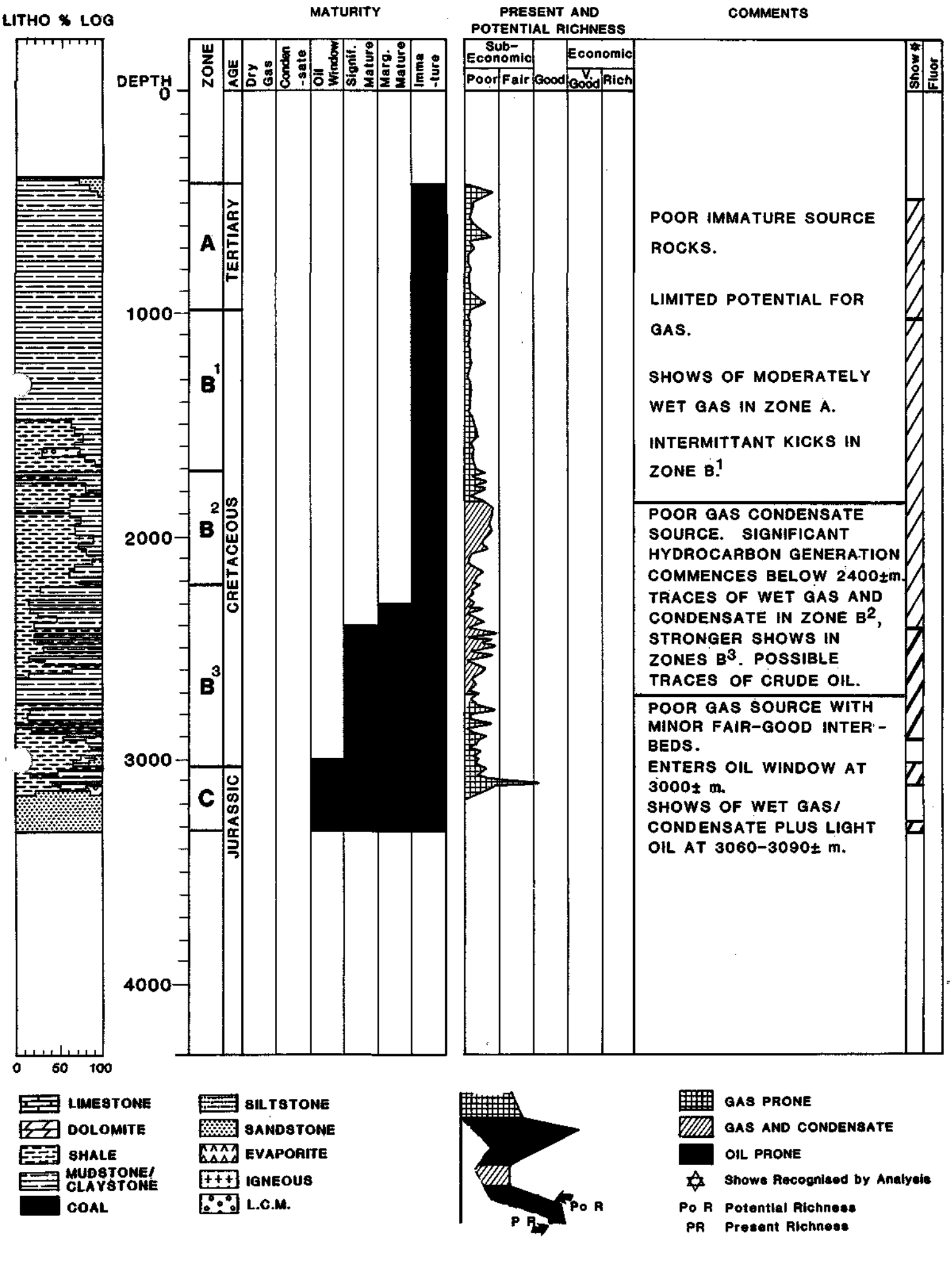


FIGURE 8

RATING

WELL 7119/12-3



BRIEF DESCRIPTION OF THE ANALYSES PERFORMED BY GEOCHEM

"Screen Analyses" are described in sections A, C and D, "Sample Preparation" in section B, "Follow-up Analyses" in sections E through K and "Correlation Studies" in section L. The analyses can be run on either core or cuttings material with the proviso that samples must be canned for the C_1-C_7 analysis and should be canned (or at least wet) for the C_4-C_7 analysis. The other analyses can be run on both canned and bagged samples.

A) C_1-C_7 LIGHT HYDROCARBON ANALYSIS

The abundance and composition of the C_1-C_7 hydrocarbons in sediments reflects their source richness, maturity and the character of the hydrocarbons they can yield. Most importantly, it is extremely sensitive to the presence of migrated hydrocarbons and is an excellent method for their detection. As it provides the information on most of the critical parameters and is also economical, this analysis is excellent for screening samples to decide which of them merit further analysis.

During the time which elapses betwwen the collection of the sample at the wellsite and its analysis in the laboratory, a fraction of the total gas passes from the rock to the air space at the top of the can. For this reason, both the air space and the cuttings are analysed.

The analysis involves the gas chromatographic separation of the individual C_1-C_4 gaseous hydrocarbons (methane, ethane, propane, isobutane and normal butane) and a partial resolution of the C_5-C_7 gasoline-range hydrocarbons (for their complete resolution see Section E). The ppm abundance of the five gases and of the total C_5-C_7 hydrocarbons are calculated from their electronically integrated peak areas (not from peak height) by comparison with a standard.

In the report, the following data are tabulated: the abundance and composition of the air space gas, of the cuttings gas and of the combined air space and cuttings gases. The combined results are also presented graphically.

B) SAMPLE WASHING AND HAND PICKING

All of the analyses described in subsequent sections are run on washed and hand picked samples.

Cuttings are washed to remove the drilling mud, care being taken not to remove soft clays and fine sand during the washing procedure. Using the C_1-C_7 hydrocarbon data profile of the well, or the organic carbon profile (if this analysis is used for screening), electric logs (if supplied) and the appearance of the cuttings under the binocular microscope, samples are selected to represent the lithological and geochemical zones penetrated by the well. These samples are then carefully hand picked and the lithology of the uncaved material is described. It is these samples which are submitted for further analysis.

Sample material remaining after analysis is retained for six months. Unless instructions are received to the contrary, Geochem Laboratories may then destroy the samples.

Our reports incorporate a gross lithological description of all the samples which have been analysed and litho percentage logs. As screen analyses are recommended at narrow intervals, a complete lithological profile is obtained.

C) ORGANIC CARBON ANALYSIS

The organic carbon content of a rock is a measure of its total organic richness. Combined with the visual kerogen, C_1-C_7, C_4-C_7, pyrolysis and C_{15+} analyses, the organic carbon content is used to evaluate the potential (not necessarily actual) hydrocarbon source richness of the sediment. This analysis is an integral part of a total evaluation and it can also be used as an economical screen analysis for dry samples (when the C_1-C_7 analysis cannot be used).

Hand picked samples are dried, crushed and then acidised to remove the inorganic calcium and magnesium carbonates. The actual analysis involves combustion in a Leco carbon analyser. Blanks, standards and duplicates are run routinely for purposes of quality control at no extra cost to the client.

The data are tabulated and presented diagramatically in our reports in a manner which facilitates comparison with the gross lithology (see Section B) of the samples.

D) MINI-PYROLYSIS

An ideal screen analysis which provides a definitive measure of potential source richness upon those samples whose organic carbon contents suggest fair or good source potential. This is described in detail in section K.

E) DETAILED C_4-C_7 HYDROCARBON ANALYSIS

The abundance and composition of the C_4-C_7 gasoline-range hydrocarbons in sediments reflects their source quality, level of thermal maturation and organic facies. In addition, the data also reveal the presence of migrated hydrocarbons and can be used for crude oil-parent source rock correlation studies.

This powerful analysis, performed upon hand picked lithologies, is employed as a follow-up to confirm the potential of samples which have been selected using the initial screen analysis. It is used in conjunction with the organic carbon, visual kerogen and C_{15+} analyses.

The individual normal paraffins, isoparaffins, naphthenes and aromatics with between four and seven carbon atoms in the molecule (but also including toluene) are resolved by capillary gas chromatography and their peak areas electronically integrated.

Normalised compositions, selected ratios and the ppm abundance of the total gasoline-range fraction are tabulated in the report and also presented graphically.

F) KEROGEN TYPE AND MATURATION

Kerogen is the insoluble organic matter in rocks. Visual examination of the kerogen gives a direct measure of thermal maturity and of the composition of the organic matter (organic facies) and indicates the source quality of the sediment - which is confirmed using the organic carbon, light hydrocarbon, pyrolysis and C_{15+} analyses.

The type of hydrocarbon (oil or gas) generated by a source rock is a function of the types and level of thermal maturation of the organic matter which are present. Both of these parameters are measured directly by this method.

Kerogen is separated from the inorganic rock matrix by acid digestion and flotation methods which avoid oxidation of the organic matter. It is then mounted on a glass slide and examined at high and low magnifications with a Leitz microscope. Chemical methods measure the total kerogen population but, with this technique, individual particles can be selected for examination and spurious material identified. This is particularly valuable in reworked, contaminated and turbodrilled sediments.

The following data are generated: the types of organic matter present and their relative abundances, an estimate of the proportion of reworked material, preservation state, the thermal maturity of the non-reworked organic matter using the spore colouration technique.

Our maturation scale has been developed to digitise small but recognisable changes in organic matter colouration resulting from increasing maturity and to place particular emphasis upon the immature to mature transition. In the absence of a universal colouration scale, the most significant points on our scale have been calibrated against equivalent vitrinite reflectance values. The following maturation stages are recognised at the low end of the scale:-

a) immature; thermal index less than 2- (0.45% Ro)
b) marginally mature; indices between 2- and 2. Minor hydrocarbon generation from amorphous and herbaceous (± algal) organic matter
c) mature; indices between 2 (0.53% Ro) and 2 to 2+ (0.72% Ro), significant generation from amorphous, algal and herbaceous organic matter but wood only marginally mature
d) oil window; indices of 2 to 2+ (0.72% Ro) through to 3 (1.2% Ro). Peak hydrocarbon generation.

The condensate zone starts at a thermal index of 3 whilst indices of 3+ (2.0% Ro) and higher indicate the eometamorphic dry gas stage.

A total of fourteen types of organic matter are sought based upon the major categories of algal, amorphous, herbaceous (spore, pollen, cuticle), wood, inertinite and resin. This detail is essential for a proper understanding of hydrocarbon source potential as the different sub-groups within each category have different properties.

Upon completion of the study, the kerogen slides are sent to the client.

G) VITRINITE REFLECTANCE

Vitrinite reflectance is an alternative/confirmatory method for evaluating thermal maturation which is used in conjection with the visual kerogen analysis. The reflectivity of vitrinite macerals increases in response to thermal alteration and is used to define maturation levels and, by projection, to predict maturity at depth or the thicknesses of section removed by erosion.

Measurements are made upon kerogen separations in conjunction with polished whole rock samples. In general, this analysis is performed upon the same samples as the visual kerogen analysis, thus facilitating a direct comparison of the two sets of results.

If possible, forty to fifty measurements are taken per sample - unless the sediments are organically lean, vitrinite is sparse or only a single uniform population is present. The data are plotted in a histogram which distinguishes the indigenous vitrinite from possible reworked or caved material. Averages are calculated for each population. Comments upon exinite fluorescence and upon the character of the phytoclasts are noted on the histograms. The reports contain the tabulated data, histograms and the reflectivities plotted against depth.

The vitrinite and visual kerogen techniques provide mutually complementary information upon maturity, organic matter type and diagenesis.

H) C_{15+} EXTRACTION, DEASPHALTENING AND CHROMATOGRAPHIC SEPARATION

Sections "A" and "E" dealt with analyses covering the light end of the hydrocarbon spectrum. This section is concerned with the solvent extractable organic material in the rock with more than fourteen carbon atoms in the molecule (i.e. the heavy end). The amount and composition of this extract indicates source richness and type, the level of thermal maturation and the possible presence of migrated hydrocarbons.

These results are integrated with those derived from the pyrolysis, visual kerogen, organic carbon and light hydrocarbon analyses.

The techniques involved in this analysis employ pure solvents and have been designed to give reproducible results. Hand picked samples are ground and then solvent extracted in a soxhlet apparatus, or by blending, with dichloromethane (the solvent system can be adapted to client's specifications). After asphaltene precipitation, the total extract is separated by column chromatography or high pressure liquid chromatography into the following fractions: paraffin-naphthene hydrocarbons, aromatic hydrocarbons, eluted NSO's (nitrogen-, sulphur-, and oxygen- containing non-hydrocarbons) and non-eluted NSO's. Note that the non-hydrocarbons are split into three fractions and not reported as a gross value. These fractions can be submitted for further analyses (carbon isotopes, gas chromatography, high mass spectroscopy) including correlation studies.

For convenience and thoroughness, the data are reported in three formats: the weights of the fractions, ppm abundances and normalised percentage compositions. The data are also presented diagramatically.

J) GC ANALYSIS OF C_{15+} PARAFFIN-NAPHTHENE HYDROCARBONS

The gas chromatographic configurations of the heavy C_{15+} paraffin-naphthene hydrocarbons reflect source type, the degree of thermal maturation and the presence and character of migrated hydrocarbons or contamination.

Not only is this analysis an integral part of any source rock study but it also provides a fingerprint for correlation purposes and helps to define the geochemical/palynological environmental character of the source rocks from which crude oils were derived.

The paraffin-naphthene hydrocarbons obtained by column chromatography are separated by high resolution capillary chromatography. Excellent resolution of the individual normal paraffins, isoprenoids and significant individual isoparaffins and naphthenes is achieved. Runs are normally terminated at nC_{35}. A powerful in-house microprocessor system is being introduced to correct for the change in response factor with chain length.

The normal paraffin carbon preference indices (C.P.I.) indicate if odd (values in excess of 1) or even (values less than 1) normal paraffins are dominant. Strong odd preferences (± strong pristane peaks) are characteristic of immature land plant organic matter whilst even preferences (± strong phytane peaks) suggest a reducing environment of deposition. With increasing maturity, values approach 1.0 and oils are typically close to 1.0. The indices are calculated using the following formulae:

$$C.P.I_A = \frac{\frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{20} + C_{22} + C_{24} + C_{26}} + \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{22} + C_{24} + C_{26} + C_{28}}}{2}$$

$$C.P.I_B = \frac{\frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{24} + C_{26} + C_{28} + C_{30}} + \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{26} + C_{28} + C_{30} + C_{32}}}{2}$$

Chromatograms are reproduced in the report for use as visual fingerprints and in addition, the following data are tabulated: normalised normal paraffin distributions; proportions of paraffins, isoprenoids and naphthenes in the total paraffin-naphthene fraction; C.P.I_A and C.P.I_B; pristane to phytane ratio; pristane to nC_{17} ratio.

K) PYROLYSIS

The process of thermal maturation can be simulated in the laboratory by pyrolysis, which involves heating the sample under specified conditions and measuring the oil-like material which is freed/generated from the rock. With this analysis, the potential richness of immature sediments can be determined and, by coupling the pyrolysis unit to a gas chromatograph, the liberated material can be characterised. These results are correlated with those obtained from the organic carbon, kerogen and C_{15+} analyses.

Small amounts of powdered sample are heated in helium to release the thermal bitumen (up to 340°C) and pyrolysate (340-550°C). The thermal bitumen correlates with the solvent extractable material (see above) whilst the pyrolysate fraction does not exist in a "free" state but is generated from the kerogen, thus simulating maturation in the subsurface. Abundances (weight ppm of rock) are measured with a flame ionisation detector against a standard. Thermal bitumen includes source indigenous, contaminant and migrated hydrocarbons but the pyrolysate abundance is a measure of ultimate source richness. The capillary gas chromatogram of the pyrolysate is used to evaluate the character of the parent organic matter and whether it is oil or gas prone. Peak temperature(s) of pyrolysate evolution is recorded. Carbon dioxide can be measured if requested but is normally ignored as the separation of the organic and inorganic species has been found to be artificial and unreliable.

Pyrolysate yields provide a definitive measure of potential source richness which avoids the ambiguities of the organic carbon data and the problem of contamination. This analysis is also used to evaluate the quality and character of the organic matter and the degree to which it has realised its ultimate hydrocarbon potential. Geochem does not employ the pyrolysis technique to evaluate maturation, preferring the kerogen and vitrinite reflectance analyses which avoid the problem of reworking and hence, are more reliable.

Capillary chromatograms produced for the pyrolysate hydrocarbons range from C_1 (methane) out towards C_{35} but exhibit considerable variations. They are used to define whether a source rock will yield oil, condensate or gas. With this new technique, it is now possible to complete the evaluation of a source rock.

The data are tabulated and presented graphically. MINI-PYROLYSIS includes ppm thermal bitumen and ppm pyrolsate. PYROLYSIS also provides the above together with the temperature of peak pyrolysate evolution. The capillary chromatograms of the pyrolysate obtained by PYROLYSIS-GC are reproduced in the report. The Mini-Pyrolysis analysis is recommended as a screening technique.

L) CORRELATION STUDY ANALYSES

Oil to oil and oil to parent source rock correlation studies require high resolution analytical techniques. This requirement is satisfied by some of the analyses discussed above but others have been selected specifically for correlation work. Many of these analyses also provide information upon the character of the environment of deposition of the parent source rocks.

- detailed C_4-C_7 hydrocarbon (gasoline range) analysis. See Section E. Although these hydrocarbons can be affected by migrational/alteration processes, they commonly provide a very useful correlation parameter.
- capillary gas chromatography of the C_{15+} paraffin-naphthenes. See section J. The branched±normal paraffin distributions are used to "fingerprint" the samples.
- capillary chromatograms of whole oils and of the C_{8+} fraction of source rocks.
- capillary gas chromatography of C_{15+} aromatic hydrocarbons. Separate chromatograms of the hydrocarbons and of the sulphur-bearing species are reproduced.
- high pressure liquid chromatograms.
- mass spectrometric carbon isotope analyses of crude oil and rock extract fractions and of kerogen separations. A powerful tool for comparing hydrocarbons and correlating hydrocarbons to organic matter. With this technique the problem of source rock contamination can be avoided. The data are recorded on x-y or Galimov plots.
- mass fragmentograms (mass chromatograms) of fragment ions characteristic of selected hydrocarbon groups such as the steranes and terpanes. The fragmentograms provide a convenient and simple means of presenting detailed mass spectrometric data and are used as a sophisticated fingerprinting technique. This provides the ultimate resolution for correlating hydrocarbons and facilitates the examination of hydrocarbon classes.
- vanadium and nickel contents.

Suites of (rather than single) analyses are employed in correlation studies, the actual selection depending upon the complexity of the problem. See also section N.

M) ANALYSES FOR SPECIAL CASES

M-1) ELEMENTAL KEROGEN ANALYSIS

This analysis evaluates source quality, whether the sediments are oil or gas prone, the character of the organic matter and its level of thermal maturation. It is the chemical equivalent of the visual kerogen analysis. The pyrolysis analysis is generally preferred to this technique, both methods providing similar information.

M-2) SULPHUR ANALYSIS

The abundance of sulphur in source rocks and crude oils.

M-3) CARBONATE CONTENT

The mineral carbonate content of sediments is determined by acid treatment. These data are particularly useful when used in conjunction with organic carbon contents as a screening technique.

M-4) NORMAL PARAFFIN ANALYSIS

Following the removal of the branched paraffins and naphthenes from the total paraffin-naphthene fraction, a chromatogram of the normal paraffins is obtained. The resulting less complicated chromatogram facilitates the examination of normal paraffin distributions.

M-5) SOLID BITUMEN EVALUATION

Residual solid bitumen after crude oil is generated by three prime processes: the action of waters, gas deasphalting, thermal alteration. Thus it provides a means of determing the reservoir history of a crude and of evaluating whether adjacent traps will or will not be prospective for oil. In carbonate sections, where organic matter is sometimes sparse, this technique is also used to evaluate thermal maturation levels.

The analysis involves the determination of the solubility (in CS_2) of the solid bitumen and of the atomic hydrogen to carbon ratio of the insoluble fraction.

N) CRUDE OIL ANALYSIS

N-1) API GRAVITY

This can be performed upon large (hydrometer) and small (SG bottle, pycnometer) samples and even upon stains extracted from sediments (refractive index).

N-2) SULPHUR CONTENTS (ASTM E30-47)

N-3) POUR POINT (ASTM D97-66, IP15/67)

N-4) VISCOSITY (ASTM D445-72, IP71/75)

N-5) FRACTIONAL DISTILLATION

Graph of cumulative distillation yield against temperature. Five percent cuts taken for further analysis. Mass spectfometric studies of these fractions provide a detailed picture of the distribution of paraffins and of the various naphthene and aromatic groups within a crude, which is useful both for correlation and for refinery evaluation purposes.