Daily mud properties — Date 31/5-1988 — Date 31/5-1988

(((ooo)) Norsk Hydro

System : Boredata Sandnes

Well: 7219/9-1

Mud Contractor: Promud

Data: "Mid depth" from table 3, otherwise from table 14 — 3 — 14 — 3

Date:	Mid. depth m,MD:	Mud dens.: (SG):	PV: cps:	YP: mPa:	GEL: 0: mPa:	GEL: 10: mPa:	Ph:	100: psi: (cc):	HP/HT: (cc):	Cl- inn/out mg/l	Alkalinity Pf:	Pm:	Mf:	Ca++ inn/out: mg/l	Oil: %:	Sol: %:	H2O %	V.G. meter at 115 gr. F: 600: rpm:	300: rpm:	200: rpm:	100: rpm:	6: rpm:	3: rpm:	Mud type
:871117:	374:	0	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871118:	434:	1.05:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871119:	441:	1.06:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871120:	443:	1.06:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871121:	594:	1.05:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871122:	718:	1.06:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871123:	718:	1.06:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871124:	718:	1.06:	0:	0:	:	:	:	:	:		:	:	:	:	:	:	:	:	:	:	:	:	:	SPUD
:871125:	718:	1.08:	20:	11:	2:	2:	9	:13	:	:62000/62000:		:1		:0.9:	100/100:	:	:	:	:	:	:	:	KCL/POLYMER
:871126:	755:	1.1	: 17:	9:	2:	4:	11.1:	7	:	:60000/60000:	0.5	:1.2		:1.4:	400/400:	:	:	:	:	:	:	:	KCL/POLYMER
:871127:	1109:	1.11:	18:	14:	2:	5:	10	: 6.8:		:60000/60000:	0.3	:0.6		:0.7:	200/200:	:	:	:	:	:	:	:	KCL/POLYMER
:871128:	1392:	1.15:	21:	12:	2:	4:	9.3:	6.2:		:58000/58000:	0	:0.3		:0.1:	220/220:	:	9:	:	:	:	:	:	KCL/POLYMER
:871129:	1625:	1.22:	19:	12:	2:	4:	9	: 6	:	:60000/60000:	0	:0.4		:0.1:	200/200:	:	12:	:	:	:	:	:	KCL/POLYMER
:871130:	1625:	1.13:	13:	8:	2:	4:	9	: 6	:	:45000/45000:	0.02	:0.2		:0.2:	150/150:	:	4:	:	:	:	:	:	KCL/POLYMER
:871201:	1625:	1.15:	20:	15:	2:	4:	8.4:	6	:	:35000/35000:	0	:0.01		:0.1:	160/160:	:	5:	:	:	:	:	:	KCL/POLYMER
:871202:	1625:	1.15:	20:	15:	3:	5:	8.4:	6	:	:35000/35000:	0	:0.01		:0.1:	160/160:	:	5:	:	:	:	:	:	KCL/POLYMER
:871203:	1625:	1.17:	19:	10:	2:	4:	8.6:	5.6:		:53000/53000:	0	:0.01		:0.1:	300/300:	:	7:	:	:	:	:	:	KCL/POLYMER
:871204:	1625:	1.17:	18:	19:	2:	4:	8.5:	5.5:		:60000/60000:	0	:0.01		:0.1:	260/260:	:	7:	:	:	:	:	:	KCL/POLYMER
:871205:	1625:	1.17:	17:	10:	2:	4:	8.5:	5.5:		:62000/62000:	0	:0.01		:0.1:	250/250:	:	7:	:	:	:	:	:	KCL/POLYMER
:871206:	1625:	1.17:	17:	10:	2:	4:	8.5:	5.5:		:62000/62000:	0	:0.01		:0.1:	250/250:	:	7:	:	:	:	:	:	KCL/POLYMER
:871207:	1625:	1.17:	14:	8:	2:	3:	9.4:	5.1:	11.8:	62000/62000:	0	:0.1		:0.1:	250/250:	:	7:	:	:	:	:	:	KCL/POLYMER
:871208:	1791:	1.18:	18:	9:	2:	5:	11.9:	4.9:	13	:65000/65000:	0.1	:1.9		:0.3:	200/200:	:	8:	:	:	:	:	:	KCL/POLYMER
:871209:	1907:	1.2	: 18:	10:	4:	12:	9.8:	4.3:	13	:66000/66000:	0	:1.4		:0.2:	220/220:	0:	10:	90	: 56:	38:	30:	20:	5:	3:KCL/POLYMER
:871210:	1923:	1.27:	18:	10:	2:	5:	10.2:	4.2:	13	:65000/65000:	0	:1.3		:0.2:	200/200:	0:	12:	88	: 55:	37:	28:	19:	5:	3:KCL/POLYMER
:871211:	1931:	1.27:	19:	10:	2:	6:	9.9:	4	: 14	:68000/68000:	0	:0.8		:0.2:	200/200:	0:	13:	87	: 57:	38:	31:	20:	5:	3:KCL/POLYMER
:871212:	1958:	1.27:	19:	12:	2:	7:	9.5:	3.9:	14	:69000/69000:	0	:0.6		:0.2:	280/280:	0:	13:	87	: 61:	42:	33:	22:	6:	4:KCL/POLYMER
:871213:	1985:	1.27:	18:	11:	2:	6:	10	: 4	: 14	:69000/69000:	0.1	:1.8		:0.9:	200/200:	0:	12:	88	: 58:	40:	31:	21:	5:	3:KCL/POLYMER
:871214:	2015:	1.27:	18:	10:	2:	6:	10.1:	4.3:	14	:65000/65000:	0.1	:0.6		:0.8:	200/200:	0:	12:	88	: 57:	39:	30:	21:	5:	3:KCL/POLYMER
:871215:	2042:	1.27:	18:	10:	2:	6:	9.8:	4.2:	13.4:	61000/61000:	0.5	:0.6		:0.6:	200/200:	0:	12:	88	: 57:	39:	30:	21:	5:	3:KCL/POLYMER
:871216:	2072:	1.27:	19:	10:	2:	6:	9.4:	3.8:	13.2:	65000/65000:	0.5	:0.2		:0.5:	200/200:	0:	12:	88	: 58:	39:	31:	22:	5:	3:KCL/POLYMER
:871217:	2099:	1.27:	19:	10:	2:	6:	9.4:	3.9:	14	:65000/65000:	0.1	:0.4		:0.5:	200/200:	0:	13:	87	: 55:	37:	29:	20:	5:	4:KCL/POLYMER
:871218:	2114:	1.27:	19:	10:	2:	6:	10	: 3.8:	14	:66000/66000:	0.05	:0.3		:0.4:	280/280:	0:	13:	87	: 57:	38:	30:	20:	5:	4:KCL/POLYMER
:871219:	2210:	1.27:	15:	10:	2:	4:	9.4:	4	: 12.4:	63000/63000:	0.05	:0.3		:0.6:	400/400:	0:	13:	87	: 50:	35:	27:	18:	4:	3:KCL/POLYMER
:871220:	2302:	1.27:	16:	9:	2:	3:	9.3:	3.6:	14.6:	64000/64000:	0.05	:0.2		:0.4:	440/400:	0:	13:	87	: 50:	34:	26:	18:	4:	3:KCL/POLYMER
:871221:	2345:	1.27:	15:	8:	2:	3:	9.5:	4.2:	12.8:	63000/63000:	0.1	:0.5		:0.4:	400/400:	0:	12:	88	: 46:	31:	21:	17:	4:	3:KCL/POLYMER
:871222:	2420:	1.27:	16:	8:	2:	4:	9.6:	4.3:	14.4:	60000/60000:	0.1	:0.5		:0.6:	320/320:	0:	12:	88	: 49:	33:	23:	18:	4:	3:KCL/POLYMER
:871223:	2444:	1.27:	14:	8:	2:	3:	9.6:	4.7:	14.8:	60000/60000:	0.1	:0.3		:0.5:	320/320:	0:	12:	88	: 44:	30:	21:	15:	3:	2:KCL/POLYMER
:871224:	2453:	1.26:	14:	10:	2:	4:	9.6:	4	: 14.8:	58000/58000:	0.1	:0.3		:0.5:	320/320:	0:	11:	89	: 47:	33:	25:	18:	4:	3:KCL/POLYMER
:871225:	2557:	1.23:	14:	9:	2:	4:	9.3:	3.8:	14.8:	57000/57000:	0.1	:0.2		:0.3:	360/360:	0:	10:	90	: 45:	31:	23:	17:	4:	3:KCL/POLYMER
:871226:	2657:	1.23:	14:	7:	2:	3:	9.6:	4.2:	14.6:	57000/57000:	0.1	:0.5		:0.5:	280/280:	0:	11:	89	: 42:	28:	21:	15:	3:	2:KCL/POLYMER

Daily mud properties — Date 31/5-1988 — Date 31/5-1988

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(ooo)

System : Boredata Sandnes

Well: 7219/9-1
Norsk
Hydro
Mud Contractor: Promud
Data: "Mid depth" from table 3, otherwise from table 14 — 3 — 14 — 3

Date	Mid. depth m,MD	Mud dens. (SG)	PV cps	YP mPa	GEL 0 mPa	GEL 10 mPa	100:HP/HT: psi Ph	Cl- inn/out (cc)	Cl- inn/out mg/l	Alkalinity Pf	Alkalinity Pm	Alkalinity Mf	Ca++ inn/out mg/l	Oil %	Sol %	H2O %	V.G. meter at 115 gr. 600 rpm	300 rpm	200 rpm	100 rpm	6 rpm	3 rpm	F: Mud type
:871227:	2735:	1.23:	14:	7:	2:	3:	9.2:	4.1:	15	:56000/56000:	0.1	:0.2	:0.5:	360/360:	0:	12:	88	: 42:	28:	21:	14:	3:	2:KCL/POLYMER:
:871228:	2751:	1.23:	14:	7:	2:	4:	9.2:	4.2:	18	:54000/54000:	0.04:	0.3	:0.4:	300/300:	0:	12:	88	: 41:	27:	21:	14:	4:	3:KCL/POLYMER:
:871229:	2751:	1.23:	14:	7:	2:	4:	9.2:	4.2:	17	:58000/58000:	0.05:	0.3	:0.3:	300/300:	0:	12:	88	: 42:	28:	21:	13:	4:	3:KCL/POLYMER:
:871230:	2751:	1.23:	14:	7:	3:	4:	9	: 4.3:	17	:56000/56000:	0.05:	0.2	:0.3:	300/300:	0:	12:	88	: 41:	27:	20:	13:	4:	2:KCL/POLYMER:
:871231:	2751:	1.27:	18:	10:	2:	6:	9.9:	4.1:	17	:56000/56000:	0.1	:0.5	:0.5:	280/280:	0:	13:	87	: 55:	37:	27:	18:	5:	3:KCL/POLYMER:
:880101:	2751:	1.28:	20:	10:	3:	9:	9.9:	4	: 13	:56000/56000:	0.1	:0.6	:0.6:	300/300:	0:	13:	87	: 60:	40:	31:	22:	6:	3:KCL/POLYMER:
:880102:	2751:	1.3	: 21:	11:	2:	7:	9.8:	4.3:	14	:57000/57000:	0.1	:0.5	:0.6:	280/280:	0:	14:	86	: 64:	43:	33:	22:	4:	3:KCL/POLYMER:
:880103:	2751:	1.31:	21:	11:	2:	8:	9.4:	4.2:	14	:60000/60000:	0.1	:0.4	:0.4:	280/280:	0:	15:	85	: 63:	42:	33:	21:	4:	3:KCL/POLYMER:
:880104:	2064:	1.31:	22:	11:	2:	10:	9.5:	4.2:	14.2:	61000/61000:	0.1	:0.4	:0.6:	300/300:	0:	15:	85	: 65:	43:	35:	24:	5:	3:KCL/POLYMER:
:880105:	2064:	1.31:	22:	12:	2:	12:	9.5:	4.6:	14.8:	60000/60000:	0.4	:0.7	:1.3:	520/520:	0:	15:	85	: 68:	46:	37:	24:	5:	3:KCL/POLYMER:
:880106:	2004:	1.31:	21:	9:	2:	12:	11.8:	4.8:	15	:60000/60000:	0.9	:2.8	:1.8:	320/320:	0:	15:	85	: 60:	39:	31:	22:	4:	3:KCL/POLYMER:
:880107:	2058:	1.31:	19:	8:	2:	12:	12.1:	5.4:	18	:62000/62000:	1.9	:6.7	:3.1:	300/300:	0:	15:	85	: 53:	34:	26:	17:	4:	3:KCL/POLYMER:
:880108:	2098:	1.31:	23:	8:	2:	10:	12.1:	4.9:	16.4:	60000/60000:	1.6	:5.5	:2.4:	280/280:	0:	15:	85	: 61:	38:	28:	17:	3:	2:KCL/POLYMER:
:880109:	2139:	1.31:	23:	7:	1:	5:	12.1:	4.5:	15	:59000/59000:	1.4	:6.1	:2.5:	240/240:	0:	16:	84	: 60:	37:	28:	17:	3:	2:KCL/POLYMER:
:880110:	2227:	1.3	: 24:	8:	1:	5:	12	: 4.4:	14	:59000/59000:	0.8	:5.6	:1.6:	240/240:	0:	16:	84	: 63:	39:	29:	18:	3:	2:KCL/POLYMER:
:880111:	2347:	1.31:	24:	9:	2:	5:	11.8:	4.3:	14	:58000/58000:	0.8	:4.6	:1.7:	220/220:	0:	16:	84	: 66:	42:	31:	19:	3:	2:KCL/POLYMER:
:880112:	2398:	1.31:	28:	9:	2:	6:	11.7:	3.6:	14.5:	55000/55000:	0.3	:4.8	:1.1:	160/160:	0:	16:	84	: 75:	47:	34:	20:	3:	2:KCL/POLYMER:
:880113:	2503:	1.31:	25:	9:	2:	5:	11.5:	4.2:	14	:58000/58000:	0.3	:4.8	:1	:200/200:	0:	16:	84	: 68:	43:	31:	19:	4:	3:KCL/POLYMER:
:880114:	2604:	1.31:	25:	9:	2:	5:	11.4:	4.2:	14	:58000/58000:	0.3	:4.6	:0.9:	200/200:	0:	16:	84	: 68:	43:	31:	19:	4:	3:KCL/POLYMER:
:880115:	2692:	1.31:	26:	11:	2:	5:	11.2:	3.8:	13.5:	57000/57000:	0.1	:3.8	:0.7:	320/320:	0:	17:	83	: 74:	48:	33:	24:	4:	3:KCL/POLYMER:
:880116:	2720:	1.31:	26:	11:	2:	5:	11	: 4	: 13.5:	58000/58000:	0.1	:4	:0.7:	240/240:	0:	16:	84	: 74:	48:	33:	24:	4:	3:KCL/POLYMER:
:880117:	2720:	1.31:	26:	11:	2:	5:	10.8:	4	: 13.5:	58000/58000:	0.1	:4	:0.7:	240/240:	0:	16:	84	: 74:	48:	33:	24:	4:	3:KCL/POLYMER:
:880118:	2723:	1.31:	26:	11:	2:	5:	10.6:	3.9:	13.2:	51000/51000:	0.1	:3.6	:0.7:	240/240:	0:	16:	84	: 75:	49:	36:	24:	5:	3:KCL/POLYMER:
:880119:	2723:	1.3	: 26:	11:	3:	6:	10.7:	3.8:	13.8:	60000/60000:	0.1	:3	:0.7:	360/360:	0:	17:	83	: 74:	48:	37:	23:	5:	3:KCL/POLYMER:
:880120:	2723:	1.15:	16:	8:	2:	3:	11.4:	3.7:	14.8:	32000/32000:	0.3	:4.4	:0.8:	240/240:	0:	6:	94	: 48:	32:	22:	14:	2:	2:POLYMER
:880121:	2756:	1.16:	16:	7:	2:	3:	11.8:	4	: 12	:35000/35000:	0.6	:4	:1.4:	200/200:	0:	6:	94	: 46:	30:	19:	12:	2:	2:POLYMER
:880122:	2810:	1.16:	14:	6:	2:	3:	11.6:	3.9:	13.6:	32000/32000:	0.3	:3.6	:0.8:	160/160:	0:	6:	94	: 42:	28:	18:	11:	2:	2:POLYMER
:880123:	2933:	1.15:	12:	6:	2:	5:	11.3:	4.5:	14	:28000/28000:	0.2	:3.1	:0.6:	240/240:	0:	7:	93	: 36:	24:	17:	10:	2:	1:POLYMER
:880124:	2996:	1.15:	15:	7:	1:	8:	10.9:	5	: 14	:26000/26000:	0.5	:2.9	:0.4:	320/320:	0:	7:	93	: 44:	29:	19:	12:	2:	1:POLYMER
:880125:	3118:	1.16:	12:	6:	1:	4:	10.5:	4.9:	14.4:	26000/26000:	0.1	:2.7	:0.4:	440/440:	0:	8:	92	: 38:	26:	17:	10:	2:	1:POLYMER
:880126:	3168:	1.16:	15:	6:	1:	4:	10.2:	4	: 12.6:	24000/24000:	0.1	:1.4	:0.3:	540/540:	0:	7:	93	: 42:	27:	19:	12:	1:	1:POLYMER
:880127:	3263:	1.15:	14:	6:	1:	5:	9.4:	4.8:	13.6:	26000/26000:	0.1	:1.5	:0.4:	640/640:	0:	7:	93	: 41:	27:	19:	12:	1:	1:POLYMER
:880128:	3342:	1.15:	16:	6:	1:	4:	10.2:	4.4:	14.8:	23000/23000:	0	:1	:0.4:	560/560:	0:	7:	93	: 44:	28:	20:	12:	1:	1:POLYMER
:880129:	3387:	1.15:	16:	6:	1:	4:	9.4:	4.4:	14.8:	22000/22000:	0	:0.9	:0.3:	540/540:	0:	7:	93	: 44:	28:	20:	12:	2:	1:POLYMER
:880130:	3405:	1.15:	15:	6:	1:	4:	10.3:	4.5:	13.8:	22000/22000:	0.1	:0.8	:0.5:	520/520:	0:	7:	93	: 42:	27:	19:	12:	1:	0:POLYMER
:880131:	3485:	1.15:	14:	6:	1:	4:	10.2:	4.3:	14.6:	21000/21000:	0.1	:0.8	:0.5:	440/440:	0:	7:	93	: 40:	26:	19:	11:	1:	0:POLYMER
:880201:	3512:	1.15:	14:	5:	1:	4:	10	: 4	: 14.5:	18000/18000:	0.05:	0.8	:0.5:	420/420:	0:	7:	93	: 39:	25:	19:	11:	2:	1:POLYMER
:880202:	3585:	1.15:	16:	6:	1:	6:	10.2:	4.3:	15	:18000/18000:	0.05:	0.7	:0	:400/400:	0:	8:	92	: 45:	29:	21:	14:	3:	2:POLYMER
:880203:	3613:	1.17:	16:	6:	1:	4:	9.6:	4	: 14.4:	18000/18000:	0.5	:0.7	:0	:240/240:	0:	8:	92	: 45:	29:	20:	14:	3:	2:POLYMER
:880204:	3677:	1.17:	17:	6:	1:	7:	9.5:	4.7:	16	:17000/17000:	0	:0.6	:0.5:	280/280:	0:	8:	92	: 47:	30:	21:	14:	3:	2:POLYMER

Daily mud properties — Date 31/5-1988 — Date 31/5-1988

System : Boredata Sandnes

Well: 7219/9-1
Mud Contractor: Promud
Data: "Mid depth" from table 3, otherwise from table 14

Date	Mid. depth m,MD	Mud dens. (SG)	PV cps	YP mPa	GEL 0 mPa	GEL 10 mPa	Ph	100 psi (cc)	HP/HT (cc)	Cl- inn/out mg/l	Alkalinity Pf	Alkalinity Pm	Alkalinity Mf	Ca++ inn/out mg/l	Oil %	Sol %	H2O %	V.G. meter at 115 gr. F: 600 rpm	300 rpm	200 rpm	100 rpm	6 rpm	3 rpm	Mud type
880205	3708	1.17	16	6	1	6	9.3	4.8	15.8	18000/18000	0	0.6	0.6	280/280	0	8	92	44	28	21	13	2	1	POLYMER
880206	3754	1.17	15	6	1	5	9.9	5	16	20000/20000	0	0.5	0.5	240/240	0	8	92	43	28	20	14	3	2	POLYMER
880207	3786	1.17	14	6	1	7	9.4	5.3	16	20000/20000	0	0.5	0.5	280/280	0	8	92	40	26	19	12	2	1	POLYMER
880208	3880	1.19	14	6	1	7	9	5	15	15000/15000	0	0.4	0.6	280/280	0	9	91	41	27	20	14	2	1	POLYMER
880209	3941	1.19	15	6	1	6	9.2	4.9	15	15000/15000	0	0.5	0.6	200/200	0	9	91	42	27	19	12	3	1	POLYMER
880210	3943	1.19	14	6	1	6	8.8	5.2	15.4	15000/15000	0	0.4	0.5	200/200	0	9	91	40	26	19	13	3	1	POLYMER
880211	3991	1.2	14	6	2	11	9	5.3	16	15000/15000	0	0.4	5	280/280	0	10	90	40	26	20	13	2	1	POLYMER
880212	4044	1.2	13	6	2	10	8.8	6	16.2	15000/15000	0	0.5	0.7	300/300	0	10	90	39	26	20	14	3	2	POLYMER
880213	4107	1.2	14	6	2	8	9	5.4	17	16000/16000	0	0.6	0.6	180/180	0	10	90	41	27	21	14	3	2	POLYMER
880214	4150	1.2	14	7	2	10	9.2	5.3	19	15000/15000	0	0.5	0.6	300/300	0	10	90	42	28	21	14	3	2	POLYMER
880215	4150	1.2	14	7	2	9	8.8	5.3	19	15000/15000	0	0.5	0.5	300/300	0	10	90	41	27	20	14	3	2	POLYMER
880216	4218	1.2	13	7	2	12	8.7	6.3	19	15000/15000	0	0.4	0.6	320/320	0	10	90	39	26	20	14	3	2	POLYMER
880217	4224	1.2	13	6	2	10	9.4	5.4	17	15000/15000	0.1	0.7	0.8	280/280	0	10	90	38	25	19	13	3	2	POLYMER
880218	4278	1.25	19	9	1	13	9.2	5.6	18.4	15000/15000	0.1	0.6	0.6	360/360	0	12	88	56	37	30	21	9	5	POLYMER
880219	4300	1.25	18	9	2	13	9.2	5.4	18	15000/15000	0.1	0.6	0.6	360/360	0	12	88	53	35	29	19	7	4	POLYMER
880220	4300	1.25	19	8	2	11	9	5.4	18	15000/15000	0.1	0.5	0.5	320/320	0	12	88	54	35	28	19	6	3	POLYMER
880221	2595	1.26	19	8	2	13	9.5	5.8	19	15000/15000	0.1	0.8	1	400/400	0	12	88	53	34	28	18	6	3	POLYMER
880222	1420	1.26	19	8	2	13	9.5	6	19	15000/15000	0.2	0.8	1	400/400	0	13	87	54	35	29	19	6	3	POLYMER
880223	429	1.03	0	0																				
880224	377	1	0	0																				
880225	0	0	0	0																			1	

Table B-11

MUD CONSUMPTION

Well: 7219/9-1
Mud company: Promud

Hole size: 36"

Barite	(Mt)	49
Bentonite	(Mt)	16
CMC	(Kg)	3689
NaOH	(l)	90

Hole size: 26"

Bentonite	(Mt)	17
NaOH	(l)	130
Propol Reg	(Kg)	418

Hole size: 17 1/2"

Barite	(Mt)	60
Bentonite	(Mt)	4
Bicarbonate	(Kg)	328
KCl	(Kg)	23212
KCl-Brine	(Kg)	483
NaOH	(l)	30
Propol Reg	(kg)	6066
Propol SL	(kg)	2107
XC-Polymer	(kg)	2183

Hole size: 12 1/4"

Barite	(Mt)	194
Bentonite	(Mt)	8
Bicarbonate	(Kg)	3007
IMCO-spot	(Kg)	1610
KCl	(Kg)	98495
Magconol	(Kg)	50
Milpolymer 302	(Kg)	1750
NaOH	(l)	545
Propol Reg	(Kg)	5673
Propol SL	(Kg)	5757
XC-polymer	(Kg)	2054

Hole size: 8 3/8"

Barite	(Mt)	89
Bentonite	(Mt)	4
Bicarbonate	(Kg)	716
DD	(l)	560
Magcolube	(l)	450
Magconol	(Kg)	50
Milpolymer 302	(Kg)	2200
Miltemp	(Kg)	1831
NaOH	(l)	3000
Propol Reg	(Kg)	4222
Propoal SL	(Kg)	5751

4-568

3/

Final Geochemical Report

Norsk Hydro A/S

7219/9-1A (Sidetrack)

Barents Sea

Norway

INTRODUCTION

Geochemical screening using the Oil Show Analyser (OSA) was performed on 881 cuttings samples from the sidetrack well 7219/9-1A. The interval analysed was from 2077 to 4300m.

Analysis at the well site from 2077 to 2720 metres was performed on 257 picked argillaceous cuttings. At 2720 metres, at the request of Norsk Hydro, this was changed to analysis of bulk samples. Due to equipment failure no TOC results were reported at the wellsite from 3327 metres to TD (4300m). These samples were re-analysed using an Oil Show Analyser in the Windsor laboratory. In addition, TOC results for the interval 2722 to 2917 metres which were obtained at the wellsite were found to be too low and this interval was also re-analysed.

In addition the samples in the interval 2077 - 2720m were re-analysed at Windsor as bulk cuttings.

In summary, the origin of the results reported are as follows:-

BULK CUTTINGS

2077 - 2917 metres	-	Windsor
2917 - 3327 metres	-	Wellsite
3327 - 4300 metres	-	Windsor

PICKED MATERIAL

2077 - 2720 metres	-	Wellsite

Samples analysed were 2 and 3 metre composite cuttings samples. These were washed and air-dried prior to crushing and analysis.

APPENDIX A

SAMPLE PREPARATION
SAMPLE CONTAMINATION
DESCRIPTION OF ANALYTICAL EQUIPMENT
PRESENTATION OF RESULTS
INTERPRETATION OF OSA DERIVED PARAMETERS
ORGANIC MATTER TYPES

SAMPLE PREPARATION

Small samples of ditch cuttings are taken and thoroughly washed in cold water through a 2.36mm sieve and collected in a 180 micron sieve to remove cavings. Any large quantities of contaminants such as lost circulation material are removed at this stage. The washed material is then examined under a binocular microscope and any further contaminants removed. The samples are then air dried at room temperature to prevent the loss of 'free hydrocarbons' and then ground to a homogenous powder in preparation for pyrolysis.

SAMPLE CONTAMINATION

The effects of contamination, if unrecognized, can lead to misleading geochemical data. The major contaminants at the wellsite include paint chips, lost circulation material (mica, nuthulls, etc), steel fragments, and pipe dope. In the 7219/9-1A well contaminants were removed by picking at the wellsite from the pre-dried sample.

Organic mud additives, especially those used for water loss control, can also cause serious contamination problems.

Another source of contamination to be aware of is caused by migrated hydrocarbons. The presence of migrated oil or bitumen in rock can give a major response in the vicinity of 300 degrees centigrade on the pyrogram (S1) while solid bitumen and the 'heavy end' fraction of petroleum has been found to produce a measurable response in the region 300-550 degrees centigrade. This is the same temperature range in which kerogen is cracked releasing hydrocarbons during pyrolysis. Thus large quantities of bitumen or migrated petroleum in rocks can affect the size and maximum temperature (Tmax) of the (S2) peak and cause non-source rocks to be falsely identified as source rocks as reported by Clementz (1979)*.

The problems encountered as a result of hydrocarbon contamination may be overcome by solvent extraction using a 50:50 solution of tricloroethane and acetone. As a guideline, samples with high S1 values (greater than 1.0 mgHC/g rock) are solvent extracted and reanalysed to obtain more valid values for S2 and Tmax. The S1 value obtained in the first analysis remains a useful indicator of oil accumulations, and degree of contamination. No samples were solvent extracted for 7219/9-1A.

* Clementz, D. 1979, 'Effect of Oil and Bitumen Saturation on Source Rock Pyrolusis', A.A.P.G. Bull., Vol 62 (12).

DESCRIPTION OF ANALYTICAL EQUIPMENT

Principle of Operation

Small quantities of sample (approx. 100 mg) are analysed by programmed pyrolysis in an inert Helium atmosphere. Any evoled hydrocarbons are detected by a Flame Ionisation Detector. The output from this sensor provides the peak data from the S0, S1 and S2 indices. In addition, the temperature, Tmax, for maximum generation of cracked hydrocarbons is measured by a probe monitoring oven temperature.

On completion of the pyrolysis cycle the sample is transferred to a second oven. The sample is heated in air and any carbonaceous material remaining is converted to carbon dioxide, this is detected by a thermal conductivity detector (TCD), the output of which is the S4 peak. The Oil Shows Analyser thus derives the Total Organic Carbon content from the sum of the pyrolysed carbon (S0+S1+S2) and the residual carbon (S4).

The O.S.A. used the following analytical cycle. (Also see Fig. A overleaf):-

Pyrolysis:

Carrier gas	:	Helium
Initial Isotherm	:	90 deg. C
Isothermal Hold	:	2 minutes
Second Isotherm	:	300 deg. C
Isothermal Hold	:	2 minutes
Temperature Ramp	:	30 deg/min
Final Temperature	:	600 deg. C

Oxidation:

Oxidation Gas	:	Air (after removal of C02)
Oven Temperature	:	600 deg. C
Oxidation Time	:	5 minutes

The equipment was calibrated using a standard supplied by Exploration Logging Overseas, Inc. A quality control sample was run routinely every ten unknown samples, or every 24 hours if less than ten samples were analysed during this period.

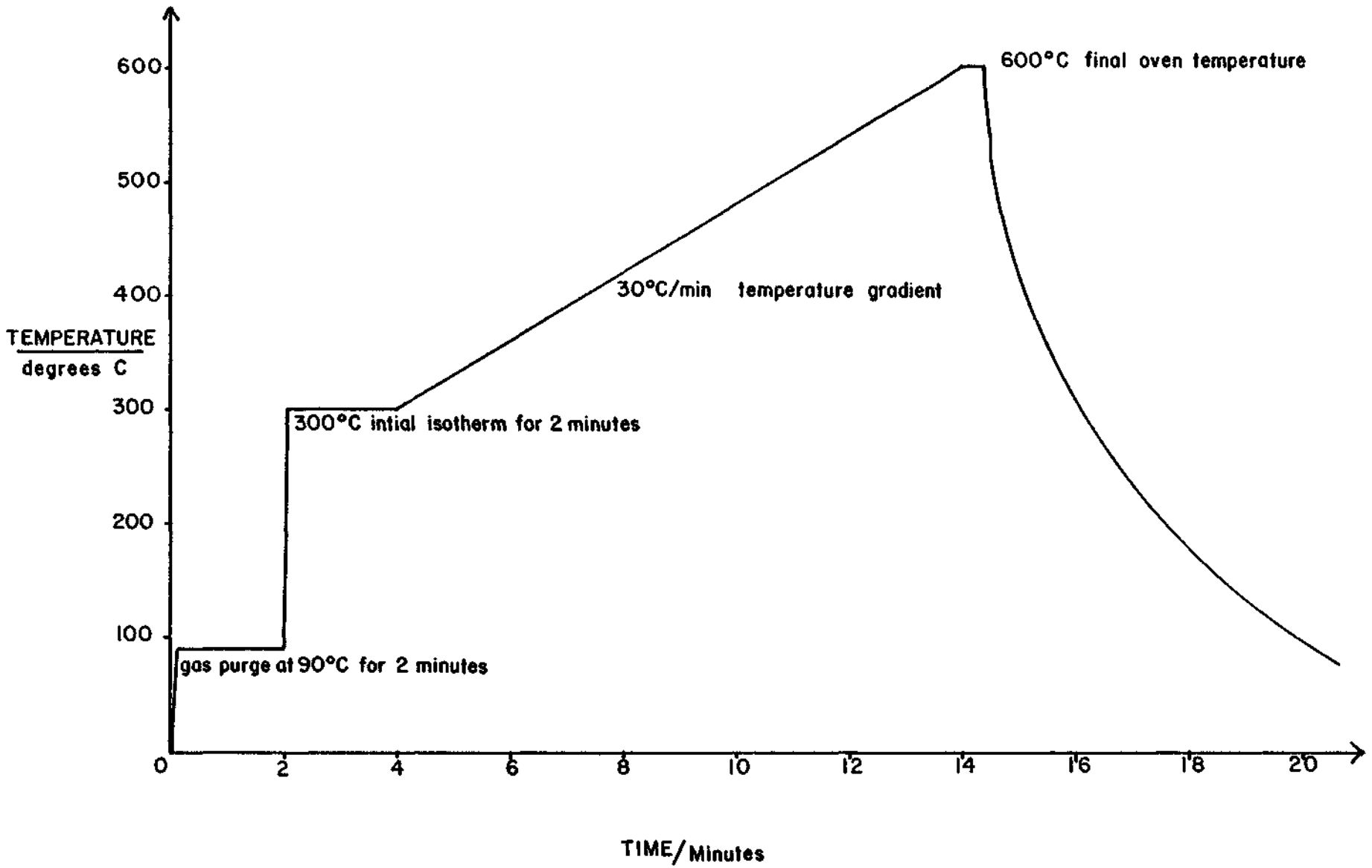
PRESENTATION OF RESULTS

The processed data is expressed in terms of:

SO	:	Low temperature gas yield (mgHC/g rock)
S1	:	Low temperature oil yield (mgHC/g rock)
S2	:	High temperature hydrocarbon yield (mgHC/g rock)
Tmax	:	Temperatures at which maximum emission of hydrocarbons occurs.
T.O.C.	:	Total Organic Carbon (weight percent of whole rock) comprised of S4 (residual organic carbon), plus 82% of the quantity S0+S1+S2
T.P.I.	:	Total Production Index (S0+S1/S0+S1+S2)
H.I.	:	Hydrogen Index (S2/TOC)

The Pyrolysis Cycle Of The Oil Shows Analyzer

Fig A



The following twelve pages of data from 2077m to 2720m includes both bulk crushed results analysed in Windsor and picked cuttings results analysed at wellsite. The two types of data are on facing pages for ease of comparison.

APPENDIX B

TABULATION OF ANALYTICAL DATA

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 12:57
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2077.00	.37	.11	.75	471	203	0	0.00	.57	.43
2080.00	.29	.08	.53	470	183	0	0.00	.43	.45
2082.00	1.04	.09	.56	465	54	0	0.00	.55	.50
2087.00	.99	.18	.97	437	98	0	0.00	1.21	.56
2090.00	.93	.17	.79	438	85	0	0.00	1.28	.62
2092.00	.26	.11	.56	419	215	0	0.00	.79	.59
2095.00	.70	.08	.60	432	86	0	0.00	.41	.41
2097.00	.34	.14	.78	429	229	0	0.00	.88	.53
2100.00	.30	.11	.54	431	180	0	0.00	.84	.61
2102.00	.41	.14	.70	436	171	0	0.00	1.01	.59
2105.00	.55	.20	.93	428	169	0	0.00	1.46	.61
2107.00	.51	.18	.76	408	149	0	0.00	1.38	.64
2110.00	.47	.16	.86	433	183	0	0.00	1.12	.57
2112.00	.62	.13	.53	436	85	0	0.00	1.09	.67
2115.00	.46	.16	.71	437	154	0	0.00	1.19	.63
2117.00	.73	.19	.92	436	126	0	0.00	1.38	.60
2120.00	.45	.15	.85	435	189	0	0.00	.93	.52
2122.00	.28	.09	.43	440	154	0	0.00	.60	.58
2125.00	.28	.12	.61	438	218	0	0.00	.79	.56
2127.00	.35	.15	.91	441	260	0	0.00	.93	.51
2130.00	.36	.12	.65	439	181	0	0.00	.84	.56
2132.00	1.20	.24	1.60	438	133	0	0.00	1.28	.44
2135.00	.76	.15	.80	437	105	0	0.00	.97	.55
2137.00	1.12	.15	.94	438	84	0	0.00	.82	.47
2140.00	1.15	.19	1.44	441	125	0	0.00	.89	.38
2142.00	1.19	.19	1.37	438	115	0	0.00	.88	.39
2145.00	1.12	.19	1.40	439	125	0	0.00	.89	.39
2147.00	.98	.19	1.32	439	135	0	0.00	.93	.41
2150.00	.85	.14	.94	438	111	0	0.00	.79	.46
2152.00	.92	.17	1.24	436	135	0	0.00	.76	.38
2155.00	.77	.18	1.16	435	151	0	0.00	1.00	.46
2157.00	.80	.17	1.07	436	134	0	0.00	.94	.47
2160.00	3.25	.76	6.93	433	213	0	.01	2.26	.25
2162.00	2.25	.35	2.24	442	100	0	0.00	2.00	.47
2165.00	1.74	.26	1.63	440	94	0	0.00	1.51	.48
2167.00	1.42	.16	1.00	440	70	0	0.00	.90	.47
2170.00	.90	.17	1.04	443	116	0	0.00	1.02	.50
2172.00	.88	.07	.36	440	41	0	0.00	.51	.59
2175.00	.89	.12	.83	442	93	0	0.00	.60	.42
2177.00	1.08	.11	.78	443	72	0	0.00	.55	.41
2180.00	.75	.11	.85	443	113	0	0.00	.50	.37

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:01
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2182.00	.61	.13	.92	443	151	0	0.00	.62	.40
2185.00	1.08	.15	1.05	442	97	0	0.00	.72	.41
2187.00	1.46	.19	1.33	443	91	0	0.00	.98	.42
2190.00	1.21	.18	1.34	443	111	0	0.00	.79	.37
2192.00	1.14	.13	.77	440	68	0	0.00	.79	.51
2195.00	1.57	.26	2.02	440	129	0	0.00	1.09	.35
2197.00	1.13	.26	1.98	446	175	0	0.00	1.16	.37
2200.00	.71	.17	1.20	451	169	0	0.00	.81	.40
2202.00	1.01	.12	.70	446	69	0	0.00	.69	.50
2205.00	.74	.09	.41	445	55	0	0.00	.64	.61
2207.00	.43	.18	1.07	449	249	0	0.00	1.11	.51
2210.00	.32	.13	.78	445	244	0	0.00	.83	.52
2212.00	.87	.15	1.02	445	117	0	0.00	.76	.43
2215.00	.24	.08	.34	436	142	0	0.00	.65	.66
2217.00	.60	.11	.53	439	88	0	0.00	.75	.59
2220.00	.52	.12	.74	0	142	0	0.00	.73	.50
2222.00	.35	.13	.89	451	254	0	0.00	.69	.44
2225.00	.32	.10	.61	474	191	0	0.00	.64	.51
2227.00	.32	.07	.30	442	94	0	0.00	.51	.63
2230.00	.26	.09	.49	445	188	0	0.00	.56	.53
2232.00	.30	.09	.44	439	147	0	0.00	.61	.58
2235.00	.21	.09	.39	473	186	0	0.00	.65	.63
2237.00	.18	.10	.55	439	306	0	0.00	.62	.53
2240.00	.17	.06	.29	445	171	0	0.00	.46	.61
2242.00	.53	.12	.71	439	134	0	0.00	.76	.52
2245.00	.21	.07	.33	442	157	0	0.00	.47	.59
2247.00	.41	.09	.53	451	129	0	0.00	.61	.54
2250.00	.17	.06	.30	442	176	0	0.00	.45	.60
2252.00	.31	.07	.42	438	135	0	0.00	.40	.49
2255.00	.27	.12	.57	436	211	0	0.00	.82	.59
2257.00	.16	.09	.30	0	188	0	0.00	.76	.72
2260.00	.19	.12	.38	0	200	0	0.00	1.10	.74
2262.00	.57	.14	.58	438	102	0	0.00	1.12	.66
2265.00	.47	.14	.56	439	119	0	0.00	1.07	.66
2267.00	.29	.13	.41	0	141	0	0.00	1.17	.74
2270.00	1.02	.23	1.15	441	113	0	0.00	1.63	.59
2272.00	.67	.21	.89	443	133	0	0.00	1.62	.65
2275.00	2.10	.39	2.93	440	140	0	0.00	1.74	.37
2277.00	1.48	.30	2.05	442	139	0	0.00	1.59	.44
2280.00	1.96	.31	2.10	443	107	0	0.00	1.58	.43
2282.00	4.02	.61	5.21	443	130	0	0.00	2.14	.29

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:04
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2285.00	3.80	.55	4.56	445	120	0	0.00	2.11	.32
2287.00	2.23	.41	2.93	440	131	0	0.00	1.98	.40
2290.00	1.49	.24	1.85	441	124	0	0.00	1.08	.37
2292.00	.73	.16	.93	437	127	0	0.00	1.02	.52
2295.00	3.39	.92	8.51	438	251	0	0.00	2.57	.23
2297.00	1.49	.30	2.69	442	181	0	0.00	.88	.25
2300.00	2.00	.39	3.72	444	186	0	0.00	.93	.20
2302.00	.64	.14	1.30	536	203	0	0.00	.44	.25
2305.00	.92	.19	1.86	565	202	0	0.00	.48	.21
2307.00	.71	.34	3.34	589	470	0	0.00	.75	.18
2310.00	.83	.21	1.70	446	205	0	0.00	.77	.31
2312.00	.81	.10	.63	443	77	0	0.00	.55	.47
2315.00	.76	.13	.84	442	111	0	0.00	.68	.45
2317.00	.32	.06	.38	441	119	0	0.00	.30	.44
2320.00	.27	.06	.46	436	170	0	0.00	.21	.31
2322.00	.28	.06	.47	445	168	0	0.00	.26	.36
2325.00	.39	.09	.71	443	182	0	0.00	.37	.34
2327.00	.34	.06	.41	441	121	0	0.00	.29	.41
2330.00	.28	.08	.65	518	232	0	0.00	.29	.31
2332.00	.35	.12	1.09	595	311	0	0.00	.41	.27
2335.00	.34	.10	.85	476	250	0	0.00	.40	.32
2337.00	.52	.10	.76	443	146	0	0.00	.47	.38
2340.00	.63	.06	.45	443	71	0	0.00	.26	.37
2342.00	.30	.05	.25	439	84	0	0.00	.29	.53
2345.00	.16	.03	.20	441	125	0	0.00	.21	.51
2347.00	.25	.05	.31	439	124	0	0.00	.26	.46
2350.00	.19	.05	.36	435	189	0	0.00	.25	.41
2352.00	.21	.07	.44	428	210	0	0.00	.38	.46
2355.00	.18	.04	.30	439	167	0	0.00	.24	.44
2357.00	.08	.04	.22	437	273	0	0.00	.21	.49
2360.00	.22	.05	.30	439	136	0	0.00	.25	.45
2362.00	.17	.04	.30	440	176	0	0.00	.21	.41
2365.00	.12	.05	.37	442	312	0	0.00	.28	.43
2367.00	.28	.08	.55	421	196	0	0.00	.46	.46
2370.00	.78	.13	1.06	441	136	0	0.00	.55	.34
2372.00	.86	.14	1.11	444	129	0	0.00	.53	.32
2375.00	.93	.14	1.12	435	120	0	0.00	.55	.33
2377.00	.66	.10	.76	445	115	0	0.00	.46	.38
2380.00	1.99	.20	1.84	448	92	0	0.00	.53	.22
2382.00	4.47	.38	3.47	451	78	0	0.00	1.14	.25
2385.00	1.79	.15	1.26	447	70	0	0.00	.55	.30

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:08
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2387.00	1.01	.11	.78	445	77	0	0.00	.53	.40
2390.00	.53	.09	.58	442	109	0	0.00	.48	.45
2392.00	.49	.09	.67	443	137	0	0.00	.46	.41
2395.00	.56	.09	.71	445	127	0	0.00	.40	.36
2397.00	.62	.12	.82	442	132	0	0.00	.59	.42
2400.00	.47	.07	.46	441	98	0	0.00	.40	.47
2402.00	.37	.06	.43	442	116	0	0.00	.33	.43
2405.00	.75	.08	.57	434	77	0	0.00	.36	.39
2407.00	.79	.10	.75	443	95	0	0.00	.40	.35
2410.00	1.05	.09	.59	440	56	0	0.00	.45	.43
2412.00	.77	.08	.59	440	77	0	0.00	.39	.40
2415.00	.64	.08	.63	442	98	0	0.00	.37	.37
2417.00	.52	.06	.46	444	88	0	0.00	.27	.37
2420.00	.55	.07	.52	447	95	0	0.00	.30	.37
2422.00	.38	.05	.37	442	97	0	0.00	.27	.42
2425.00	.25	.04	.29	442	116	0	0.00	.20	.41
2427.00	.36	.05	.36	436	100	0	0.00	.25	.41
2430.00	.38	.07	.49	440	129	0	0.00	.32	.40
2432.00	.81	.13	.97	440	120	0	0.00	.60	.38
2435.00	.93	.13	1.13	444	122	0	0.00	.49	.30
2437.00	.81	.13	.93	443	115	0	0.00	.58	.38
2440.00	.73	.13	.82	437	112	0	0.00	.79	.49
2442.00	.63	.10	.56	435	89	0	0.00	.62	.53
2445.00	.30	.07	.41	443	137	0	0.00	.38	.48
2447.00	.47	.08	.54	444	115	0	0.00	.42	.44
2450.00	.81	.11	.73	443	90	0	0.00	.56	.43
2452.00	.64	.08	.54	444	84	0	0.00	.41	.43
2455.00	.40	.09	.65	422	163	0	0.00	.47	.42
2457.00	.40	.11	.67	450	168	0	0.00	.64	.49
2460.00	.30	.10	.69	453	230	0	0.00	.56	.45
2462.00	.35	.10	.58	449	166	0	0.00	.59	.50
2465.00	.25	.09	.56	463	224	0	0.00	.54	.49
2467.00	.36	.08	.59	454	164	0	0.00	.37	.39
2470.00	.30	.04	.24	448	80	0	0.00	.26	.52
2472.00	.10	.03	.15	446	150	0	0.00	.23	.61
2475.00	.11	.03	.18	444	164	0	0.00	.20	.53
2477.00	.18	.03	.21	448	117	0	0.00	.20	.49
2480.00	.29	.05	.29	446	100	0	0.00	.28	.49
2482.00	.33	.04	.29	447	88	0	0.00	.23	.44
2485.00	.47	.05	.35	448	74	0	0.00	.22	.39
2487.00	.67	.06	.35	448	52	0	0.00	.32	.48

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 03:34
: 15 Aug 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2490.00	1.02	.08	.60	447	59	0	0.00	.32	.35
2492.00	1.01	.08	.68	446	67	0	0.00	.32	.32
2495.00	1.49	.11	.91	446	61	0	0.00	.47	.34
2497.00	1.55	.10	.87	445	56	0	0.00	.35	.29
2500.00	2.20	.12	1.09	448	50	0	0.00	.41	.27
2502.00	1.24	.08	.70	446	56	0	0.00	.32	.31
2505.00	1.24	.08	.67	448	54	0	0.00	.31	.32
2507.00	.99	.08	.67	448	68	0	0.00	.35	.34
2510.00	1.17	.11	.85	445	73	0	0.00	.48	.36
2512.00	1.08	.09	.75	446	69	0	0.00	.39	.34
2515.00	1.24	.08	.64	441	52	0	0.00	.38	.37
2517.00	1.01	.08	.63	449	62	0	0.00	.37	.37
2520.00	1.17	.10	.84	444	72	0	0.00	.38	.31
2522.00	.88	.16	1.32	446	150	0	0.00	.56	.30
2525.00	1.05	.17	1.42	447	135	0	0.00	.62	.30
2527.00	.68	.11	.91	450	134	0	0.00	.39	.30
2530.00	.88	.10	.83	449	94	0	0.00	.38	.31
2532.00	.52	.08	.64	449	123	0	0.00	.27	.30
2535.00	.38	.10	.80	441	211	0	0.00	.37	.32
2537.00	.35	.07	.58	459	166	0	0.00	.28	.33
2540.00	.34	.07	.59	459	174	0	0.00	.23	.28
2542.00	.23	.07	.55	443	239	0	0.00	.26	.32
2545.00	1.13	.13	1.09	446	96	0	0.00	.45	.29
2547.00	.62	.10	.87	442	140	0	0.00	.37	.30
2550.00	.62	.10	.80	445	129	0	0.00	.38	.32
2552.00	.62	.09	.76	442	123	0	0.00	.35	.32
2555.00	.60	.07	.54	445	90	0	0.00	.28	.34
2557.00	.82	.10	.84	445	102	0	0.00	.35	.29
2560.00	1.31	.22	2.04	443	156	0	0.00	.64	.24
2562.00	1.88	.26	2.12	443	113	0	0.00	.96	.31
2565.00	1.38	.21	1.77	444	128	0	0.00	.77	.30
2567.00	1.44	.21	1.86	445	129	0	0.00	.64	.26
2570.00	1.37	.16	1.22	444	89	0	0.00	.68	.36
2572.00	1.51	.18	1.45	445	96	0	0.00	.69	.32
2575.00	2.03	.28	2.49	444	123	0	0.00	.84	.25
2577.00	1.13	.13	1.12	446	99	0	0.00	.49	.30
2580.00	1.74	.21	1.95	445	112	0	0.00	.61	.24
2582.00	1.26	.14	1.26	448	100	0	0.00	.43	.25
2585.00	.78	.12	1.02	448	131	0	0.00	.46	.31
2587.00	1.24	.18	1.58	447	127	0	0.00	.55	.26
2590.00	.67	.10	.86	448	129	0	0.00	.39	.31

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 03:41
: 15 Aug 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2592.00	.42	.06	.50	449	119	0	0.00	.20	.29
2595.00	.76	.13	1.28	445	168	0	0.00	.34	.21
2597.00	1.15	.15	1.28	446	111	0	0.00	.49	.28
2600.00	.71	.08	.71	446	100	0	0.00	.30	.30
2602.00	.71	.09	.79	447	111	0	0.00	.27	.25
2605.00	.39	.07	.59	443	151	0	0.00	.30	.34
2607.00	.38	.05	.38	448	100	0	0.00	.23	.38
2610.00	.38	.06	.53	449	138	0	0.00	.18	.25
2612.00	.38	.07	.51	446	134	0	0.00	.31	.38
2615.00	.39	.07	.50	445	128	0	0.00	.30	.37
2617.00	.61	.07	.65	447	107	0	0.00	.23	.26
2620.00	.58	.09	.80	447	138	0	0.00	.26	.25
2622.00	.55	.09	.82	447	149	0	0.00	.25	.23
2625.00	.37	.05	.46	447	124	0	0.00	.19	.29
2627.00	.42	.05	.42	447	100	0	0.00	.16	.28
2630.00	.44	.08	.67	450	152	0	0.00	.27	.29
2632.00	.39	.04	.32	456	82	0	0.00	.17	.35
2635.00	.24	.05	.48	486	200	0	0.00	.18	.27
2637.00	.22	.05	.42	462	191	0	0.00	.14	.25
2640.00	.19	.05	.46	491	242	0	0.00	.18	.28
2642.00	.24	.06	.52	458	217	0	0.00	.22	.30
2645.00	.24	.06	.57	460	238	0	0.00	.20	.26
2647.00	.32	.05	.38	444	119	0	0.00	.17	.31
2650.00	.29	.04	.32	447	110	0	0.00	.17	.35
2652.00	.49	.08	.66	441	136	0	0.00	.31	.32
2655.00	.47	.08	.65	434	138	0	0.00	.30	.32
2657.00	.74	.12	1.04	434	141	0	0.00	.35	.25
2660.00	.48	.08	.59	442	123	0	0.00	.33	.36
2662.00	.56	.07	.58	443	104	0	0.00	.29	.33
2665.00	.48	.07	.65	442	135	0	0.00	.25	.28
2667.00	.67	.10	.91	442	136	0	0.00	.33	.27
2670.00	.46	.09	.70	439	152	0	0.00	.36	.34
2672.00	1.07	.12	1.03	441	96	0	0.00	.41	.28
2675.00	1.20	.14	1.23	440	103	0	0.00	.46	.27
2677.00	1.32	.16	1.38	441	105	0	0.00	.51	.27
2680.00	1.05	.12	1.00	442	95	0	0.00	.45	.31
2682.00	1.19	.16	1.29	441	108	0	0.00	.59	.31
2685.00	1.31	.19	1.38	440	105	0	0.00	.93	.40
2687.00	1.06	.21	1.46	438	138	0	0.00	1.01	.41
2690.00	.89	.13	.79	438	89	0	0.00	.76	.49
2692.00	.91	.13	.82	438	90	0	0.00	.77	.48

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 03:45
: 15 Aug 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2695.00	.90	.12	.87	440	97	0	0.00	.59	.40
2697.00	.78	.09	.67	440	86	0	0.00	.37	.36
2700.00	.76	.08	.65	441	85	0	0.00	.36	.36
2702.00	.80	.12	1.01	437	126	0	0.00	.45	.31
2705.00	.71	.11	.75	437	106	0	0.00	.53	.41
2707.00	.70	.08	.75	445	107	0	0.00	.22	.23
2722.00	1.07	.09	.93	436	87	0	0.00	.21	.18
2725.00	.88	.09	.52	435	59	0	0.00	.53	.50
2727.00	.74	.09	.66	437	89	0	0.00	.43	.39
2730.00	.52	.06	.45	440	87	0	0.00	.24	.35
2732.00	.99	.09	.85	436	86	0	0.00	.19	.18
2735.00	.54	.05	.42	440	78	0	0.00	.24	.36
2737.00	.50	.06	.42	442	84	0	0.00	.25	.37
2740.00	.51	.05	.45	443	88	0	0.00	.20	.31
2742.00	.62	.07	.58	443	94	0	0.00	.29	.33
2745.00	1.41	.28	1.80	426	128	0	0.00	1.53	.46
2747.00	1.35	.40	2.75	423	204	0	0.00	2.04	.43
2750.00	.73	.10	.72	441	99	0	0.00	.48	.40
2752.00	.52	.07	.56	421	108	0	0.00	.32	.36
2755.00	.29	.05	.34	415	117	0	0.00	.28	.45
2757.00	.18	.04	.25	416	139	0	0.00	.25	.50
2760.00	.12	.02	.15	422	125	0	0.00	.12	.44
2762.00	.13	.03	.21	429	162	0	0.00	.15	.42
2765.00	.48	.06	.42	437	88	0	0.00	.26	.38
2767.00	.56	.06	.46	443	82	0	0.00	.32	.41
2770.00	.87	.14	1.08	440	124	0	0.00	.56	.34
2772.00	.60	.06	.46	449	77	0	0.00	.21	.31
2775.00	.50	.05	.42	450	84	0	0.00	.23	.35
2777.00	.43	.05	.41	448	95	0	0.00	.20	.33
2780.00	.44	.04	.34	442	77	0	0.00	.16	.32
2782.00	.56	.05	.44	447	79	0	0.00	.22	.33
2785.00	.80	.10	.80	442	100	0	0.00	.42	.34
2787.00	.67	.07	.60	445	90	0	0.00	.24	.29
2790.00	.53	.05	.44	445	83	0	0.00	.22	.33
2792.00	.68	.07	.47	444	69	0	0.00	.34	.42
2795.00	.53	.06	.42	443	79	0	0.00	.29	.41

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:22
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2797.00	.40	.06	.44	447	110	0	0.00	.26	.37
2800.00	.79	.06	.52	450	66	0	0.00	.19	.27
2802.00	.83	.08	.68	440	82	0	0.00	.29	.30
2805.00	.77	.06	.50	446	65	0	0.00	.26	.34
2807.00	.73	.06	.52	450	71	0	0.00	.25	.32
2810.00	1.04	.09	.68	448	65	0	0.00	.38	.36
2812.00	1.08	.10	.81	449	75	0	0.00	.45	.36
2815.00	.92	.09	.70	451	76	0	0.00	.33	.32
2817.00	.92	.07	.56	452	61	0	0.00	.23	.29
2820.00	.92	.08	.65	449	71	0	0.00	.28	.30
2822.00	.78	.11	.89	447	114	0	0.00	.49	.36
2825.00	.64	.13	1.08	447	169	0	0.00	.48	.31
2827.00	.62	.13	1.10	447	177	0	0.00	.48	.30
2830.00	.79	.08	.64	449	81	0	0.00	.35	.35
2832.00	.76	.09	.64	443	84	0	0.00	.48	.43
2835.00	.76	.13	.93	447	123	0	0.00	.67	.42
2837.00	.86	.12	.79	439	92	0	0.00	.65	.45
2840.00	.75	.07	.51	446	68	0	0.00	.28	.35
2842.00	.71	.07	.59	445	83	0	0.00	.23	.28
2845.00	.70	.05	.40	449	57	0	0.00	.22	.35
2847.00	.78	.06	.46	449	59	0	0.00	.23	.33
2850.00	.88	.06	.52	455	59	0	0.00	.21	.29
2852.00	.81	.04	.39	453	48	0	0.00	.14	.26
2855.00	1.05	.05	.45	454	43	0	0.00	.17	.27
2857.00	.84	.07	.65	448	77	0	0.00	.18	.22
2860.00	.72	.05	.40	451	56	0	0.00	.15	.27
2862.00	.88	.06	.47	451	53	0	0.00	.22	.32
2865.00	.62	.04	.36	456	58	0	0.00	.12	.25
2867.00	.73	.04	.34	452	47	0	0.00	.12	.26
2870.00	.78	.04	.34	456	44	0	0.00	.12	.26
2872.00	.72	.04	.34	454	47	0	0.00	.12	.26
2875.00	.67	.04	.38	455	57	0	0.00	.15	.28
2877.00	.43	.04	.31	441	72	0	0.00	.16	.34
2880.00	.09	.01	.09	447	100	0	0.00	.06	.40
2882.00	.38	.04	.35	451	92	0	0.00	.17	.33
2885.00	.70	.06	.47	451	67	0	0.00	.20	.30
2887.00	.77	.07	.59	451	77	0	0.00	.23	.28
2890.00	.37	.05	.35	450	95	0	0.00	.21	.38
2892.00	.47	.05	.33	454	70	0	0.00	.27	.45
2895.00	.44	.04	.28	453	64	0	0.00	.17	.38
2897.00	.42	.03	.23	446	55	0	0.00	.19	.45

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:25
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
2900.00	.44	.04	.27	447	61	0	0.00	.21	.44
2902.00	.49	.06	.40	440	82	0	0.00	.31	.44
2905.00	.30	.03	.19	455	63	0	0.00	.15	.44
2907.00	.34	.05	.36	449	106	0	0.00	.23	.39
2910.00	.43	.04	.30	446	70	0	0.00	.21	.41
2912.00	.47	.03	.15	451	32	0	0.00	.16	.52
2915.00	.15	.01	.09	456	60	0	0.00	.09	.50
2917.00	.15	.01	.07	430	47	0	0.00	.09	.56
2920.00	.11	.03	.09	456	82	0	0.00	.23	.72
2922.00	.13	.02	.15	447	115	0	0.00	.12	.44
2925.00	.25	.03	.24	451	96	0	0.00	.16	.40
2927.00	.33	.06	.42	448	127	0	0.00	.30	.42
2930.00	.59	.06	.52	456	88	0	0.00	.24	.32
2932.00	.45	.06	.48	449	107	0	0.00	.25	.34
2935.00	.44	.05	.44	451	100	0	0.00	.22	.33
2937.00	.49	.07	.48	447	98	0	0.00	.31	.39
2940.00	.34	.03	.13	449	38	0	0.00	.20	.61
2942.00	.49	.04	.30	442	61	0	0.00	.21	.41
2945.00	.55	.06	.43	441	78	0	0.00	.30	.41
2947.00	.55	.06	.45	440	82	0	0.00	.31	.41
2950.00	.81	.09	.71	443	88	0	0.00	.37	.34
2952.00	.84	.10	.85	445	101	0	0.00	.40	.32
2955.00	.82	.11	.87	443	106	0	0.00	.41	.32
2957.00	.55	.03	.13	448	24	0	0.00	.20	.61
2960.00	.73	.09	.76	448	104	0	0.00	.36	.32
2962.00	.55	.08	.61	447	111	0	0.00	.33	.35
2965.00	.62	.09	.73	446	118	0	0.00	.34	.32
2967.00	.61	.09	.68	449	111	0	0.00	.35	.34
2970.00	.61	.09	.71	452	116	0	0.00	.33	.32
2972.00	.63	.05	.33	452	52	0	0.00	.23	.41
2975.00	.91	.08	.56	448	62	0	0.00	.41	.42
2977.00	.77	.11	.75	446	97	0	0.00	.55	.42
2980.00	.75	.08	.67	449	89	0	0.00	.28	.29
2982.00	.70	.10	.88	445	126	0	0.00	.35	.28
2985.00	.55	.07	.55	449	100	0	0.00	.29	.35
2987.00	.47	.07	.55	448	117	0	0.00	.28	.34
2990.00	.49	.06	.51	449	104	0	0.00	.26	.34
2992.00	2.29	.45	4.39	448	192	0	0.00	.99	.18
2995.00	2.17	.40	3.96	448	182	0	0.00	.84	.18
2997.00	2.52	.50	3.05	440	121	0	0.00	2.92	.49
3000.00	1.45	.30	2.47	443	170	0	0.00	1.14	.32

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:29
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3002.00	1.34	.30	2.30	444	172	0	0.00	1.32	.36
3005.00	1.06	.13	1.10	447	104	0	0.00	.51	.32
3007.00	.82	.07	.62	447	76	0	0.00	.26	.30
3010.00	.69	.08	.68	450	99	0	0.00	.28	.29
3012.00	.64	.08	.68	449	106	0	0.00	.26	.28
3015.00	.80	.09	.82	449	102	0	0.00	.30	.27
3017.00	.76	.10	.80	449	105	0	0.00	.36	.31
3020.00	.62	.08	.72	449	116	0	0.00	.29	.29
3022.00	.55	.06	.55	449	100	0	0.00	.21	.28
3025.00	.42	.06	.47	449	112	0	0.00	.20	.30
3027.00	.52	.06	.52	450	100	0	0.00	.22	.30
3030.00	.58	.09	.78	448	134	0	0.00	.36	.32
3032.00	.66	.08	.71	452	108	0	0.00	.28	.28
3035.00	.60	.05	.44	451	73	0	0.00	.19	.30
3037.00	.58	.06	.51	452	88	0	0.00	.22	.30
3040.00	.48	.06	.49	451	102	0	0.00	.24	.33
3042.00	.52	.10	.83	447	160	0	0.00	.41	.33
3045.00	.25	.04	.35	450	140	0	0.00	.18	.34
3047.00	.23	.03	.26	449	113	0	0.00	.11	.30
3050.00	.37	.05	.39	446	105	0	0.00	.26	.40
3052.00	.29	.02	.15	450	52	0	0.00	.06	.29
3055.00	.37	.06	.36	447	97	0	0.00	.33	.48
3057.00	.37	.03	.24	448	65	0	0.00	.16	.40
3060.00	.50	.05	.45	444	90	0	0.00	.18	.29
3062.00	.33	.02	.15	449	45	0	0.00	.10	.40
3065.00	.31	.03	.23	450	74	0	0.00	.10	.30
3067.00	.33	.02	.19	452	58	0	0.00	.09	.32
3070.00	.42	.05	.43	448	102	0	0.00	.23	.35
3072.00	.50	.05	.37	444	74	0	0.00	.20	.35
3075.00	.45	.05	.41	450	91	0	0.00	.18	.31
3077.00	.39	.02	.20	453	51	0	0.00	.08	.29
3080.00	.45	.04	.32	451	71	0	0.00	.13	.29
3082.00	.34	.05	.42	447	124	0	0.00	.24	.36
3085.00	1.05	.19	1.86	448	177	0	0.00	.43	.19
3087.00	.85	.13	1.15	444	135	0	0.00	.36	.24
3090.00	.66	.11	.87	452	132	0	0.00	.40	.31
3092.00	.49	.07	.59	450	120	0	0.00	.31	.34
3095.00	.58	.10	.82	447	141	0	0.00	.41	.33
3097.00	.39	.10	.80	445	205	0	0.00	.38	.32
3100.00	.33	.04	.35	447	106	0	0.00	.19	.35
3102.00	.38	.06	.50	446	132	0	0.00	.20	.29
3105.00	.43	.09	.80	444	186	0	0.00	.29	.27

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:33
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3107.00	.45	.06	.40	441	89	0	0.00	.29	.42
3110.00	.72	.07	.47	428	65	0	0.00	.40	.46
3112.00	1.30	.10	.58	443	45	0	0.00	.62	.52
3115.00	1.72	.05	.35	445	20	0	0.00	.27	.44
3117.00	.76	.07	.45	438	59	0	0.00	.38	.46
3120.00	.61	.06	.40	440	66	0	0.00	.31	.44
3122.00	.86	.06	.39	443	45	0	0.00	.28	.42
3125.00	.80	.05	.35	442	44	0	0.00	.29	.45
3127.00	.29	.03	.21	451	72	0	0.00	.11	.34
3130.00	.21	.04	.28	446	133	0	0.00	.18	.39
3132.00	.38	.02	.18	442	47	0	0.00	.09	.33
3135.00	.49	.06	.33	447	67	0	0.00	.35	.51
3137.00	.67	.07	.41	434	61	0	0.00	.43	.51
3140.00	1.17	.20	1.34	414	115	0	0.00	1.10	.45
3142.00	1.22	.10	.71	423	58	0	0.00	.44	.38
3145.00	1.03	.12	.94	431	91	0	0.00	.55	.37
3150.00	.84	.24	1.84	441	219	0	0.00	1.03	.36
3152.00	.56	.11	.84	444	150	0	0.00	.51	.38
3155.00	.36	.06	.45	447	125	0	0.00	.27	.38
3157.00	.28	.07	.52	440	186	0	0.00	.38	.42
3160.00	.21	.07	.55	444	262	0	0.00	.28	.34
3162.00	.36	.07	.48	438	133	0	0.00	.37	.44
3165.00	.54	.07	.56	446	104	0	0.00	.31	.36
3167.00	.68	.04	.31	451	46	0	0.00	.17	.35
3170.00	.50	.05	.42	445	84	0	0.00	.21	.33
3172.00	.42	.07	.54	441	129	0	0.00	.28	.34
3175.00	.44	.07	.63	439	143	0	0.00	.26	.29
3177.00	.43	.05	.43	438	100	0	0.00	.23	.35
3180.00	.40	.03	.26	445	65	0	0.00	.11	.30
3182.00	.57	.06	.50	423	88	0	0.00	.21	.30
3185.00	.65	.03	.28	429	43	0	0.00	.13	.32
3187.00	.65	.05	.39	433	60	0	0.00	.23	.37
3190.00	.48	.05	.40	442	83	0	0.00	.18	.31
3192.00	.35	.04	.32	439	91	0	0.00	.12	.27
3195.00	.34	.04	.33	441	97	0	0.00	.13	.28
3197.00	.35	.02	.22	451	63	0	0.00	.07	.24
3200.00	.39	.05	.45	444	115	0	0.00	.18	.29
3202.00	.43	.05	.40	443	93	0	0.00	.16	.29
3205.00	.36	.06	.48	439	133	0	0.00	.19	.28
3207.00	.34	.03	.24	444	71	0	0.00	.10	.29
3210.00	.34	.04	.35	443	103	0	0.00	.16	.31

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:36
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3212.00	.39	.07	.56	443	144	0	0.00	.31	.36
3215.00	.35	.05	.39	446	111	0	0.00	.18	.32
3217.00	.34	.04	.39	429	115	0	0.00	.15	.28
3220.00	.33	.06	.51	438	155	0	0.00	.18	.26
3222.00	.33	.04	.36	445	109	0	0.00	.13	.27
3225.00	.48	.10	.86	445	179	0	0.00	.35	.29
3227.00	.77	.11	.92	446	119	0	0.00	.36	.28
3230.00	.68	.07	.64	444	94	0	0.00	.22	.26
3232.00	.54	.03	.31	449	57	0	0.00	.10	.24
3235.00	.76	.06	.51	443	67	0	0.00	.18	.26
3237.00	.61	.04	.35	451	57	0	0.00	.11	.24
3240.00	.55	.05	.44	451	80	0	0.00	.13	.23
3242.00	.61	.07	.54	444	89	0	0.00	.31	.36
3245.00	.65	.07	.60	441	92	0	0.00	.29	.33
3247.00	.91	.05	.42	442	46	0	0.00	.16	.28
3250.00	.61	.05	.41	442	67	0	0.00	.16	.28
3252.00	.14	.05	.43	444	307	0	0.00	.17	.28
3255.00	.50	.05	.39	449	78	0	0.00	.17	.30
3257.00	.51	.04	.39	448	76	0	0.00	.13	.25
3260.00	.50	.03	.29	446	58	0	0.00	.10	.26
3262.00	.79	.01	.11	449	14	0	0.00	.04	.27
3265.00	.58	.05	.42	445	72	0	0.00	.13	.24
3267.00	.58	.04	.35	450	60	0	0.00	.13	.27
3270.00	.38	.04	.31	437	82	0	0.00	.13	.30
3272.00	.59	.04	.35	443	59	0	0.00	.11	.24
3275.00	.48	.03	.30	443	62	0	0.00	.10	.25
3277.00	.61	.02	.22	448	36	0	0.00	.07	.24
3280.00	.77	.04	.36	446	47	0	0.00	.09	.20
3282.00	.65	.06	.51	445	78	0	0.00	.17	.25
3285.00	.40	.04	.41	452	102	0	0.00	.12	.23
3287.00	.34	.04	.40	453	118	0	0.00	.12	.23
3290.00	.52	.03	.31	442	60	0	0.00	.09	.23
3292.00	.50	.02	.18	453	36	0	0.00	.04	.18
3295.00	.74	.02	.17	455	23	0	0.00	.05	.23
3297.00	.59	.02	.18	452	31	0	0.00	.04	.18
3300.00	.62	.02	.16	455	26	0	0.00	.05	.24
3302.00	.66	.09	.67	437	102	0	0.00	.38	.36
3305.00	.51	.07	.57	442	112	0	0.00	.28	.33
3307.00	.34	.03	.30	451	88	0	0.00	.12	.29
3310.00	.31	.04	.33	450	106	0	0.00	.13	.28
3312.00	.34	.06	.54	446	159	0	0.00	.20	.27

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:14
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3315.00	.58	.07	.57	447	98	0	0.00	.28	.33
3317.00	.43	.03	.30	457	70	0	0.00	.08	.21
3320.00	.36	.03	.28	448	78	0	0.00	.10	.26
3322.00	1.30	.05	.41	443	32	0	0.00	.17	.29
3325.00	.73	.05	.43	446	59	0	0.00	.18	.30
3327.00	.37	.06	.43	436	116	0	0.00	.25	.37
3330.00	.13	.04	.30	435	231	0	0.00	.15	.33
3332.00	.47	.06	.42	413	89	0	0.00	.31	.42
3335.00	.24	.06	.40	417	167	0	0.00	.27	.40
3337.00	.21	.06	.42	418	200	0	0.00	.28	.40
3340.00	.30	.09	.65	420	217	0	0.00	.40	.38
3342.00	.18	.05	.41	432	228	0	0.00	.24	.37
3345.00	.34	.04	.24	429	71	0	0.00	.20	.45
3347.00	.13	.03	.27	428	208	0	0.00	.15	.36
3350.00	.15	.05	.37	418	247	0	0.00	.26	.41
3352.00	.29	.09	.56	429	193	0	0.00	.57	.50
3355.00	.44	.06	.41	436	93	0	0.00	.31	.43
3357.00	1.55	.24	2.12	454	137	0	0.00	.77	.27
3362.00	1.14	.15	1.37	455	120	0	0.00	.45	.25
3367.00	.72	.07	.54	457	75	0	0.00	.27	.33
3370.00	.33	.06	.45	448	136	0	0.00	.22	.33
3372.00	.14	.04	.30	438	214	0	0.00	.21	.41
3375.00	.38	.09	.75	451	197	0	0.00	.29	.28
3377.00	.38	.06	.51	447	134	0	0.00	.27	.35
3380.00	.14	.05	.35	444	250	0	0.00	.22	.39
3382.00	.48	.10	.77	454	160	0	0.00	.44	.36
3387.00	.48	.10	.77	454	161	0	0.00	.44	.36
3390.00	.35	.06	.42	426	120	0	0.00	.26	.38
3392.00	.37	.05	.42	441	114	0	0.00	.21	.33
3395.00	.33	.04	.28	459	85	0	0.00	.19	.40
3397.00	.25	.03	.21	462	84	0	0.00	.16	.43
3400.00	.27	.06	.43	464	159	0	0.00	.29	.40
3402.00	1.89	.17	1.72	464	91	0	0.00	.38	.18
3405.00	1.79	.15	1.51	467	84	0	0.00	.27	.15
3407.00	1.89	.21	2.16	461	114	0	0.00	.40	.16
3410.00	1.15	.11	.93	463	81	0	0.00	.34	.27
3412.00	1.29	.09	.78	462	60	0	0.00	.33	.30
3415.00	1.25	.12	1.15	464	92	0	0.00	.32	.22
3417.00	.90	.07	.57	463	63	0	0.00	.27	.32

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:20
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3420.00	.51	.04	.37	465	73	0	0.00	.13	.26
3422.00	.10	.06	.59	449	590	0	0.00	.10	.14
3425.00	.61	.03	.29	470	48	0	0.00	.10	.26
3427.00	.37	.04	.37	468	100	0	0.00	.17	.31
3430.00	.28	.05	.48	479	171	0	0.00	.18	.27
3432.00	.22	.05	.44	421	200	0	0.00	.14	.24
3435.00	.22	.03	.24	468	109	0	0.00	.07	.23
3437.00	.14	.03	.26	450	186	0	0.00	.12	.32
3440.00	.18	.02	.20	470	111	0	0.00	.08	.29
3442.00	.20	.04	.37	0	185	0	0.00	.15	.29
3445.00	.30	.02	.14	449	47	0	0.00	.07	.33
3447.00	.22	.04	.33	446	150	0	0.00	.17	.34
3450.00	.30	.03	.22	467	73	0	0.00	.12	.35
3452.00	.46	.06	.49	467	107	0	0.00	.20	.29
3455.00	.50	.06	.52	464	104	0	0.00	.17	.25
3457.00	.39	.05	.42	463	108	0	0.00	.17	.29
3460.00	.37	.02	.20	475	54	0	0.00	.10	.33
3462.00	.42	.04	.36	507	86	0	0.00	.17	.32
3465.00	.27	.02	.18	418	67	0	0.00	.09	.33
3467.00	.51	.03	.24	477	47	0	0.00	.10	.29
3470.00	.42	.02	.16	476	38	0	0.00	.09	.36
3472.00	.42	.02	.14	439	33	0	0.00	.07	.33
3475.00	.39	.02	.18	469	46	0	0.00	.09	.33
3477.00	.35	.03	.19	468	54	0	0.00	.12	.39
3480.00	.22	.02	.17	476	77	0	0.00	.09	.35
3482.00	.12	.02	.15	0	125	0	0.00	.14	.48
3485.00	.20	.01	.11	434	55	0	0.00	.05	.31
3487.00	.11	.02	.17	411	155	0	0.00	.10	.37
3490.00	.11	.02	.16	0	145	0	0.00	.09	.36
3492.00	.24	.04	.28	0	117	0	0.00	.25	.47
3495.00	.19	.03	.24	0	126	0	0.00	.10	.29
3497.00	.20	.02	.19	0	95	0	0.00	.08	.30
3500.00	.36	.04	.30	442	83	0	0.00	.13	.30
3502.00	.11	.02	.16	432	145	0	0.00	.05	.24
3505.00	.19	.02	.15	469	79	0	0.00	.05	.25
3507.00	.15	.02	.16	418	107	0	0.00	.07	.30
3510.00	.17	.02	.15	428	88	0	0.00	.07	.32
3512.00	.60	.02	.21	446	35	0	0.00	.07	.25
3515.00	.43	.05	.43	407	100	0	0.00	.16	.27
3517.00	.42	.04	.38	411	90	0	0.00	.15	.28
3520.00	.53	.07	.56	415	106	0	0.00	.29	.34

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 13:57
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3522.00	.41	.05	.42	409	102	0	0.00	.20	.32
3525.00	.24	.02	.19	408	79	0	0.00	.08	.30
3527.00	.41	.08	.76	435	185	0	0.00	.18	.19
3530.00	.20	.03	.22	418	110	0	0.00	.10	.31
3532.00	.18	.04	.28	416	156	0	0.00	.17	.38
3535.00	.17	.03	.21	411	124	0	0.00	.12	.36
3537.00	.14	.02	.17	0	121	0	0.00	.10	.37
3540.00	.10	.02	.19	424	190	0	0.00	.08	.30
3542.00	.12	.02	.19	422	158	0	0.00	.08	.30
3545.00	.23	.03	.22	412	96	0	0.00	.10	.31
3547.00	.32	.03	.28	454	88	0	0.00	.09	.24
3550.00	.24	.02	.19	417	79	0	0.00	.08	.30
3552.00	.24	.03	.25	419	104	0	0.00	.13	.34
3555.00	.17	.02	.15	451	88	0	0.00	.06	.29
3557.00	.17	.02	.21	422	124	0	0.00	.08	.28
3560.00	.84	.10	.68	466	81	0	0.00	.48	.41
3562.00	.46	.04	.33	0	72	0	0.00	.14	.30
3565.00	.76	.06	.55	456	72	0	0.00	.23	.29
3567.00	.58	.06	.46	446	79	0	0.00	.28	.38
3570.00	.54	.03	.22	465	41	0	0.00	.15	.41
3572.00	.62	.06	.48	455	77	0	0.00	.29	.38
3575.00	.84	.10	.78	461	93	0	0.00	.40	.34
3577.00	.83	.08	.68	466	82	0	0.00	.33	.33
3580.00	.73	.08	.62	442	85	0	0.00	.31	.33
3582.00	.50	.05	.37	469	74	0	0.00	.23	.38
3585.00	.43	.03	.25	447	58	0	0.00	.17	.40
3587.00	.39	.05	.34	423	87	0	0.00	.27	.44
3590.00	3.71	.53	5.27	468	142	0	0.00	1.10	.17
3592.00	.91	.07	.64	469	70	0	0.00	.18	.22
3595.00	.85	.04	.40	457	47	0	0.00	.13	.25
3597.00	.98	.06	.55	460	56	0	0.00	.19	.26
3600.00	.68	.05	.47	424	69	0	0.00	.17	.27
3602.00	.50	.05	.42	446	84	0	0.00	.14	.25
3605.00	.69	.12	1.11	415	161	0	0.00	.38	.26
3607.00	.35	.03	.33	0	94	0	0.00	.09	.21
3610.00	.75	.04	.36	472	48	0	0.00	.11	.23
3612.00	.60	.07	.70	416	117	0	0.00	.16	.19
3615.00	.51	.07	.64	410	125	0	0.00	.22	.26
3617.00	.42	.06	.57	411	136	0	0.00	.20	.26
3620.00	1.01	.25	2.20	411	218	0	0.00	.79	.26
3622.00	.62	.06	.57	0	92	0	0.00	.13	.19

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:25
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3625.00	.39	.04	.35	415	90	0	0.00	.11	.24
3627.00	.48	.05	.46	466	96	0	0.00	.12	.21
3630.00	.55	.05	.47	467	85	0	0.00	.16	.25
3632.00	.60	.08	.69	470	115	0	0.00	.22	.24
3635.00	.57	.06	.52	465	91	0	0.00	.17	.25
3637.00	1.67	.40	3.50	458	210	0	0.00	1.27	.27
3640.00	.79	.07	.55	461	70	0	0.00	.24	.30
3642.00	.72	.07	.62	464	86	0	0.00	.20	.24
3645.00	.53	.04	.34	467	64	0	0.00	.12	.26
3647.00	.57	.05	.47	465	82	0	0.00	.13	.22
3650.00	.70	.05	.43	466	61	0	0.00	.17	.28
3652.00	.45	.05	.46	456	102	0	0.00	.10	.18
3655.00	.61	.05	.48	469	79	0	0.00	.10	.17
3657.00	.61	.05	.46	468	75	0	0.00	.16	.26
3660.00	.74	.06	.48	466	65	0	0.00	.19	.28
3662.00	1.02	.10	.89	466	87	0	0.00	.33	.27
3665.00	.55	.04	.38	458	69	0	0.00	.11	.22
3667.00	.47	.04	.34	459	72	0	0.00	.09	.21
3670.00	.57	.03	.32	467	56	0	0.00	.09	.22
3672.00	.49	.04	.37	462	76	0	0.00	.11	.23
3675.00	.44	.04	.33	460	75	0	0.00	.14	.30
3677.00	.43	.04	.37	459	86	0	0.00	.11	.23
3680.00	.91	.08	.72	470	79	0	0.00	.22	.23
3682.00	2.06	.15	1.38	474	67	0	0.00	.37	.21
3685.00	1.27	.14	1.09	471	86	0	0.00	.54	.33
3687.00	1.23	.06	.51	472	41	0	0.00	.19	.27
3690.00	1.03	.09	.83	467	81	0	0.00	.20	.19
3692.00	.91	.04	.41	470	45	0	0.00	.12	.23
3695.00	.52	.05	.45	471	87	0	0.00	.15	.25
3697.00	.58	.04	.33	471	57	0	0.00	.10	.23
3700.00	.58	.05	.43	466	74	0	0.00	.15	.26
3702.00	.69	.05	.49	468	71	0	0.00	.14	.22
3705.00	2.72	.20	1.91	468	70	0	0.00	.44	.19
3707.00	.84	.06	.58	470	69	0	0.00	.16	.22
3710.00	1.17	.11	1.15	464	98	0	0.00	.23	.17
3712.00	1.12	.09	.82	463	73	0	0.00	.22	.21
3715.00	.58	.05	.51	464	88	0	0.00	.15	.23
3717.00	1.03	.10	.88	470	85	0	0.00	.28	.24
3720.00	.63	.05	.43	470	68	0	0.00	.14	.25
3722.00	6.08	.68	6.74	470	111	0	0.00	1.48	.18
3725.00	1.52	.08	.76	470	50	0	0.00	.20	.21

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:28
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3730.00	15.60	1.45	15.23	474	98	0	0.00	2.27	.13
3732.00	3.99	.32	3.19	473	80	0	0.00	.67	.17
3735.00	1.81	.12	1.23	479	68	0	0.00	.27	.18
3737.00	1.15	.08	.79	476	69	0	0.00	.19	.19
3740.00	1.15	.06	.54	473	47	0	0.00	.15	.22
3742.00	.45	.03	.32	473	71	0	0.00	.09	.22
3745.00	.89	.05	.51	476	57	0	0.00	.12	.19
3747.00	1.33	.10	.99	474	74	0	0.00	.18	.15
3750.00	.48	.05	.40	472	83	0	0.00	.17	.30
3752.00	.45	.08	.69	409	153	0	0.00	.28	.29
3755.00	4.47	.54	5.03	469	113	0	0.00	1.43	.22
3757.00	1.91	.21	1.92	464	101	0	0.00	.60	.24
3765.00	1.04	.08	.73	470	70	0	0.00	.19	.21
3767.00	2.43	.11	1.12	473	46	0	0.00	.22	.16
3770.00	2.09	.10	.97	475	46	0	0.00	.21	.18
3772.00	4.36	.32	3.37	474	77	0	0.00	.53	.14
3775.00	1.86	.12	1.23	476	66	0	0.00	.23	.16
3777.00	3.13	.26	2.67	472	85	0	0.00	.41	.13
3780.00	2.56	.25	2.56	473	100	0	0.00	.46	.15
3782.00	5.44	1.04	10.75	470	198	0	0.00	1.75	.14
3785.00	4.04	.31	3.26	476	81	0	0.00	.48	.13
3787.00	4.60	.57	4.69	470	102	0	0.00	2.17	.32
3790.00	3.29	.26	2.66	475	81	0	0.00	.49	.16
3792.00	5.22	.51	5.20	472	100	0	0.00	.94	.15
3795.00	3.94	.33	3.42	474	87	0	0.00	.56	.14
3797.00	1.99	.17	1.71	474	86	0	0.00	.39	.19
3800.00	1.13	.10	1.04	475	92	0	0.00	.11	.10
3802.00	4.52	.43	4.24	467	94	0	0.00	.94	.18
3805.00	2.98	.19	1.97	475	66	0	0.00	.36	.15
3807.00	1.75	.09	1.03	475	59	0	0.00	.11	.10
3810.00	1.91	.17	1.59	471	83	0	0.00	.41	.21
3812.00	2.41	.25	1.69	473	70	0	0.00	1.28	.43
3815.00	.56	.30	2.89	476	516	0	0.00	.73	.20
3817.00	2.75	.40	4.42	475	161	0	0.00	.42	.09
3820.00	3.71	.28	2.54	475	68	0	0.00	.80	.24
3822.00	.50	.17	1.71	468	342	0	0.00	.37	.18
3825.00	1.47	.06	.52	477	35	0	0.00	.15	.22
3827.00	.93	.13	1.47	479	158	0	0.00	.15	.09

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:32
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3830.00	3.21	.18	1.75	480	55	0	0.00	.47	.21
3832.00	3.99	.26	2.54	479	64	0	0.00	.64	.20
3835.00	4.56	.37	2.59	473	57	0	0.00	1.89	.42
3837.00	1.85	.14	1.25	475	68	0	0.00	.48	.28
3840.00	1.18	.12	.52	463	44	0	0.00	.94	.64
3842.00	1.26	.09	.84	478	67	0	0.00	.26	.24
3845.00	1.22	.10	.70	472	57	0	0.00	.54	.44
3847.00	1.01	.08	.88	473	87	0	0.00	.11	.11
3850.00	2.71	.20	1.87	475	69	0	0.00	.51	.21
3852.00	.99	.03	.27	481	27	0	0.00	.08	.23
3855.00	1.19	.03	.26	483	22	0	0.00	.10	.28
3857.00	1.17	.10	1.13	479	97	0	0.00	.12	.10
3860.00	.88	.08	.71	474	81	0	0.00	.21	.23
3862.00	1.85	.13	1.16	478	63	0	0.00	.42	.27
3867.00	1.21	.12	1.34	477	111	0	0.00	.14	.09
3870.00	9.97	.82	8.67	475	87	0	0.00	1.18	.12
3872.00	3.43	.24	2.32	475	68	0	0.00	.63	.21
3875.00	6.72	.38	3.39	475	50	0	0.00	1.23	.27
3877.00	0.00	.67	6.83	468	0	0	0.00	1.19	.15
3880.00	5.02	.54	5.34	472	106	0	0.00	1.17	.18
3885.00	1.15	.08	.65	472	57	0	0.00	.32	.33
3887.00	1.50	.15	1.61	476	107	0	0.00	.16	.09
3890.00	1.50	.10	.92	478	61	0	0.00	.31	.25
3892.00	.99	.09	.76	477	77	0	0.00	.34	.31
3895.00	1.95	.06	.46	479	24	0	0.00	.26	.36
3897.00	1.13	.08	.72	480	64	0	0.00	.24	.25
3900.00	6.95	.47	4.65	479	67	0	0.00	1.03	.18
3902.00	.06	.05	.35	483	583	0	0.00	.20	.36
3905.00	1.06	.08	.69	479	65	0	0.00	.23	.25
3907.00	1.44	.11	1.22	485	85	0	0.00	.14	.10
3910.00	5.72	.42	4.37	479	76	0	0.00	.67	.13
3912.00	1.00	.06	.51	478	51	0	0.00	.17	.25
3915.00	1.61	.09	.86	479	53	0	0.00	.21	.20
3917.00	1.68	.13	1.45	481	86	0	0.00	.15	.09
3920.00	2.98	.20	2.00	473	67	0	0.00	.43	.18
3922.00	1.48	.11	1.01	480	68	0	0.00	.26	.20
3925.00	1.20	.06	.56	481	47	0	0.00	.16	.22
3927.00	2.24	.17	1.86	478	83	0	0.00	.19	.09
3930.00	1.10	.05	.48	477	44	0	0.00	.16	.25

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:36
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
3932.00	2.29	.15	1.46	480	64	0	0.00	.33	.19
3935.00	2.32	.15	1.42	462	61	0	0.00	.33	.19
3937.00	1.25	.10	1.06	476	85	0	0.00	.11	.09
3940.00	1.83	.13	1.10	474	60	0	0.00	.45	.29
3942.00	2.08	.18	1.39	477	67	0	0.00	.77	.36
3945.00	1.51	.16	1.21	470	80	0	0.00	.69	.36
3947.00	1.62	.12	1.33	483	82	0	0.00	.13	.09
3950.00	4.82	.74	7.90	477	164	0	0.00	1.05	.12
3952.00	4.60	.46	4.62	474	100	0	0.00	.96	.17
3955.00	4.61	.28	2.87	479	62	0	0.00	.46	.14
3957.00	1.15	.14	1.56	483	136	0	0.00	.15	.09
3960.00	3.70	1.39	13.84	467	374	0	0.00	2.86	.17
3962.00	6.52	.71	7.40	476	113	0	0.00	1.16	.14
3965.00	4.93	.29	2.95	481	60	0	0.00	.52	.15
3967.00	8.04	1.06	11.70	477	146	0	0.00	1.11	.09
3970.00	5.49	1.07	11.59	479	211	0	0.00	1.36	.11
3972.00	3.13	.18	1.86	486	59	0	0.00	.36	.16
3975.00	4.98	.36	3.80	482	76	0	0.00	.49	.11
3977.00	12.10	.74	7.95	481	66	0	0.00	.97	.11
3980.00	6.57	.41	4.35	483	66	0	0.00	.60	.12
3982.00	3.23	.25	2.48	484	77	0	0.00	.59	.19
3985.00	2.25	.27	2.85	483	127	0	0.00	.45	.14
3987.00	2.48	.16	1.62	485	65	0	0.00	.28	.15
3990.00	4.24	.40	4.30	481	101	0	0.00	.51	.11
3992.00	1.65	.08	.77	485	47	0	0.00	.22	.22
3995.00	2.17	.16	1.49	481	69	0	0.00	.49	.25
3997.00	1.90	.11	.84	481	44	0	0.00	.52	.38
4002.00	.90	.04	.37	487	41	0	0.00	.06	.14
4005.00	1.39	.03	.32	461	23	0	0.00	.05	.14
4007.00	2.09	.18	1.92	485	92	0	0.00	.23	.11
4010.00	2.02	.11	1.18	460	58	0	0.00	.16	.12
4015.00	1.12	.04	.40	476	36	0	0.00	.05	.11
4017.00	1.09	.06	.62	474	57	0	0.00	.07	.10
4020.00	1.04	.03	.28	469	27	0	0.00	.04	.13
4022.00	1.04	.07	.79	433	76	0	0.00	.09	.10
4025.00	.90	.03	.32	467	36	0	0.00	.04	.11
4027.00	1.80	.10	1.12	485	62	0	0.00	.14	.11
4030.00	.90	.03	.30	467	33	0	0.00	.04	.12
4032.00	.97	.03	.32	476	33	0	0.00	.04	.11

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 22:41
: 26 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
4035.00	.98	.04	.39	439	40	0	0.00	.05	.11
4037.00	1.80	.15	1.60	470	89	0	0.00	.16	.09
4040.00	.68	.03	.31	469	46	0	0.00	.04	.11
4042.00	.65	.03	.29	465	45	0	0.00	.04	.12
4045.00	.89	.02	.22	459	25	0	0.00	.03	.12
4050.00	.99	.03	.28	421	28	0	0.00	.04	.13
4052.00	1.27	.05	.53	481	42	0	0.00	.06	.10
4055.00	1.45	.07	.76	476	52	0	0.00	.08	.10
4057.00	1.01	.08	.92	475	91	0	0.00	.09	.09
4060.00	1.23	.07	.76	459	62	0	0.00	.08	.10
4062.00	1.09	.06	.65	474	60	0	0.00	.07	.10
4067.00	1.05	.04	.48	484	46	0	0.00	.05	.09
4070.00	.97	.04	.42	474	43	0	0.00	.05	.11
4072.00	.83	.05	.54	475	65	0	0.00	.06	.10
4075.00	.69	.04	.49	475	71	0	0.00	.05	.09
4077.00	1.49	.10	1.06	479	71	0	0.00	.10	.09
4080.00	.72	.05	.51	464	71	0	0.00	.05	.09
4082.00	.89	.06	.63	469	71	0	0.00	.07	.10
4085.00	.77	.05	.51	474	66	0	0.00	.06	.11
4087.00	.75	.05	.53	482	71	0	0.00	.05	.09
4090.00	.61	.02	.27	469	44	0	0.00	.03	.10
4092.00	.64	.02	.23	468	36	0	0.00	.03	.12
4095.00	1.08	.02	.23	444	21	0	0.00	.03	.12
4097.00	.58	.03	.38	486	66	0	0.00	.04	.10
4100.00	.80	.03	.35	483	44	0	0.00	.04	.10
4102.00	.98	.05	.58	489	59	0	0.00	.06	.09
4105.00	1.31	.07	.72	478	55	0	0.00	.08	.10
4107.00	1.33	.06	.69	484	52	0	0.00	.07	.09
4110.00	2.41	.15	1.61	484	67	0	0.00	.17	.10
4112.00	1.01	.05	.58	470	57	0	0.00	.07	.11
4115.00	.98	.06	.59	425	60	0	0.00	.08	.12
4117.00	1.04	.05	.56	484	54	0	0.00	.06	.10
4120.00	1.12	.06	.64	477	57	0	0.00	.07	.10
4122.00	.99	.05	.52	469	53	0	0.00	.06	.10
4125.00	1.09	.07	.75	477	69	0	0.00	.08	.10
4127.00	1.06	.05	.54	481	51	0	0.00	.06	.10
4130.00	1.27	.08	.82	469	65	0	0.00	.09	.10
4132.00	1.02	.06	.63	481	62	0	0.00	.07	.10
4135.00	.80	.05	.55	480	69	0	0.00	.06	.10

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 14:21
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	SO mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
4137.00	.98	.05	.60	482	61	0	0.00	.06	.09
4140.00	.87	.05	.53	480	61	0	0.00	.06	.10
4142.00	1.02	.06	.60	480	59	0	0.00	.07	.10
4145.00	.67	.04	.48	480	72	0	0.00	.06	.11
4147.00	1.02	.07	.75	477	74	0	0.00	.08	.10
4150.00	1.04	.16	1.73	482	166	0	0.00	.20	.10
4152.00	1.22	.29	3.18	480	261	0	0.00	.29	.08
4155.00	3.29	.29	3.20	481	97	0	0.00	.30	.09
4157.00	.97	.05	.53	480	55	0	0.00	.05	.09
4162.00	1.69	.22	2.45	465	145	0	0.00	.24	.09
4165.00	2.65	.25	2.71	489	102	0	0.00	.26	.09
4167.00	1.25	.06	.70	482	56	0	0.00	.07	.09
4170.00	2.72	.25	2.70	480	99	0	0.00	.26	.09
4172.00	1.24	.09	1.00	482	81	0	0.00	.10	.09
4175.00	1.79	.14	1.51	489	84	0	0.00	.15	.09
4177.00	1.74	.09	1.02	486	59	0	0.00	.10	.09
4180.00	3.46	.17	1.85	497	53	0	0.00	.18	.09
4182.00	7.33	.77	8.49	480	116	0	0.00	.78	.08
4185.00	4.48	.27	2.97	491	66	0	0.00	.29	.09
4187.00	4.25	.24	2.60	490	61	0	0.00	.25	.09
4190.00	6.92	.35	3.83	492	55	0	0.00	.37	.09
4192.00	9.20	.70	7.68	491	83	0	0.00	.74	.09
4195.00	7.71	.66	7.35	492	95	0	0.00	.66	.08
4197.00	4.31	.26	2.84	487	66	0	0.00	.27	.09
4200.00	7.68	.54	5.94	489	77	0	0.00	.56	.09
4202.00	8.26	.76	8.40	492	102	0	0.00	.77	.08
4205.00	3.92	.36	3.94	490	101	0	0.00	.37	.09
4207.00	5.24	.28	3.13	485	60	0	0.00	.30	.09
4212.00	2.63	.16	1.76	491	67	0	0.00	.17	.09
4215.00	3.97	.16	1.76	492	44	0	0.00	.18	.09
4217.00	2.74	.13	1.41	490	51	0	0.00	.14	.09
4222.00	10.45	1.29	13.45	480	129	0	0.00	2.09	.13
4225.00	3.71	.43	4.50	427	121	0	0.00	.65	.13
4227.00	1.57	.09	1.01	488	64	0	0.00	.11	.10
4230.00	2.00	.10	1.07	490	54	0	0.00	.11	.09
4232.00	1.46	.06	.69	493	47	0	0.00	.07	.09
4235.00	1.20	.05	.52	492	43	0	0.00	.06	.10
4237.00	1.00	.06	.65	492	65	0	0.00	.07	.10
4240.00	.87	.04	.44	488	51	0	0.00	.05	.10
4242.00	.79	.03	.37	492	47	0	0.00	.04	.10
4245.00	.81	.03	.31	541	38	0	0.00	.04	.11

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO A/S
WELL : 7219/9-1(SIDETRACK)

Printed at : 14:25
: 16 Jul 1988

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
4247.00	.82	.04	.41	480	50	0	0.00	.05	.11
4250.00	.60	.02	.19	495	32	0	0.00	.03	.14
4252.00	.60	.02	.21	501	35	0	0.00	.03	.13
4255.00	.67	.03	.29	501	43	0	0.00	.04	.12
4257.00	.71	.03	.32	456	45	0	0.00	.04	.11
4260.00	.68	.04	.39	459	57	0	0.00	.05	.11
4262.00	.76	.03	.37	493	49	0	0.00	.04	.10
4265.00	.79	.04	.41	499	52	0	0.00	.05	.11
4267.00	.63	.02	.17	466	27	0	0.00	.02	.11
4270.00	.62	.02	.24	491	39	0	0.00	.03	.11
4272.00	.61	.03	.32	476	52	0	0.00	.04	.11
4275.00	.68	.02	.22	487	32	0	0.00	.03	.12
4277.00	.53	.02	.17	412	32	0	0.00	.02	.11
4282.00	.60	.02	.19	488	32	0	0.00	.03	.14
4285.00	.53	.02	.17	491	32	0	0.00	.02	.11
4287.00	.50	.01	.16	415	32	0	0.00	.02	.11
4290.00	.54	.02	.20	495	37	0	0.00	.02	.09
4292.00	.55	.01	.16	491	29	0	0.00	.02	.11
4295.00	.49	.01	.14	490	29	0	0.00	.02	.13
4297.00	.69	.03	.30	494	43	0	0.00	.03	.09

EXPLORATION LOGGING GEOCHEMICAL DATA PRINT

FOR : NORSK HYDRO
WELL : 7219/9-1A

Printed at : 20:57
: 28 Jul 1988

THE LITHOLOGIES OF THE FOLLOWING SAMPLES WERE PICKED AND ANALYSED SEPARATELY IN ORDER TO DETERMINE THE ORIGIN OF THE ORGANIC CONTENT.

	SOURCE BED EVALUATION						FREE HYDROCARBS		
DEPTH m	TOC %wt	PC	S2 mg/g	TMAX degC	S2/TOC HI	S3/TOC OI	S0 mg/g	S1 mg/g	TPI mg/g
Cuttings Samples									
4005.01	1.01	.11	.74	464	73	0	0.00	.57	.44
4005.02	6.54	.38	3.67	478	56	0	0.00	.92	.20
4010.01	1.62	.16	1.25	471	77	0	0.00	.68	.35
4010.02	1.80	.15	1.11	475	62	0	0.00	.69	.38
4057.01	1.04	.08	.54	458	52	0	0.00	.39	.42
4057.02	1.64	.26	1.87	468	114	0	0.00	1.32	.41
4065.01	.50	.08	.54	458	108	0	0.00	.39	.42
4065.02	1.76	.14	1.27	460	72	0	0.00	.46	.27

ANY DEPTH WITH (.01) AS THE LAST DIGIT REFERS TO PICKED LIMESTONE CUTTINGS.
ANY DEPTH WITH (.02) AS THE LAST DIGIT REFERS TO PICKED CLAYSTONE DATA.

APPENDIX E

LITHOLOGY DATA SHEETS

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 1 DEPTH INTERVAL 2077 m to 2130 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST M. Wadsworth

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	SLTST	SST		CLYST		
2077	100			GD TR	CLAYSTONE	CLYST, PRED M GY, OCC M BRN GY - OLV GY, BLKY - ANG, RR SUBFISS, NON CALC POSSIBLY CAVINGS.
2080	100	SL TR		GD TR	CLAYSTONE	CLYST, A/A
2082	85	5		10	CLAYSTONE	CLYST, M DK GY - M GY, BLKY, LOC SL SLTY, NON CALC
2085					LAT	NO ANALYSIS
2087	50	30		20	CLAYSTONE	CLYST, A/A
2090		70		30	CLAYSTONE	CLYST, PRED A/A, OCC OLV GY, SUBFISS, V SLTY.
2092		70		30	CLAYSTONE	CLYST, M GY - M DK GY, PRED BLKY, NON CALC
2095		70		30	CLAYSTONE	CLYST, GEN A/A
2097		70		30	CLAYSTONE	CLYST, GEN A/A, OCC OLV BRN GY, SLTY, SUBFISS
2100		80		20	CLAYSTONE	CLYST, GEN A/A
2102		90		10	CLAYSTONE	CLYST, M - M DK GY, BLKY - LOC ANG, OCC MICROMR, NON CALC
2102		90		10	SANDSTONE	SST, LT - MOD OLV BRN GY, V.F - F, RR MED, SUBANG, MOD SRTD, ARG & KAOL MTX, LOC SI CALC CMT
2105		90		20	CLAYSTONE	CLYST, A/A
2107		80		20	CLAYSTONE	CLYST, PRED M GY - DK GY, HD, BLKY, LOC SUBFISS, MICROMIC, TR MICROMR
2110		80		20	CLAYSTONE	CLYST, A/A
2112		80		20	CLAYSTONE	CLYST, A/A.
2115		80		20	CLAYSTONE	CLYST, M GY, OCC M DK GY, LOC OLV BRN, BLKY, BCMG SUBFISS, BCMG LOC SLTY,
2117		90		20	CLAYSTONE	CLYST, M DK GY - M OLV BRN, PRED SUBFISS, SLTY, MICROMIC
2120		80		20	CLAYSTONE	CLYST, A/A, BCMG V SLTY.
2122		80		20	CLAYSTONE	CLYST, M OLV GY - M GY, SUBFISS, V SLTY, MICROMIC
2125		80		20	CLAYSTONE	CLYST, PRED M DK GY, OCC M GY, RR M OLV GY, V SLTY, MICROMIC
2127		80		20	CLAYSTONE	CLYST, A/A
2130		90		10	CLAYSTONE	CLYST, A/A

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 2 DEPTH INTERVAL 2132 m to 2195 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST M. Wadsworth

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	CLYST	SLTST	LST	SST		
2132	20	20		60	CLAYSTONE	CLYST, A/A
2135	20	20		60	CLAYSTONE	CLYST, M GY, OCC M OLU GY, SUBFISS, COM V SLTY, COM V MICROMIC, TR MICROPYR
2137	GD TR	50		50	CLAYSTONE	CLYST, A/A
2140	GD TR	90		10	CLAYSTONE	CLYST, A/A
2142		90		10	SILTSTONE	SLTST, M OLU GY, SUBFISS, V MICROMIC NON CALC
2145		90		10	SILTSTONE	SLTST, A/A M OLU GY - M GY
2147		60		40	SILTSTONE	SLTST, A/A
2150		60		40	SILTSTONE	SLTST, A/A
2152		40		60	SILTSTONE	SLTST, A/A
2155		50		50	SILTSTONE	SLTST, A/A
2157		60		40	SILTSTONE	SLTST, M OLU GY, OCC M GY, SUBFISS, V MICROMIC, LOC MICROPYR, TR CARBFGS
2160		30		70	SILTSTONE	SLTST, GEN A/A
2162		40		60	SILTSTONE	SLTST, A/A
2165		40		60	SILTSTONE	SLTST, A/A
2167		30		70	SILTSTONE	SLTST, M - M DK GY, M OLU GY, SUBFISS, LOC SUBBLKY, V MICROMIC, RR CARB FRAG
2170		10		90	SILTSTONE	SLTST, GEN A/A, V MICROMIC
2172		10		90	SILTSTONE	SLTST, A/A
2175		10		90	SILTSTONE	SLTST, M BRN GY - M GY, FISS, V MICROMIC, LOC SDY, NON CALC
2177		10		90	SILTSTONE	SLTST, A/A
2180		10		90	SILTSTONE	SLTST, A/A
2182		10	10	80	SILTSTONE	SLTST M LT - M GY/BRN GY, FISS V V MICROMIC, LOC SDY, NON CALC
2185	10	70		20	SILTSTONE	SLTST, A/A
2187	10	70	10	10	SILTSTONE	SLTST, A/A
2190	10	70	10	10	CLAYSTONE	CLYST, M DK GY - M DK BRN GY, FISS, LOC SL MICROMIC, NON CALC
2192	40	40	10	10	SILTSTONE	SLTST, M DK GY BRN - M BRN GY, FISS, V MICROMIC, NON CALC
2195	40	40	10	10	SILTSTONE	SLTST, A/A

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL # 7219/9-1A

SHEET No 3 DEPTH INTERVAL 2197 m to 2260 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN.

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2197	10	60	20	10	CLAYSTONE	gy, gy blk, brn, mod firm, splintg
2200	10	70	10	10	CLAYSTONE	blky, lab, sl slty, grdg - sltst
2202	10	70	10	10	CLAYSTONE	
2205	10	30	10	50	CLAYSTONE	
2207	30	10	10	50	CLAYSTONE	
2210	TR	10	50	40	CLAYSTONE	
2212	TR	10	50	40	CLAYSTONE	m brn, gy, blky, sub fiss, sl calc.
2215	TR	10	50	40	CLAYSTONE	
2217	TR	10	50	40	CLAYSTONE	
2220	TR	10	50	30	CLAYSTONE	
2222	TR	10	50	40	CLAYSTONE	
2225	TR	10	40	50	CLAYSTONE	gy, gy/brn, blk, blky, splintg, sl calc.
2227	TR	10	40	50	CLAYSTONE	
2230	TR	10	40	50	CLAYSTONE	
2232	TR	10	40	50	CLAYSTONE	
2235	TR	10	40	50	CLAYSTONE	
2237	TR	10	40	50	CLAYSTONE	
2240	TR	10	30	60	CLAYSTONE	dk gy, gy, blk, blky, fiss, slty, sl calc.
2242	TR	20	30	50	CLAYSTONE	
2245	TR	20	30	50	CLAYSTONE	
2247	TR	20	30	50	CLAYSTONE	
2250	TR	40	30	30	CLAYSTONE	
2252	TR	50	10	40	CLAYSTONE	dk gy, olv gy, occ blky, splintg, slty subfiss, sl calc.
2255	TR	50	10	40	CLAYSTONE	
2257	TR	50	10	40	CLAYSTONE	
2260	—	80	10	10	CLAYSTONE	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 4 DEPTH INTERVAL 2262 m to 2325 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2262		80	10	10	CLAYSTONE	
2265		50	10	40	CLAYSTONE	dk gy, gy, blk, blky, splty, sl calc.
2267		70	10	20	CLAYSTONE	
2270		60	10	30	CLAYSTONE	
2272		50	TR	50	CLAYSTONE	
2275		40	TR	60	CLAYSTONE	
2277		40	–	60	SANDSTONE	clr, trnsl, f-vf grn, mod w srtd, subang-ang.
2280		30	–	70	SANDSTONE	
2282		30	–	70	BLACK SHALE	dk gy, blk, blky, plty, sbfy, gy mod firm, splty, non calc.
2285		30	–	70	CLAYSTONE	
2287		30	–	70	CLAYSTONE	
2290		30	–	70	CLAYSTONE	
2292		60	–	40	CLAYSTONE	
2295		60		40	CLAYSTONE	dk gy, gy, dkv gy, mod firm, occ hd,
2297		40	10	50	CLAYSTONE	blk, blky, splty, calc i.p.
2300		20	10	70	CLAYSTONE	
2302		30	10	60	CLAYSTONE	
2305		30	10	60	CLAYSTONE	
2307		30	10	60	SANDSTONE	trnsl, clr, f-vf grn, mod w srtd,
2310		40	10	50	SANDSTONE	ang-subang, mod w cmtd.
2312		40	10	50	CLAYSTONE	
2315		40	10	50	SANDSTONE	
2317		30	10	60	SANDSTONE	clr, trnsp occ trnsl, f-vf grn, mod
2320	TR	30	10	60	CLAYSTONE	to poly srtd, mod-poly cmtd.
2322	TR	30	10	60	SANDSTONE	
2325	TR	30	10	60	SANDSTONE	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 5 DEPTH INTERVAL 2327 m to 2390 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOLAN.

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2327	TR	30	10	60	SANDSTONE	
2330	TR	30	10	60	SANDSTONE	f-vf grn, clr, trnsp, mod-prly srtd ang-sbang, cmtd w calc cmt
2332	TR	30	10	60	CLAYSTONE	
2335		30	10	60	CLAYSTONE	
2337		30	10	60	CLAYSTONE	
2340	TR	30	10	60	CLAYSTONE	dk gy, gy, ac grn/lgy, frm, occ hd blky, rplty, slty, occ grnl, grty.
2342	TR	30	10	60	CLAYSTONE	
2345	TR	40	10	50	CLAYSTONE	
2347		80	10	10	CLAYSTONE	
2350		60	20	20	CLAYSTONE	
2352		50	20	30	CLAYSTONE	
2355		60	20	20	CLAYSTONE	gy, gy/brn, frm, occ hd, blky, crmbly plty i.p, splty, sli - non calc.
2357		50	20	30	SANDSTONE	
2360		50	20	30	SANDSTONE	
2362		20	20	60	SANDSTONE	
2365		20	20	60	SANDSTONE	
2367		20	20	60	CLAYSTONE	
2370		30	10	60	CLAYSTONE	dk gy, gy, olv gy, frm, occ sft, amor grn blky, plty - non-sli calc.
2372		40	10	50	CLAYSTONE	
2375		50	TR	50	CLAYSTONE	
2377		50	10	40	CLAYSTONE	
2380		50	10	40	CLAYSTONE	
2382		50	10	40	CLAYSTONE	
2385		50	20	30	CLAYSTONE	dk gy, gy, olv gy, gy/grn, mod frm blky plty non calc.
2387		50	20	30	CLAYSTONE	
2390		50	20	30	SANDSTONE	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 6 DEPTH INTERVAL 2392 m to 2455 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOCAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2392		50	30	20	CLAYSTONE	
2395		40	30	30	CLAYSTONE	
2397		40	30	30	CLAYSTONE	gy, gy/brn, blk, frm, occ hd, blky frac, occ crmbly, occ splnty, sl silty non calc - occ calc.
2400		40	30	30	CLAYSTONE	
2402		30	30	40	CLAYSTONE	
2405		30	30	40	CLAYSTONE	
2407		30	30	40	CLAYSTONE	
2410		30	30	40	CLAYSTONE	
2412		30	30	40	CLAYSTONE	
2415	TR	30	20	50	SANDSTONE	f grn, trnsl - trnsp, mod w srtd subrnd-subang, prly cmtd w/ calc & sil cmt
2417		30	20	50	SANDSTONE	
2420		—	—	—	SANDSTONE	
2422		80	10	10	SANDSTONE	
2425		70	20	10	CLAYSTONE	
2427		70	20	10	CLAYSTONE	
2430		60	40	TR	CLAYSTONE	dk gy, olv gy, frm, occ hd, blky, frac, splnty, sl - non calc.
2432		30	60	10	CLAYSTONE	
2435		30	50	20	CLAYSTONE	
2437		30	40	30	CLAYSTONE	
2440		40	20	40	CLAYSTONE	
2442		40	20	40	CLAYSTONE	
2445		50	10	40	CLAYSTONE	
2447		50	10	40	CLAYSTONE	gy, gy/brn, olv gy, frm, occ hd, blky, crmbly; frm, non - sl calc.
2450		70	20	10	CLAYSTONE	
2452		70	20	10	CLAYSTONE	
2455		20	20	60	CLAYSTONE	

EMOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 7 DEPTH INTERVAL 2457 m to 2520 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOCAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2457		40	10	50	CLAYSTONE	dk gy, gy, gy/brn, frm, occ Ld, occ frm, blky, crmbly, slty i.p grdg - slhtly occ calc.
2460		20	10	70	CLAYSTONE	
2462		20	10	70	CLAYSTONE	
2465		20	TR	80	CLAYSTONE	
2467		10	10	80	CLAYSTONE	
2470		10	10	80	CLAYSTONE	
2472		10	10	80	CLAYSTONE	
2475		10	10	80	CLAYSTONE	gy, brn, occ rd/brn, occ blk, frm occ grnsh, sft, gen blky, slty. grad. sl calc
2477		TR	TR	100	CLAYSTONE	
2480		TR		100	CLAYSTONE	
2482		10	10	80	CLAYSTONE	
2485		10	10	80	CLAYSTONE	
2487		10	10	80	CLAYSTONE	
2490		10	10	80	CLAYSTONE	dk gy, gy, olv gy, frm - occ Ld blky, fab, sbblky, slty i.p mod calc.
2492		TR	20	80	CLAYSTONE	
2495		TR	10	90	CLAYSTONE	
2497		TR	10	90	CLAYSTONE	
2500		TR	10	90	CLAYSTONE	
2502		20	10	70	CLAYSTONE	
2505		20	10	70	CLAYSTONE	dk gy, olv gy, frm, gen blky, occ crmbly, fab. sl calc grdg to calc dyst
2507		10	10	80	CLAYSTONE	
2510		10	20	70	CLAYSTONE	
2512		10	20	70	CLAYSTONE	
2515		10	20	70	CLAYSTONE	
2517		10	30	60	CLAYSTONE	
2520		10	30	60	CLAYSTONE	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 8 DEPTH INTERVAL 2522 m to 2582 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2520		10	30	60	CLAYSTONE	
2522			20	80	SILTSTONE	gy/ gy/brn, frm, occ hd, blky grdg to clyst i.p non-sl calc.
2525		TR	20	80	CLAYSTONE	
2527		TR	20	80	CLAYSTONE	
2530		TR	20	80	CLAYSTONE	
2532		TR	20	80	CLAYSTONE	
2535		TR	20	80	CLAYSTONE	dk gy, olv gy, occ grn/gy, frm, occ hd, blky, splnty; cmbly sl calc
2537		TR	20	80	CLAYSTONE	
2540			20	80	SILTSTONE	
2542		TR	30	70	CLAYSTONE	
2545		TR	30	70	CLAYSTONE	
2547		TR	20	80	CLAYSTONE	dk gy, gy, brnsh/gy, frm, blky splnty, non-sl calc.
2550		TR	20	80	CLAYSTONE	
2552		TR	10	90	CLAYSTONE	
2555				100	SILTSTONE	
2557		10		90	CLAYSTONE	
2560		10		90	CLAYSTONE	
2562		10		90	CLAYSTONE	
2565		10		90	CLAYSTONE	gy, gy/brn, olv gy, frm, blky, occ fab, occ splnty, sli silty, sl calc.
2567		10		90	CLAYSTONE	
2570		10		90	CLAYSTONE	
2572		10		90	CLAYSTONE	
2575		10		90	CLAYSTONE	
2577		10		90	CLAYSTONE	
2580		10		90	CLAYSTONE	
2582		10		90	CLAYSTONE	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 9 DEPTH INTERVAL 2585 m to 2647 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SCLST	SST		
2585		TR		100	CLAYSTONE	
2587		TR		100	CLAYSTONE	m gy, gy/brn, occ grn/gy, mod firm occ hd, blky, tab, occ sp/wky
2590		TR		100	CLAYSTONE	
2592		TR	10	90	CLAYSTONE	
2595		TR		100	CLAYSTONE	
2597		TR		100	CLAYSTONE	
2600		TR	10	90	CLAYSTONE	
2602		TR	10	90	CLAYSTONE	
2605		TR	10	90	CLAYSTONE	
2607			20	80	SILTSTONE	gy/brn, dk gy/brn, firm, occ hd blky, blky, grnl i.p, sl calc
2610			20	80	SANDSTONE	
2612			20	80	SANDSTONE	
2615		10	40	50	SANDSTONE	
2617		10	40	50	SANDSTONE	vf-f grn, clr, frost, mod-poly srtd mod-poly cmtd w, calc cmt.
2620			20	80	SANDSTONE	
2622			20	80	SANDSTONE	
2625			20	80	SANDSTONE	
2627			10	90	SANDSTONE	
2630			10	90	SANDSTONE	
2632			10	90	SILTSTONE	
2635			10	90	SANDSTONE	frost, transp, occ opq. f-m grn, occ m-crs, grn subang, mod w srtd mod-poly cmtd w calc cmt.
2637			10	90	SANDSTONE	
2640			10	90	SILTSTONE	
2642			10	90	SANDSTONE	
2695			10	90	SANDSTONE	
2647			10	90	SANDSTONE	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 10 DEPTH INTERVAL 2650 m to 2715 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2650			10	90	SANDSTONE	
2652				100	SANDSTONE	f grn, opq - trnsl, occ pk, arg - subang. mod - poly srtd. sl calc.
2655				100	SANDSTONE	
2657			10	90	SANDSTONE	
2660			10	90	SILTSTONE	
2662		TR	10	90	CLAYSTONE	
2665		TR	10	90	CLAYSTONE	
2667		TR	10	90	CLAYSTONE	gy, gy/brn, blk, frm, occ hd, blky fab, splty, arg, sl calc.
2670			10	90	SILTSTONE	
2672			TR	100	SILTSTONE	
2675		TR	TR	100	CLAYSTONE	
2677			TR	100	SILTSTONE	
2680			TR	100	SILTSTONE	
2682		TR	10	90	SILTSTONE	dk gy, gy/brn, frm, occ amor, sft gen blky, arg grd to clyst l.p.
2685			TR	100	SILTSTONE	
2687			20	80	SILTSTONE	
2690		TR		100	CLAYSTONE	
2692		TR	20	80	CLAYSTONE	
2695		TR	100		CLAYSTONE	
2697		TR		100	CLAYSTONE	gy, dk gy, frm, occ hd, blky, splty arg, fab, non-sl calc.
2700			TR	100	SILTSTONE	
2702			100		SLTST/SANDSTONE	
2705			100		SLTY SANDSTONE	
2710			TR	100	SLTY SANDSTONE	
2712			100		SILTSTONE	
2715			TR	100	SLTST/SST	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 11 DEPTH INTERVAL 2717 m to 2772 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST E. DOLAN.

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2717		20	60	20	SANDY SILTSTONE	
2720		20	60	20	SANDY SILTSTONE	
		WHOLE ROCK PYROLYSIS				
	LST	CLYST	SLTST	SST		
2722	/	30	30	40		
2725	/	40	30	30		
2727	/	30	40	30		
2730	/	30	30	40		clyst dk gy, gy/brn, occ blk, frm occ Ld, blky, sl slty, gen sl calc.
2732	/	30	10	60		
2735	/	20	20	60		
2737	/	10	30	60	WHOLE ROCK	
2740	/	20	30	50		
2742	/	20	30	50		
2745	/	40	40	20		
2747	/	40	40	20		
2750		30	20	50		
2752		20	20	60		slst gy/brn, gy, frm, occ Ld, blky slty, spl slty, arg i.p grdg to clyst occ sl calc.
2755		30	20	50		
2757		20	50	30		
2760		20	30	50		
2762		20	20	60		
2765		20	20	60		
2767		10	30	60		clyst gy, gy/brn, dk gy, occ blk, frm occ Ld, sl calc
2770		20	30	60		
2772		40	40	20		

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 12 DEPTH INTERVAL 2775 m to 2837 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2775		30	20	50	WHOLE ROCK	
2777		30	20	50	'	
2780		20	50	30	'	
2782		20	30	50	'	
2785		20	40	40	'	
2787		20	60	20	'	clyst dk gy, gy, gy/brn, frm,
2790		20	60	20	'	occ hd, occ sft, blky, tab, sl calc
2792		30	60	10	'	
2795		20	50	30	'	
2797		20	40	40	'	sst vf - fn gr, mod w srtd, sub
2800		50	30	20	'	ang - ang. mod w cmtd w calc cmt
2802		50	30	20	'	
2805		60	40		'	
2807		70	30		'	
2810		80	20		'	
2812		90	10		'	clyst dk gy/blu gy, frm, occ mod hd
2815		90	10		'	blky, tab, i/p slty grdg to sltst
2817		95	5		'	
2820		95	5		'	
2822		80	20		'	
2825		80	20		'	
2827		90	10		'	
2830		100	—		'	
2832		80	10		'	sltst dk gy, gy/brn, frm, occ
2835		60	20		'	hd, blky, sl calc - mod calc.
2837		60	20		'	

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 13 DEPTH INTERVAL 2840 m to 2902 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST	WHOLE ROCK	
2840		80	10			
2842		100				
2845		100				
2847		100				
2850		100				
2852		100				clyst dk gy, gy/brn, olv gy, frm occ hd, blky, plty, occ spl/shy, occ tab, sl slty, grdg to sltst.
2855		100				
2857		100				
2860		100				
2862		80	20			
2865		100				
2867		100				
2870		100				
2872		100				
2875		90	10			sltst dk gy, gy/brn, frm, occ sft gmt, grdy, blky, crmby, occ frag. sli calc.
2877		40	10	50		
2880		10		90		
2882		40	20	40		
2885		40	10	50		
2887		30	10	60		
2890		50	10	60		sst vf-f grn, trnsl, trnsp, lod ang - subrnd, mod - prly sltd, micmic, cmt & calc cmt, prly to mod w cmtd.
2892		30	10	60		
2895		20	10	70		
2897		20	10	70		
2900		20				
2902		20	10			

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 14 DEPTH INTERVAL 2905 m to 2967 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST	WHOLE ROCK	
2905		20	10	70		SST frm/l, frm/p, occ dkgy, occ pk
2907		10	10	80		vf-f grn, occ m grn, subang-subrnd, occ w rnd, mod-poly rthd
2910		30	10	60		mod w cntd w calc cmt. occ
2912		10	~~10~~	90		micmic, occ micpyr.
2915		10		90		
2917		10		90		
2920		10		90		
2922				100		
2925				100		
2927				100		
2930		10	10	80		clyst dk gy, gy/brn, occ blk, frm
2932		10	10	80		occ hd, blky, splty, tab, slky l.p
2935			10	90		grdg to sltst, occ sl calc.
2937			10	90		
2940		10	20	70		
2942				100		
2945		20	20	60		
2947		40	10	50		clyst dk gy, gy/brn, olv gy, frm
2950		70	10	20		occ rftk, mod cmbly, occ blky, splty
2952		100				sl calc - occ v calc.
2955						
2957		70		30		
2960		60	30	10		
2962		50	30	20		slst dk gy, gy, olv gy, frm, occ hd
2965		70	30			blky, tab, splty, sl arg lgrdg
2967		10	20	70		to clyst l.p.

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 15 DEPTH INTERVAL 2997 m to 3060 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST H. GRÖNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST		
2997			20	80	Total	SST: mlt gy, lt gylt, olv gy, frm,
3000			20	80	—	occ hd, f-vf, subrnd, w srtd,
02		10	30	60	—	Silic cmt.
05		10	40	50	—	SLTST: md gy, mdk gy, frm, blky,
07		10	30	60	—	locc lam w/ carb arg mat sub fis.
3010		40	30	30	—	CLYST: mdk gy, m gy, md lt gy, dkm,
12		10	40	50	—	sft-frm loc hd, blky-sub fis, n calc
15		10	40	50	—	
17		10	30	60	—	
3020		10	40	50	—	
22		10	20	70	—	
25		10	20	70	—	
27		10	10	80	—	
3030		10	10	80	—	
32		10	10	80	—	
35		10	10	80	—	
37		10	10	80	—	
3040		10	10	80	—	SST: m gy, hd, vfs, w srt, sub ang-
42		20	30	50	—	subrnd, calc cmt
45		10	10	80	—	SLTST: med lt gy, hd, occ calc cmt
47		10	10	80	—	
3050		10	10	80	—	
52			10	90	—	
55			10	90	—	
57		10	10	80	—	
3060		10	10	80	—	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 16 DEPTH INTERVAL 3062 m to 3125 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST H. GRØNNING

DEPTH	PRE-PICKED LITH			ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	CLYST	SLTST	SST	TOTAL	
3062	10	10	80	–	
65			100	–	
67			100	–	
3070			100	–	SST: ltgy–wh, pred med fsm, occ vfsm,
72	10		90	–	-mod hd, f-vf, pred subrnd-occ subang, mod-W srtd, silic cmt, rr blk spec (carb ?)
75	10		90	–	
77	20		80	–	
3080	20		80	–	CLYST: mgy–dkgy, occ vdkgy,
82	20		80	–	pred fsm, occ mod sft, pred blky,
85	30		70	–	occ plty, n.calc, bcmy slty ip.
87	30		70	–	
3090	30		70	–	
92	30		70	–	
95	20	TR	80	–	SST: vltgy, ltgy, mltgy, occ mgy,
97	20	TR	80	–	fsm-mod hd, loc hd, vfgrnd, subang-subrnd, mod-W srtd, ll calc cmt.
3100	10		90	–	
02	10		90	–	CLYST: mltgy, mgy, occ ltgy, sft-med fsm, blky-subfiss, occ amor,
05	20		80	–	
07	30		70	–	hydrt, loc calc.
3110	30	10	60	–	SLTST: 9/a.
12	40		60	–	
15	50		50	–	
17	40		60	–	
3120	40		60	–	
22	30		70	–	
25	20		80	–	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 17 DEPTH INTERVAL 3127 m to 3190 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
		CLYST	SLTST	SST	TOTAL	
3127		20		80	-	
3130		10		90	-	
32		10		90	-	SST: mgy, m dkgy, occ ltgy, pred
35		10		90	-	mod frm, loc hd, vfg loc slty,
37		10		90	-	sub rnd - rnd any, mod srtd,
3140		10	10	80	-	pred Silic cmt.
42		10	10	80	-	SLTST: m dkgy, olvgy, mgy, frm to
45			10	90	-	loc mod hd, n. calc w/clyst lam ip.
47		10	10	80	-	
3150		10	20	70	-	
52		10	10	80	-	
55			20	80	-	
57			10	90	-	SST: mgy, gn gy, hd, w srtd, vf,
3160			10	90	-	rnd any - sub rnd, calc cmt, occ/lam
62			10	90	-	
65			10	90	-	
67			10	90	-	
3170			10	90	-	
72			10	90	-	
75			20	80	-	
77			30	70	-	
3180			20	80	-	
82			10	90	-	
85				100	-	
87				100	-	
3190				100	-	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 18 DEPTH INTERVAL 3192 m to 3255 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GROWNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
		CLYST	SLTST	SST	TOTAL	
3192				100	-	SST: ltgy, mltgy, occ mgy, mod frm,
95				100	-	comsly - blky, vf - f, subrnd - subang,
97			10	90	-	loc grdy to SLTST, silic cmt,
3200			10	90	-	
02			10	90	-	CLYST: pred mltgy, ltgy, mgy, olvgy,
05			10	90	-	sft - mod frm, loc angular, hydroturb'd,
07			10	90	-	n. calc.
3210		40	10	60	-	
12		60	10	30	-	SLTST: mgy, olvgy - brngy, sft - loc frm,
15		70	20	10	-	blky - subfis, n. calc,
17		50	10	40	-	
3220		40	20	40	-	
22		50		50	-	
25		40		60	-	
27		60	10	30	-	
3230		70	20	10	-	
32		40	20	40	-	CLYST: pred ltgy, mltgy, mgy,
35		60	10	30	-	pred sft, occ sft - frm, blky, smor,
37		80		20	-	loc hydrotic, n. calc,
3240		80	10	10	-	
42		60	10	30	-	
45		70		30	-	SST: vltgy - gywh, occ clrgrn, mod
47		70		30	-	frm - mod hd, vf - f, subrnd -
3250		80		20	-	subang, w srt,
52		90		10	-	
55		60		40	-	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 19 DEPTH INTERVAL 3257 m to 3320 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
		CLYST	SLTST	SST	TOTAL	
3257		40		60	–	
3260		30	10	60	–	SLTST: mgr - olvgr, brngry, sft. - mod
62		10	10	80	–	frm, blky, occ subfis, n. calc.
65		30	20	50	–	
67		20	30	50	–	
3270		10	40	50	–	CLYST: pred ltgy - m gy, occ dkgy,
72		20	40	40	–	mod frm - frm, blky - subfis, n. calc.
75		10	30	60	–	
77		20	20	60	–	
3280		40	20	40	–	
82		20	10	70	–	
85		20	60	20	–	SLTST: Mgy, hd, occ lam w clyst, n.
87		20	60	20	–	calc.
3290		20	40	40	–	SST: mgy, hd, vf, grd, to sltst,
92		30	40	30	–	w srt, subang - subrnd, n. calc cmt.
95		20	30	50	–	
97		20	30	50	–	
3300		30	30	40	–	
02		30	30	40	–	
05		60	20	20	–	CLYST: lt - m ltgy, sft occ frm, rr
07		70	20	10	–	mod hd, amor, loc blky - subfis,
3310		80	10	10	–	∅ calc i.p.
12		80	10	10	–	
15		60	10	30	–	
17		70	20	10	–	
3320		60	20	20	–	

EALOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 20 DEPTH INTERVAL 3322 m to 3385 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	Coal	CLYST	SLTST	SST	TOTAL	
3322		60	20	20	-	SLTST: mdkgy - olvgy brn, frm -
25		50	20	30	-	mod hd, blky - subfiss, n. calc.
27		60	20	20	-	
3330		70	10	20	-	CLYST: mgy - mltgy - ltolvgy, - ltbngy,
32		60	30	10	-	sft, amor, sl. calc.
35		70	20	10	-	SST: vltgy - wh, mod hrd - hrd, vf,
37		70	20	10	-	subang - subrnd, mod - w srtd, sl. calc.
3340		40	40	20	-	SLTST: mdk - dkgy, occ olvgy - brngy,
42		30	50	20	-	frm - occ med hd, blky - subfiss, bcm
45		70	20	10	-	sl. calc.
47		70	20	10	-	
3350		60	30	10	-	CLYST: mgry - ltgy, occ ltbngy - dkgy,
52		70	20	10	-	sft, amor, hydrated, sl. calc.
55		50	40	10	-	
57	20	60	10	10	-	coal: dkbrn - blk, sft, earthy, wit lust
3360	30	50	10	10	-	occ brittl ip.
62	10	70	10	10	-	
65	10	50	10	30	-	
67	10	70	10	10	-	
3370		80	10	10	-	SST: ltgy - dk gy, occ mltgy, mod
72		80	10	10	-	frm - hrd, vf - f, gtz clr transl, wh
75		80	10	10	-	n. calc.
77	10	60	20	10	-	coal: blk, hrd, brittle, splintery,
3380		50	20	30	-	earthy, wit greasy.
82	10	50	20	20	-	
85					-	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 21 DEPTH INTERVAL 3387 m to 3450 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST H. GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
3387		30	30	40	—	CLYST: mgy, mltgy, frm, mod hd,
90		50	10	40	—	occ vhd, blky, loc subfis,
92		50	20	30	—	n. calc grdg into SLTST ip.
95		30	20	50	—	SST: ltgy, mltgy. occ vlt gy, hd, occ
97		50	20	30	—	vhd, occ frm, qtz-transl wh-vltgy,
3400		40	30	30	—	f, subang, n. calc cmt.
02		50	30	20	—	SLTST: mgy-mdkgy, gen hd, blky,
05	10	70	10	10	—	loc subfis, loc micromic, n. calc.
07	10	70	10	10	—	COAL: 9/a.
3410	10	70	10	10	—	
12	20	60	10	10	—	
15	10	60	10	20	—	
17		60	20	20	—	
3420		50	20	30	—	CLYST: dkgy-gn blk, blky, occ subfis,
22		50	20	30	—	fis, n. calc.
25		40	20	40	—	SLTST: mgy, tr blk rd, hd, blky, n. calc.
27		30	20	50	—	SST: mgy, hd, occ crs, mod srtd,
3430		30	20	50	—	subang-subrnd, n. calc.
32		20	30	40	—	
35		20	30	40	—	
37		30	40	30	—	
3440		30	40	30	—	
42		30	40	30	—	
45		40	30	40	—	
47		30	40	30	—	
3450		30	40	30	—	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 22 DEPTH INTERVAL 3452 m to 3515 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST H. GRØNNING.

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LMST	CLYST	SLTST	SST	TOTAL	
3452		20	60	20	–	SLTST: m dkgy, m gy, occ mgy,
55		30	40	30	–	pred hd, occ mod hd - frm, blky,
57		20	30	50	–	n. calc.
3460		20	40	40	–	SST: vltgy - wh, occ ltgy - mltgy, vr
62		30	40	30	–	ltdkgy - dkgy, frm - mod hd,
65		30	50	20	–	f, subang, loc calc cmt.
67		40	40	20	–	Clyst: mltgy - vltgy, occ mgy,
3470		50	40	10	–	pred sft, loc mod frm, frm,
72		60	30	10	–	amor loc blky, n. calc.
75		30	50	20	–	
77		30	50	20	–	
3480		50	30	20	–	Clyst: ltgy, mltgy, occ mgy, occ
82		70	20	10	–	brngy - dkgy, pred sft, loc mod
85		80	20		–	frm, rr hd, gen amor, n. calc.
87		70	30		–	
3490		60	40		–	SLTST: m dkgy, brngy, mgy, hd occ
92		60	40		–	mod hd, rr frm, blky n. calc.
95		40	60		–	
97		50	50		–	
3500		70	20	10	–	SST: ltgy - vltgy, sft - mod frm,
02		70	30		–	blky occ blky - arg, loc calc cmt.
05	20	60	20		–	LST: vltgy - ltgy, occ wh, sft, amor,
07	10	40	30	20	–	W/wh spchs, dkgy - blk, arg mat.
3510		50	40	10	–	
12		50	50		–	
15		70	30		–	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 23 . DEPTH INTERVAL 3517 m to 3580 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING.

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	DOL	CLYST	SLTST	SST	TOTAL	
3517		70	30		–	CLYST: m-gy, v dkgy, m dkgy, lt-mdgy
20		80	20		–	hd - mod frm, blky - subfiss, rr hd.
22		80	20		–	hygroturgid, amor.
25		70	20	10	–	SST: lt-m gy, occ lt brn gy, sft-mod
27	TR	70	20	10	–	frm, subany - any, f grn, n. calc.
3530	TR	80	20		–	glauc i.p.
32	TR	80	20		–	TR DOL: md-dk brn, mod hd-hd,
35	TR	80	10	10	–	microcryst, blky, - subblky.
37	TR	80	20		–	
3540	TR	70	20	10	–	
42	TR	80	20		–	
45	TR	70	30		–	
47	TR	60	20	10	–	
3550	1	50	30	20	–	SST: mdkgy - brn gry, olvgy, any-blky,
52		40	30	30	–	hd, n. calc.
55		50	30	20	–	
57		50	40	10	–	
3560	10% COAL	60	30		–	COAL: blk, hd, brittle, conchoid,
62	TR COAL	70	30		–	greasy, lit.
65		60	30	10	–	
67		60	20	20	–	
3570		70	20	10	–	CLYST: ltgy - med ltgy, v sft, amor,
72		80	10	10	–	v sthly, n. calc.
75		50	20	30	–	
77		80	10	10	–	
3580		70	20	10	–	

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 24 DEPTH INTERVAL 3582 m to 3645 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
82		60	10	30	–	SST: ltgry - mddkgry, silic cmt, blky -
85		40	20	40	–	sub blky, f, tr. lam clyst.
87		70	20	10	–	
3590		80	10	10	–	
92	10	70	10	10	–	
95		70	20	10	–	
97		70	20	10	–	CLYST: mid gry - dk gry, occ grn,
3600		70	20	10	–	dom plty, sl elong, sl. slty, if.
02		50	30	20	–	frm - hd, sl. calc.
05	TR	50	40	10	–	SLTST: drk grnish, mdltgy, blky, sl.
07		70	30	TR	–	plty, occ fs.
3610		80	20		–	
12		70	30		–	
15	LST 20	60	10	10	–	LST: vltgy - wh, vsft - sft, amor, occ
17		80	10	10	–	XL w/silic cmt, occ Blky,
3620		80	10	10	–	
22		90	10	TR	–	CLYST: grngry, mltgy - vltgy, mdkgy,
25		90	10	TR	–	frm - hd, occ vhd, blky - subfis,
27		80	20	TR	–	n. calc.
3630		70	30		–	
32		70	20	10	–	
35		80	10	10	–	
37		70	10	20	–	
3640		80	10	30	–	SST: rdbrn - rd orangbrn, mod frm,
42		80	TR	20	–	- mod hd, sub blky, occ subfis,
45		80	10	10	–	n. calc.

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 25 DEPTH INTERVAL 3647 m to 3710 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
3647		90	TR	10	–	SST: ltgr - wh occ clr gn, mod frm -
50		60	20	20	–	frm, occ mod hd, mf - f, subang
52	30	50	TR	20	–	occ subrnd, calc cont ip, occ glauc,
55	10	70	10	10	–	blk carb specs.
57	TR	90	10		–	COAL: blk, med frm - occ hd,
3660	TR	70	10	20	–	blky, brit, uf, fib.
62	TR	80	TR	20	–	CLYST: lt-mgy, occ olvgy - grn gy -
65	TR	70	10	20	–	ltgrn, frm - mod hd, occ hd,
67	TR	70	TR	30	–	sub fis - fis, n. calc.
3670	TR	80	TR	20	–	SLTST: mgy brn - mgy, occ org brn,
72	TR	80	10	10	–	mod frm - mod hd, sub fis - fis, n. calc.
75	TR	80	10	10	–	SST: wh - vltgy, frm - mod hd,
77	TR	60	10	30	–	f - vf, mod srtd, subang - subrnd,
3680	10	70	10	10	–	calc cmt, tr. silic cmt, no vis por/w
82	30	50	10	10	–	tr. glauc.
85	20	70	TR	10	–	
87	TR	80	10	10	–	
3690	TR	90	TR	10	–	
92		80	TR	20	–	
95	TR	80	10	10	–	
97	TR	80	10	10	–	
3700		70	20	10	–	occ CLYST: ltgrn - palegrn,
02	TR	90	10	TR	–	
05	TR	50	20	30	–	
07	TR	70	10	20	–	
3710		80	TR	20	–	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 26 DEPTH INTERVAL 3712 m to 3775 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
12	TR	60	10	30	—	CLYST: m/ltgy - mdkgy, grngy.
15		90	TR	20	—	frm - mod hd, blky - sub blky, slicic cnt.
17		20	20	60	—	SST: vltgy - wh, ltgy, frm, occ sft, gtz
3720		10	10	80	—	vf, subrnd - rnd, occ subang, mod - w srtd.
22	10	50	10	30	—	COAL: blk, occ brit, mod sft - mod hd,
25	TR	10	TR	90	—	blky, occ elg and plty, lam.
27	TR	10	TR	90	—	
3730	20	20	10	50	—	SST: wh gy - ltgr - wh, frm - mod hd - hd,
32	10	10	TR	80	—	vf - f, subrnd - rnd, occ subang, calc cmt
35	TR	10	10	80	—	
37	TR	50	TR	50	—	CLYST: ltmgy occ olvgy - grngy - pale yn,
3740	TR	50	TR	50	—	frm - mod hd, occ hd, sub fis - fis, plty,
42	TR	10	10	80	—	n. calc.
45	TR	40	20	40	—	SLTST: mgy - m/ltgy, mod hd - hd, occ frm,
47	TR	10	10	80	—	fis - subfis, n. calc.
3750	TR	40	10	50	—	
52	TR	70	10	20	—	
55	TR	90	10	TR	—	
57	TR	100	TR	TR	—	
3760	20	80	TR	TR	—	COAL: blk, mod frm, brit, blky, wk slty ip.
62	20	80	TR	TR	—	
65	10	80	10	TR	—	
67	TR	100	TR	TR	—	
3770	TR	100	TR	TR	—	
72	40	60	TR	TR	—	
75	30	70	TR	TR	—	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 27 DEPTH INTERVAL 3777 m to 3840 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST GRØNNING

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
77	30	60	TR	10	—	CLYST: m ltgy - md hgy, grnsy,
3780	30	60	TR	10	—	frm - mod hd, occ mod sft, blky,
82	20	80	TR	TR	—	sl slty, occ plty, n. calc.
85	10	90	TR	TR	—	
87	20	70	TR	10	—	COAL: blk, mod frm, brit, blky - fis,
3790	30	50	TR	20	—	wll w/pyr.
92	20	40	10	30	—	SST: v ltgy - wh, occ ltgy, occ ltgrgy,
95	20	60	TR	20	—	mod frm - mod sft, occ sft, vf,
97	20	50	10	20	—	subang - subrnd, wl srtd, wl cmtd,
3800	10	30	40	20	—	calc cmt, v pr show.
02	20	30	30	20	—	SLTST: v ltgy - ltgy, occ grnsy, mod
05	10	70	20	TR	—	frm - sft, blky, occ plty, sl slty,
07	TR	80	10	10	—	calc cmt, grdng SST w/glauc.
3810	TR	90	TR	10	—	
12	30	70	TR	TR	—	
15	50	50	TR	TR	—	COAL: 9/a.
17	20	70	TR	10	—	
3820	20	40	10	30	—	SST: m ltgy - ltgy, v ltgy - wh, clr
22	TR	TR		100	—	occ transp, H-VD, subang - subrnd,
25	TR	10	TR	90	—	w. srtd, lse grn, TR calc cmt, TR glau
27	TR	50	10	40	—	non shows.
3830	10	40	10	40	—	CLYST: dkgy - mdgy, mdhgy, frm
32	10	40	10	40	—	occ hd - hd, blky, n. calc.
35	TR	50	10	40	—	
37	TR	50	10	40	—	
3840	TR	10	TR	90	—	

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA
NORSK HYDRO A/S WELL # 7219/9-1A
SHEET No 28 DEPTH INTERVAL 3842 m to 3905 m
GEOCHEM UNIT 175 RIG POLAR PIONEER
GEOCHEMIST DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
42	Tr	20		80	—	
45	Tr	20	Tr	80	—	
47	Tr	10		90	—	
3850	Tr	10	Tr	90	—	SDST: vltgy-wh, occ ltwh, occ
52	Tr	10		90	—	transp-transl, hd-vhd, fm cmt
55	Tr	10		90	—	vf-occ f, occ grdg SLTST, sub
57	10	10	Tr	80	—	ang-subrnd, occ ang, w srtd.
3860	10	10	Tr	80	—	calc cmt/glau and micro mic.
62	20	40	10	30	—	No shows.
65	10	60	10	20	—	CLYST: ltgy-m ltgy, mdkgy, grngy,
67	10	10	Tr	80	—	pred hd, occ frm, fis, occ blky,
3870	60	30	Tr	10	—	plty, n. calc cmt.
72	40	40	Tr	20	—	COAL: blk, bri, vit, mod sft-frm,
75	10	30	Tr	60	—	blky, sl sub fis, sl plty.
77	Tr	30	Tr	70	—	
3880	Tr	40	Tr	60	—	SST: mdltgy-ltgy, occ wh, occ
82	Tr	50	Tr	50	—	transp-transl, hd-vhd, f, mod srtd,
85	Tr	30	Tr	70	—	subrnd-subang.
87	Tr	50	Tr	50	—	
3890	Tr	30	Tr	70	—	
92	Tr	30	Tr	70	—	
95	Tr	10	Tr	90	—	CLYST: md dkgy-dkgy, occ dr blk,
97	Tr	30	Tr	70	—	frm-hd, fis, blky, n. calc.
3900	Tr	40	10	50	—	
02	Tr	30	10	60	—	
05	Tr	30	Tr	70	—	

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 29 DEPTH INTERVAL 3907 m to 3970 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
07	TR	30	10	60		
3910	TR	40	TR	60		COAL blk, brn, shny, lam, occ dull, crmbly
12	10	50	TR	40		
15	TR	60	TR	40		
17		70		20		SST v. lt gy, wh, occ frosp, occ ltd vf-f grn, occ m-sub rnd.
3920	10	70		20		
22	10	70		20		
25		50	10	40		
27		60		40		
3930		70	10	20		
32		70	10	20		
35		50		50		CLYST dk gy, gy brn, blk, mod frm occ hd, blky, splnty, occ calc, grn non calc
37		80		20		
3940		70		30		
42		70	10	20		
45		40		60		
47		50		50		
3950	10	40		50		
52		80		20		
55	10	60		30		
57	20	60	10	10		SLTST dk gy, brn, occ rdsh brn, frm occ hd, occ anor, shy, lam, blky fab, grdy to clyst, p grn non calc
3960	40		60			
62	20		80			
65	20		80			
67	40		60			
3970	30		60			

EXLOG

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL # 7219/9-1A

SHEET No 30 DEPTH INTERVAL 3972 m to 4035 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	COAL	CLYST	SLTST	SST	TOTAL	
72	40	40	10	10	—	
75	10	70	10	10	—	
77	40		50	10	—	
3980	10	70	LST 10	10	—	clyst dk gy, brn, olv gy, blky
82	10	70	10	10	—	frm, tab, occ splnty, sl calc.
85	20	70		10	—	
87	10	60	20	10	—	
3990	TR	70	10	20	—	
92	10	70	20		—	
95	30	20	30	20	—	
97	10	80	10		—	clyst dk gy, gy, frm, occ hd, occ
4000		80	20		—	amor, stky, slty grdg to sltst, non - sl calc.
4002	LST 30	50	10	10	—	
4005	40	60	—	TR	—	
4007	40	30	10	20	—	
4010	50	30	20	TR	—	
4012	50	30	10	10	—	
4015	30	20	40	10	—	sltst gy/brn, olv/gy, gy/grn, frm-
4017	50	30	20	TR	—	hd, blky, tab, occ ang, splnty,
4020	60	30	10	TR	—	
4022	60	30	—	10	—	
4025	40	50	—	10	—	
4027	50	40		10	—	
4030	70	—	30	TR	—	
4032	50	30	10	10	—	sst lt gry, trnsl, trnsp, mod w srtd
4035	60	10	30	TR	—	~~ang-sub ang, occ w rnd. mod~~- poly cmtd, w calc cmt

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 31 DEPTH INTERVAL 4037 m to 4100 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST	TOTAL	
4037	70		30			
4040	40	30	20	10		
4042	50	40	10			
4045	60	10	30			
4047	40	30	30			clyst brn, dk brn, gy, occ blk, mod
4050	20	70	10	TR		frm - hd, blky, occ crmbly, slty i/p
4052	10	80	10	TR		mod - sl calc
4055	10	80	10			
4057	TR	80				
4060		90	10			
4062		100				
4065		100				
4067	TR	100				
4070		90	10			
4072		70	30			sltst dk gy, gy/brn, frm-hd, occ
4075	TR	80	10	10		sft, amor, blky, plty, lab, occ lam
4077		90	10	TR		arg i/p grdg to clyst.
4080		80	10	10		
4082	TR	70	10	20		
4085		70	10	20		
4087		30	50	20		sst fn-vf grn, frml, frm i/p, mod
4090		40	30	30		w - prly srtd, ang-subang, mod
4092		30	30	40		w cmtd w calc & sid cmt No show, no fluor.
4095		40	20	40		
4097		40	10	50		
4100		40	10	50		

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 32 DEPTH INTERVAL 4102 m to 4162 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	clyst	SLTST	SST	total.	
4102	TR	50		50		
4105		30	30	40		
4107		40	30	30		slst dk gy, gy brn, olv gy, gen
4110		30	10	60		frm, occ hd, blky, splnty, arg,
4102		40	30	30		lam ip. occ micmic, non calc.
4115	TR	30	30	40		
4117		40	10	50		
4120		10	40	50		
4122	TR	40	20	40		
4125		40	30	30		
4127		40	30	30		clyst gy, gy grn, gy-blk, frm, hd
4130	TR	40	40	20		blky, occ fria, crmbly, blky, slty,
4130			60	40		i.p grdg to sltst. gen non calc.
4132		40	30	30		
4135	TR	20	60	20		
4137		40	50	10		
4140		50	50			
4142		70	30			
4145		100				clyst dk gy, gy brn, frm, occ hd
4147		100				occ sft, blky, tab, amor, lam i.p
4150		90	10			occ micmic occ micpyr, gen non
4152		70	30			- sli calc.
4155		80	10	10		
4157		90	10			
4160		100				
4162.		90		10		

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 34 DEPTH INTERVAL 4230 m to 4297 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST	TOTAL.	
4230	TR	70				
4232		80	10	10		clyst gy, gylbrn, olv gy, gen frm
4235		90	10			occ hd, occ amor, blky, plty, occ
4237		100				blk stky. sl slty i.p, gen non calc.
4240	TR	100				
4242		100				
4245		70	30			
4247		90	10			
4250	TR	80	20			slbt gy, gy/grn gylbrn, frm, hd
4252		80	10	10		plty, blky, crmbly, occ frag, gen
4255		80				non-sli calc, occ grdg to clyst.
4257	TR	70	20	10		
4260		60	30	10		
4262	10	50	40			
4265		70	30			
4267	20	50	20			
4270		70	30			
4272		80	10	10		clyst gy, olv gy, frm, blky, lab,
4275		90	10			gen slty, grdg to slbt, non calc
4277		90	10			
4280	TR	80	10	10		
4282		80	10	10		
4285		90	10			
4287		100				
4290		70	30			
4292	TR	70	20	10		tr sst vf-fn grn, trnsl, trnsp, mod
4295		80	20			w-poly srtd, calc cmt, mod w
4297		90	10			cmtd no fluor, no show.

GEOCHEMICAL ANALYSIS SAMPLE LITHOLOGY DATA

NORSK HYDRO A/S WELL #7219/9-1A

SHEET No 33 DEPTH INTERVAL 4165 m to 4227 m

GEOCHEM UNIT 175 RIG POLAR PIONEER

GEOCHEMIST E. DOLAN

DEPTH	PRE-PICKED LITH				ANALYSED LITH	ANALYSED LITHOLOGY DESCRIPTION
	LST	CLYST	SLTST	SST	TOTAL.	
4165		40	50	10		
4167		20	70	10		
4170	TR	30	60	10		SST trnsl, trnsp, pk, fn-vf grn mod w srtd, calc cmt, mod-prly cmtd, numic l.p. no fluor, no show
4172		30	70			
4175		20	40	40		
4177		40	50	10		
4180		60	30	10		
4182		50	40	10		
4185		40	60			
4187	TR	30	70			
4190		40	60	10		
4192		50	30	20		
4195		70	30	TR		clyst dk gy, gy brn, frm, blky, tab, org, splnty, occ slty. gen non calc, occ slty grdg to sltst.
4197		100				
4200	TR	100		TR		
4202		90		10		
4205		70	20	10		
4207		50	10	10		
4210		90	10			
4212	TR	80	20			
4215		70	20	10		
4217		60	40			
4220		70	20	10		
4222	TR	80	20			TR lst wh, yel, buff, frm, tab, org l.p, occ lam.
4225		80	20	TR		
4227		80	10	10		

HYDRO U-568

Bergen

Rapport/Report

Fortrolig/ Confidential ☒	Tittel Forfatter(e) Title/Author(s)
Fordeling Distribution: Hydro, HA (10), B.Martin/Arkiv, E.Rygg/Arkiv, A.Steen	Oil-Source Correlation Well 7219/9-1 Arne Steen

Sign: RPS

Resyme Konklusjon Anbefaling
Summary Conclusion Recommendation

Emneord Key words: Oil-Source Correlation, Biomarkers, Multivariate analysis			Emnekategori Subject category: Petroleum Geochemistry
Divisjon Seksjon Avdeling Division Section Dept: Geosection Bas.Mod./Pet.Geochem.	Kvadrant Blokk Brønn Quadrant Block Well: 7219/9-1		Dato Date: 24.06.88
			Side Pages Appendix: 50 + Appendix
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INTRODUCTION:

The purpose of this study is to determine the source of oil shows observed in well 7219/9-1.

Extraction and group type separation of selected core and sidewall core samples have been carried out by Geochem lab., Chester, UK.
SAT-biomarker analysis by GC/MS and correlation study is performed by Norsk Hydro Research Centre, Bergen, Norway

EXPERIMENTAL:

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

List of analysed metastable transitions:

Group 1 (low molecular weight biomarkers):

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

Group 2:

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

RESULTS:

Analysed samples and sample information are listed in Table 1, page 6. Samples marked "not detectable" had too low biomarker concentrations for a reliable detection.

Relative amounts of analysed compounds are determined by peak-heights and listed in Table 1, page 7.
Graphic representations of these biomarker distributions are illustrated as normalized bargraphs, see Graphs 1-20, page 21-41.
Identification of each bar (biomarker compound) is related to the molecular weight of the compound as listed above. Compound identifications are outlined on the enclosed transparent graph,- see page 21.

Maturity as an input to the correlation study, is determined by %-C_{29}-20S and %-C_{29}-αββ. The maturity trend based on these parameters, is indicated in Graph 21, page 42

XA721991A 37R x 74C 24-JUN-88 12:07 Page 1

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	1 Sample type	2 Lith.	3 Analytical quality	4 Geochem job #	5 MS-file
1	1783.00	SWC	MUDST	not detectable	1708	
2	1785.00	SWC	MUDST	not detectable	1708	
3	1823.00	SWC	MUDST	not detectable	1708	
4	1839.00	SWC	MUDST	OK	1708	AS20058
5	1853.50	SWC	MUDST	low conc.	1708	AS20058
6	----------	--------	----------	----------	---------	-------
7	1862.00	SWC	SL.CLYST	OK	1724	AS19058
8	1863.00	SWC	CALC.MUDST	not detectable	1708	
9	1871.00	SWC	MUDST	not detectable	1708	
10	1895.00	SWC	MUDST	not detectable	1708	
11	1901.50	SWC	CLYST	OK	1724	AS19058
12	----------	--------	----------	----------	---------	-------
13	1904.00	SWC	MUDST	not detectable	1708	
14	1916.00	SWC	MUDST	low conc.	1708	AS20058
15	1937.00	CORE	MUDST	OK	1706	AS27058
16	1949.00	SWC	MUDST	not detectable	1753	
17	1953.00	CORE	SST	OK	1706	AS27058
18	----------	--------	----------	----------	---------	-------
19	1960.00	CORE	SST	OK	1706	AS27058
20	1993.95	CORE	SST	OK	1706	AS27058
21	2010.00	CORE	SST	OK	1706	AS27058
22	2030.00	CORE	SST	OK	1706	AS27058
23	2044.00	CORE	SST	OK	1706	AS27058
24	----------	--------	----------	----------	---------	-------
25	2073.00	CORE	SST	OK	1706	AS27058
26	2097.00	CORE	SST	OK	1706	AS27058
27	2144.00	SWC	SST	OK	1724	AS19058
28	2293.75	SWC	MUDST	low conc.	1724	AS20058
29	2311.00	SWC	SST	low conc.	1724	AS20058
30	----------	--------	----------	----------	---------	-------
31	2561.00	SWC	SL.MUDST	low conc.	1724	AS20058
32	2683.00	SWC	MUDST	low conc.	1724	AS20058
33	2917.00	SWC	SST	not detectable	1724	
34	2942.00	SWC	SST	not detectable	1724	
35	3053.00	SWC	SST	not detectable	1724	
36	3803.00	SWC	MUDST	low conc.	1724	AS27058
37	----------	--------	----------	----------	---------	-------

Table 1: Sample information and
SAT-biomarker distribution

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	6 360-1	7 360-2	8 346-1	9 332-1	10 332-2	11 318-1
1	1783.00						
2	1785.00						
3	1823.00						
4	1839.00	0.92	0.70	1.70	1.84	2.76	5.41
5	1853.50	0.17	0.23	0.75	0.94	0.55	2.13
6	----------	------	------	------	------	------	------
7	1862.00	0.38	0.34	0.45	0.99	0.57	1.48
8	1863.00						
9	1871.00						
10	1895.00						
11	1901.50	0.17	0.22	0.38	0.50	0.45	1.05
12	----------	------	------	------	------	------	------
13	1904.00						
14	1916.00	0.19	0.26	0.62	1.00	1.98	1.84
15	1937.00	0.05	0.04	0.14	0.10	0.29	0.40
16	1949.00						
17	1953.00	1.68	1.56	2.41	5.26	1.93	7.29
18	----------	------	------	------	------	------	------
19	1960.00	1.76	1.83	2.89	6.15	2.12	8.07
20	1993.95	2.10	2.15	3.67	8.59	2.03	11.53
21	2010.00	1.20	1.06	1.57	2.96	0.96	4.08
22	2030.00	1.47	1.32	2.16	3.84	1.52	5.10
23	2044.00	2.44	2.37	4.15	8.40	2.21	11.42
24	----------	------	------	------	------	------	------
25	2073.00	2.95	2.68	3.99	7.07	2.19	9.57
26	2097.00	1.68	1.84	2.81	5.32	2.03	6.91
27	2144.00	0.49	0.37	0.36	0.85	0.30	1.07
28	2293.75	0.08	0.11	0.25	0.33	2.06	0.64
29	2311.00	0.20	0.25	0.51	0.57	0.32	1.24
30	----------	------	------	------	------	------	------
31	2561.00	0.14	0.16	0.30	0.16	3.40	1.06
32	2683.00	0.31	0.29	0.45	0.80	0.61	1.27
33	2917.00						
34	2942.00						
35	3053.00						
36	3803.00	2.40	2.25	0.30	0.44	0.15	0.95
37	----------	------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	12 304-1	13 290-3	14 276-3	15 316-1	16 316-4
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	1.33	5.10	4.36	2.07	0.51
5	1853.50	0.48	0.97	1.44	0.74	0.18
6	----------	------	------	------	------	------
7	1862.00	0.60	1.63	1.74	1.02	0.25
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.38	1.30	1.06	0.55	0.25
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	0.51	1.19	1.74	0.56	0.35
15	1937.00	0.16	0.27	0.46	0.01	0.01
16	1949.00					
17	1953.00	3.66	7.11	5.74	5.25	0.84
18	----------	------	------	------	------	------
19	1960.00	4.81	7.85	6.27	6.59	0.81
20	1993.95	7.34	8.01	3.80	10.04	0.55
21	2010.00	1.84	3.37	2.69	2.60	0.46
22	2030.00	2.70	4.86	3.83	4.08	0.62
23	2044.00	7.48	9.58	5.43	8.97	0.51
24	----------	------	------	------	------	------
25	2073.00	5.49	8.20	7.37	7.33	0.52
26	2097.00	4.02	7.13	5.29	5.47	0.70
27	2144.00	0.36	0.76	0.60	0.84	0.23
28	2293.75	0.25	0.43	2.53	0.01	0.01
29	2311.00	0.32	0.49	0.47	0.31	0.16
30	----------	------	------	------	------	------
31	2561.00	0.39	0.64	2.94	0.01	0.01
32	2683.00	0.23	0.66	0.99	0.01	0.01
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.18	0.23	0.21	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	17 302-1	18 302-5	19 288-1	20 288-4	21 454-1
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	2.94	1.67	3.87	4.26	20.00
5	1853.50	1.57	1.02	1.90	2.32	0.92
6	----------	------	------	------	------	------
7	1862.00	2.67	1.02	2.79	3.60	1.50
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	1.19	0.73	1.50	1.75	0.83
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	1.27	0.89	1.23	1.85	4.22
15	1937.00	0.01	0.01	0.01	0.01	1.10
16	1949.00					
17	1953.00	11.19	5.60	7.82	9.98	0.96
18	----------	------	------	------	------	------
19	1960.00	13.73	5.96	9.41	10.55	0.87
20	1993.95	21.78	8.59	10.66	17.89	0.52
21	2010.00	6.12	2.47	3.59	5.34	1.29
22	2030.00	7.84	3.98	5.37	7.45	1.26
23	2044.00	23.04	8.94	12.18	20.08	0.66
24	----------	------	------	------	------	------
25	2073.00	16.16	6.85	11.53	12.76	0.64
26	2097.00	11.11	4.94	8.15	9.14	0.82
27	2144.00	1.45	0.85	1.35	1.60	1.01
28	2293.75	0.26	0.31	0.21	0.34	2.15
29	2311.00	0.46	0.38	0.32	0.63	0.51
30	----------	------	------	------	------	------
31	2561.00	0.50	0.32	0.54	0.63	3.74
32	2683.00	0.24	0.20	0.19	0.38	0.90
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.18	0.22	0.08	0.20	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	22 454-2	23 440-1	24 440-2	25 426-1	26 426-2
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	11.81	36.50	23.76	79.25	50.96
5	1853.50	0.61	1.39	1.02	3.08	2.11
6	----------	------	------	------	------	------
7	1862.00	0.85	2.29	1.28	3.61	2.09
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.46	1.42	0.98	3.54	2.38
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	2.74	7.60	5.65	26.29	14.55
15	1937.00	0.73	2.68	1.78	7.86	5.37
16	1949.00					
17	1953.00	0.51	2.55	1.53	6.04	3.74
18	----------	------	------	------	------	------
19	1960.00	0.48	2.04	1.31	5.13	2.99
20	1993.95	0.29	1.08	0.68	2.71	1.70
21	2010.00	0.84	3.17	2.05	6.38	4.24
22	2030.00	0.66	2.78	1.84	6.21	4.11
23	2044.00	0.28	1.55	0.88	3.84	2.42
24	----------	------	------	------	------	------
25	2073.00	0.39	1.83	1.03	5.05	3.04
26	2097.00	0.45	2.15	1.42	5.22	3.38
27	2144.00	0.72	1.57	1.14	2.96	1.87
28	2293.75	1.35	5.68	4.20	11.86	8.31
29	2311.00	0.33	0.95	0.71	1.81	1.37
30	----------	------	------	------	------	------
31	2561.00	2.49	8.38	6.43	18.75	13.18
32	2683.00	0.66	2.48	1.66	5.40	3.49
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.20	0.17
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	27 426-3	28 426-4	29 412-1	30 412-2	31 412-3
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	4.66	8.59	5.54	208.82	10.09
5	1853.50	0.34	0.20	0.38	6.72	0.23
6	----------	------	------	------	------	------
7	1862.00	0.45	0.32	0.81	10.60	0.11
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.15	0.60	0.57	7.01	0.19
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	1.70	6.19	1.64	38.35	1.20
15	1937.00	0.43	2.09	0.41	10.28	0.10
16	1949.00					
17	1953.00	0.21	0.37	3.15	32.73	0.70
18	----------	------	------	------	------	------
19	1960.00	0.30	0.28	2.83	28.61	0.50
20	1993.95	0.17	0.23	1.73	13.89	0.22
21	2010.00	0.48	0.51	3.05	30.53	0.59
22	2030.00	0.52	0.42	2.94	29.38	0.51
23	2044.00	0.29	0.26	2.06	17.88	0.46
24	----------	------	------	------	------	------
25	2073.00	0.36	0.35	2.76	27.83	0.53
26	2097.00	0.30	0.29	2.59	25.80	0.46
27	2144.00	0.30	0.39	0.86	8.29	0.34
28	2293.75	0.79	3.12	1.90	28.32	0.50
29	2311.00	0.11	0.15	0.20	5.96	0.15
30	----------	------	------	------	------	------
31	2561.00	1.72	3.30	6.01	49.13	2.12
32	2683.00	0.36	0.87	0.99	10.09	0.20
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.03	0.01	0.45	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	32 412-4	33 398-1	34 398-2	35 398-3	36 398-4
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	26.28	2.61	141.46	44.80	20.65
5	1853.50	0.58	0.68	6.01	2.14	0.52
6	----------	------	------	------	------	------
7	1862.00	0.79	1.49	8.36	3.80	0.58
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	1.22	0.56	5.96	2.81	0.69
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	6.95	0.55	34.55	3.50	5.60
15	1937.00	2.94	0.16	10.25	0.30	2.11
16	1949.00					
17	1953.00	1.39	1.73	17.66	8.23	1.09
18	----------	------	------	------	------	------
19	1960.00	1.16	1.63	15.64	7.64	0.93
20	1993.95	0.63	1.06	8.99	4.47	0.34
21	2010.00	1.57	1.65	15.27	7.09	1.09
22	2030.00	1.70	1.59	15.06	7.01	1.26
23	2044.00	0.87	1.32	11.20	5.44	0.78
24	----------	------	------	------	------	------
25	2073.00	0.99	1.62	15.98	8.01	1.02
26	2097.00	1.06	1.57	14.94	7.15	0.99
27	2144.00	0.87	0.66	5.09	2.79	0.64
28	2293.75	6.48	0.54	34.71	0.70	4.39
29	2311.00	0.43	0.30	4.24	1.40	0.54
30	----------	------	------	------	------	------
31	2561.00	7.15	2.46	40.30	8.79	4.22
32	2683.00	2.01	0.43	8.50	1.70	0.89
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.09	0.40	0.16	0.07
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	37 384-1	38 384-2	39 370-1	40 370-2	41 414-1
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	0.53	0.20	32.75	37.75	1.46
5	1853.50	0.35	0.33	2.47	1.76	0.01
6	----------	------	------	------	------	------
7	1862.00	0.38	0.64	3.98	1.74	0.73
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.28	0.37	1.05	3.44	0.41
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	0.47	0.18	3.20	20.81	0.01
15	1937.00	0.01	0.01	0.33	7.96	0.01
16	1949.00					
17	1953.00	0.92	0.58	11.78	7.89	2.85
18	----------	------	------	------	------	------
19	1960.00	0.80	0.54	11.68	7.70	3.14
20	1993.95	0.46	0.47	8.26	5.21	2.11
21	2010.00	0.89	0.58	9.48	6.12	2.23
22	2030.00	0.88	0.59	10.12	6.88	2.83
23	2044.00	0.65	0.54	9.76	6.53	2.51
24	----------	------	------	------	------	------
25	2073.00	0.82	0.62	12.54	8.40	3.74
26	2097.00	0.70	0.59	10.67	7.14	2.80
27	2144.00	0.38	0.16	2.38	1.93	0.85
28	2293.75	0.32	0.15	1.02	17.72	0.01
29	2311.00	0.38	0.21	1.29	1.22	0.01
30	----------	------	------	------	------	------
31	2561.00	18.22	0.61	4.63	12.96	0.01
32	2683.00	0.09	0.05	2.28	4.03	0.01
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.24	0.17	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	42 414-2	43 414-3	44 414-5	45 414-6	46 414-7
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	1.30	0.41	0.36	1.44	0.58
5	1853.50	0.01	0.01	0.01	0.01	0.01
6	----------	------	------	------	------	------
7	1862.00	0.53	0.19	0.11	0.18	0.33
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.28	0.19	0.20	0.30	0.37
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	0.01	0.01	0.01	0.01	0.01
15	1937.00	0.01	0.01	0.01	0.01	0.01
16	1949.00					
17	1953.00	1.76	0.71	0.42	0.47	0.95
18	----------	------	------	------	------	------
19	1960.00	1.72	0.66	0.32	0.55	0.99
20	1993.95	1.25	0.49	0.22	0.30	0.54
21	2010.00	1.50	0.81	0.43	0.60	0.97
22	2030.00	1.80	0.71	0.42	0.71	1.05
23	2044.00	1.62	0.47	0.36	0.29	0.62
24	----------	------	------	------	------	------
25	2073.00	2.23	0.79	0.48	0.50	1.00
26	2097.00	1.71	0.72	0.45	0.47	0.80
27	2144.00	0.57	0.25	0.20	0.34	0.42
28	2293.75	0.01	0.01	0.01	0.01	0.01
29	2311.00	0.01	0.01	0.01	0.01	0.01
30	----------	------	------	------	------	------
31	2561.00	0.01	0.01	0.01	0.01	0.01
32	2683.00	0.01	0.01	0.01	0.01	0.01
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	47 414-8	48 414-9	49 400-1	50 400-2	51 400-4
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	1.08	2.72	17.51	9.80	5.33
5	1853.50	0.01	0.01	1.34	0.86	0.25
6	----------	------	------	------	------	------
7	1862.00	0.35	0.22	4.71	3.19	1.21
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.32	0.45	2.68	1.68	0.80
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	0.01	0.01	3.57	2.29	1.03
15	1937.00	0.01	0.01	0.44	0.23	0.19
16	1949.00					
17	1953.00	1.02	0.63	22.66	12.85	4.56
18	----------	------	------	------	------	------
19	1960.00	1.02	0.51	24.02	13.56	4.66
20	1993.95	0.55	0.29	18.92	10.26	3.29
21	2010.00	0.90	0.54	14.36	9.89	3.45
22	2030.00	1.12	0.53	16.18	10.72	3.90
23	2044.00	0.79	0.41	20.46	11.21	3.82
24	----------	------	------	------	------	------
25	2073.00	1.07	0.56	27.35	14.94	5.18
26	2097.00	0.86	0.48	21.47	11.94	4.15
27	2144.00	0.55	0.35	3.67	2.44	1.15
28	2293.75	0.01	0.01	1.23	0.61	0.27
29	2311.00	0.01	0.01	1.21	0.74	0.39
30	----------	------	------	------	------	------
31	2561.00	0.01	0.01	1.46	0.74	0.66
32	2683.00	0.01	0.01	0.74	0.47	0.34
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	52 400-6	53 400-7	54 400-8	55 400-9	56 400-10
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	3.68	12.14	9.12	8.50	21.85
5	1853.50	0.30	0.54	0.98	0.94	0.54
6	----------	------	------	------	------	------
7	1862.00	0.74	0.74	1.20	1.12	0.53
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.40	0.96	0.66	0.67	0.79
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	0.85	2.05	1.67	1.36	2.39
15	1937.00	0.18	0.27	0.24	0.15	0.30
16	1949.00					
17	1953.00	3.61	4.73	7.10	6.27	4.17
18	----------	------	------	------	------	------
19	1960.00	3.54	4.28	6.44	5.56	3.60
20	1993.95	2.18	2.41	4.14	3.36	1.81
21	2010.00	2.76	3.72	5.81	4.95	3.35
22	2030.00	3.13	3.93	6.06	5.22	3.58
23	2044.00	2.96	3.22	5.02	4.28	2.52
24	----------	------	------	------	------	------
25	2073.00	3.77	4.65	6.49	5.48	3.53
26	2097.00	3.07	3.81	5.73	4.93	3.16
27	2144.00	0.87	1.36	1.50	1.61	1.25
28	2293.75	0.22	0.71	0.64	0.55	1.02
29	2311.00	0.27	0.53	0.81	0.77	0.71
30	----------	------	------	------	------	------
31	2561.00	0.52	0.70	0.78	0.61	0.76
32	2683.00	0.26	0.43	0.57	0.55	0.50
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	57 386-1	58 386-2	59 386-3	60 386-4	61 386-5
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	6.68	6.61	6.32	6.32	2.86
5	1853.50	0.85	0.80	0.79	0.79	0.26
6	----------	------	------	------	------	------
7	1862.00	1.47	1.70	1.43	1.43	0.60
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.95	1.05	1.02	1.02	0.49
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	1.24	0.98	0.99	0.99	0.35
15	1937.00	0.13	0.16	0.15	0.15	0.08
16	1949.00					
17	1953.00	7.94	8.80	8.64	8.64	2.85
18	----------	------	------	------	------	------
19	1960.00	8.50	9.71	9.36	9.36	3.03
20	1993.95	7.67	8.56	7.91	7.91	2.67
21	2010.00	5.64	5.99	5.89	5.89	1.81
22	2030.00	6.22	7.02	6.75	6.75	2.22
23	2044.00	8.13	9.12	8.39	8.39	2.80
24	----------	------	------	------	------	------
25	2073.00	9.02	12.14	10.48	10.48	3.69
26	2097.00	7.56	8.56	8.17	8.17	2.66
27	2144.00	1.48	1.69	1.30	1.30	0.57
28	2293.75	0.37	0.40	0.26	0.26	0.26
29	2311.00	0.68	0.80	0.74	0.74	0.27
30	----------	------	------	------	------	------
31	2561.00	0.26	0.31	0.39	0.39	0.18
32	2683.00	0.38	0.41	0.45	0.45	0.21
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	62 386-6	63 386-7	64 386-8	65 386-9	66 386-10
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	3.45	6.38	5.78	4.03	10.76
5	1853.50	0.34	0.33	0.65	0.51	0.48
6	----------	------	------	------	------	------
7	1862.00	0.74	0.23	0.79	0.73	0.31
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	0.58	0.40	0.54	0.43	0.34
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	0.51	0.78	1.09	0.99	1.08
15	1937.00	0.13	0.12	0.13	0.16	0.26
16	1949.00					
17	1953.00	2.95	1.73	4.51	3.80	2.05
18	----------	------	------	------	------	------
19	1960.00	2.97	1.56	4.34	3.60	1.90
20	1993.95	2.28	1.09	2.88	2.25	1.10
21	2010.00	1.93	1.41	3.13	3.17	1.83
22	2030.00	2.23	1.36	3.44	2.97	1.81
23	2044.00	2.45	1.32	3.42	2.75	1.48
24	----------	------	------	------	------	------
25	2073.00	3.97	1.57	4.80	4.17	1.85
26	2097.00	2.63	1.25	3.60	2.97	1.58
27	2144.00	0.48	0.33	1.19	1.06	0.57
28	2293.75	0.23	0.22	0.27	0.24	0.25
29	2311.00	0.39	0.23	0.65	0.58	0.46
30	----------	------	------	------	------	------
31	2561.00	0.21	0.35	0.51	0.46	0.25
32	2683.00	0.19	0.28	0.44	0.29	0.37
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	67 372-1	68 372-2	69 372-3	70 372-4	71 372-5
1	1783.00					
2	1785.00					
3	1823.00					
4	1839.00	18.64	12.14	4.17	6.07	12.65
5	1853.50	2.11	1.44	0.55	0.22	0.60
6	----------	------	------	------	------	------
7	1862.00	5.18	3.39	0.88	1.17	0.51
8	1863.00					
9	1871.00					
10	1895.00					
11	1901.50	2.74	1.67	0.54	0.79	0.65
12	----------	------	------	------	------	------
13	1904.00					
14	1916.00	3.51	2.58	0.78	0.98	1.86
15	1937.00	0.29	0.21	0.12	0.17	0.14
16	1949.00					
17	1953.00	25.31	14.81	3.97	5.48	4.82
18	----------	------	------	------	------	------
19	1960.00	28.74	16.94	4.35	6.08	4.71
20	1993.95	25.96	15.10	3.62	4.70	3.73
21	2010.00	14.63	9.23	2.85	3.78	3.11
22	2030.00	17.33	10.72	3.42	4.36	3.90
23	2044.00	27.51	15.97	3.89	5.09	4.33
24	----------	------	------	------	------	------
25	2073.00	35.51	20.31	4.50	6.21	5.16
26	2097.00	26.01	13.93	3.86	5.16	3.91
27	2144.00	3.99	2.93	0.78	1.08	1.01
28	2293.75	0.43	0.34	0.19	0.23	0.32
29	2311.00	1.66	1.10	0.45	0.61	0.56
30	----------	------	------	------	------	------
31	2561.00	0.83	0.58	0.30	0.33	0.47
32	2683.00	0.66	0.47	0.27	0.24	0.28
33	2917.00					
34	2942.00					
35	3053.00					
36	3803.00	0.01	0.01	0.01	0.01	0.01
37	----------	------	------	------	------	------

SAT-biomarker pattern in
Well 7219/9-1

0	Depth	72 372-6	73 372-7	74 372-8
1	1783.00			
2	1785.00			
3	1823.00			
4	1839.00	5.48	4.95	20.97
5	1853.50	0.84	0.71	0.85
6	----------	------	------	------
7	1862.00	0.95	0.78	0.58
8	1863.00			
9	1871.00			
10	1895.00			
11	1901.50	0.59	0.59	0.77
12	----------	------	------	------
13	1904.00			
14	1916.00	1.19	1.08	2.04
15	1937.00	0.22	0.15	0.29
16	1949.00			
17	1953.00	6.17	5.42	4.46
18	----------	------	------	------
19	1960.00	6.04	5.15	3.87
20	1993.95	4.53	3.81	2.67
21	2010.00	4.41	3.88	2.86
22	2030.00	5.06	4.24	3.29
23	2044.00	5.15	4.27	3.46
24	----------	------	------	------
25	2073.00	6.15	6.01	4.46
26	2097.00	5.18	4.43	3.19
27	2144.00	1.11	1.05	0.87
28	2293.75	0.40	0.38	0.49
29	2311.00	0.70	0.63	0.74
30	----------	------	------	------
31	2561.00	0.56	0.54	0.87
32	2683.00	0.38	0.36	0.18
33	2917.00			
34	2942.00			
35	3053.00			
36	3803.00	0.01	0.01	0.01
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88/216

U-568

3

ROBERTSON RESEARCH INTERNATIONAL LIMITED

REPORT NO. 6322/Ic

MICROSCOPY AND CHEMICAL ANALYSIS OF KEROGENS FROM THE NORSK HYDRO 7219/9-1 BARENTS SEA WELL, INTERVAL 507m TO 4219m

by

A.G. COLLINS

PROJECT NO. RRPC/889/Ic/25651

NORSK HYDRO P.O. NO. 550472

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1 SUMMARY

The interval 507m to 4219m in the Norsk Hydro 7219/9-1 Barents Sea well has been analysed for maturity and kerogen type. Data are presented from spore colour index, vitrinite reflectivity, visual kerogen typing and elemental analysis. The data are shown in tabulated form, together with depth plots for the spore colour and vitrinite reflectance values. Comments on the microscopy are given in the text.

Results of the analysis of three reference samples for spore colouration, vitrinite reflectivity and visual kerogen typing are also included.

2 INTRODUCTION

This report presents the results of geochemical analyses of sidewall core and core samples from the interval 507m to 4219m in the Norsk Hydro 7219/9-1 Barents Sea well. Results of the analysis of three reference samples are also included. The samples were received at Robertson Research International's North Wales laboratories in four consignments between 14th January and 5th April, 1988, and comprised 3 reference samples, 63 sidewall cores and 9 conventional cores. Preliminary results were sent to Norsk Hydro by facsimile message over the period 11th February to 3rd May, 1988.

The numbers of analyses carried out are as follows:

	No. of samples
Kerogen preparation	75
Spore colour index	71
Visual kerogen typing	75
Vitrinite relectivity	47
Elemental analysis (C,H,O,N,S)	37

RRI personnel involved in the study were:

Alan Collins	-	Spore colour and kerogen microscopy and report preparation
Sandra Martin	-	Vitrinite microscopy
Jacqui Milner	-	Vitrinite microscopy
Malcolm Jones	-	Supervision of kerogen preparation

Our contact at Norsk Hydro throughout the project has been Nils Telnaes.

3 RESULTS

3.1 Analytical Procedures

Procedures followed during the course of the study are set out in Appendix 2. Samples were received as whole rock fragments and were generally small. Additional sample material, consisting of extracted residue of crushed rock powders, was used to prepare further kerogen for elemental analysis where initial kerogen yields were too small for reliable measurement. Spore colour was estimated using a >20μm sieved kerogen fraction, while kerogen type was evaluated using total residue. The 1 to 10 spore colour index (SCI) scale used correlates approximately with the following zones of oil generation:

1-3.5, immature
3.5-5, early mature, generation of low gravity oils
5-7, middle mature, generation of medium gravity oils (35° to 42°API)
7-8.5, late mature, generation of light oils (>42°API) and condensates
8.5-10, post-mature, generation of condensate, wet gas and, ultimately, dry gas.

Table 1 lists the kerogen components in terms of inertinitic (non-source), vitrinitic (gas-prone) and sapropelic (oil-prone) and is a summary of the more detailed values given in Table 2.

Vitrinite reflectivity examination was carried out wholly on kerogen concentrates using sieved kerogen (>20μm) where possible but unsieved material where sample availability was limited.

All slides and polished mounts were examined for exinite fluorescence in incident UV/blue light.

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
Ref 1		SH, brn-gy	4.0	.31(4)L .45(5) .85(1)R	Mnr	15	85				
Ref 2 (1)		SH, ol-gy	3.5	.42(8) .33(3)L .64(5)R	5	30	65				
Ref 2 (2)		SH, ol-gy	3.5	.40(11) .81(5)R	5	55	40				
507.0	Swc	MDST, brn-blk	4.0 5.0 R	.37(9) .51(4)R	15	80	5				
540.0	Swc	MDST, lt ol-gy	4.0		35	55	10				
595.0	Swc	MDST, brn-blk	4.0-4.5	.37(12) .26(3)L .58(9)R	25	75	Mnr				
640.0	Swc	MDST, ol-gy	4.0-4.5		60	40	Mnr				
680.0	Swc	MDST, ol-gy	4.0 6.5 R	.45(19) .31(1)L .64(15)R .84(7)R	15	85	Mnr				
700.0	Swc	MDST, ol-gy	4.5		10	90	Mnr				
824.0	Swc	MDST, ol-blk	4.0-4.5	.45(8) .27(3)L .72(9)R	15	85	Mnr				
914.0	Swc	MDST, ol-blk	4.0-4.5		10	90	Mnr				
1020.0	Swc	MDST, ol-blk+ mnr MDST, ol-gy	4.5	.39(13) .54(4)R .83(3)R	20	80	Mnr				
1122.0	Swc	MDST, ol-blk	4.5		15	80	5				
1209.0	Swc	MDST, ol-blk	4.5	.43(12) .29(4)L .57(16)R .75(5)R	15	85	Mnr				
1285.5	Swc	MDST, ol-blk	4.5 3.0 C		15	70	15				
1371.5	Swc	MDST, ol-blk	4.5-5.0	.45(13) .32(3)L .66(15)R	10	90	*				
1456.0	Swc	MDST, ol-blk	4.5-5.0		15	80	5				
1473.0	Swc	MDST, ol-blk, shly	4.5-5.0	.42(4) .29(1)L .59(9)R .94(7)R	15	85	Mnr				
1520.0	Swc	MDST, ol-blk	5.0	.48(6) .20(1)L .65(5)R	10	85	5				
1588.0	Swc	MDST, ol-blk	4.0		15	80	5				

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1A

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
1725.0	Swc	MDST, ol-blk, shly	4.5	.50(25) .32(2)L .68(14)R	65	25	10				
1749.0	Swc	MDST, ol-blk	4.5		90	5	5				
1775.0	Swc	MDST, ol-blk	4.5	.50(23) .37(1)L .73(25)R	75	20	5				
1848.0	Swc	MDST, ol-blk	4.5-5.0		15	85	Mnr				
1862.0	Swc	MDST, ol-blk	*		10	90	*				
1881.0	Swc	MDST, ol-blk	4.5 ? 7.5 ? R		15	85	*				
1901.5	Swc	MDST, brn-blk, shly	4.5-5.0		10	5	85				
1905.0	Swc	MDST, brn-blk, shly	5.0		10	55	35				
1911.0	Swc	SH, blk	4.5-5.0	.60(5) .42(3)L .74(4)R	10	60	30				
1915.0	Swc	MDST, brn-blk	5.0		20	80	Mnr				
1919.0	Swc	MDST, brn-blk	5.0		15	75	10				
1928.0	Core	MDST, ol-gy	7.0 R	.53(27) .69(12)R .84(6)R	55	35	10				
1935.0	Core	MDST, ol-gy	5.5 7.0-7.5 R	.56(24) .38(7)L .82(16)R 1.07(4)R	50	45	5				
1942.0	Core	MDST, ol-gy	6.5-7.0 R	.60(24) .84(21)R 1.06(7)R	25	75	Mnr				
1949.0	Core	MDST, lt ol-gy, sndy	5.0-5.5 6.5 R	.64(34) .40(4)L .86(13)R 1.18(4)R	40	55	5				
1993.0	Core	SST, yel-gy+ mnr OS	-		35	60	5				
2012.0	Core	SST, yel-gy	-		40?	20?	40?				
2046.0	Core	SST, yel-gy	-		25?	35?	40?				
2076.0	Core	SST, lt ol-gy+ mnr BIT	-		20	75	5				
2100.9	Core	SST, lt ol-gy+ mnr OS	5.0	.63(30) .44(14)L .98(5)R	20	80	Mnr				
2155.5	Swc	MDST, gy-blk	5.0	.61(30) .42(4)L .80(12)R	60	30	10				

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1B

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
2173.0	Swc	SLTST, med gy, mic+ 10% SST, wht	5.0-6.0	.62(40) .44(5)L .78(3)R 1.08(7)R	50	10	40				
2192.0	Swc	SLTST, med gy, mic+ 10% SST, wht	6.0-6.5	.65(39) .49(10)L .79(1)R 1.07(3)R	50	35	15				
2293.8	Swc	MDST, gy-blk	5.0	.62(30) .50(20)L .81(5)R	20	65	15				
2305.0	Swc	MDST, lt ol-gy	6.0 ? 7.0 ? R	.65(31) .45(7)L .85(14)R	80	15	5				
2307.0	Swc	MDST, ol-gy	5.5	.65(20) .48(10)L .90(21)R	80	15	5				
2323.5	Swc	MDST, ol-gy	6.0-6.5		70	30	Mnr				
2332.5	Swc	MDST, ol-gy	5.5-6.0		65	15	20				
2487.0	Swc	MDST, ol-gy+ 20% SST v lt gy	6.0-6.5		25	65	10				
2497.5	Swc	SST, v lt gy+ 20% MDST, ol-gy	6.0-6.5		75	10	15				
2510.5	Swc	MDST, ol-gy+ mnr SST v lt gy	6.5	.65(25) .49(9)L .82(12)R 1.08(7)R	70	20	10				
2561.5	Swc	MDST, ol-blk	6.5-7.0	.65(35) .48(15)L .94(5)R	60	30	10				
2564.0	Swc	MDST, ol-gy	7.0 ?		60	30	10				
2670.0	Swc	MDST, ol-gy	7.0 ?	.67(31) .50(10)L .90(11)R	65	25	10				
2673.5	Swc	MDST, ol-gy+ mnr SST v lt gy	6.5-7.0		55	35	10				
2683.0	Swc	MDST, ol-gy+ 10% SST v lt gy	7.0	.69(34) .56(16)L .91(5)R	45	40	15				
2746.0	Swc	MDST, dk gy+ 10% SST lt gy	6.5-7.0	.70(29) .53(11)L .95(12)R 1.24(2)R	80	10	10				
2991.0	Swc	SLTST, lt gy+ 30% MDST, dk gy	8.0 R	.81(17) .68(5)L 1.16(9)R	85	10	5				
3085.0	Swc	MDST, gy-blk+ mnr SLTST, lt gy	7.5-8.0		40	55	5				

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1C

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

GENERAL DATA			MATURITY DATA		KEROGEN COMPOSITION DATA						
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	SPORE COLOUR INDEX	VITR. REFL. R oil av %	% (Visual, from microscopy)			% (Calculated)			
					INERTINITE	VITRINITE	SAPROPEL	INERT	VIT	ALG SAP	WXY SAP
3149.0	Swc	MDST, dk gy	7.5-8.0	.84(1) 1.09(2)R 1.32(4)R	20	75	5				
3651.0	Swc	MDST, dk gy	7.5-8.0	1.09(2) .71(15)L 1.33(24)R 1.71(6)R	20	80	Mnr				
3727.0	Swc	SST, lt gy	8.0-8.5	1.10(10) .84(10)L 1.33(10)R 1.53(8)R	15	85	Mnr				
3783.0	Swc	MDST, gy-blk	7.5-8.0	1.06(18) .81(4)L 1.37(16)R 1.71(15)R	20	80	*				
3803.0	Swc	MDST, gy-blk	8.0	1.14(4) 1.47(9)R 1.80(6)R	10	90	Mnr				
3879.0	Swc	MDST, gy-blk	7.5	1.12(18) .85(12)L 1.45(12)R 1.66(6)R	15	85	Mnr				
3904.0	Swc	MDST, gy-blk	7.5	1.16(23) .78(8)L 1.44(4)R	15	85	*				
3965.0	Swc	MDST, med-dk gy	8.5	1.23(5) 1.50(8)R	25	75	*				
3970.5	Swc	MDST, gy-blk	8.5	1.15(11) 1.53(9)R	40	60	*				
4007.5	Swc	MDST, gy-blk+ mnr SLTST, med gy	8.5-9.0 R	1.28(4) 1.67(4)R	35	60	5				
4043.5	Swc	MDST, dk gy+ mnr SLTST, med gy	8.0-8.5	1.24(3) 1.53(5)R 1.93(10)R	40	60	Mnr				
4052.5	Swc	MDST, dk gy	8.5-9.0 R	1.29(8) 1.67(10)R	40	60	Mnr				
4062.0	Swc	MDST, dk gy	9.0 R		50?	50?	* ?				
4153.5	Swc	MDST, gy-blk	8.5	1.19(15) 1.55(14)R 1.83(19)R 2.41(5)R	60?	40?	Mnr?				
4162.0	Swc	MDST, med-dk gy	8.5	1.23(13) 1.67(15)R	70?	30?	* ?				
4219.0	Swc	MDST, dk gy	8.0-8.5	1.22(9) 1.63(16)R	30	65	5				

MATURITY AND KEROGEN COMPOSITION DATA

TABLE : 1D

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

Sample Depth (metres)	Palynomorphs %	Inertinite %	Vitrinite %	Amorphous (lipt.) %	Amorphous (humic) %	Cuticle %
Reference Samples						
REF.1	5 Sp	Mnr	Mnr	?80	?15	
REF.2 (1)	5 Sp, Di	5	10	?60	?20	
REF.2 (2)	Mnr Sp, Di	5	15	?40	?40	
507	5 Sp, Di	15	20		60	
540	Mnr Sp, Di	35	25	?10	30	
595	Mnr Sp, Di	25	10		65	
640	Mnr Sp	60	10		30	
680	Mnr Sp, Di	15	5		80	
700	Mnr Sp, Di	10	15		75	Mnr
824	Mnr Sp, Di	15	20		65	
914	Mnr Sp	10	15		75	
1020	Mnr Sp, Di	20	5		75	
1122	5 Sp	15	5		75	
1209	Mnr Sp	15	5		80	Mnr
1285.5	Mnr Sp, Di	15	10	?15	60	
1371.5		10	10		80	
1456	5 Sp	15	5		75	
1473	Mnr Sp, Di	15	5		80	
1520	5 Sp, Di	10	5		80	
1588	5 Sp, Di	15	5		75	
1725	10 Sp, Di	65	5		20	
1749	5 Sp, Di	90	5			
1775	5 Sp, Di	75	10		10	
1848	Mnr Sp, Di	15	10		75	
1862		10	40		50	Mnr
1881		15	10		75	
1901.5	10 Sp, Al	10	5	?75		

TABLE 2A Detailed Kerogen Composition Data

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

Sample Depth (metres)	Palynomorphs %	Inertinite %	Vitrinite %	Amorphous (lipt.) %	Amorphous (humic) %	Cuticle %
1905	5 Sp	10	20	?30	35	
1911	10 Sp	10	10	?20	50	
1915	Mnr Sp	20	20	Mnr	60	
1919	10 Sp	15	20		55	
1928	10 Sp	55	15		?20	
1935	5 Sp	50	25		?20	
1942	Mnr Sp	25	75			
1949	5 Sp	40	25		?30	
1993	5 Sp	35	30		?30	
2012	?10 Sp	?10	?5	- 75 INDETERMINATE -		
2046	?20 Sp	?10	?15	- 55 INDETERMINATE -		
2076	5 Sp	20	75			Mnr
2100.9	Mnr Sp	20	80			Mnr
2155.5	10 Sp	60	20		10	
2173	40 Sp	50	10			Mnr
2192	15 Sp	50	35			Mnr
2293.8	15 Sp	20	55		10	
2305	5 Sp	80	15			Mnr
2307	5 Sp	80	15			
2323.5	Mnr Sp	70	30			
2332.5	20 Sp	65	15			Mnr
2487	5 Sp	25	55		10	5
2497.5	15 Sp	75	10			
2510.5	10 Sp	70	20			
2561.5	10 Sp	60	30			
2564	10 Sp	60	30			
2670	10 Sp	65	25			
2673.5	10 Sp	55	35			Mnr
2683	15 Sp	45	40			Mnr

TABLE 2B Detailed Kerogen Composition Data

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

Sample Depth (metres)	Palynomorphs %	Inertinite %	Vitrinite %	Amorphous (lipt.) %	Amorphous (humic) %	Cuticle %
2746	10 Sp	80	10			
2991	5 Sp	85	10			
3085	5 Sp	40	55			Mnr
3149	5 Sp	20	30		?45	
3651	Mnr Sp	20	25		?55	
3727	Mnr Sp	15	20		?65	
3783		20	80			
3803	Mnr Sp	10	15		?75	
3879	Mnr Sp	15	65		20	
3904		15	85			
3965		25	75			
3970.5		40	60			
4007.5	5 Sp	35	60			
4043.5	Mnr Sp	40	?60			
4052.5	Mnr Sp	40	?60			
4062		?50	?50			
4153.5	Mnr Sp	?60	?40			
4162	Mnr Sp	?70	?30			
4219	5 Sp	30	65			

Abbreviations: Sp = Spores, Di = Dinocysts, Al = Algae
lipt. = liptinitic (oil-prone), Mnr = Minor (<2½%)

TABLE 2C Detailed Kerogen Composition Data

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

Depth (metres)	C%	H%	N%	S%	Ash%	Difference %	$^{H}/_{C}$	$^{O}/_{C}$
1881	70.9	3.36	2.26	1.6	$^{I}/_{S}$	(21.9)	0.57	*
1901.5	57.1	4.32	2.41	14.8	13.6	7.73	0.91	0.10
1905	56.1	3.67	1.52	13.40	$^{I}/_{S}$	(25.3)	0.79	*
1911	68.9	4.99	2.07	4.44	$^{I}/_{S}$	(19.6)	0.87	*
1915	67.8	4.15	1.96	5.85	$^{I}/_{S}$	(20.2)	0.73	*
1919	58.4	9.2	2.2	$^{I}/_{S}$	$^{I}/_{S}$	(30.2)	1.89	*
1928	40.0	3.34	1.17	1.37	$^{I}/_{S}$	(54.1)	1.00	*
1935	24.3	2.14	0.80	9.76	22.1	(40.9)	1.06	*
1942	43.1	3.03	1.36	11.77	21.1	19.6	0.84	0.34
1949	47.6	3.22	1.24	18.89	27.8	1.25	0.81	0.02
2100.9	34.9	2.55	0.93	18.33	36.2	7.09	0.88	0.15
2155.5	75.2	4.11	2.01	1.58	$^{I}/_{S}$	(17.1)	0.66	*
2173	80.6	5.01	1.75	0.89	2.0	9.74	0.75	0.09
2192	78.2	3.76	1.73	1.16	$^{I}/_{S}$	(15.2)	0.58	*
2192(R)	79.1	3.79	1.42	0.74	$^{I}/_{S}$	(15.0)	0.57	*
2293.8	81.2	5.23	1.68	2.82	1.0	8.04	0.77	0.07
2305	80	3.0	2.0	$^{I}/_{S}$	$^{I}/_{S}$	(15)	0.45	*
2307	75.7	3.37	2.14	1.04	$^{I}/_{S}$	(17.8)	0.53	*
2487	78.4	4.04	1.82	0.56	2.0	13.2	0.62	0.13
2497.5	77.7	3.30	1.40	6.0	$^{I}/_{S}$	(11.6)	0.51	*
2510.5	79.1	3.93	1.75	0.53	$^{I}/_{S}$	(14.7)	0.60	*
2510.5(R)	80.5	4.43	1.91	0.43	$^{I}/_{S}$	(12.7)	0.66	*

TABLE 3A Elemental Analysis Data

COMPANY: NORSK HYDRO WELL: 7219/9-1 LOCATION: BARENTS SEA

Depth (metres)	C%	H%	N%	S%	Ash%	Difference %	$^{H}/_{C}$	$^{O}/_{C}$
2670	80	4.0	2.0	$^{I}/_{S}$	$^{I}/_{S}$	(14)	0.60	*
2673.5	80.3	3.93	1.45	0.68	$^{I}/_{S}$	(13.6)	0.59	*
2683	82.2	4.40	1.52	0.75	$^{I}/_{S}$	(11.1)	0.64	*
2746	71.7	4.11	1.21	7.23	$^{I}/_{S}$	(15.8)	0.69	*
2746(R)	76.9	4.13	1.41	3.48	$^{I}/_{S}$	(14.1)	0.64	*
2991	64.5	3.53	1.32	5.16	$^{I}/_{S}$	(25.5)	0.66	*
2991(R)	83.5	4.41	1.39	1.39	$^{I}/_{S}$	(9.3)	0.63	*
3651	69.2	4.08	1.45	$^{I}/_{S}$	$^{I}/_{S}$	(25.3)	0.71	*
3803	28.7	1.95	0.93	$^{I}/_{S}$	$^{I}/_{S}$	(68.4)	0.82	*
3803(R)	71.0	4.0	4.3	$^{I}/_{S}$	$^{I}/_{S}$	(20.7)	0.68	*
3879	72.3	3.50	1.26	6.21	13.6	3.13	0.58	0.03
3904	69.3	4.36	1.46	0.90	1.50	22.5	0.75	0.24
3970.5	61.4	2.69	1.47	$^{I}/_{S}$	$^{I}/_{S}$	(34.4)	0.53	*
3970.5(R)	79.1	3.72	1.25	3.66	$^{I}/_{S}$	(12.3)	0.53	*
4052.5	58.1	2.79	0.89	$^{I}/_{S}$	$^{I}/_{S}$	(38.2)	0.58	*

Notes:

1. $^{I}/_{S}$ = Insufficient material for analysis
2. Oxygen assumed 100-(C + H + N + S + ASH)%.
3. * = Oxygen not calculated
4. (R) Repeat analysis
5. $^{H}/_{C}$, $^{O}/_{C}$ Atomic ratios.

TABLE 3B Elemental Analysis Data

APPENDIX 1
ABBREVIATIONS USED IN ANALYTICAL DATA SHEETS

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

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

Robertson Group

APPENDIX 2

ANALYTICAL PROCEDURES AND TECHNIQUES

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

1. Sample Preparation

General

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

Kerogen Preparation

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

2. Maturity Evaluation

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

Spore Colouration

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

Vitrinite Reflectivity

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

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

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

Airspace Gas Analysis

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

Gasoline Analysis and Cuttings Gas Analysis

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

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

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

3. Source Rock Evaluation

Total Organic Carbon Content (TOC)

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

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

Rock-Eval Pyrolysis

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

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

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

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

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

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

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

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

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

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

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

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

Visual Examination of Kerogen Concentrates

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

Extract Analysis

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

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

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

The data tabulated in reports comprise the following parameters:

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

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

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

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

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

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

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

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

Capillary Gas Chromatography of C_{15+} Alkanes

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

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

Capillary Gas Chromatography of Aromatic and Branched/Cyclic Alkanes

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

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

Gas Chromatography-Mass Spectrometry

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

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

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

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

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

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

Pyrolysis-Gas Chromatography

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

Elemental Analysis

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

4. Oil Analysis

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

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

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

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

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

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

5. Gas Analysis

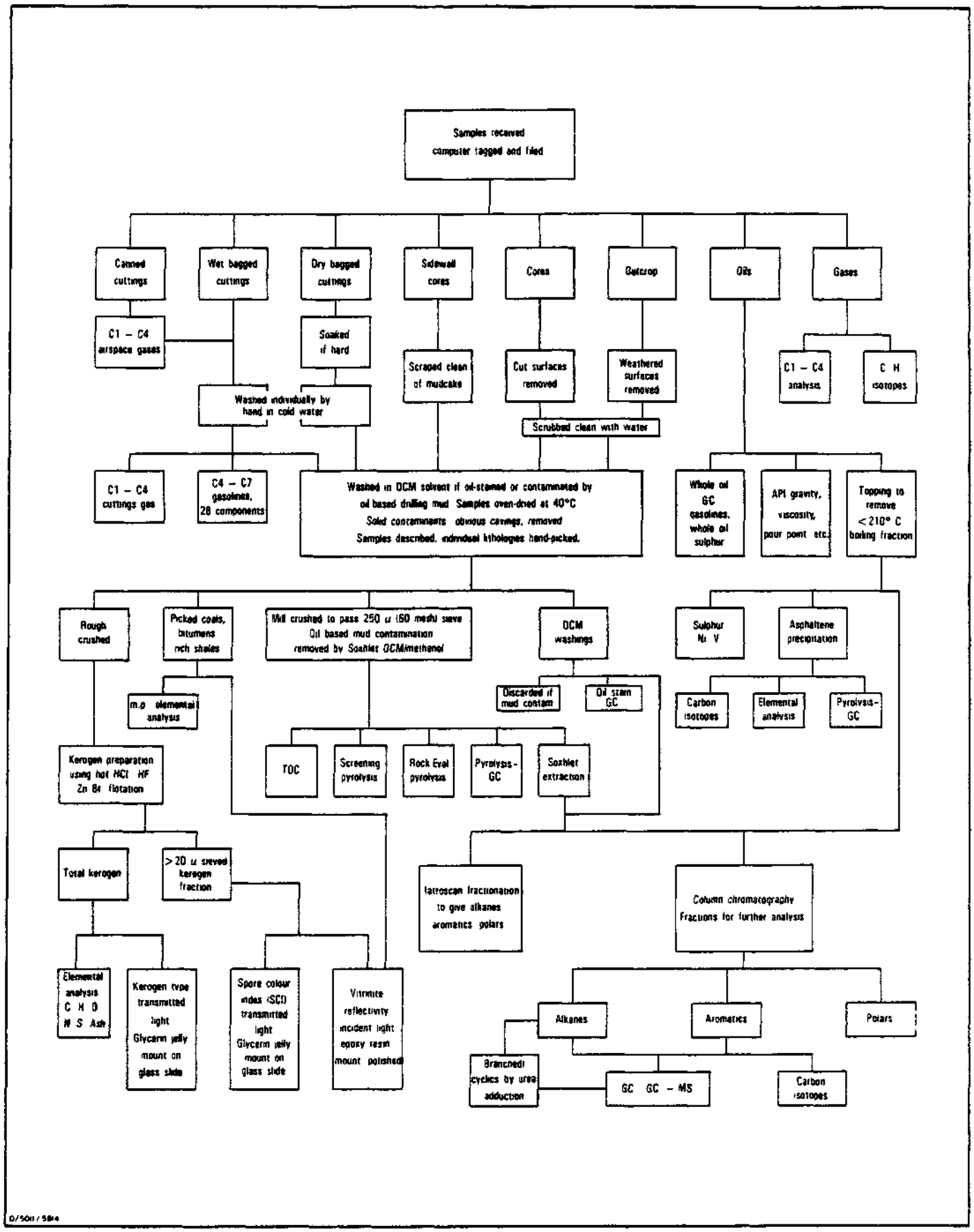
The hydrocarbon gases, C_1 to C_4, may be collected from the airspace of sealed canned samples or may be received from well-site tests in a special sealed gas cylinder (gas mouse). Chromatographic separation of the C_1 to C_4 gases is effected as described under airspace gas analysis. In addition, the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

6. Solid Bitumen Analysis

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

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

FLOW CHART FOR GEOCHEMICAL ANALYSIS



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APPENDIX FIGURE 1

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

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

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

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

APPENDIX TABLE 1

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