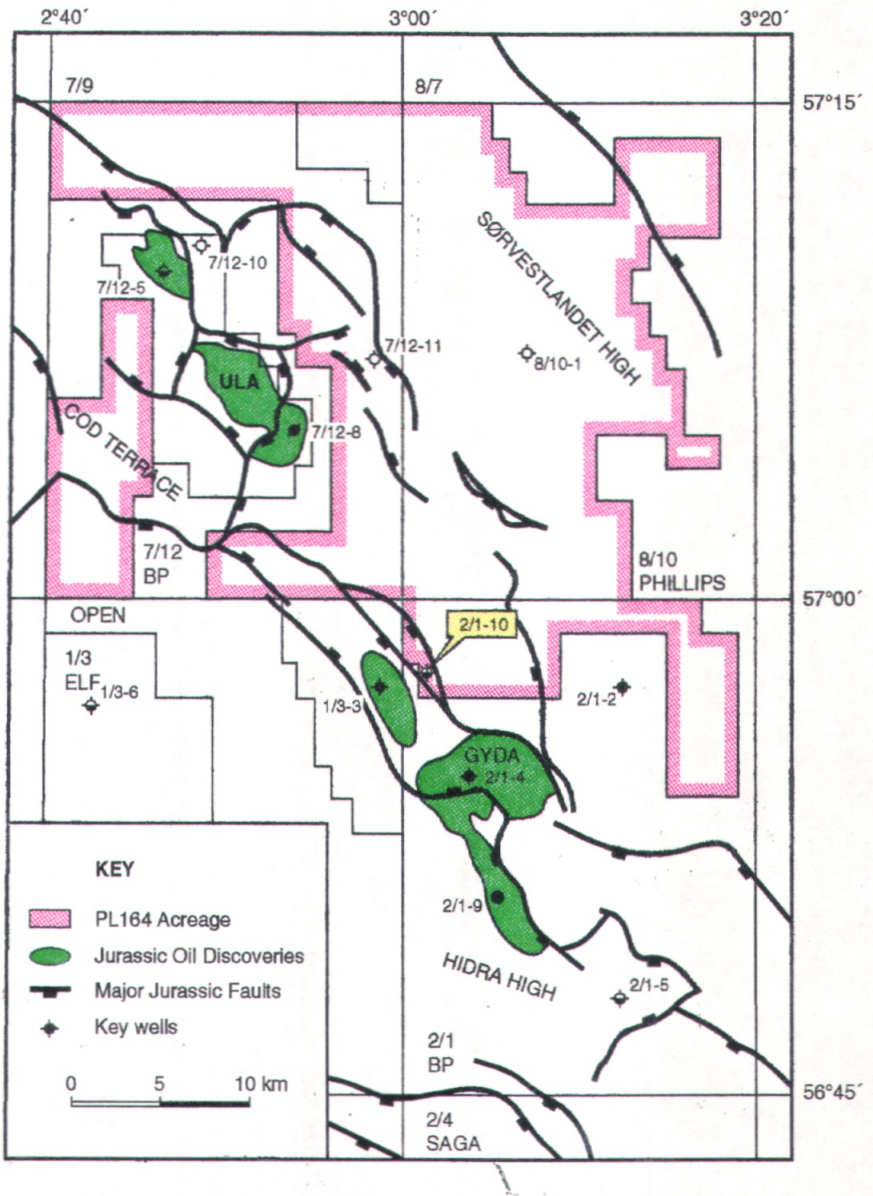
BP NORWAY

2/1-10

Completion report



BP Norway Limited U.A.

Exploration Department
&
Development Department

2/1-10

COMPLETION REPORT

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June 1992.

Approved by: .....
Licence Evaluation Manager

.....
Head of Well Evaluation

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BP Norway Limited U.A.
Location exploration well 2/1-10

COUNTRY : NORWAY
AREA : NORTH SEA

LICENCE NO : 164
BLOCK NO : 2/1

WELLHEAD CO-ORDINATES :
UTM : 6 313 619.42 mN
501 346.22 mE

LAT : 56°57´53.61"N
LONG : 3°01´19.70"E

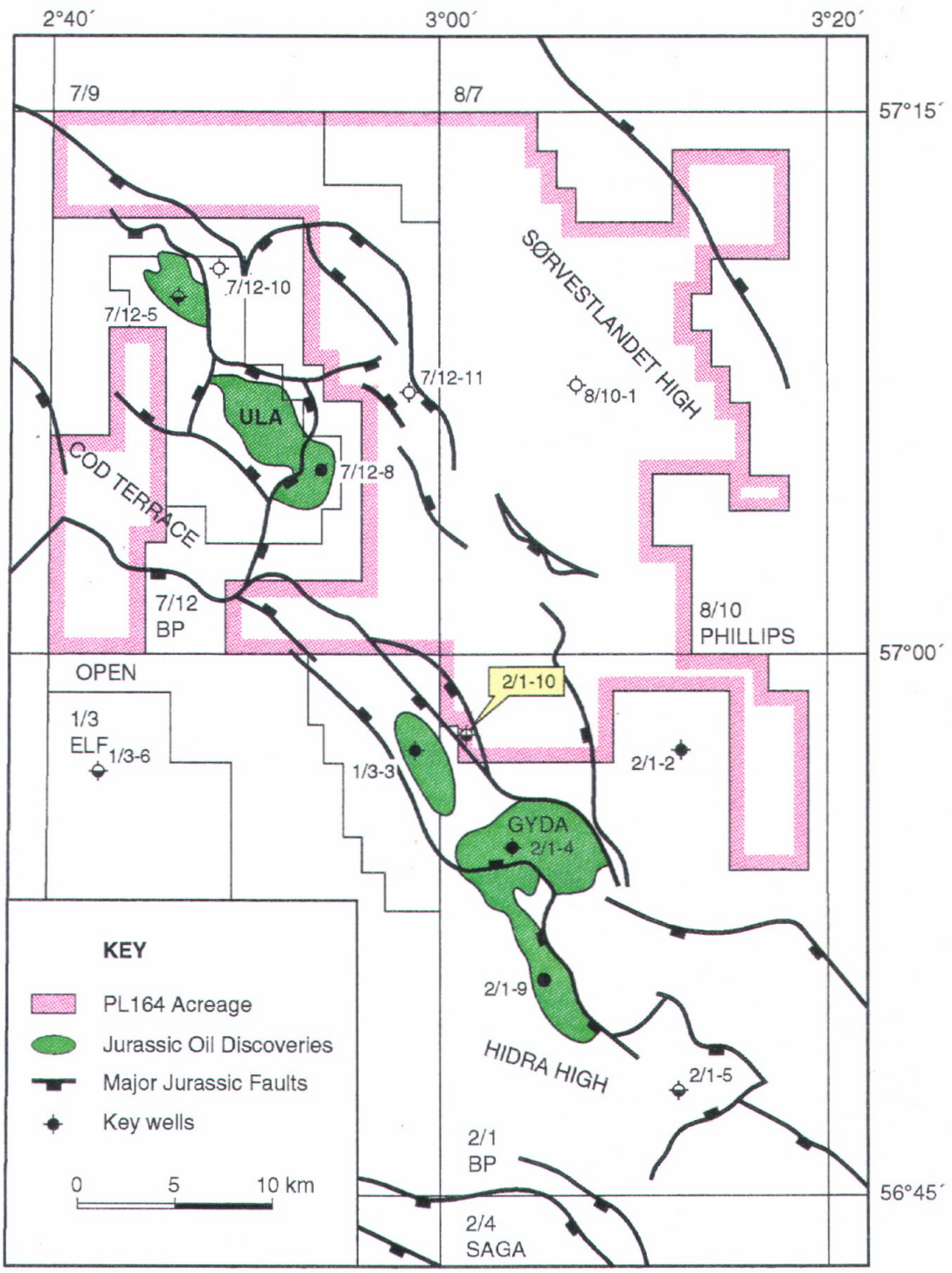


Fig.1.1
MC.NO.2239

SUMMARY

The 2/1-10 well was drilled on a prospect located 7.8 km north-west of the Gyda Platform. It was drilled as a vertical hole from the semi-submersible rig "Ross Isle". The primary well objective was to test an Upper Jurassic Ula Formation sandstone target and, if successful, to prove a volume of oil that was commercial as a tie-back development to the Gyda Platform. A secondary target was an intra-Farsund Formation sandstone.

2/1-10 was spudded on 9 November 1991. A 9 7/8" riserless pilot hole was drilled to the 13 3/8"casing depth at 1100m BRT DD in one pass. The pilot hole was opened to 36" to a depth of 112m BRT DD, and to 26" to a depth of 161m BRT DD. A 30"/20" conductor string was set at 160m BRT DD. The pilot hole was further opened to 17 1/2" to a depth of 1101m BRT DD and the 13 3/8" casing shoe set at 1096m BRT DD. The 12 1/4" hole section was drilled to 3242m BRT DD, and 9 5/8" casing was set at 3230m BRT DD. Total depth of 4525m BRT DD (4525.5m BRT LD) was reached in the 8 1/2" hole in the Triassic Skagerrak Formation on 29th December 1991.

A KCl-polymer mud system was used to drill both 12 1/4" and 8 1/2" hole sections.

Mandal Formation mudstones yielded minor gas shows and moderate fluorescence. The intra-Farsund (Gyda) sandstone was encountered at 4188.5m BRT LD (4189.5m BRT DD), 50m deeper than originally predicted. A 133m thick Gyda Sandstone Member was encountered, instead of the most likely prognosed model of a 15 - 30m thick intra Farsund (Gyda) sandstone, separated from an underlying Ula sandstone by a 50 - 60m thick Farsund mudstone. The Gyda Sandstone Member was cored from 4193m to 4288.5m BRT LD. Fair quality shows were observed in the uppermost 5 metres of the sandstone only; thereafter they were intermittent and of poor quality. A minilog summarising the well information is presented din Fig. 1.2

The main reservoir parameters are given in the tables below:

Average Reservoir Properties			
Net thickness (m TVT)	86.4		
	Arithm.	Harm.	Geom.
Net porosity	14.2 %		
Net water saturation	85.0 %		
Net k_h (cutoff = 0.3 mD)	16.8		6.2
Net k_v (cutoff = 0.3 mD)		0.8	

Reservoir Properties By Zone								
Zone	**Interval**	**Net porosity**	**Net Sw**	**Net Vclay**	**N/G**	**Net Average Permeabilities**		
	m BRT LD	%	%	%	%	k_h Arithm.	k_h Geom.	k_v Harm.
D	4188.5 - 4219.0	5	100	19	2	0.2	0.1	0
C	4219.0 - 4245.5	17	80	4	94	11.6	6.6	1.5
B2	4245.5 - 4270.0	10	80	0	61	27.7	9.0	2.5
B1	4270.0 - 4287.0	10	91	0	98	11.1	5.9	1.2
A4	4287.0 - 4302.0	20	87	0	100	33.9	20.5	3.9
A3-A1	4302.0 - 4322.0	13	89	6	73	2.0	1.2	0.5

WELL DATA SHEET

PROSPECT:	2/1-JU15
OPERATOR:	BP NORWAY LIMITED U.A.
WELL:	2/1-10
WELLHEAD CO-ORDINATES: (Vertical well)	6 313 619.42 mN 56° 57′ 53.61" N 501 346.22 mE 3° 01′ 19.70" E
ROTARY TABLE ELEVATION: WATER DEPTH:	22 m AMSL 67 m
OBJECTIVES:	Prove up a commercial volume of oil for satellite tieback to the Gyda field.
DATE SPUDDED:	9 November 1991
DATE COMPLETED:	14 January 1992
WELL STATUS:	Plugged and abandoned, dry with oil shows

TOTAL DEPTH:	Drillers Depth (DD)	Loggers Depth (LD)
	4525 m BRT	4525.5 m BRT 4503.5 m SS

1. DATA COLLECTION

1.1 CUTTINGS SAMPLES TAKEN

Table 1.1: Cuttings Samples Taken

Purpose	Type	Company	No. of Sets	Drilled Interval (mBRT DD)	Sample Interval (m)
Distribution	Washed and dried cuttings	BPN CONOCO NPD/OD	1 1 1	1100-3800 3800-3958 3958-4525	10 5 3
Bulk Storage	Unwashed cuttings	BPN CONOCO STATOIL NPD/OD	1 1 1 1	1100-3800 3800-3958 3958-4525	10 5 3
Biostrati-graphical Analysis	Unwashed cuttings	BPN	1	1100-3800 3800-3958 3958-4525	10 5 3
Geochemical Analysis	Unwashed cuttings, sealed	BPN	1	2000-4040 4040-4525	30 5

NOTES: For Comparison of driller's and logger's depth see Table 1.4

REFERENCE: BP Norway Ltd. U.A. (1991a and b), Exlog Rig Site Geologist

1.2 CORES TAKEN

Well 2/1-10 was cored across the Gyda Formation, 95.5 meters in total. The interval was cored in five runs using 27 meter core barrels. The core diameter was 4" (8 1/2" core bit).

One inch horizontal priority core plugs were cut every 1 meter at the wellsite for "Quick Turnaround Measurements" of porosity, permeability and grain density. 97 partially cleaned core plugs were analysed within 24 hours of receipt at Norcore's laboratory. The priority core analysis data was used in correlating log results prior to the decision to abandon the well.

The rest of the core was cut into one metre sections and preserved in capped aluminium core barrels. On arrival to Norcore's laboratory in Stavanger the state of preservation of the cores were good.

Table 1.2: Cored Interval

No.	Interval Cored		Recovery		Comments
	Hole diameter (inches)	m BRT DD	m	%	
1	8.5	4193 - 4220.5	27.5	100	
2	8.5	4220.5 - 4246	25.2	95	
3	8.5	4246 - 4272.5	26.5	100	
4	8.5	4272.5 - 4278.5	5.7	95	
5	8.5	4278.5 - 4288.5	9.9	99	

Note that drillers (coring) depth is 0.7 meter deeper than loggers depth through the reservoir section. Maximum hole deviation is 7.6° at TD.

1.3 PRESERVED CORE SAMPLES

A portion of the core was preserved for further laboratory analysis. A 30 centimetre whole core sample is preserved for every 2 meters of cored interval. The whole core samples (47 in total) were preserved by wrapping in cling film and aluminium foil before dipping them in hot wax. A listing of preserved whole core samples is contained in the Norcore A/S conventional core analysis report (Norcore A/S, 1991).

1.4 WIRELINE LOGS RUN

Table 1.3: Logs Run

Run No	Date	Log	Logged Interval (m BRT LD)	Hole Size (inch)	Opr Time (min)	Lost Time (min)
1A	3/12/91	DIL-LSS-GR	89 - 3238.5	12 1/4"	465	0 [1]
2B	30/12/91	DLL-MSFL-SDT-GR	3233 - 4525.5	8 1/2"	720	0
2A	31/12/91	LDL-CNL-GR	4050 - 4525.5	8 1/2"	300	0
2A	31/12/91	RFT-GR-SAMPLER	4193 - 4463	8 1/2"	840	75 [2]
2A	31/12/91	SHDT-GR	3800-4525.5	8 1/2"	255	0
2B	31/12/91	RFT-GR-SAMPLER	4226.5	8 1/2"	405	0
2A	1/01/92	CHECK SHOT	1000 - 4375	8 1/2"	360	0 [3]
2A	1/01/92	CST-GR	4110 - 3840	8 1/2"	375	25 [4]
3B	7/01/92	CST-GR	4515 - 4300	8 1/2"	540	20 [5]
3C	7/01/92	CST-GR	4191 - 3796	8 1/2"	435	0 [6]

1 Compressional and Shear waves recorded.

2 HP-crystal gauge used for pressure recording. Rubber-pad on RFT was lost during logging. This was probably the reason for the seal failures encountered (20 in total).

3 Not able to record check shot survey below 4380 m BRT due to hole conditions.

4 Not able to go down below 4280 m BRT due to bad hole conditions. The run was abandoned. Recovered 2 cores out of 9 fired (10 initiated) from the interval 4110 to 3840 r BRT. A wiper trip was needed to complete the CST programme.

5 Initiated 31 bullets from 4515 to 4302 m BRT. Got stuck at 4302 m, but came free by pulling approximately 10,000 lbs with the drawwork using a T-bar. Recovered 8 cores out of 11 fired.

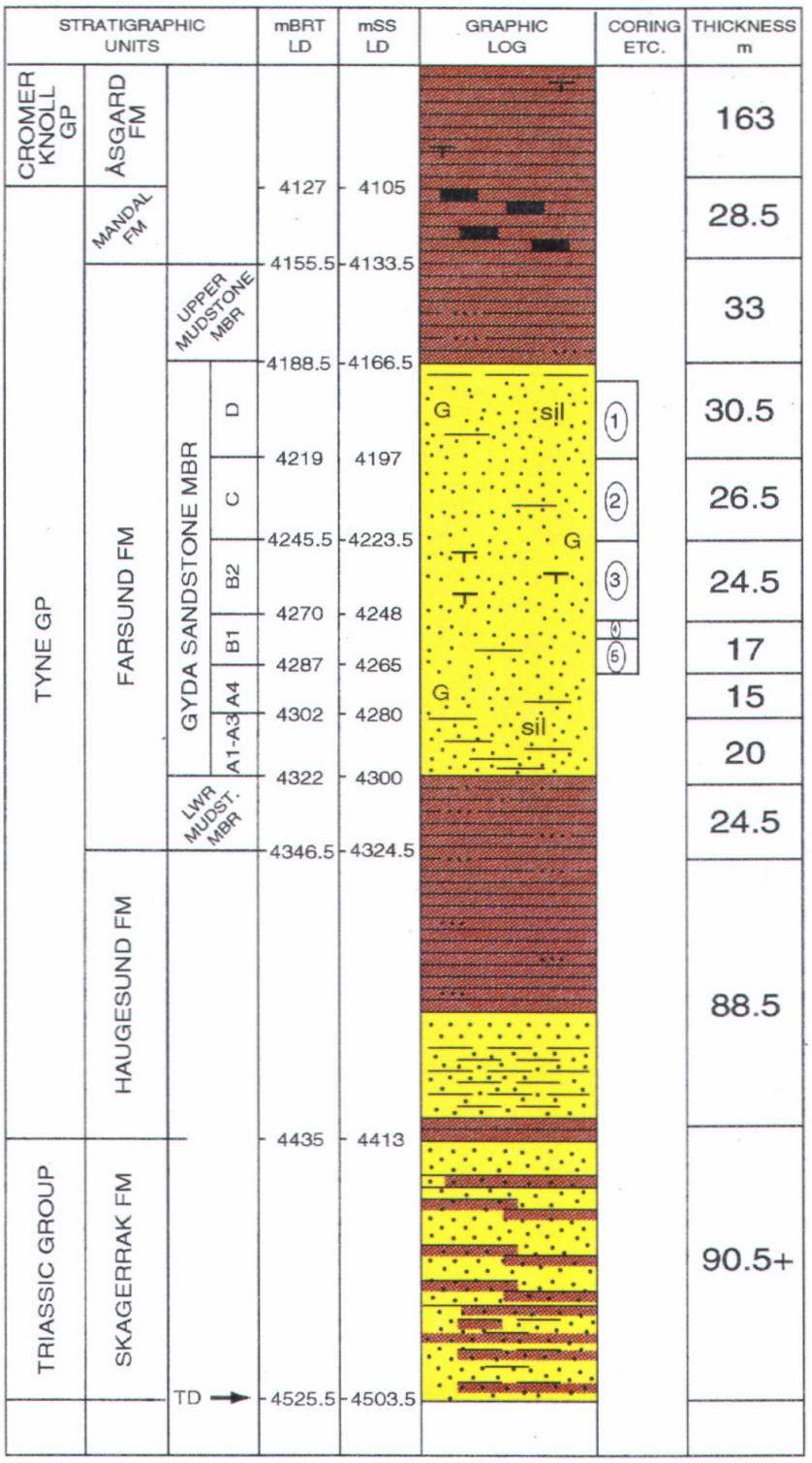
6 Initiated 30 bullets from 4191 to 3796 m BRT. Recovered 10 cores out of 30 fired.

The following comparisons were noted between driller's and loggers's depth:

Table 1.4: Driller's and logger's depth

Size	Driller's Depth m MD BRT	Logger's Depth m MD BRT	Remarks
30"/20" Casing	160.0	N/A	Casing depth
17 1/2" hole TD	1101	N/A	
13 3/8" Casing	1096.0	1094.5	Casing depth
12 1/4" hole TD	3242.0	3241.5	
9 5/8" Casing	3234	3233	Casing Depth
8 1/2" hole TD	4525	4525.5	TD Depth

Summarised Reservoir Section
Well 2 / 1-10



Comments

1. RTE = 22m
2. Core to log shift: LD = DD+1m
3. Cored interval
   #1: 4193 - 4220.5m BRT DD
   #2: 4220.5 - 4246m BRT DD
   #3: 4246 - 4272.5m BRT DD
   #4: 4272.5 - 4278.5m BRT DD
   #5: 4278.5 - 4288.5 m BRT DD
4. Full geological section in Encl. 1 and Fig. 1.2

Fig.2.1
MC.NO.2235

2.GEOLOGY

2.1 STRATIGRAPHY

A biostratigraphical analysis of the interval from 3780m to 4459.5m was carried out by Haliburton (1992). Table 2.1 sums up the results of this study.

A lithostratigraphical breakdown of the well is given in Table 2.2 based on NPD nomenclature (Vollset, J. & Dore, A.G., 1984, Isaksen, D. & Tonsdad, K., 1989). The reservoir section is summarised in Fig. 2.1.

Table 2.1: Chronostratigraphy

Period	Stage	Depth Interval (m BRT LD)*
LATE CRETACEOUS	UNDIFFERENTIATED	3323 - 3796
	TURONIAN	3796 - 3810
EARLY CRETACEOUS	LATE ALBIAN	3860 - 3880
	EARLY APTIAN	3910
	EARLY BARREMIAN	3930 - 3950
	LATE HAUTERIVIAN	3955
	EARLY VALANGINIAN	3976 - 4009
	LATE RYAZANIAN	4039 - 4100
	EARLY RYAZANIAN	4127 - 4145
LATE JURASSIC	LATE PORTLANDIAN	4160
	EARLY PORTLANDIAN	4169 - 4212.23
	LATE KIMMERIDGIAN	4214.35 - 4260
	'MID' KIMMERIDGIAN	4276.18 - 4280.23
	EARLY KIMMERIDGIAN	4371 - 4433

* Log to Core shift: LD = DD - 1m

Table 2.2: Lithostratigraphy

Lithostratigraphy	Top mBRT ld	Top mSS ld	Thick-ness	Lithological Description
NORDLAND GP				Mudstone: Medium - light grey, green grey, brown grey, very soft, non moderate calcareous, traces pyrite
HORDALAND GP	1711.5	1689.5	1265	Mudstone: Brown grey, green grey, soft, sticky, silty and calcareous in parts, traces of limestone
ROGALAND GP	2976.5	2954.5	244	
Balder Fm	2976.5	2954.5	26.5	Mudstone: Light to medium grey, speckled light blue green, tuffaceous
Sele Fm	3003.0	2981.5	12	Mudstone: Light grey, soft , amorphous, non - sl calc.
Lista Fm	3015.0	2993.0	96	Mudstone: Medium grey to brown grey, soft to firm, amorphous. Sandstone: White to light grey, fine - very fine, subangular.
Vidar Fm	3111.0	3089.0	32	Limestone: White, moderately hard, chalky mudstone, trace chert.
Lista Fm	3143.0	3121.0	25	Mudstone: Medium grey brown, green grey, soft to firm, silty, calcareous.
Våle Fm	3168.0	3146.0	52.5	Mudstone: Varicoloured medium to light grey, grey brown, red brown, red orange, grey green, amorphous, non calc.
SHETLAND GP	3220.5	3198.5	631	
Ekofisk Fm	3220.5	3198.5	102	Limestone: Wh - very light grey, soft to firm, lime mudstone, chalky, argillaceous, traces of chert.
Tor Fm	3322.5	3300.5	284.5	Limestone: White, mod hard, lime mudstone, chalky, traces of chert.
Hod Fm	3607	3585	182	Limestone: Off white to pale grey, pale pink to light pinky brown, soft to firm, argillaceous, glauconitic.
Blodøks Fm	3789	3767	33	Mudstone: Light to medium grey, heterogeneous, very calcareous, locally silty. Siltstone: Light to medium grey, grey brown, heterogeneous, very calcareous, traces of glauconite.
Hidra	3822	3800	29.5	Limestone:: White, pale grey - grey white, homogeneous, compact mudstone, locally chalky wackstone, argillaceous.
CROMER KNOLL GP	3851.5	3829.5	275.5	
Rødby Fm	3851.5	3829.5	37.5	Mudstone: Light to medium grey, grey blue, occasionally pale pink brown, speckled black, non to slightly calcareous, silty, traces of glauconite
Sola Fm	3889	3867	25	Mudstone: Light to medium grey blue, red brown, heterogeneous, calcareous, silty, occasionally glauconitic, traces of glauconitic sandstones

Lithostratigraphy	Top mBRT ld	Top mSS ld	Thick-ness	Lithological Description
Tuxen Fm	3914	3892	50	Mudstone: Light grey to grey blue, homogeneous, very argillaceous grading very calcareous mudstone
Åsgard Fm.	3964	3942	163.0	Mudstone: Light to medium grey, brown, homogeneous, becoming slightly calcareous,.Traces of Limestones: White, homogeneous, compact mudstone.
TYNE GROUP	4127	4105	308	
Mandal Fm.	4127	4105	28.5	Mudstone: Dark brown balck, subfissile, homogeneous, carbonaceous, traces of pyrite
Farsund Fm.	4155.5	4133.5	191	
Upper Mdst Mbr	4155.5	4133.5	33.0	Mudstone: Medium to dark grey, grey brown, locally moderately, carbonaceous, locally very silty.
Gyda Sst Mbr	4188.5	4166.5	133.5	Sandstone: Light to medium grey, very fine to fine, subangular, subspherical, locally argillaceous and calcareous.
Zone D	4188.5	4166.5	30.5	
Zone C	4219	4197	26.5	
Zone B2	4245.5	4223.5	24.5	
Zone B1	4270	4258	17.0	
Zone A4	4287	4265	15	
Zone A1-A3:	4302	4280	20	
Lower Mdst Mbr	4322	4300	24.5	Mudstone: Light brown to medium grey, silty, sandy, slightly calcareous, locally grading sandstone
Haugesund Fm	4346.5	4324.5	88.5	Mudstone: Varicoloured light grey - white, dark grey, homogeneous, silty, sandy, locally grading sandstone. Sandstone: Light grey, soft, fine, subangular.
TRIASSIC	4435	4413	90.5+	Sandstone: and interbedded Mudstone: Varicoloured red brown, light to medium grey, light brown, green, white, amorphous, slightly sandy. Sandstone:White to light grey, fine to very fine, subang, silic cem, trace chlorite, trace pyrite.
TD	4525.5	4503.5		

2.2 HYDROCARBON SHOWS

Table 2.3: Hydrocarbon Shows

Drilled Depth (m BRT)	Strati-graphy	Gas Composition (%)	Oil Shows	
			Fluorescence	Cut Fluorescence
1100-3220.5	Nordland Gp Hordaland Gp Rogaland Gp	TG: 0.01 - 1.70 C1: 0.018 - 1.479 C2: 0 - 0.0025 C3: 0 - 0.0010 C4: 0 - 0.0010	None	
3220.5-3849	Shetland Gp	TG: 0.01 - 0.25 C1: 0.001 - 0.2367 C2: 0 - 0.0035 C3: 0 - 0.0005 C4: 0 - 0.0003	None	
3849-3916	Rødby Fm Sola Fm	TG: 0.01 - 0.03 C1: 0.005 - 0.017 C2: 0. - 0.0009 C3: 0 - 0.0002 C4: 0	None	
3916-3965	Tuxen Fm	TG: 0.02 - 0.45 C1: 0.02 - 0.142 C2: 0.002 - 0.053 C3: 0.0006- 0.032 C4: 0.0002 - 0.013	None- poor dull yellow	Slow, streaming, yellow
3965-4125	Åsgard Fm	TG: 0.02 - 0,13 C1: 0.004 - 0.0419 C2: 0,0007-0.0118 C3: 0 - 0.0071 C4: 0	None	
4125-4189	Mandal Fm	TG: 0.39 - 0.35 C1: 0.096 - 1.199 C2: 0.036 - 0.410 C3: 0.030 - 0.196 C4: 0.010 - 0.083	None-poor dull yellow	Moderate fast-instantaneous streaming bright blue- white
4189-4316.5	Farsund Fm (Gyda Sandstone)	TG: 0.02 - 3.8 C1: 0.004 - 1.123 C2: 0.001 - 0.410 C3: 0.004 - 0.227 C4: 0 - 0.071	Good yellow white in top 5m. Intermittent & patchy elsewhere	Slow, streaming, pale yellow
4346-4525	Haugesund Fm Skagerak Fm	TG: 0.02 - 0.24 C1: 0.004 - 0.073 C2: 0.001 - 0.028 C3: 0 - 0.014 C4: 0 - 0.007	None	

NOTES:
TG=Total Gas
C1=Methane
C2=Ethane
C3=Propane
C4=Butane

REFERENCE: Exlog Rig Site Geologist

2.3 CORE DESCRIPTION

Five cores were cut in the Gyda formation from 4193m to 4288.5m BRT DD (95.5 m). For core recovery see section 1.1. A core description summary is given in Enclosure 2. For a more detailed sedimentological description and interpretation see separate sedimentology report (Cade et al., 1992)

2.4 SIDE WALL CORE DESCRIPTION

Three CST runs were made.

In run 2A it was not possible to go down below 4280m BRT LD due to deteriorating hole. The run was aborted after a total of 10 bullets were shot at a shallower interval than originally planned, 2 SWC were recovered, 7 lost and 1 misfired.

A wiper trip was needed to complete the CST programme.

Run 3B was aborted due to the tool getting stuck at 4302 m. The tool was pulled after getting free to check the tool for damage.Run 3B shot a total of 31 bullets, (8 recovered, 3 lost, and 20 was misfired).

Run 3C shot 30 bullets (10 recovered and 20 lost).

Table 2.4: Sidewall Core Descriptions

SWC No	Logged Depth m BRT	Recovery (cm)	Lithology	Fluorescence
RUN 2A				
1	4110	LOST		
2	4080	LOST		
3	4055	LOST		
4	4035	LOST		
5	4000	LOST		
6	3955	2 (rubble)	LIMESTONE: medium grey, moderately hard, brittle,blocky, occasionally platy, homogeneous, compact mudstone, very slight traces of finely disseminated pyrite.	
7	3935	2 (rubble)	MUDSTONE: dark grey black, moderately hard, brittle, blocky, homogeneous, very calcareous, non swelling.	
8	3900	LOST		
9	3870	MISFIRE		
10	3840	LOST		
11-30?			CST run aborted due to deteriorating hole conditions	
RUN 2B				
1	4515.0	LOST		
2	4490.0	3 (rubble)	SANDSTONE: quartz, light brown, moderately hard, friable, heterogeneous, grainstone, quartz, very fine, subangular, subspherical, well sorted, moderate siliceous cement, locally patchy calcareous cement and inclusions, abundant argillaceous matrix, abundant dark very fine brown specs	
3	4484.0	MISFIRE		

SWC No	Logged Depth m BRT	Recovery (cm)	Lithology	Fluorescence
4	4467.5	2	SILTSTONE with SANDSTONE inclusions: SILTSTONE: medium red brown,firm to moderately hard, brittle,blocky, locally calcareous inclusions, micromicaceous, locally sandy grading sandstone. SANDSTONE: quartz, light blue grey, firm, friable, blocky, heterogeneous,grainstone, quartz, very fine, clear, white, translucent, subangular, locally subrounded, subspherical, moderately well sorted, quartz cemented, light blue grey argillaceous matrix, locally rare traces of dark brown flecks, micromicaceous.	
5	4459.5	2 (rubble)	MUDSTONE (silty) locally grading SANDSTONE: MUDSTONE: medium red brown, firm to moderately hard, brittle, blocky, occasionally flaky, heterogeneous, micromicaceous, locally very silty and sandy grading sandstone. SANDSTONE: quartz, grey blue to blue green, medium brown, very hard, brittle, blocky, heterogeneous, grainstone, quartz, very fine to fine, clear, brown, white, angular to subangular, subspherical, modertate to poor sorting, abundant medium brown argillaceous matrix, trace blue green mineral, abundant very fine mica.	
6	4459.0	MISFIRE		
7	4450.5	1	SANDSTONE: quartz, light blue grey, soft, crumbly, homogeneous, grainstone, quartz, very fine, occasionally fine, clear, translucent, subangular, Subspherical, light blue grey argillaceous matrix.	
8	4441.5	LOST		
9	4434.0	MISFIRE		
10	4433.0	2 (rubble)	MUDSTONE: medium to dark grey, firm, brittle, occasionally sticky, blocky, homogeneous, silty to sandy, locally abundant very fine sand grains, clear, subrounded, subspherical, non calcareous, slightly calcareous sandstone lenses	

SWC No	Logged Depth m BRT	Recovery (cm)	Lithology	Fluorescence
11	4410.0	1.5	SANDSTONE: quartz, pa brown white, soft to firm, crumbly to friable, heterogeneous, grainstone, quartz, very fine, clear, translucent, subangular to subrounded, subspherical, moderately well sorted, white and brown argillaceous matrix, non calcareous, hydroturgid, locally clasts of medium grey silty micaceous mudstone.	
12	4394.5	MISFIRE		
13	4380.0	1 (rubble)	SILTSTONE: medium grey, grey brown, speckled white, firm, blocky, heterogeneous, rare trace mica, sandy, calcareous.	
14	4371.0	1 (rubble)	SILTSTONE: medium grey, grey brown, speckled white, firm, friable, blocky, heterogeneous, traces of mica, locally very sandy grading very fine sandstone, calcareous.	
15	4360.0	MISFIRE		
16	4350.0	MISFIRE		
17	4345.0	MISFIRE		
18	4340.0	MISFIRE		
19	4335.0	MISFIRE		
20	4330.5	MISFIRE		
21	4326.0	MISFIRE		
22	4322.5	MISFIRE		
23	4320.0	MISFIRE		
24	4318.0	MISFIRE		
25	4316.0	MISFIRE		
26	4314.0	MISFIRE		
27	4310.0	MISFIRE		
28	4308.0	MISFIRE		
29	4304.0	MISFIRE		
30	4302.0	MISFIRE		
31	4300.0	LOST		
32-60			Run 3B aborted due to tool becoming stuck at 4302 mBRT.	

SWC No	Logged Depth m BRT	Recovery (cm)	Lithology	Fluorescence
RUN 3C				
1	4191.0	2 (broken)	SANDSTONE/SILTSTONE: quartz, medium brown, brown grey, soft, friable, homogeneous, grainstone, quartz, very fine grading siltstone, clear, subangular to subrounded, subspherical, moderately well sorted, minor calcareous cement, abundant medium brown argillaceous matrix.	
2	4190.0	1 (broken)	SANDSTONE: quartz, medium brown, brown gray, soft, friable, locally firm, blocky, homogeneous, grainstone, quartz, very fine, clear, subangular to subrounded, subspherical, moderately well sorted, poor to moderately calcareous cemented, abundant medium brown argillaceous matrix	
3	4188.0	LOST		
4	4186.0	LOST		
5	4184.0	1 (broken)	SILTSTONE: light to medium grey, soft to firm, occasionally slightly sticky, heterogeneous, occasionally very fine sand, locally calcareous.	
6	4182.0	LOST		
7	4180.0	LOST		
8	4178.0	LOST		
9	4176.0	LOST		
10	4174.0	LOST		
11	4172.0	LOST		
12	4170.0	LOST		
13	4168.0	LOST		
14	4166.0	1	MUDSTONE: dark brown black, moderately hard, platy, subfissile, homogeneous, carbonaceous, slightly silty, locally calcareous.	
15	4164.0	LOST		
16	4162.0	LOST		

SWC No	Logged Depth m BRT	Recovery (cm)	Lithology	Fluorescence
17	4160.0	2 (broken)	MUDSTONE: dark brown black, moderately hard to hard, brittle, blocky, platy, subfissile, slightly carbonaceous, homogeneous, slightly silty, non calcareous.	
18	4158.0	LOST		
19	4156.0	LOST		
20	4152.0	1.8	MUDSTONE: dark brown black, hard to very hard, brittle, blocky, splintery, flaky, moderately carbonaceous, slightly silty, non calcareous.	
21	4148.0	LOST		
22	4144.0	LOST		
23	4140.0	LOST		
24	4136.0	LOST		
25	4132.0	LOST		
26	4128.0	LOST		
27	4126.0	0.5 (rubble)	MUDSTONE: medium to dark grey brown, hard, brittle, blocky, homogeneous, calcareous.	
28	4124.0	2.5	MUDSTONE: light to medium grey, firm, blocky, homogeneous, very calcareous.	
29	3820.5	1 (rubble)	SANDSTONE: quartz, light grey blue, blue white, hard, heterogeneous, grainstone, quartz, fine, occasionally very fine, occasionally medium, clear, translucent, subangular to subrounded, subspherical, calcareous cemented, light grey blue argillaceous matrix, glauconite specs. Also MUDSTONE: light to medium brown, firm, heterogeneous, very calcareous, very silty grading siltstone.	
30	3796	1.5 broken)	LIMESTONE: light grey to white, speckled blue green, moderately hard, blocky, heterogeneous, chalky wackstone, compact wackstone to packstone, abundant fine glauconite specs, good visible porosity, very argillaceous grading very calcareous mudstone.	
31				

REFERENCE: BP Norway Ltd. U.A. (1991b), Exlog Rig Site Geologist

Well 2 / 1-10 Core Analysis

Core Data

FIELD: GYDA WELL: 2110 PLOT: PLCOR MD CURVE IN METERS

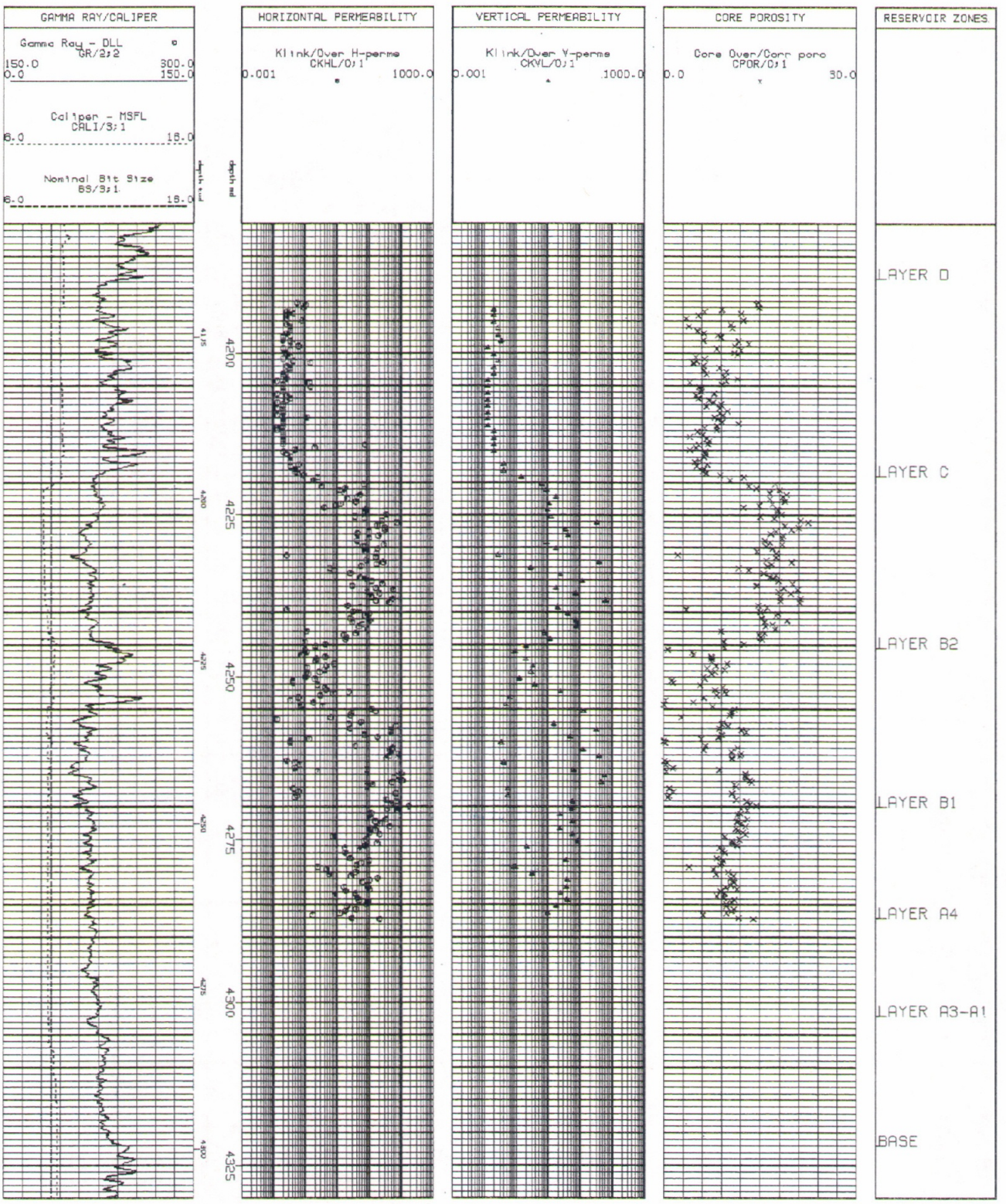


Fig.3.1

3 FORMATION EVALUATION

3.1 CORE ANALYSIS

On receipt of the core in the laboratory the natural Gamma radiation was measured and a Spectral Gamma Log produced on a scale of 1 to 200.

Routine core analysis was performed on 283 horizontal core plugs cut from the whole cored interval at 0.35 m intervals. The following parameters were determined:

- o helium porosity
- o horizontal air permeability
- o horizontal liquid permeability (Klinkenberg corrected air permeability)
- o grain density

Routine core analysis was also performed on 92 vertical core plugs cut at 1 m intervals. The following parameters were determined:

- vertical air permeability
- vertical liquid permeability (Klinkenberg corrected air permeability)

Results of the core analysis are shown in Figure 3.1. A listing of porosity, permeability and grain density is contained in the Norcore A/S conventional core analysis report, (Norcore, 1992).

Core porosity and permeability from conventional core analysis were corrected to a overburden pressure of 4000 psi as given by the Gyda 1Q90 Petrophysical Study (BP, 1992).

A comparison was made between the "Fast Turnaround measurements" and the conventional core analysis results. The results indicate that the conventional core porosities are approx. 1 - 2 p.u. higher than the fast turnaround core porosities. This difference is assumed to be due to the more thorough core cleaning procedure applied for the conventional core analysis. The difference in permeabilities are considerably larger. The core permeabilities from the conventional core analysis is approximately +/- 50 % compared to the "Fast Turnaround measurements". The difference between the permeabilities is most likely due to different lithology since the conventional and "Fast Turnaround measurements" are taken on different core plugs. The depth trend in porosity and permeability based on the two methods are similar.

Further use of the conventional core data is discussed in Section 3.2.2.

Well 2 / 1-10 Raw Logs

GR-RT-DT

FIELD: GYDA WELL: 2110 PLOT: RAW MD CURVE IN METERS

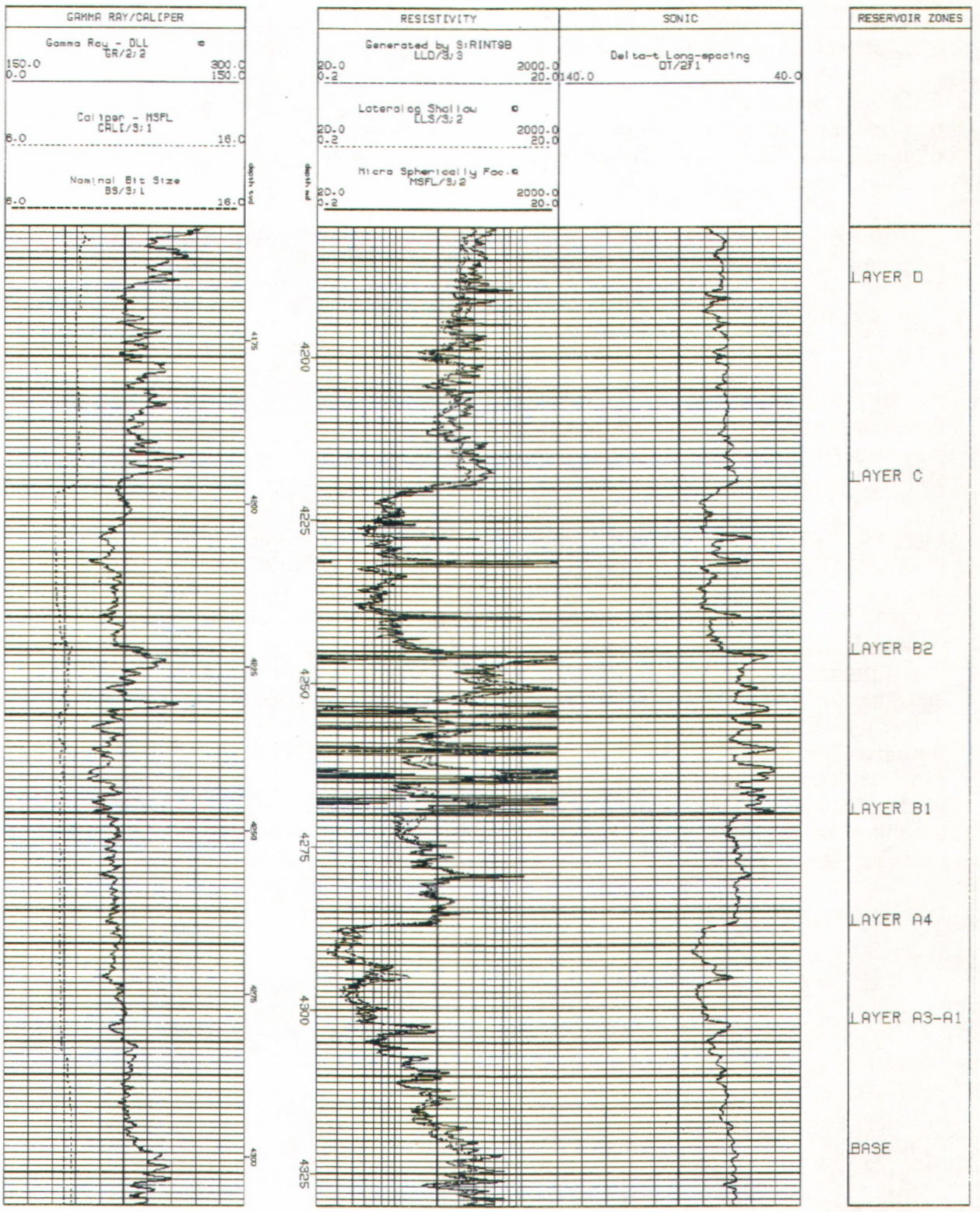


Fig.3.2

3.2 LOG ANALYSIS

3.2.1 Log Quality

Log quality was generally good through the reservoir section. All logs repeated well.

Run 2A, LDL/CNL/GR, was depth shifted -0.3 meters to tie in with Run 2B, DLL/MSFL/SDT/GR.

The DIL, NGT, LDL and the CNL logging tools were all calibrated before and after the logging operation and checked against a master calibration. The other tools used were all calibrated before and after use. All tool calibrations were satisfactory.

The RFT quartz gauge has been used for pressure analysis.

3.2.2 Log Interpretation Technique

The raw logs used in the interpretation are listed in Table 3.1 below.

Table 3.1: Raw Logs Used in the Interpretation

Log Trace	Log Run	Tool
GR	2B	DLL/MSFL/SDT/GR
CALI	2B	DLL/MSFL/SDT/GR
DLL	2B	DLL/MSFL/SDT/GR
MSFL	2B	DLL/MSFL/SDT/GR
DT	2B	DLL/MSFL/SDT/GR
RHOB	2A	LDL/CNL/GR

The raw logs used in the log interpretation are presented in Figure 3.2 and 3.3.

Borehole corrections have been applied to the density log, neutron log, gamma ray log, latero log and the MSFL log. Invasion corrections have been applied to the latero log and the MSFL log.

The layering seen in well 2/1-10 is of similar quality and characteristics as found in the Gyda Field. A similar approach was therefore used in defining well 2/1-10 layer characteristics and definitions. Table 2.2 presents the reservoir layering used in the log interpretation.

Porosities used in the interpretation were taken from overburden corrected core measurements in the cored reservoir zones (D, C, B2 and B1). In the zones not cored (A4 and A3-A1), the porosities were calculated from the bulk density log regressed to the overburden corrected core porosity using Gyda 1Q90 regression constants (BP, 1990). The Gyda 1Q90 regression constants are believed appropriate for porosity correlations in the A-zones as they worked well through the cored zones, D, C, B2 and B1.

Well 2 / 1-10 Raw Logs

GR-NPHI-RHOB

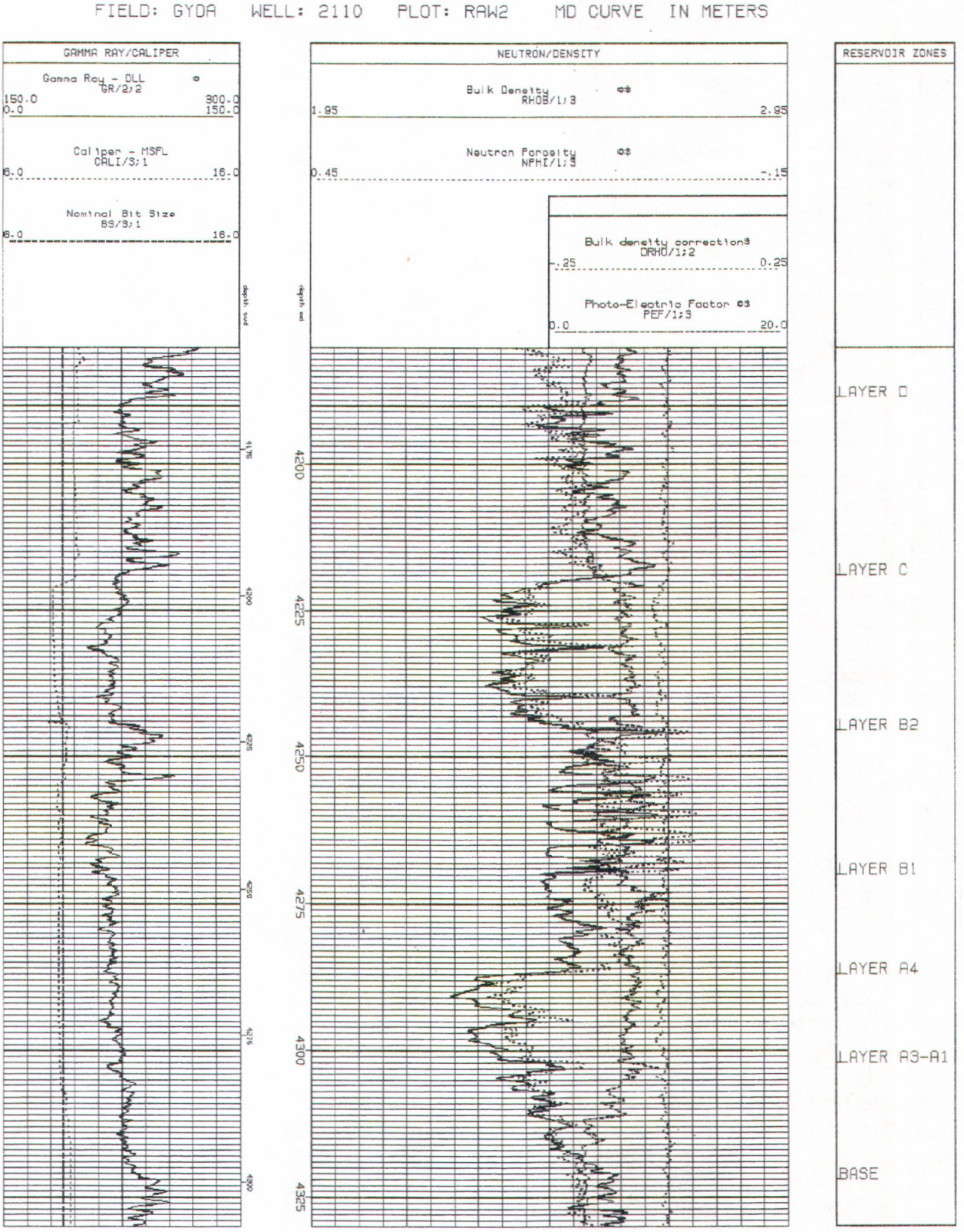


Fig.3.3

However, for the matter of regional well correlations, regression constants for porosity correlations between the density log and core porosity have also been generated for the cored reservoir zones.

Table 3.2 presents average core grain density determined by arithmetically averaging the core grain densities over each reservoir layer. The average core grain densities are used in generating the correlation between the density log measurements and the core porosities.

Table 3.2 Average Core Grain Density

Layer	Reservoir zone	Grain density, g/cc	Remarks
1	D	2.697	
2	C	2.652	
3	B2	2.651	
4	B1	2.646	
5	A4	2.647	no core, 1Q90 value
6	A3-A1	2.654	no core, 1Q90 value

The correlations between the density log measurements and the measured core porosity values is of the following form:

$$\phi = a * \text{density log measurement (g/cc)} + b$$

where the constant "a" and "b" are the regression constants and are given in Table 3.3. below. (Layers A4 and A3-A1 are using Gyda 1Q90 regression constants).

Table 3.3 Constants "a" and "b" used in correlating Density Log to Core Porosity

Layer	Reservoir zone	Constant "a"	Constant "b"	Remarks
1	D	-54.8398	147.9030	
2	C	-63.1910	167.5824	
3	B2	-60.3844	160.0791	
4	B1	-61.8867	163.7521	
5	A4	-60.9435	161.3113	no core, 1Q90 value
6	A3-A1	-60.7541	161.2413	no core, 1Q90 value

The density log measurements were regressed to the core porosities forcing the regression line through the average matrix density for each layer shown in Table 3.2.
The correlations derived between the density log measurements and the overburden corrected core porosities by reservoir zone are presented in Figure 3.4 through Figure 3.7.

Zone D, density log - core porosity crossplot

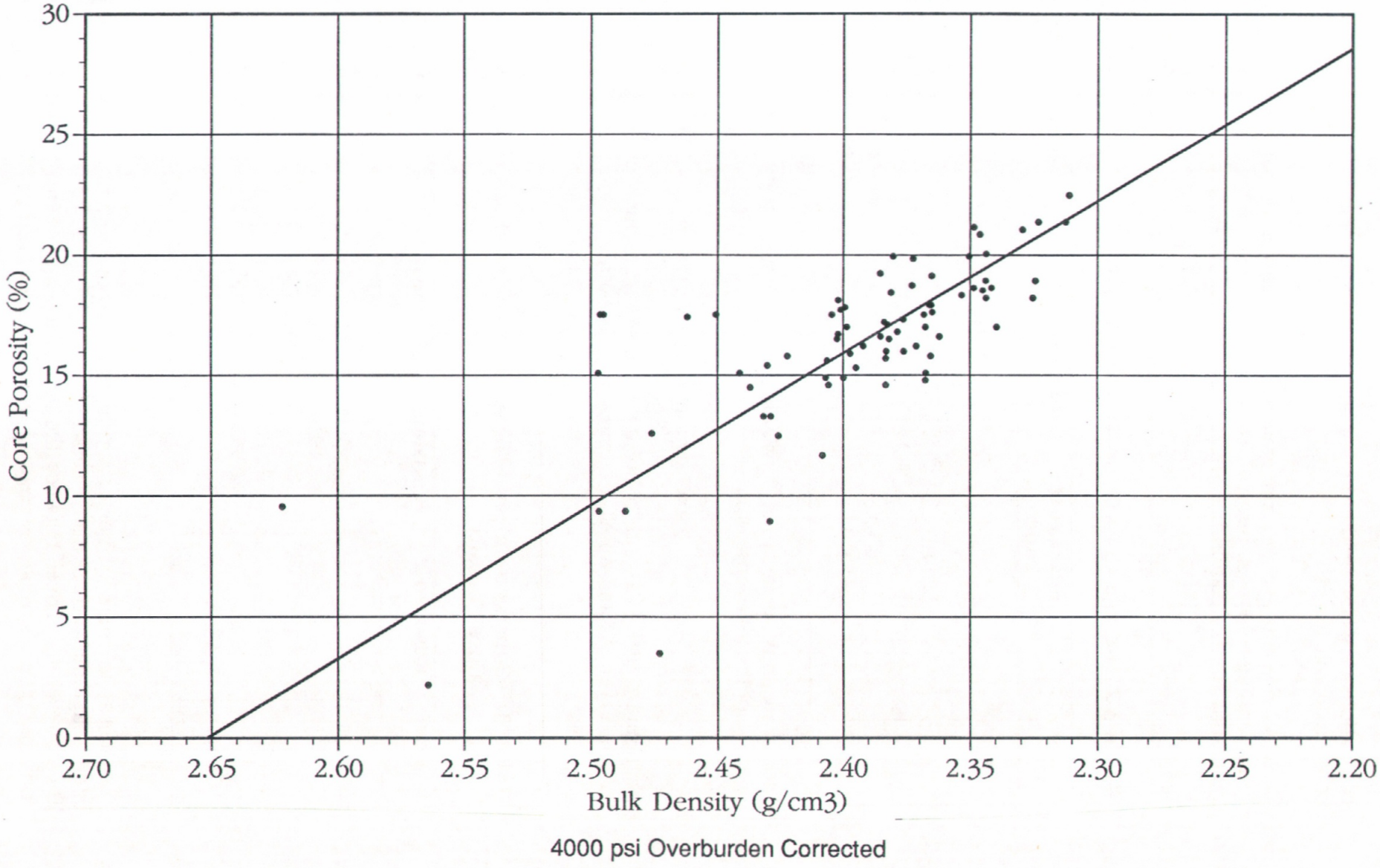
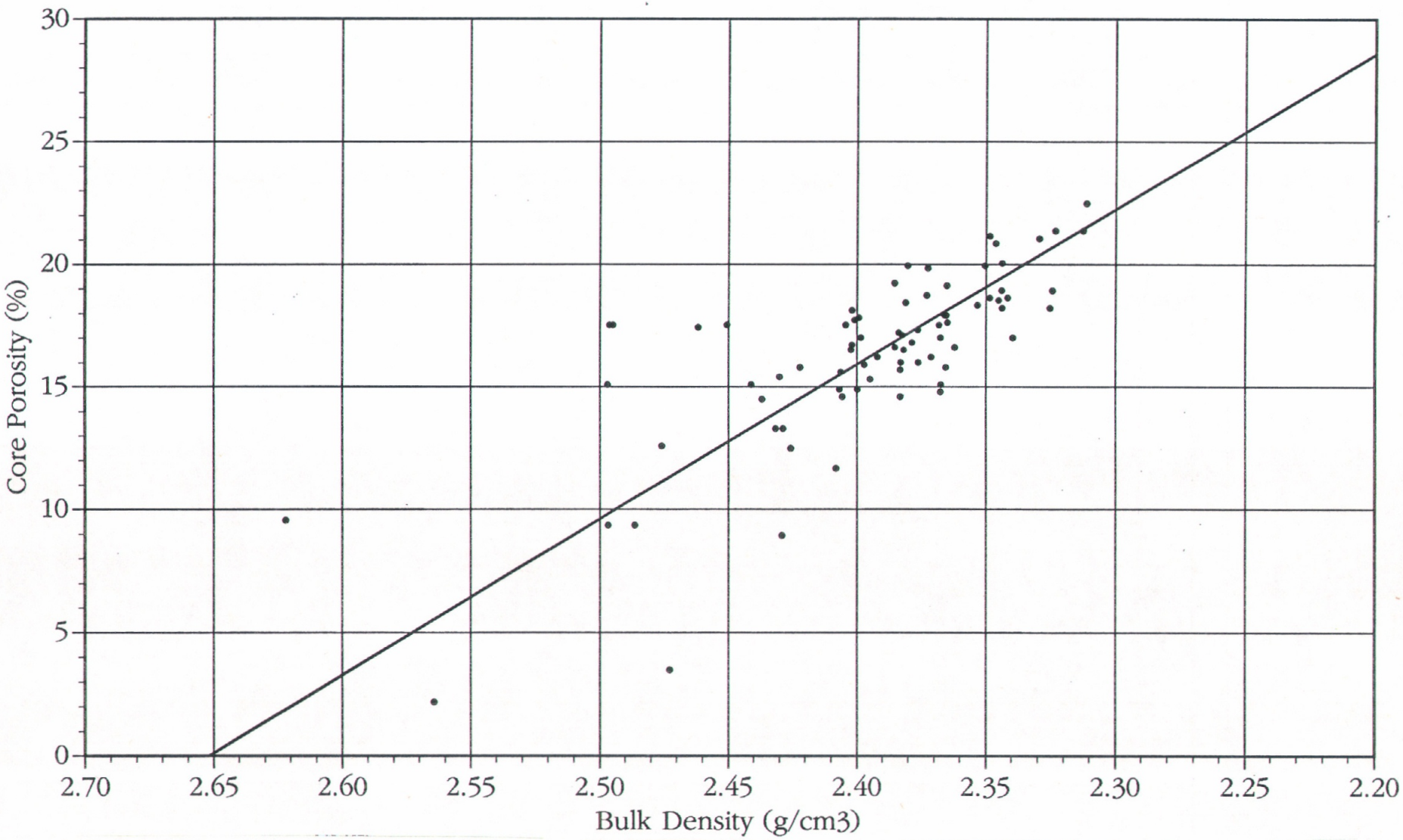


Fig.3.4

Zone C, density log - core porosity crossplot



4000 psi Overburden Corrected

Fig.3.5

Zone B2, density log - core porosity crossplot

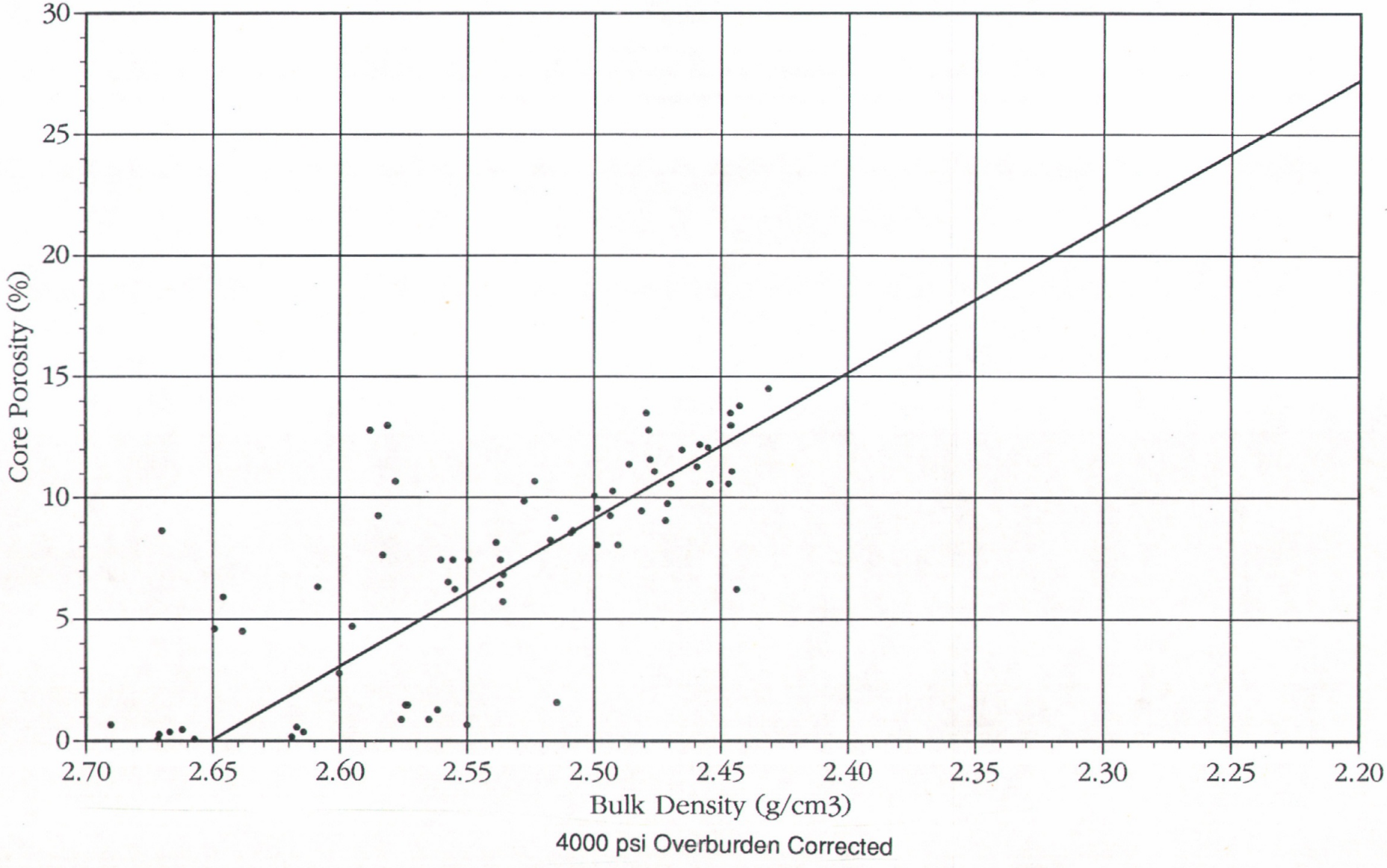


Fig.3.6

Zone B1, density log - core porosity crossplot

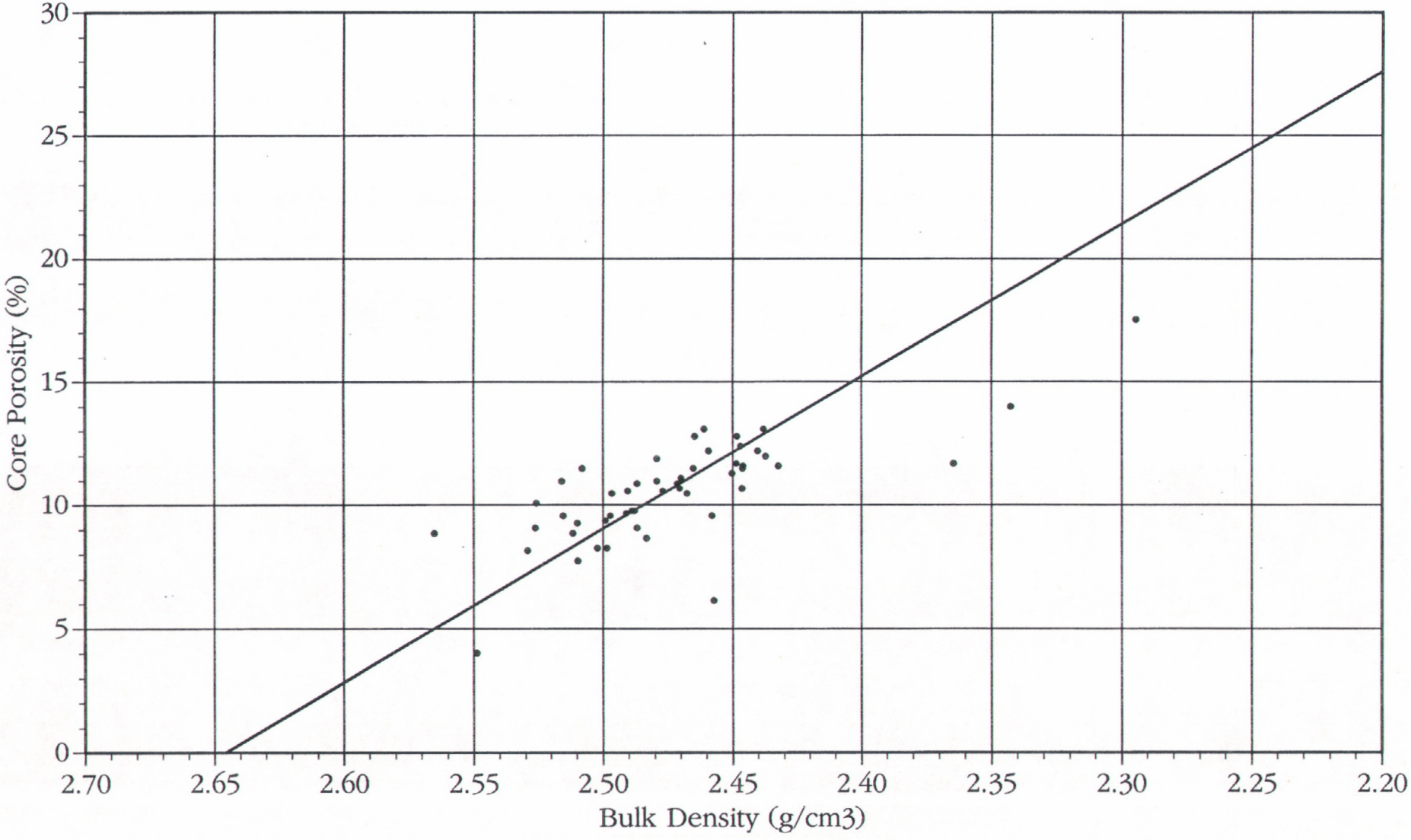


Fig.3.7

Predictions of horizontal and vertical permeabilities were also needed to obtain an estimate of permeabilities in the un-cored lower reservoir interval. The correlations derived between the core porosity and the measured core permeabilities are of the form:

$$\log(k) = a * \phi + b$$

where the constant "a" and "b" are the layer dependent regression constants. The regression constants for predicting horizontal permeabilities are given in Table 3.4. below. Figure 3.8 through Figure 3.11 show the derived correlations between core porosity and the measured core horizontal permeabilities. The Gyda 1Q90 regression constants did not give a good match between predicted and measured permeabilities. Therefore it was decided to use the regression constants generated for zone C in zone A4 and A3-A1.

Table 3.4 Constants "a" and "b" used in correlating Core Horisontal Permeability to Porosity Curve

Layer	Reservoir zone	Constant "a"	Constant "b"	Remarks
1	D	0.0039	-1.5461	
2	C	0.1931	-2.5180	
3	B2	0.2428	-1.6922	
4	B1	0.2789	-2.1641	
5	A4	0.1931	-2.5180	no core, zone C value
6	A3-A1	0.1931	-2.5180	no core, zone C value

A similar approach was used in correlating vertical permeabities to the derived porosity curve. The regression constants obtained in deriving a vertical permeability correlation are presented in Table 3.5 below. Figure 3.12 through Figure 3.15 show the derived correlations between the predicted porosity curve and the measured core vertical permeabilities. The Gyda 1Q90 regression constants did not give a good match between predicted and measured permeabilities. Therefore it was decided to use the regression constants generated for zone C in zone A4 and A3-A1.

Zone D, horizontal core permability - core porosity crossplot

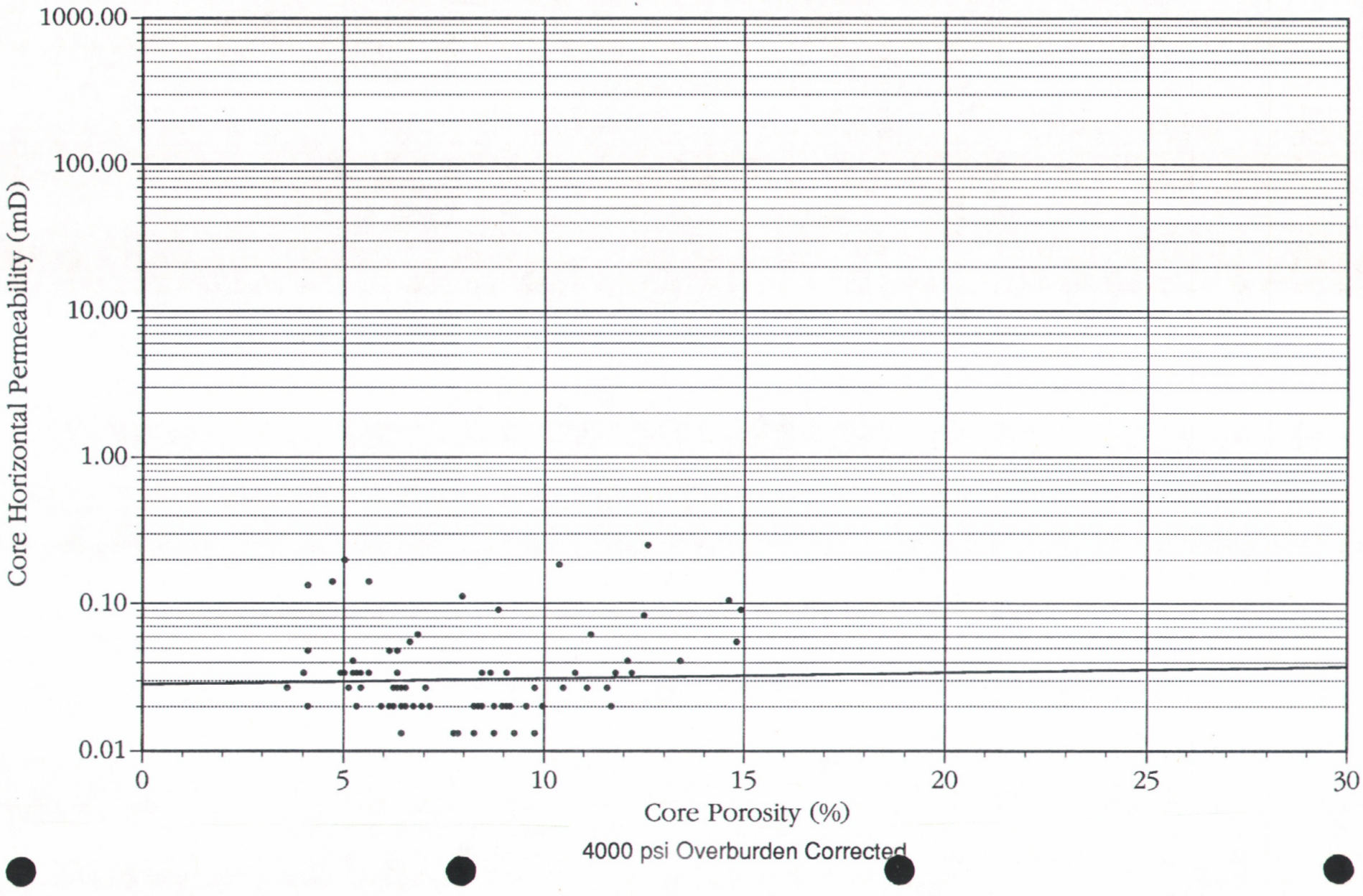


Fig.3.8

Table 3.5 Constants "a" and "b" used in correlating Core Vertical Permeability to Porosity Curve

Layer	Reservoir zone	Constant "a"	Constant "b"	Remarks
1	D	0.0015	-1.7254	
2	C	0.1535	-2.2508	
3	B2	0.2288	-1.6687	
4	B1	0.2322	-2.0455	
5	A4	0.1535	-2.2508	no core, zone C value
6	A3-A1	0.1535	-2.2508	no core, zone C value

All correlations of core data to log data were done using all measured core values from the conventional core analysis (corrected for overburden pressure). A permeability cutoff of 0.3 mD was only applied in generating the net reservoir thickness. This implied that the generated correlations for permeability and porosity are valid for permeabilities above and below 0.3 mD.

Water saturations were determined using the Archie equation. The Archie parameters a, m and n (Gyda Field reservoir layer values) are given in Table 3.6.

Zone C, horizontal core permability - core porosity crossplot

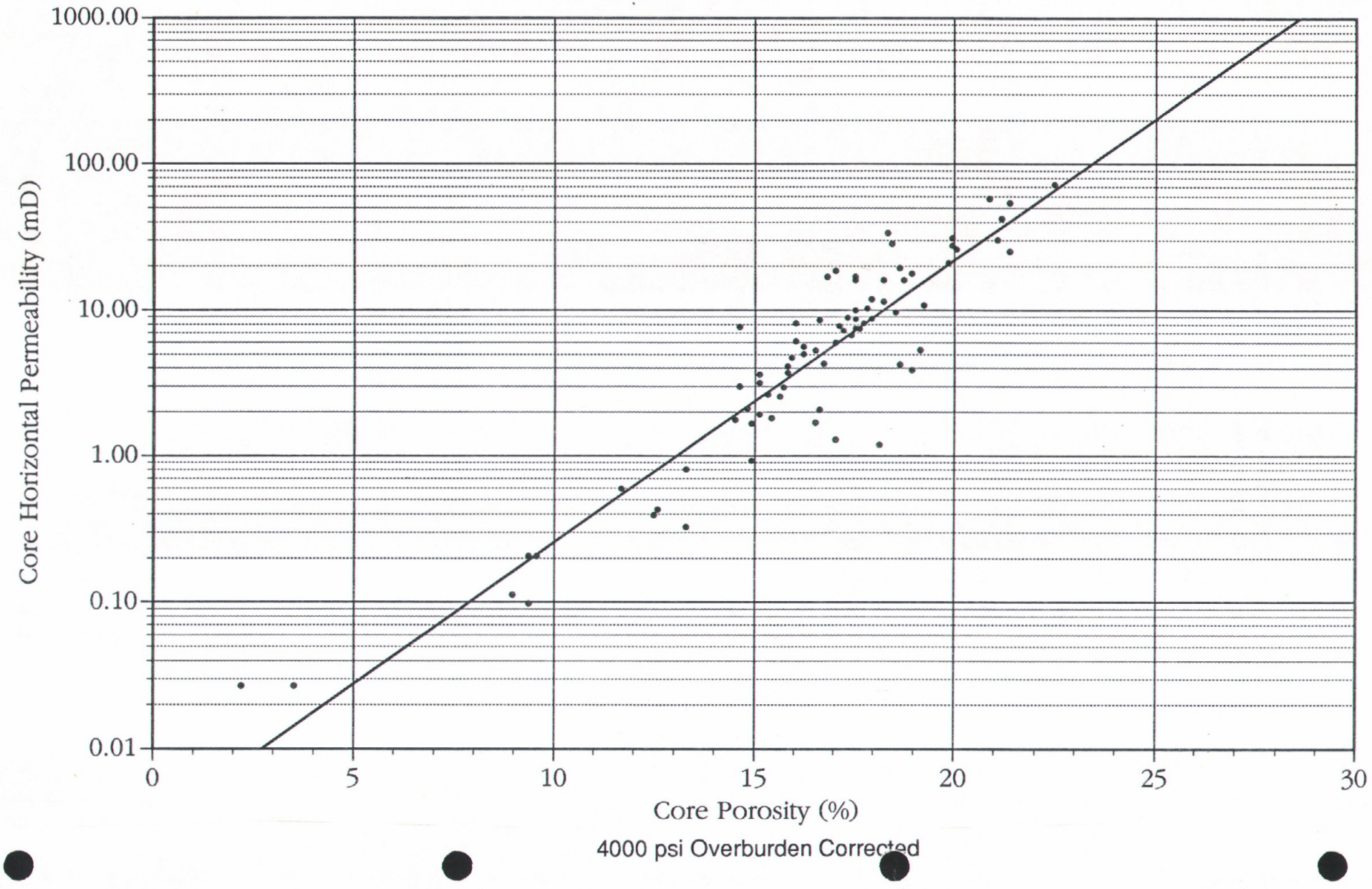


Fig.3.9

Zone B2, horizontal core permability - core porosity crossplot

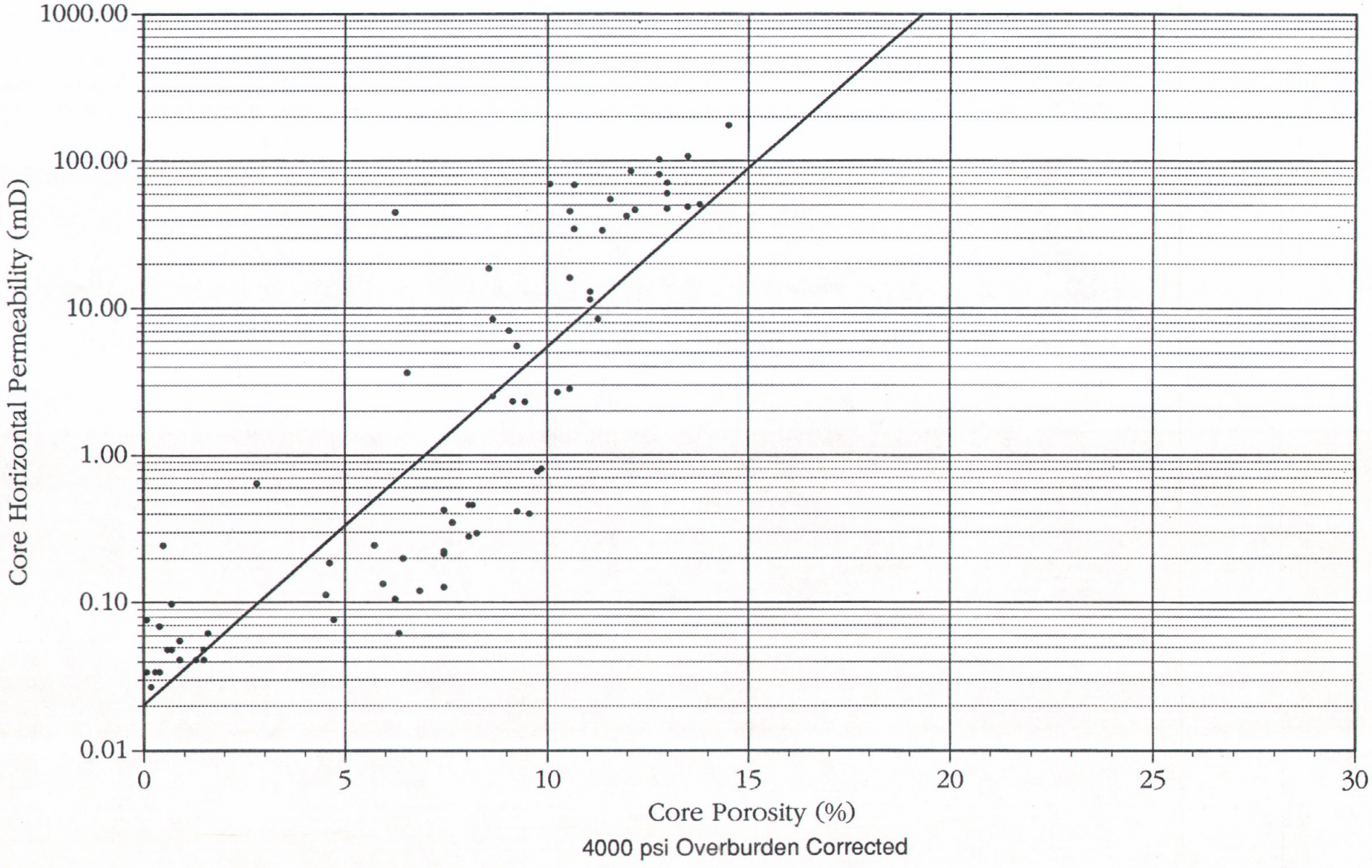


Fig.3.10

Zone B1, horizontal core permability - core porosity crossplot

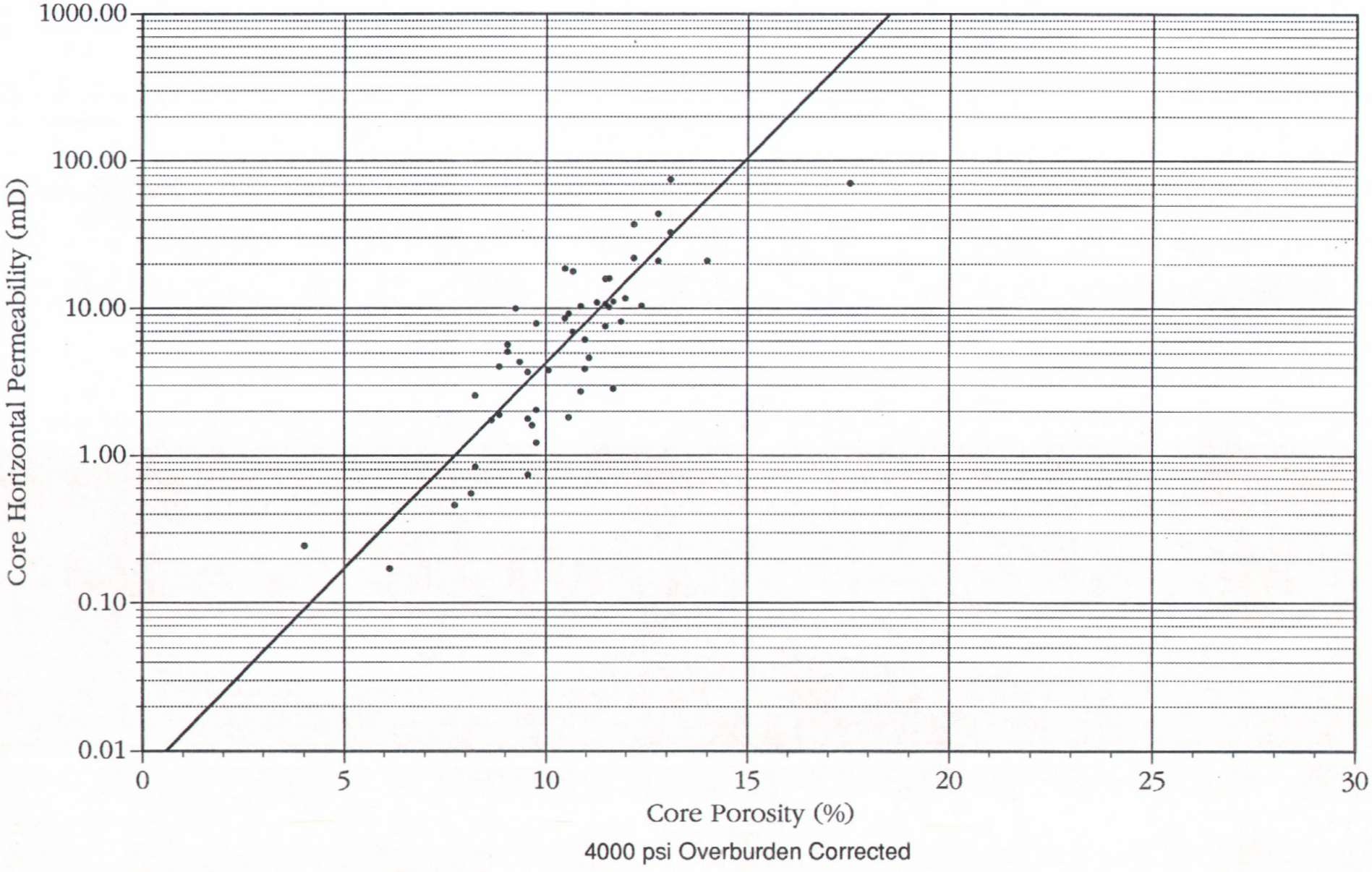


Fig.3.11

Zone D, vertical core permeability - core porosity crossplot

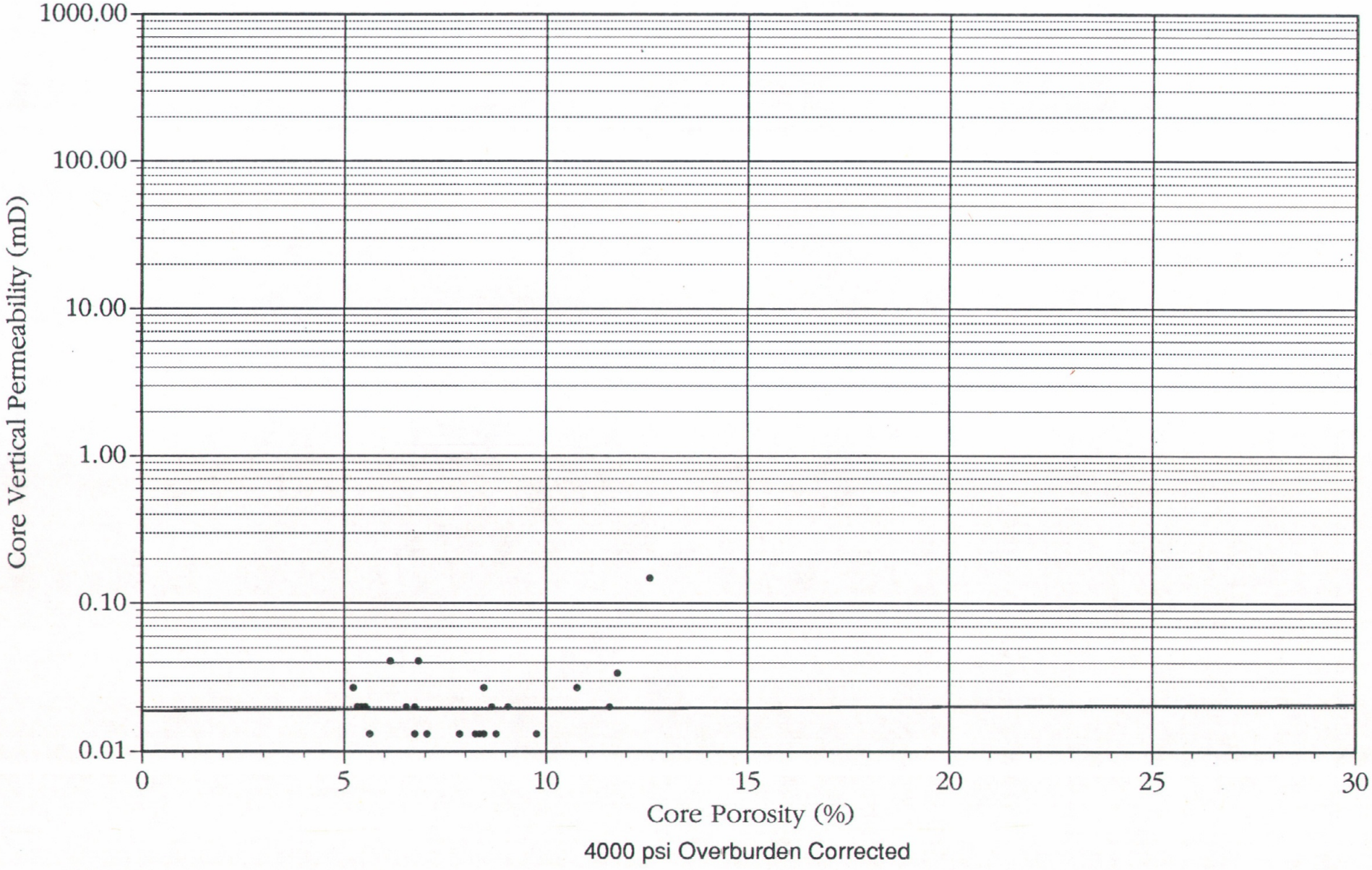


Fig.3.12

Zone C, vertical core permeability - core porosity crossplot

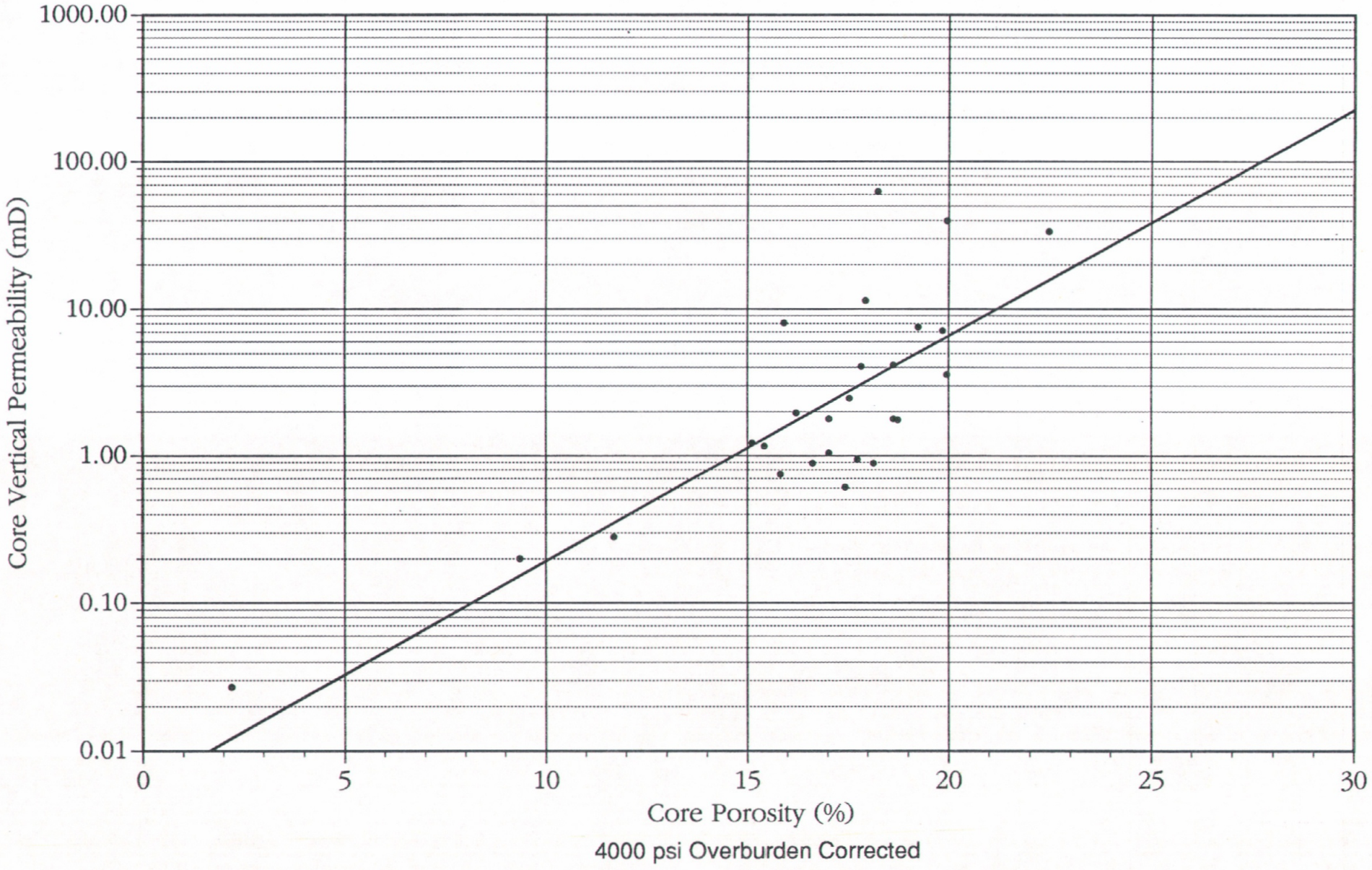


Fig.3.13

Zone B2, vertical core permeability - core porosity crossplot

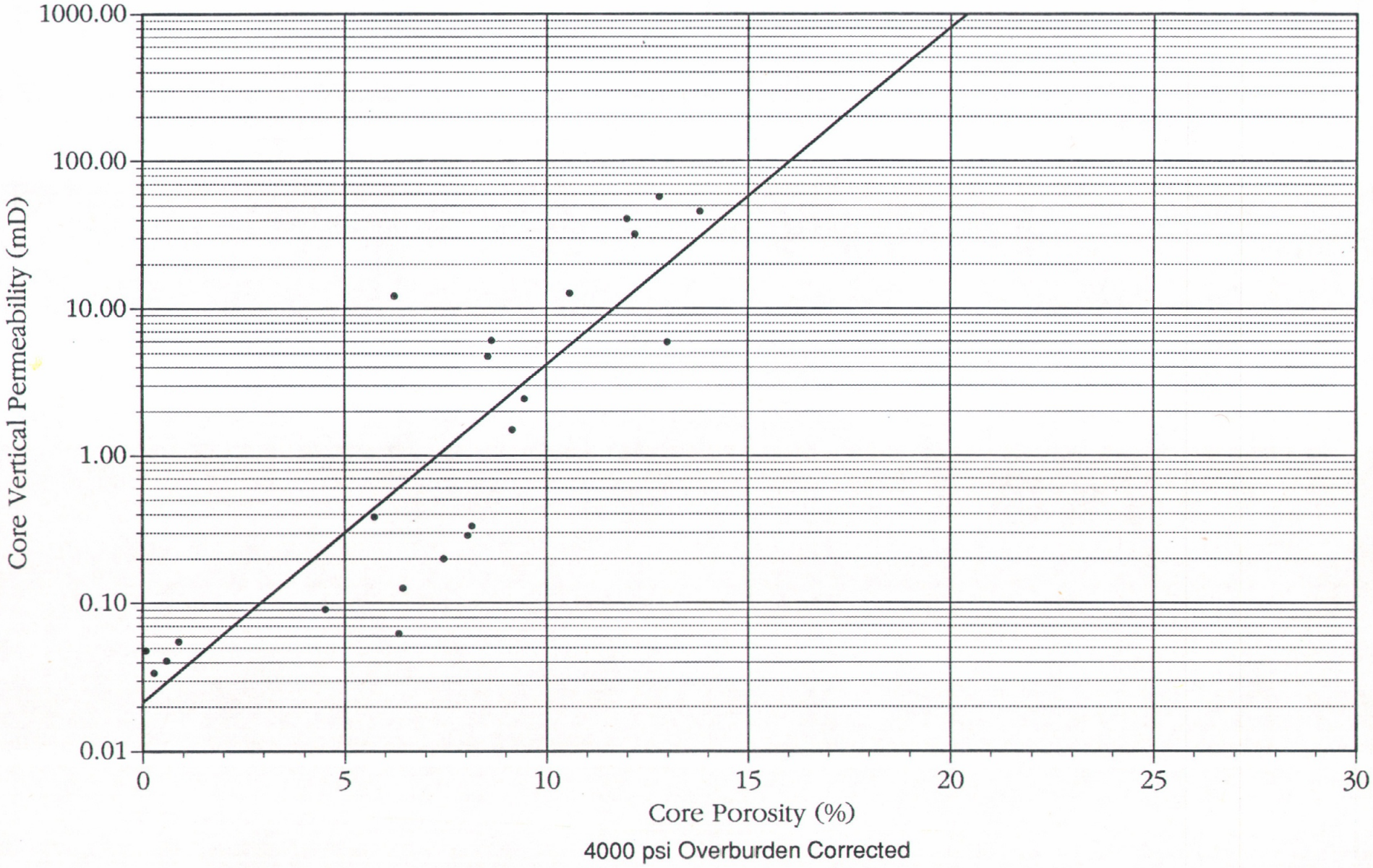


Fig.3.14

Zone B1, vertical core permeability - core porosity crossplot

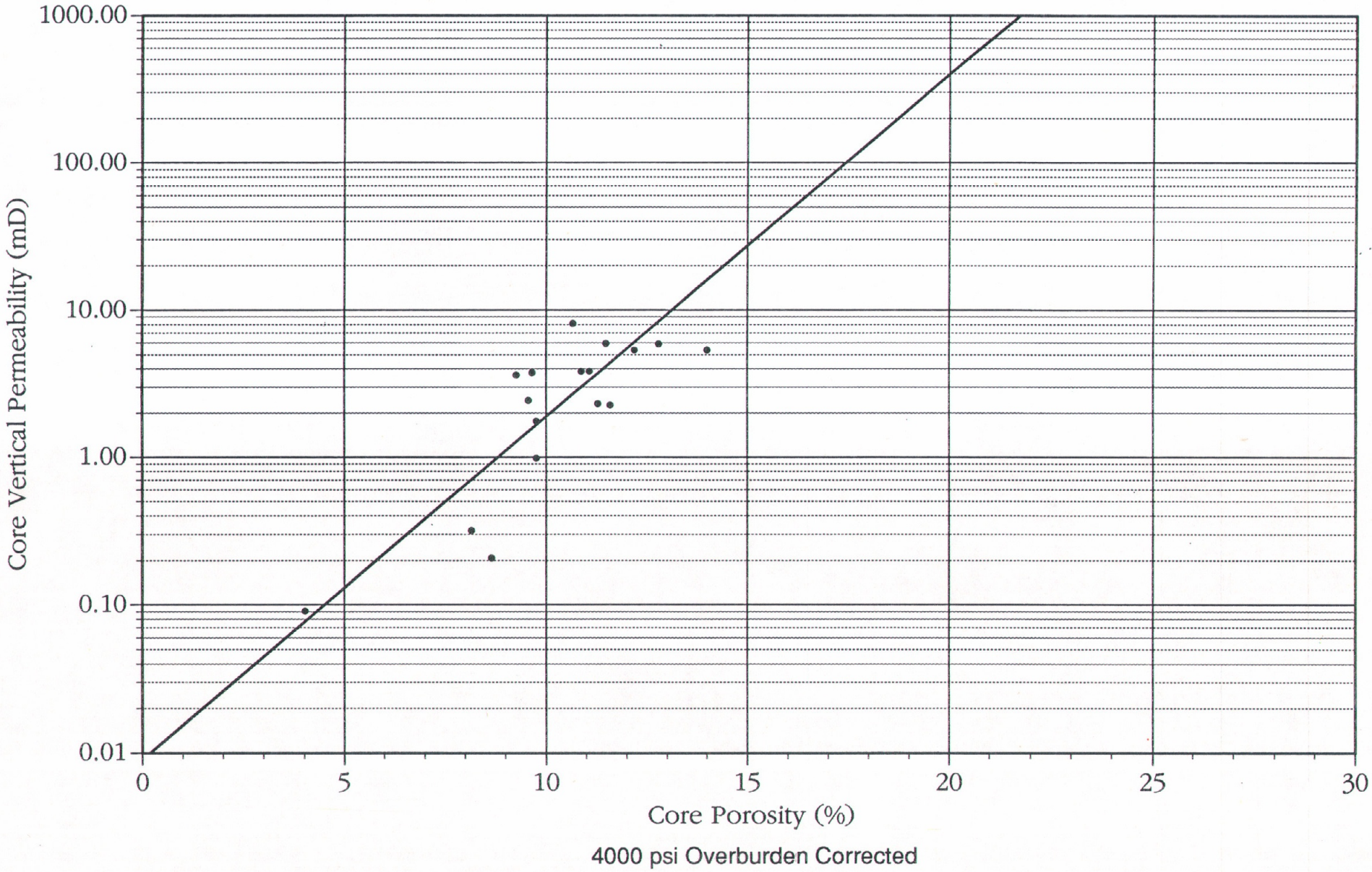


Fig.3.15

Table 3.6: Reservoir Parameters Used in the Log Analysis

Sandstone matrix	Density Δt Gamma ray	layer dependent 52.0 µs/ft 51 API units (corrected)
Shale	Gamma ray Δt Density	200 API units (corrected) 110 µs/ft 2.42 g/cc
Fluids	R_w Δt Density	0.014 ohm-m at 317 °F 185 µs/ft 1.05 g/cc — wrong gradient
Archie constants	Tortuosity (a) Cementation factor (m) Saturation exponent (n)	1.0 layer dependent layer dependent

Constants "m", "n" used in calculating water saturations using Archie equation

Layer	Reservoir zone	Cementation factor m	Saturation Exponent n
1	D	2.002	1.77
2	C	2.011	1.80
3	B2	2.018	1.835
4	B1	2.025	1.957
5	A4	2.036	1.957
6	A3-A1	2.036	1.957

Well 2 / 1-10 CPI Log

CPI PLOT

FIELD: GYDA WELL: 2110 PLOT: FINAL MD CURVE IN METERS

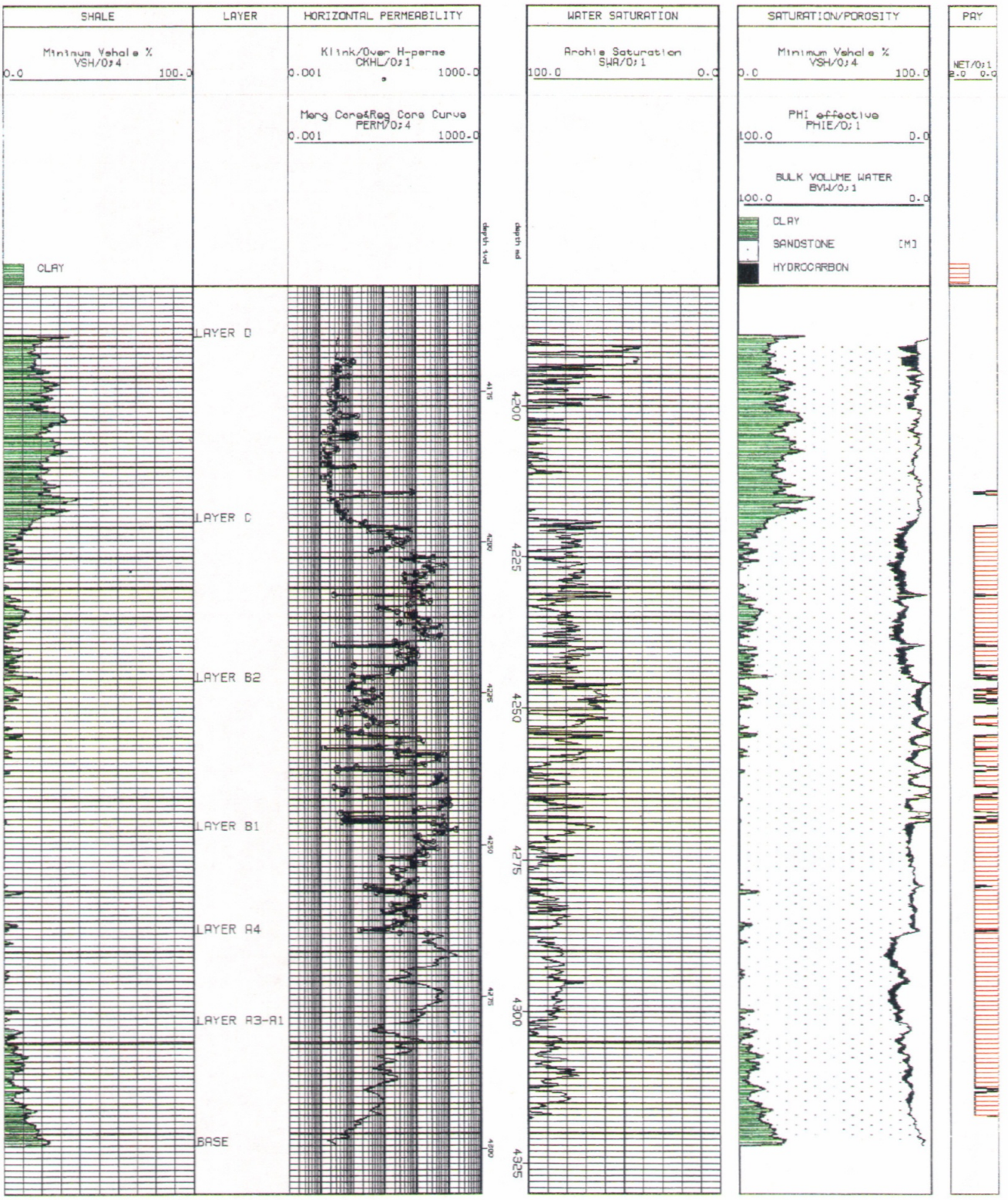


Fig.3.16

3.2.3 Results of the Analysis

The raw logs used in the log interpretation are presented in Figure 3.2 and 3.3. A final CPI log is presented in Figure 3.16 together with the core permeability derived from the conventional core analysis.

Average values of water saturations (Sw), porosity (Ø), shale content and net to gross values for the net Gyda reservoir are given in Table 3.7 below:

Table 3.7 Average Net Reservoir Properties

Net thickness (m TVT)	86.4		
	Arithm.	Harm.	Geom.
Net porosity	14.2 %		
Net water saturation	85.0 %		
Net k_h (cutoff = 0.3 mD)	16.8		6.2
Net k_v (cutoff = 0.3 mD)		0.8	

Average net reservoir zone values of water saturations (Sw), porosity (Ø), shale content and net to gross are given in Table 3.8 below:

Table 3.8 Reservoir Properties by Zone

Zone	Interval	Net porosity	Net Sw	Net Vclay	N/G	Net Average Permeabilities		
	m BRT LD	%	%	%	%	k_h Arithm.	k_h Geom.	k_v Harm.
D	4188.5 -4219.0	5	100	19	2	0.2	0.1	0
C	4219.0 - 4245.5	17	80	4	94	11.6	6.6	1.5
B2	4245.5 - 4270.0	10	80	0	61	27.7	9.0	2.5
B1	4270.0 - 4287.0	10	91	0	98	11.1	5.9	1.2
A4	4287.0 - 4302.0	20	87	0	100	33.9	20.5	3.9
A3-A1	4302.0 - 4322.0	13	89	6	73	2.0	1.2	0.5

High water saturations of 80 - 100% were calculated through the whole reservoir. This is based on a Rw of 0.014 Ohm-m @ 317 °F. (145,000 NaCl equivalents). This compares favourably with the formation pressure gradient of 1.05 SG @ 317 °F established by RFT measurements. This value of Rw is also close to the ones measured in well 1/3-3 and in the main Gyda Field of respectively 0.012 Ohm-m and 0.011 Ohm-m.

UV-light core photography only showed 0.5 m of dull fluorescence towards the top of zone D plus some very thin (0.2 m) lenses with fluorescence in zone C. No gas-cut was measured when drilling through the reservoir. This, together with the log analysis and the RFT formation gradient of 1.05 SG, seem to conclude that the formation is water wet.

Layer D shows 2% net-to-gross based on the permeability cutoff applied over the total reservoir interval. Low horizontal and vertical permeabilities ranging between 0.3 and 0.01 mD were encountered in this reservoir layer.

Layer B2 contains calcite cemented intervals influencing the log readings. The sonic log and density log readings are influenced by the cyclic change in rock density though these intervals reflecting porous sandstone layers separated by calcite cemented sandstone.

Layer A4 is of considerably better quality compared to the other reservoir zones. A significant improvement in porosity and permeability is seen in this layer, averaging 20% and 33.9 mD respectively.

Well 2 / 1-10
RFT Formation Pressures

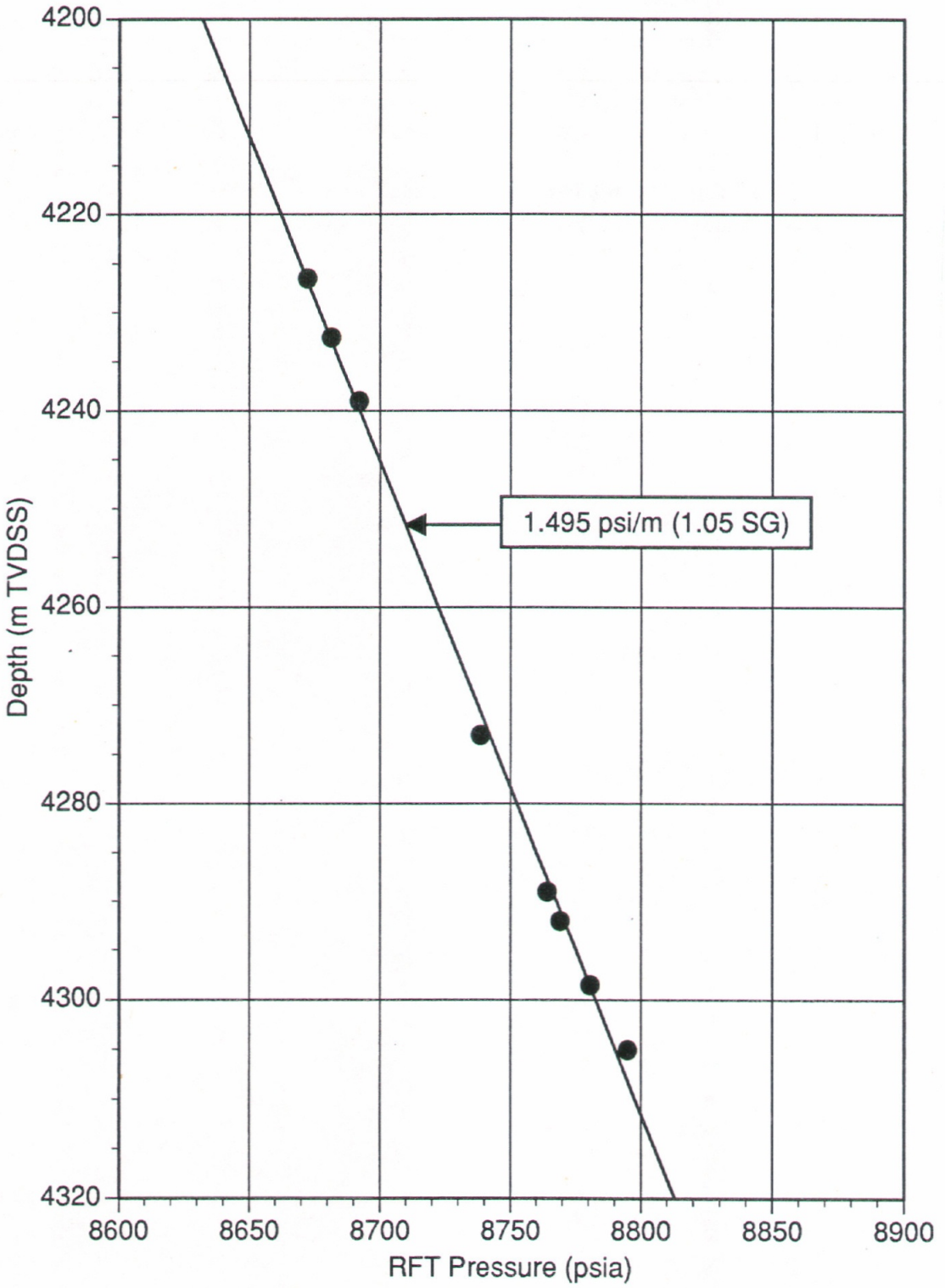


Fig.3.17

3.3 PRESSURE DATA

Leak Off Test results are given in Table 3.9.

Table 3.9: Leak Off Test Results

Drilled Depth (m BRT)	Casing Size (Inches)	Mud Weight (SG)	Pump Pressure (PSI)	Leak Off Pressure (PSI)	(SG)	Remarks
1104	17 1/2	1.37	980	3120	1.99	F.I.T.
3245	12 1/4	1.30	297	8939	1.94	L.O.T

The RFT pressure tool was run in 8.5" open hole to establish formation pressures across the reservoir section. The RFT points obtained were sufficient to obtain the formation pressure gradient.

The RFT pressure tests are listed in Table 3.10. The valid RFT pressures obtained are presented in Figure 3.17.

Table 3.10 RFT Pressures

Test No	Depth m brt ld	Mud Hydrostatic before Test psia	Mud Hydrostatic after Test psia	Formation Pressure psia	Comment / k/μ (mD/cP)
1	4200.7	9180.0	9181.7	-	Tight
2	4205.0	9186.7	9189.2	-	Tight
3	4210.0	9200.0	9202.0	-	Tight
4	4226.5	9227.0	9232.4	8694.6	7.07 mD/cP
5	4232.5	9246.3	9245.0	8703.9	5.19 mD/cP
6	4239.0	9256.9	9257.0	8714.5	4.02 mD/cP
7	4243.0	9266.3	9265.0	8730.4	Supercharged
8	4273.0	9326.3	9326.5	8760.9	17.15 mD/cP
9	4289.0	9359.0	9357.8	8786.6	55.59 mD/cP
10	4292.0	9363.2	9363.7	8791.5	53.10 mD/cP
11	4298.5	9381.1	9378.5	8802.9	13.66 mD/cP
12	4305.0	9392.0	9392.7	8817.3	Supercharged
13	4311.0	9401.6	N/A	-	Tight

Several attempts to obtain pressure measurements in reservoir zone D failed due the low permeability of the sand encountered. RFT pressure testing was also attempted in the Haugesund formation (4397.5 m BRT) and in the Triassic (4463.0 m BRT), but sealfailures were encountered.

The RFT pressure points obtained in the reservoir zones C, B2 and A4 clearly defines a water gradient. The RFT gradient through the reservoir sands is 1.495 psi/m which corresponds to a reservoir fluid density of 1.05 SG. This water gradient is in line with the log interpretation proving the formation being water wet.

3.4 RFT SAMPLING

One segregated RFT sample was taken in the reservoir zone C at 4226.2 m brt ld. Chemical analysis of the fluid sample is presented in Table 3.11 below. The two RFT samples are most likely mudfiltrate and not formation water, as the RFT samples and the mudfiltrate have similar compositions. Further details is outlined in "RFT and Mud Analysis", Well 2/1-10, Geco Plakla A/S, (1992)

Table 3.11 RFT Segregated Sampling

Run No	Depth m brt ld	Chamber Volume	Chamber Pressure	Contents
2B	4226.2	2 3/4	0 psig	9.0 l water Rw = 0.071 Ωm @ 68 °F Density : 1.077 SG pH : 7.2 Na ions : 12,800 mg/l K ions : 39,000 mg/l Ca ions : 85 mg/l Cl ions : 57,000 mg/l Bicarbonate : 1,904 mg/l Sulfate : 3,900 mg/l Nil gas Nil H_2S Traces of hydrocarbons
2B	4226.2	1	0 psig	2.8 l water Rw = 0.066 Ωm @ 68 °F Density : 1.084 SG pH : 7.4 Na ions : 14,000 mg/l K ions : 42,325 mg/l Ca ions : 105 mg/l Cl ions : 64,000 mg/l Bicarbonate : 2,226 mg/l Sulfate : 4,700 mg/l Nil gas Nil H_2S Traces of hydrocarbons

3.5 TEMPERATURE DATA

Maximum wireline logging temperature data has been corrected using the Horner plot. Equilibrium reservoir temperature at 4255m BRT LD is calculated to be 317 ^{0}F (158 ^{0}C) using the Gyda field temperature gradient of 3.7 ^{0}F/100m.

Table 3.12: Temperature Data

Run	Depth (mBRT LD)[1]	Hole Diameter	Circulation Time	Time Since Circulation	Temperature Measured °C	Temperature Measured °F	Temperature Corrected °C	Temperature Corrected °F
1A	3241	12 1/4	4.75	8.75	99.4	211		
2B	4480	8 1/2	30.00	11.00	136.1	277		
2A	4480	8 1/2	30.00	22.00	148.3	299	163	326[2]
2A	4480	8 1/2	30.00	42.00	152.8	307		
2A	4480[3]	8 1/2	30.00	62.00	156.7	314		

REFERENCES:
Wireline logs:
1A: DLL-LLS-GR
2B: DLL-MSFL-SDT-GR
2A: LDL-CNL-GR
2A: SHDT/GR
2A: Check shot
Log Quality Control Sheets

NOTES:
1)Depth of thermometer
2)Good reliability
3)Temperature measurement at 4380m corrected to 4480m using Gyda Field temperature gradient of 3.7 ^{0}F/100m

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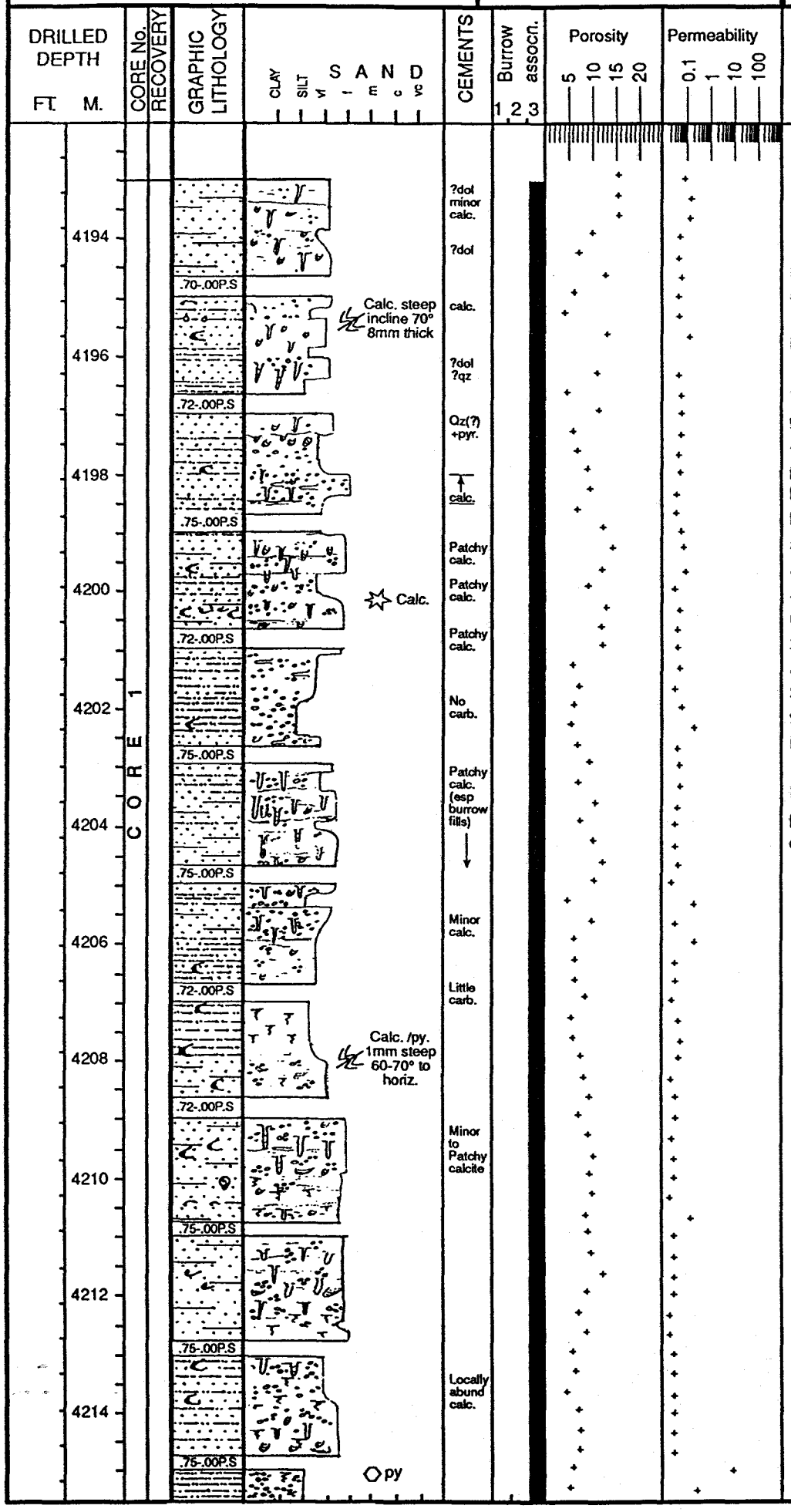
WELL	BP NORWAY 2/1-10	DEPTH	4193m-4215m	AUTHOR	C A Cade
CORE No(s)	1,2	SHEET	1 of 5	SCALE	1:100	DATE	20 Jan 1992



Half slabbed core. Good condition. Day/Fluor light. Rockall Stavanger

Reservoir Zone D
(4189.5 -4220m DD)

Desription:

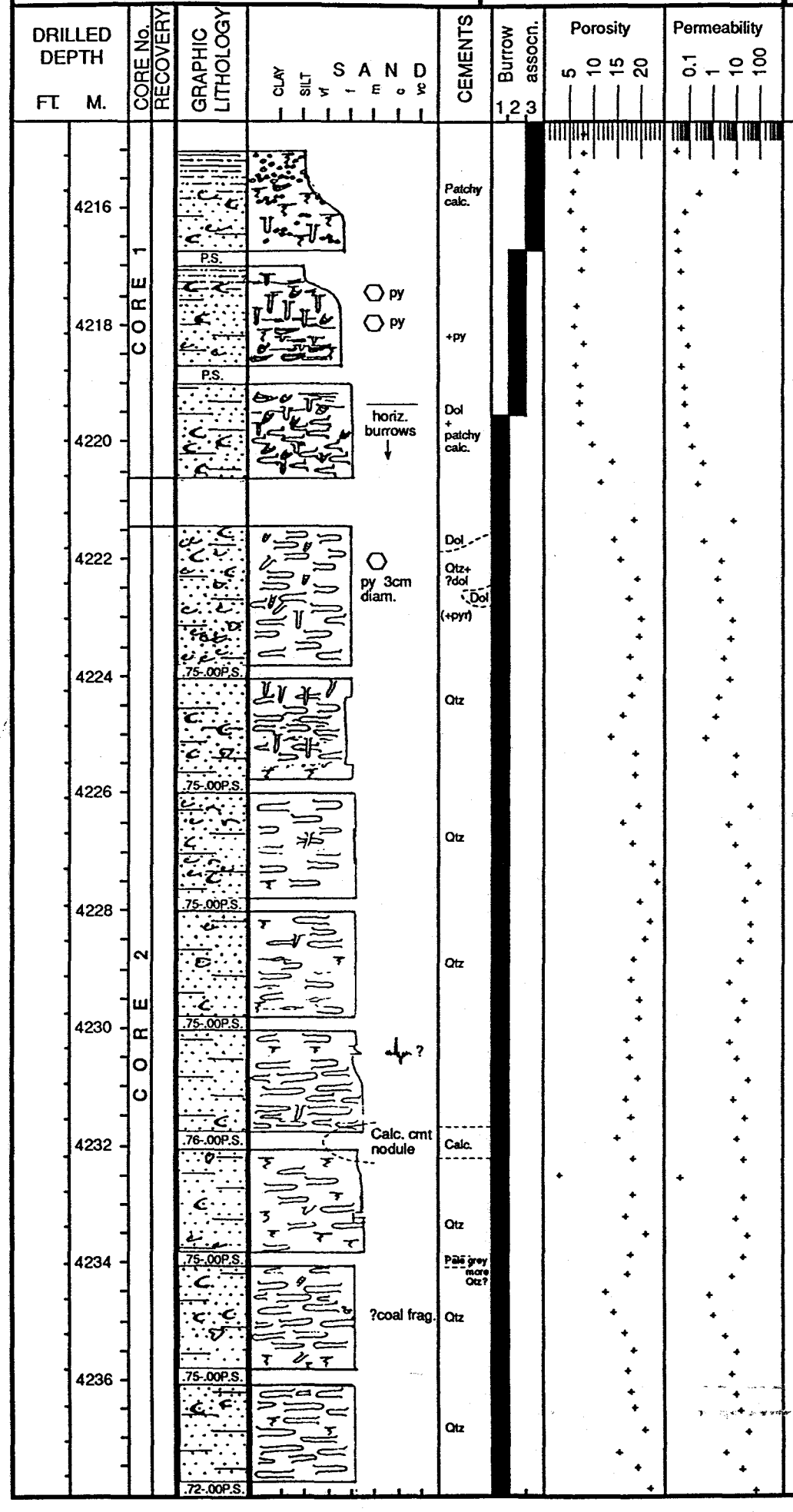
Dark grey siltstones and grey-buff argillaceous very fine and fine sandstones. Some primary clay lamination visible, but otherwise intensely burrowed. Main burrow types are small horizontal Chondrites and long vertical Skolithos. Smaller vertical burrows in upper and lower parts of the zone, including Teichichnus around 4215m-4220m. Scattered belemnite guards and thin walled bivalve shell debris. Rare ammonites.

Little visible porosity due to pore filling clay and patchy carbonate cement.

Interpretation:

Shallow marine shelf. Distal part of shelf sandsheet. Backround siltstone deposition interrupted by storm influxes of sand, which were then thoroughly burrowed. No clear grain size trend to indicate either drowning or progradation. Therefore probably aggradational

WELL	BP NORWAY 2/1-10	DEPTH	4215m-4238m	AUTHOR	C A Cade
CORE No(s)	1,2	SHEET	2 of 5	SCALE	1:100
				DATE	20 Jan 1992



Half slabbed core. Good condition. Day/Fluor light. Rockall Stavanger

Reservoir Zone C (4220m-4246.5m DD)

Description:

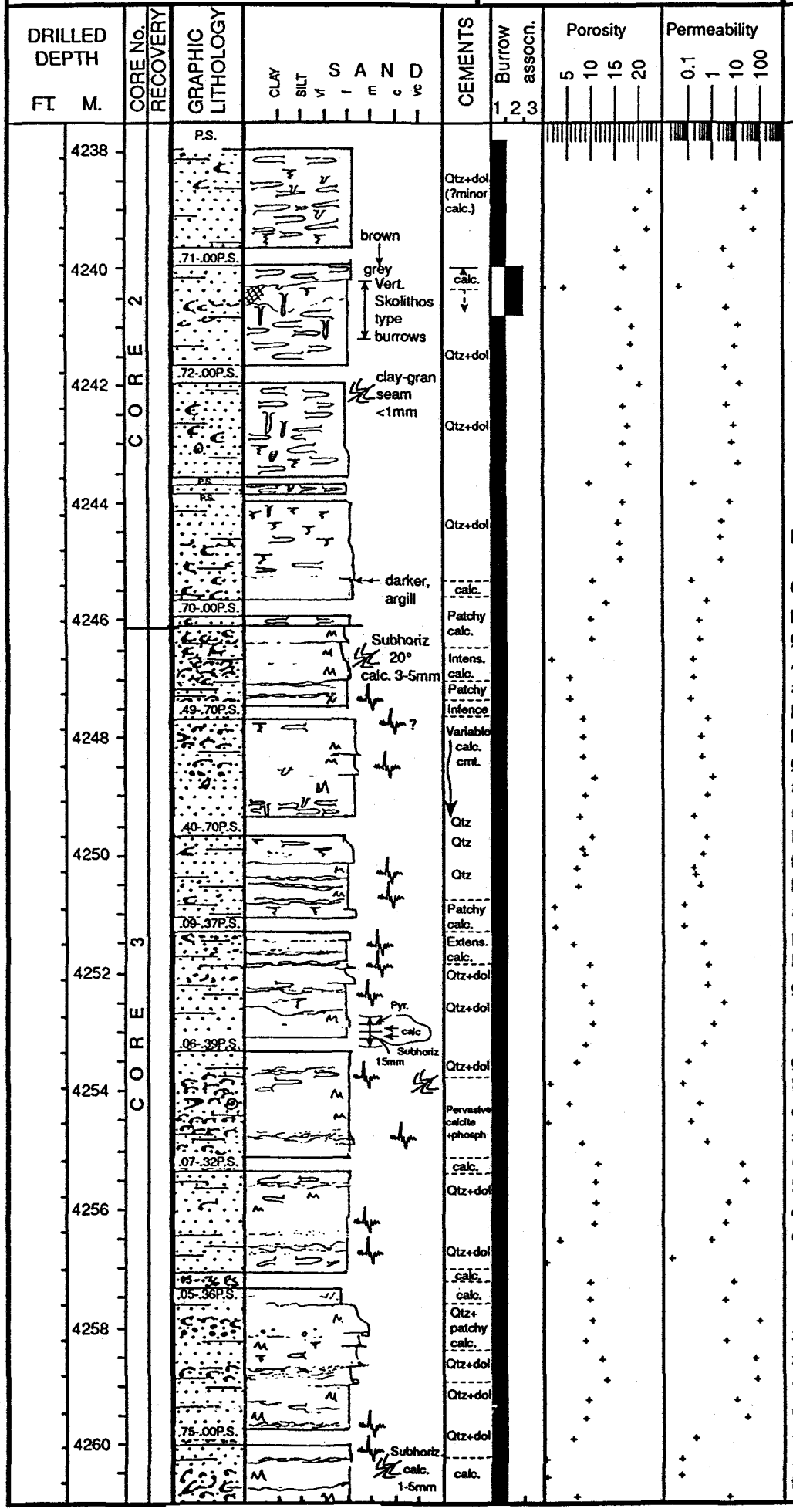
Buff or grey fine or fine to medium sandstones, with little grain size variation. Only in the finer grained sections are there clay drapes. No primary sedimentary structures preserved, because of extensive bioturbation. Dominant burrow type is horizontal, Palaeophycus type. At top and bottom of this zone there are vertical burrows, some with spreite, cross-cutting the horizontally-burrowed fabric. Scattered fossil debris including belemnite guards and (mostly tghin walled) bivalve shell debris. Some bivalve shells are still articulated and may be in life position.

The sandstones are moderately well cemented (moderate visible porosity preserved), by quartz and subordinate dolomite. There are two thin horizons (4232m, 4240.5m) tightly cemented by calcite. At least one of these is a nodule.

Interpretation:

Aggrading shallow marine sand sheet. Sands deposited as a result of storm transport and then thoroughly bioturbated in intervening quiescent periods.

WELL	BP NORWAY 2/1-10	DEPTH	4238m-4261m	AUTHOR	C A Cade
CORE No(s)	2,3	SHEET	3 of 5	SCALE	1:100	DATE	20 Jan 1992



Half slabbed core. Good condition. Day/Fluor light. Rockall Stavanger

Reservoir Zone B2
(4246.5m-4271m DD)

Description:

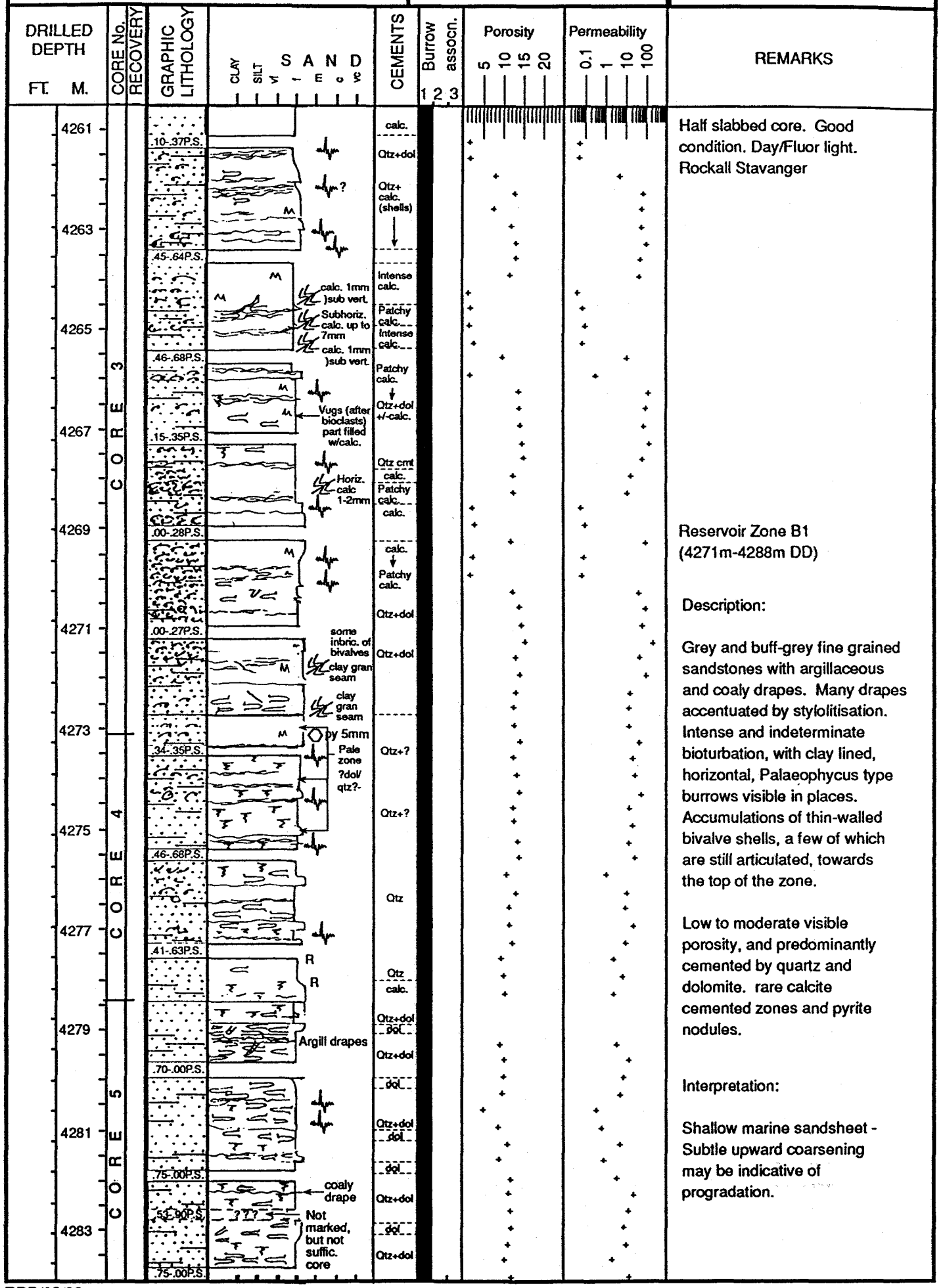
Grey fine, fine to medium, and in places medium (with scattered granules) sandstones. Argillaceous drapes are common and some have been accentuated by *stylolitisation*. Intense bioturbation, which in places gives an apparently massive appearance. Visible burrows are mostly of horizontal, Palaeophycus type. Abundant fossil material including bivalves, belemnites and ammonites. Concentrations of phosphatised, thick walled bivalve shell debris in coarser grained, erosionally-based beds.

Variable cementation, but generally well-cemented with low visible porosity. Mostly cemented by quartz and subordinate dolomite, but with numerous tight calcite cemented horizons. These often correspond with concentrations of phosphatised shell debris.

Interpretation:

Shallow marine sand sheet. Sand deposition predominant, but with probable breaks in cementation indicated by the early carbonate cemented horizons with phosphatic fragments.

WELL	BP NORWAY 2/1-10	DEPTH	4261m-4284m	AUTHOR	C A Cade
CORE No(s)	3.4 and 5 SHEET 4 of 5	SCALE	1:100	DATE	20 Jan 1992



Half slabbed core. Good condition. Day/Fluor light. Rockall Stavanger

Reservoir Zone B1 (4271m-4288m DD)

Description:

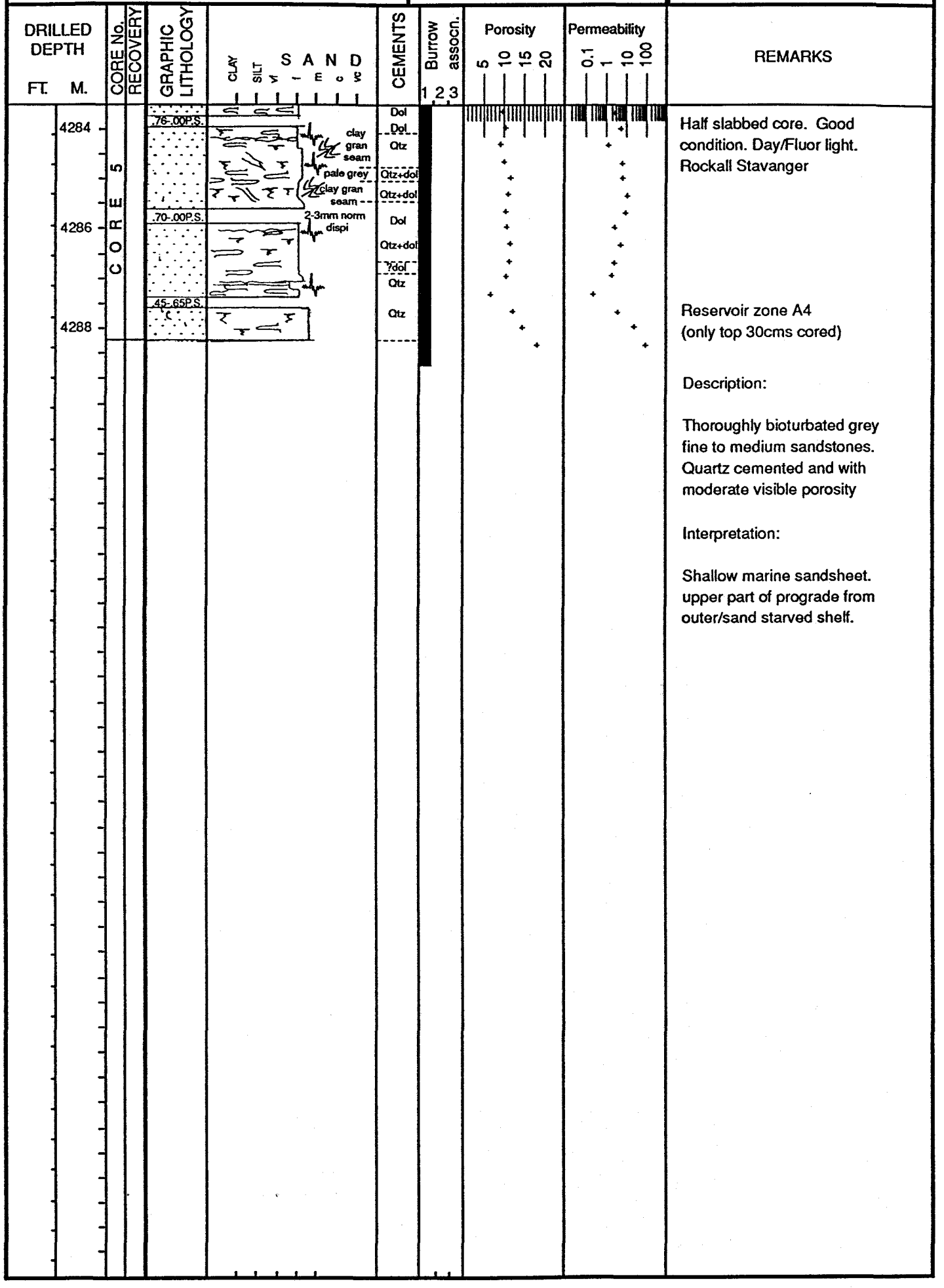
Grey and buff-grey fine grained sandstones with argillaceous and coaly drapes. Many drapes accentuated by stylolitisation. Intense and indeterminate bioturbation, with clay lined, horizontal, Palaeophycus type burrows visible in places. Accumulations of thin-walled bivalve shells, a few of which are still articulated, towards the top of the zone.

Low to moderate visible porosity, and predominantly cemented by quartz and dolomite. rare calcite cemented zones and pyrite nodules.

Interpretation:

Shallow marine sandsheet - Subtle upward coarsening may be indicative of progradation.

WELL	BP NORWAY 2/1-10	DEPTH	4284m-4288.33m	AUTHOR	C A Cade
CORE No(s)	5	SHEET	5 of 5	SCALE	1:100
				DATE	22 Jan 1992



BP PETROLEUM DEVELOPMENT LIMITED

Minilog

WISARD

SCALE 1:10000 MEASURED DEPTH

2/1-10

CO-ORDINATES AT SURFACE
Latitude: 56 57 53.610N
Longitude: 03 01 19.700E
Grid Reference: 501346.22mE
6313619.42mN

VERTICAL WELL
Projection mnemonic: NUTM31
Geodetic Datum: ED50

WELL CLASSIFICATION: EXPLORATION WELL
COMPLETION WELL STATUS: ABANDONED DRY WITH OIL SHOW

OPERATOR: BP NORWAY LIMITED U.A.
RIG USED: ROSS ISLE
RIG TYPE: SEMI-SUBMERSIBLE (ANCHORED)
DEPTH DATUM: KB
DATUM HEIGHT: 22.0 mAMSL
WATER DEPTH: 67.0 m
REACHED TD: 29-DEC-1991

DATE SPUDDED: 09-NOV-1991
RIG RELEASED: 14-JAN-1992
TOTAL DEPTH: 4525.5 mBKB (WIRELINE)
4503.5 mTVDSS
4525.0 mBKB (DRILLER)
4503.0 mTVDSS

LICENCE: PL164
INTERESTS:
STATOIL (DEN NORSKE STATS OLJESELSKAP A/S) 50.000%
BP NORWAY LIMITED U.A. 30.000%
CONOCO NORWAY INC. U.A. 10.000%
SVENSKA PETROLEUM AB 10.000%

DRILLING CONTRACTOR: ROSS RIG

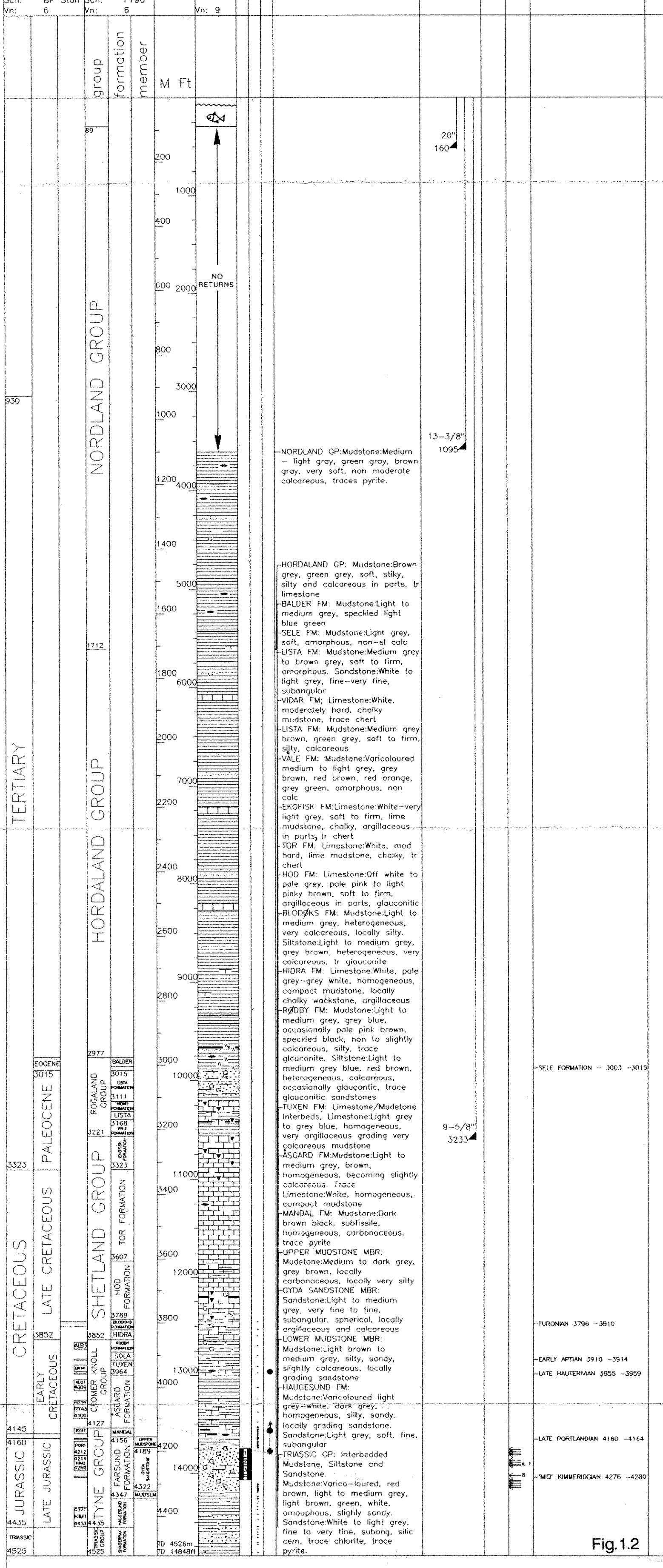


Fig.1.2

AUTHOR: GBV PLOTTED BY: WISARD DBA DATE: 22-MAY-1992 15:18