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ELF AQUITAINE NORGE A/S

311E-R 83/066/GS/mbs

Stavanger, 28.03.83

PRELIMINARY EVALUATION OF WELL 1/3-3 RESULTS

Dispatching:

Dig. Europe : MM Suau, Duchemin

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Copy: Moulinier, Barril, Bathiard, Stock, Junca, Dupuy, Kirkemo.

1. Introduction

Well 1/3-3 reached a TD of 4875 m RKB on 27/12/1982. It encountered two hydrocarbon bearing zones :

1 - from 4180 to 4220 m RKB; Upper Jurassic Age

2 - from 4527 to 4554 m RKB; Lower Jurassic Age

The Lower Jurassic zone, quite shaly on the logs, was found to be almost tight in DST 1. From the seismic surveys the corresponding accumulation appears to be small and for the time being unmappable. The Lower Jurassic zone will not be further considered here.

The following evaluation concerns only the Upper Jurassic reservoir.

2. General data (Figs 1, 2, 3)

The 1/3-3 structure is approx. 8 km long and 2 km wide at the water-oil contact, covering an area of 10 km^2. It extends into the neighbouring block 2/1, the bulk (91% of the rock volume) being however, in block 1/3.

It is located on a line joining ULA and EKOFISK, some 45 km NNW of EKOFISK, and 20 km from ULA. Water depth is 67 m.

3. Geometrical and petrophysical results

The Upper Jurassic reservoir can be subdivided into 3 layers characterized by changes in porosity, permeability and saturation. Fig. 4 lists the characteristics of the various layers, called A, B1, B2 for the oil zone, C1, C2, C3 for the water zone. Porosities and saturations are based on a preliminary Coriband interpretation, shown in Fig. 5. (This interpretation uses a Rw of 0.012 Ωm at 310^{o}F, a value confirmed by DST 2 in the water zone).

4. Test Results

Operation	Layer Perfos. (m RKB)	Main Results
DST 2 WATER ZONE	C1 4233-4240	Qw = 170 m^3/d Choke: 3/8" WHFP = 13 bars BHFP = 484 bars Permeability: ~~20~~ md Actual PI:1.4 m^3/d/bar Ideal PI:6.8 m^3/d/bar Formation P: 608 bars T:165°C Water salinity (NaCl): 315 g/l density (surf.cond): 1.19 g/cm^3
DST 3A OIL ZONE	B1 4202-4208	Small flow of water only (mud filtrate + formation water) Q ≃ 6 m^3/d Choke: 2" WHFP : 0 bar BHFP : 417 bars Permeability: 0.5 md CONCL.: Oil considered non producible
DST 3B OIL ZONE	B2 (4202-4208) + 4211-4214	Choke:1/2" 1/4" Qo :198 m^3/d 143 m^3/d Qg :45000 m^3/d 28000 m^3/d GOR=196vol/vol CO_2: 3% WHFP :39 bars 101 bars H_2S: o BHFP:230 bars (est.) - No water produced Oil spec. gravity : 0.829 (39 °API) Gas spec. gravity : 0.820 (AIR = 1) Oil F.V.F. (Bo) : 1.7 (from correlations) Formation P : 605 bars T : 165°C

4. Accumulations

Rock volumes are based on the isobath map of Top of Upper Jurassic sandstones (Perfetti, March '82), shifted to fit the results of 1/3-3.

The layers found in 1/3-3 are supposed to extend over the whole structure, parallel to the top (figs. 6, 7)

Calculations take into account a 5 m transition zone above the WOC.

Accumulations are calculated for layers A, B1, B2, and C; for details see the tables of Fig. 8.

ACCUMULATIONS (Oil : 10^6 S.T. m^3
(Gas : 10^9 std m^3
(total structure)

	PROVED		UPDIP		TOTAL	
LAYER	Oil	Ass. Gas	Oil	Ass. Gas	Oil	Ass. Gas
A	2.27	0.44	0.99	0.19	3.26	0.63
B1	2.06	0.40	0.31	0.06	2.37	0.46
B2	2.28	0.45	0.11	0.02	2.39	0.47
C	3.84	0.75	-		3.84	0.75
TOTAL	10.45	2.04	1.41	0.27	11.86	2.31

Of the total accumulation, 93% is in block 1/3, 7% in block 2/1.

Probabilistic estimates of Accumulations (all layers included)

Mini = 0.75 x Proved
Median = Proved + 1/2 Updip
Maxi = Petrophysical properties may improve NNW, towards ULA. As a maxi case, assume all rock volume to have properties of layer C1 (ϕ = 0.20; Sw =0.60; α =1)

ACCUMULATIONS (OIL: 10^6 S.T. m^3
(PROBABILISTIC) (GAS: 10^9 std m^3

	1/3		2/1		Total	
	Oil	Ass. Gas	Oil	Ass. Gas	Oil	Ass. Gas
MINI	7.3	1.4	0.6	0.1	7.9	1.5
MEDIAN	10.4	2.0	0.8	0.15	11.2	2.2
MAXI	22.2	4.3	2.3	0.5	24.5	4.8

5. Estimation of recoverable reserves

Since DST 3A did not flow any oil, only oil in layers B2 and C is considered moveable in the mini and median cases. Therefore, we define a producible accumulation on which we apply a recovery factor to estimate recoveries:

PRODUCIBLE ACCUMULATIONS (Oil: 10^6 S.T. m^3

(Gas: 10^9 std. m^3

	1/3		2/1		Total	
	Oil	Ass. Gas	Oil	Ass. Gas	Oil	Ass. Gas
MINI	4.5	0.9	0.14	0.03	4.6	0.9
MEDIAN	6.0	1.2	0.2	0.04	6.2	1.2
MAXI	22.2	4.3	2.3	0.5	24.5	4.8

The recovery factors which follow should be considered as very speculative. Points to be considered are:

- Low to moderate permeabilities
- Possibility of active bottom water drive
- Risk of water coning

Recovery factors chosen: for oil

20% Mini case

25% Median case

30% Maxi case

For gas a 40% recovery factor has been chosen as a first approximation, in all cases.

RECOVERABLE RESERVES Oil : 10^6 S.T. m^3

Gas : 10^9 std. m^3

	1/3		2/1		Total	
	Oil	Ass. Gas	Oil	Ass. Gas	Oil	Ass. Gas
MINI	0.9	0.35	0.03	0.01	0.92	0.36
MEDIAN	1.5	0.5	0.05	0.02	1.55	0.52
MAXI	6.7	1.7	0.7	0.2	7.4	1.9

G. Stock

Reservoir Department

LIST OF FIGURES ATTACHED

POSITION MAP

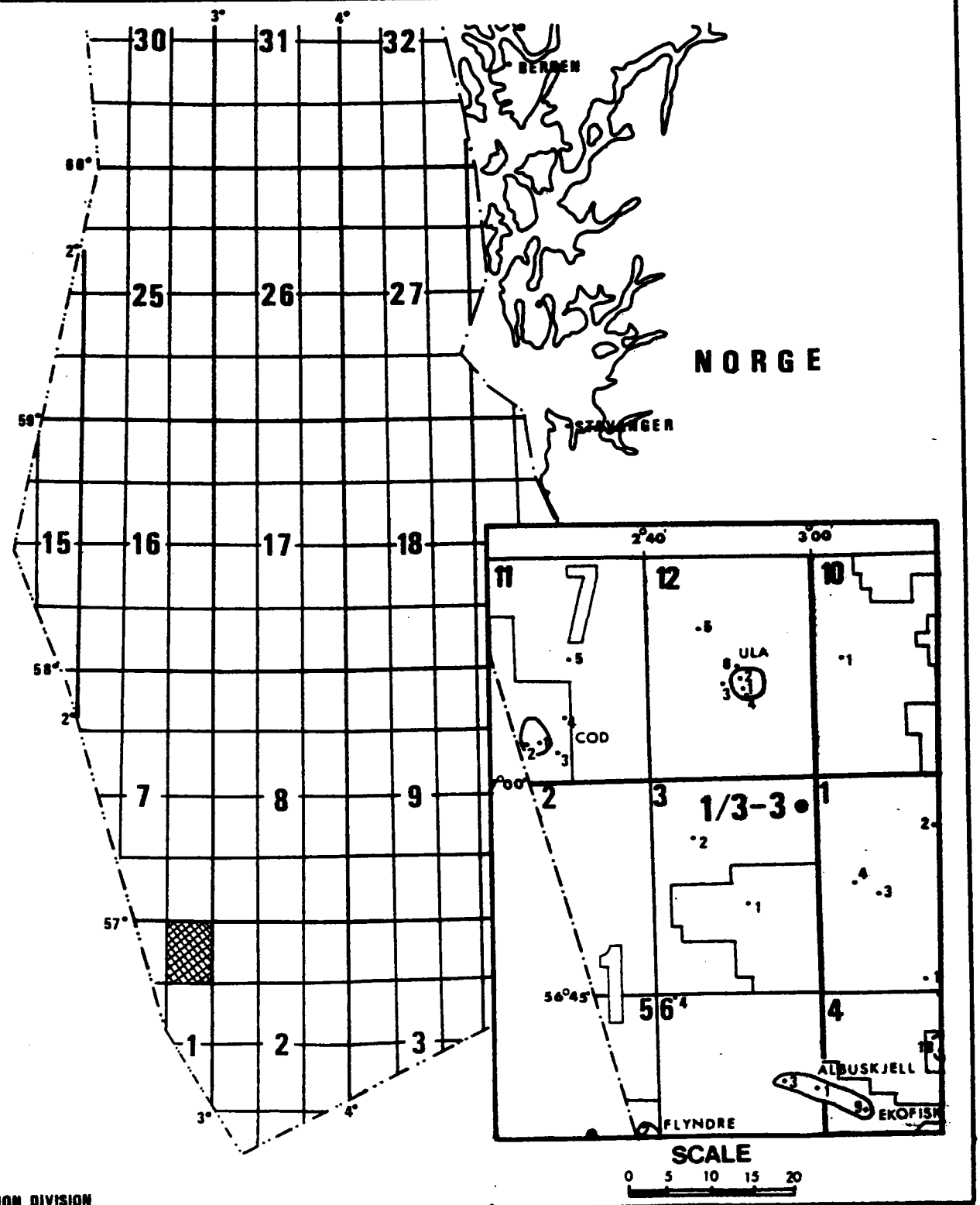
BLOCK : 1/3

WELL : 1/3-3

OWNER : Statoil, EAN, Shell, Texaco, Total.

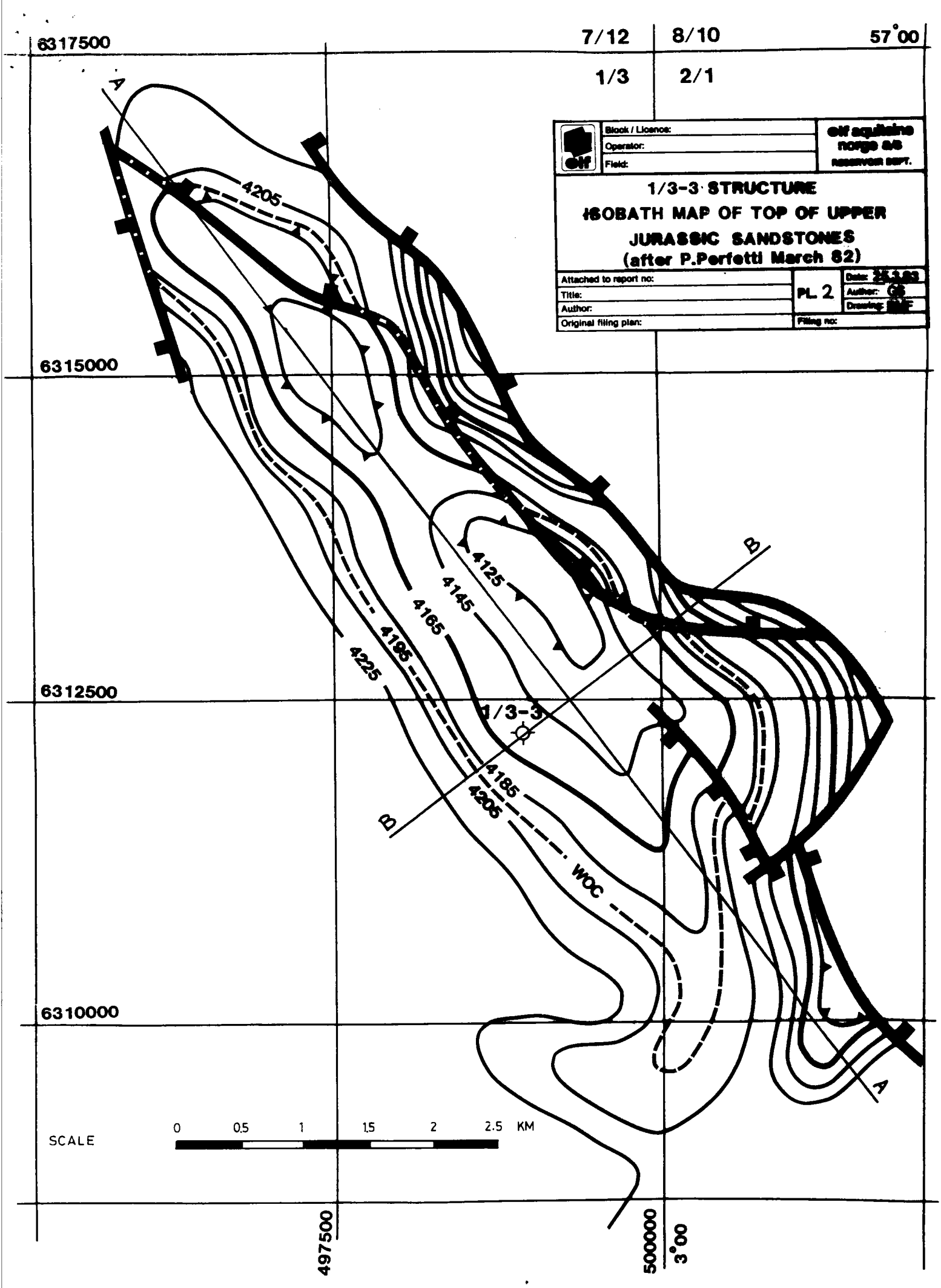
Scale: 1/2500 000

Date: June '82



EXPLORATION DIVISION

Fig.1


6317500
7/12
8/10
57°00
1/3
2/1
Block / Licence:
Operator:
Field:
elf aquitaine norge as
RESERVOIR DEPT.
1/3-3 STRUCTURE
ISOBATH MAP OF TOP OF UPPER
JURASSIC SANDSTONES
(after P.Perfetti March 82)
Attached to report no:
Title:
Author:
Original filing plan:
PL. 2
Date:
Author:
Drawing:
Filing no:
A
B
4205
4125
4145
4165
4185
4225
4195
4205
WOC
1/3-3
6315000
6312500
6310000
SCALE
0
0.5
1
1.5
2
2.5 KM
497500
500000
3°00

Coord x:02° 58' 54.05"E Z ground: -68m
Coord y:56° 57' 08.56"N Z RKB: +25m
Line: crossing of 8186 216 and 8186 407
Depths datum: RKB
Rig: Borgsten Dolphin
Stopped in:

Spudded: 22.08-82
Started drilling: 22.08-82
At T.D: 27.12.82
Completed:
T.D Driller: 4867 T.D. Logger: 4875

Well **1/3-3**

Country **Norway off-shore**

OPERATOR EAN

LICENCE 065 OWNED BY Statoil,EAN Total,Shell,Texaco.

TARGETS

Upper Jurassic Sandstone(Ula Form.)
Triassic Sandstone

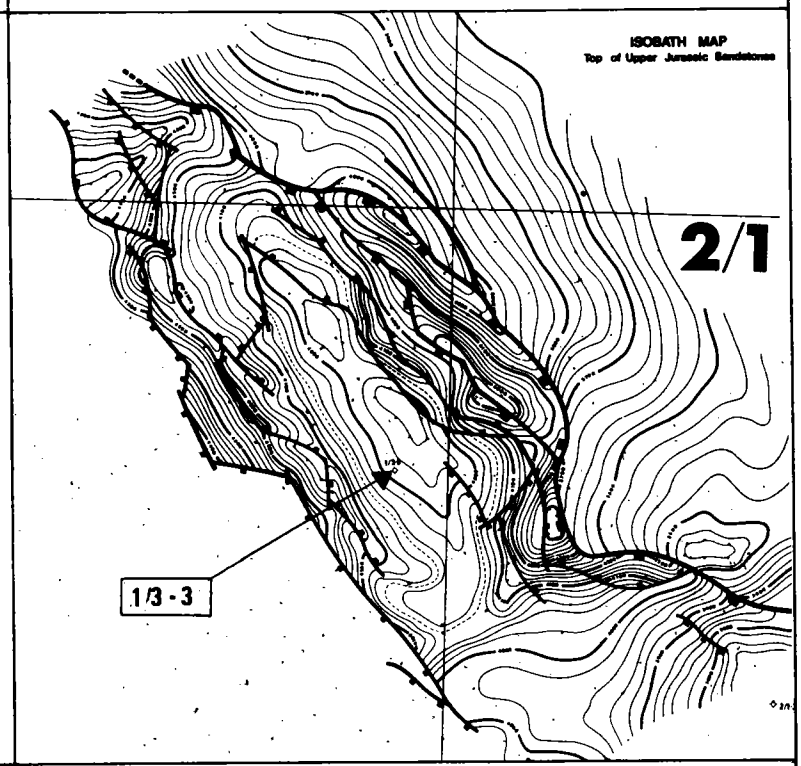
RESULTS

CASINGS

30" AT 153m
20" AT 697m
13 3/8" AT 1902m
$9\frac{5}{8}$" AT 4047m

CORES

C 1	4129-4147m	99%
C 2	4181-4199m	100%
C 3	4199-4213m	100%
C 4	4231-4239m	100%
C 5	4231-4239m	44%
C 6	4239-4248m	97%



SHOWS

2955-2956m: Yellow fluo - rescencein Paleocene Sand-stone
4192-4227m, Yellow to yellowish green direct fluo.

maxi of 6% C1, 1,2% C2,0,5%, C3,0,2% IC4,0,2 0,2% NC4

LOGS

RKB

ISF BHC GR	
Run 1	697-155m
2	1913-697m
3	4063-1904m
4	4354-4041m
5	4875-4047m
6	4835-4047m
HDT	
RUN 1	4063-1904m
2	4875-4047m
CST	4054-1908
RUN 1	asked: 45 recov: 40
2	4818-4260 m (rec:24)
3	4875-4200m (rec:15)

LDT-CNL GR-CAL	
Run 1	697-155m
2	1913-697m
3	4063-1904m
5	4875-4300m
CBL	
RUN 1	1904- 550m
RUN 2	4048-1598m
DLL-MSFL	
RUN 1	4353-4049m
2	4750-4300m
RFT	
RUN 1	4354-4049m
SST	
RUN 1	4200-200m
2	4875-4200m
NGT	
RUN 1	43523-40487
2	4875 -4300

TESTS

RFT 1	4212m
RFT 1 BIS	4212m
RFT 2	4188 / 4244m
RFT 3	4214m
RFT 4	4436.5m

Checked: C. LEGORJUS
Date: 12/01/83.

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FIG. 3

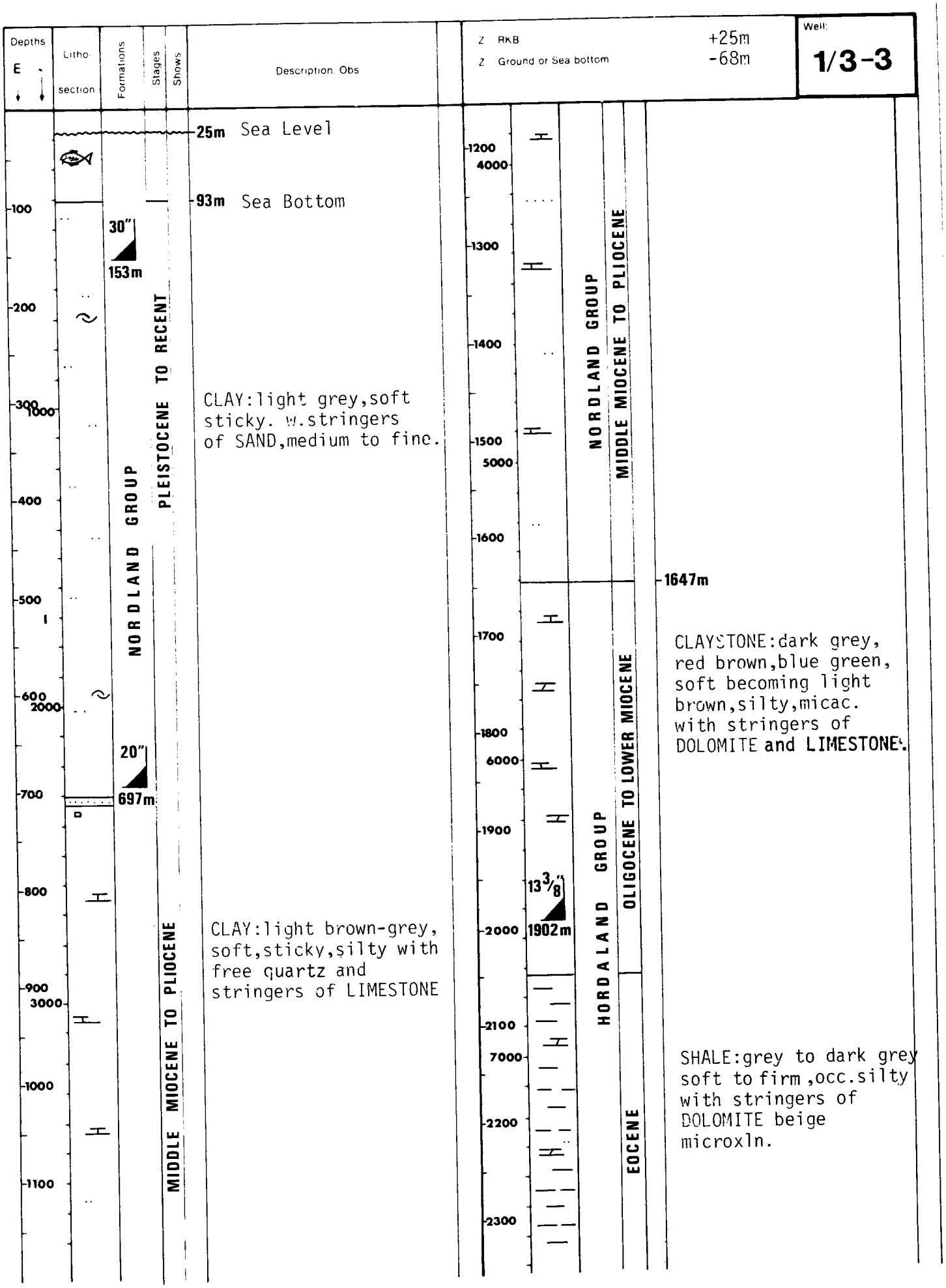

Depths
Litho-section
Formations
Stages
Shows
Description. Obs
Z RKB +25m
Z Ground or Sea bottom -68m
Well:
1/3-3
25m Sea Level
93m Sea Bottom
30"
153m
NORDLAND GROUP
PLEISTOCENE TO RECENT
CLAY:light grey,soft sticky. w.stringers of SAND,medium to fine.
20"
697m
MIDDLE MIOCENE TO PLIOCENE
CLAY:light brown-grey, soft,sticky,silty with free quartz and stringers of LIMESTONE
NORDLAND GROUP
MIDDLE MIOCENE TO PLIOCENE
1647m
CLAYSTONE:dark grey, red brown,blue green, soft becoming light brown,silty,micac. with stringers of DOLOMITE and LIMESTONE.
HORDALAND GROUP
OLIGOCENE TO LOWER MIOCENE
13 3/8"
1902m
EOCENE
SHALE:grey to dark grey soft to firm ,occ.silty with stringers of DOLOMITE beige microxln.

FIG. 3a

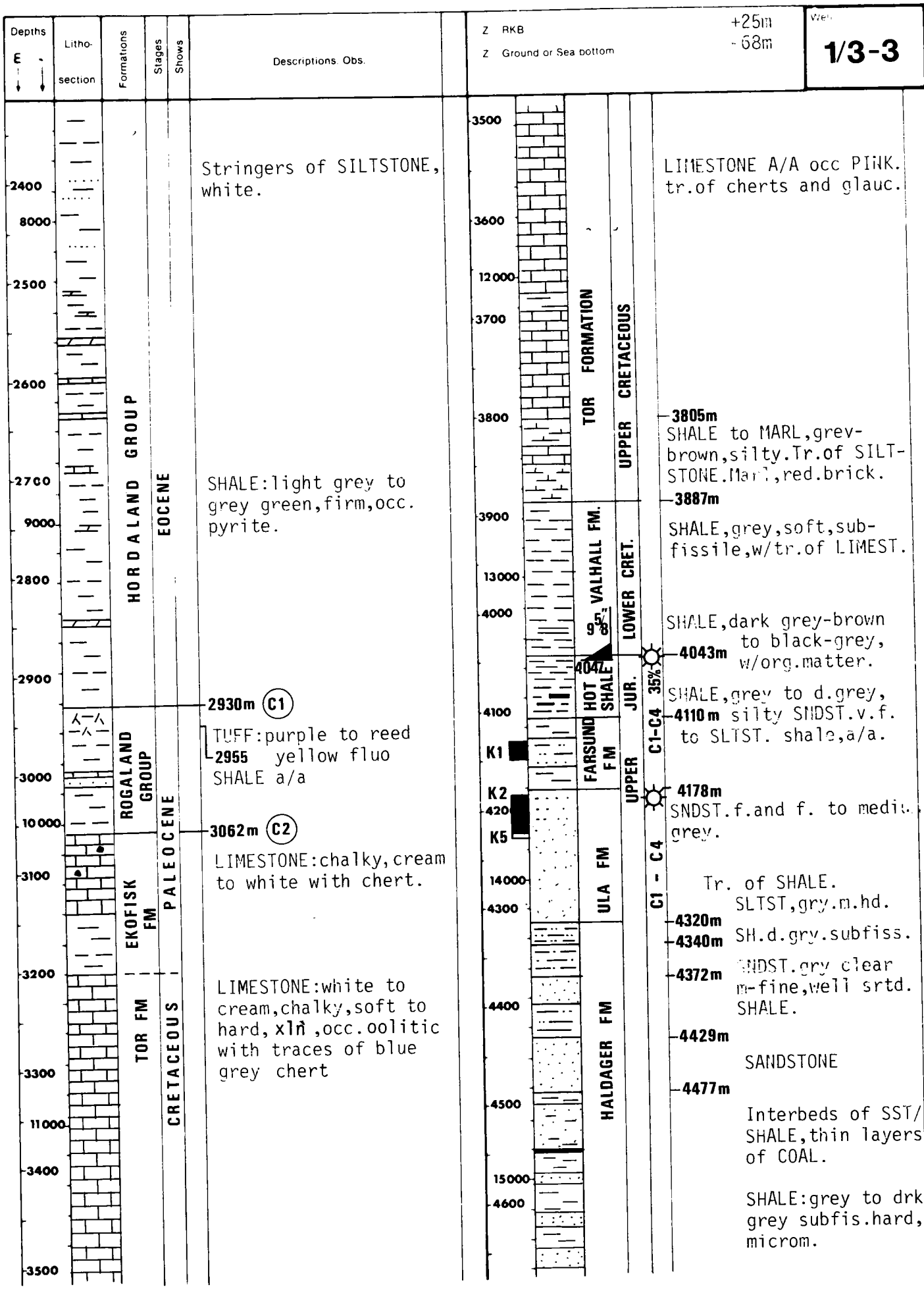


FIG. 3b

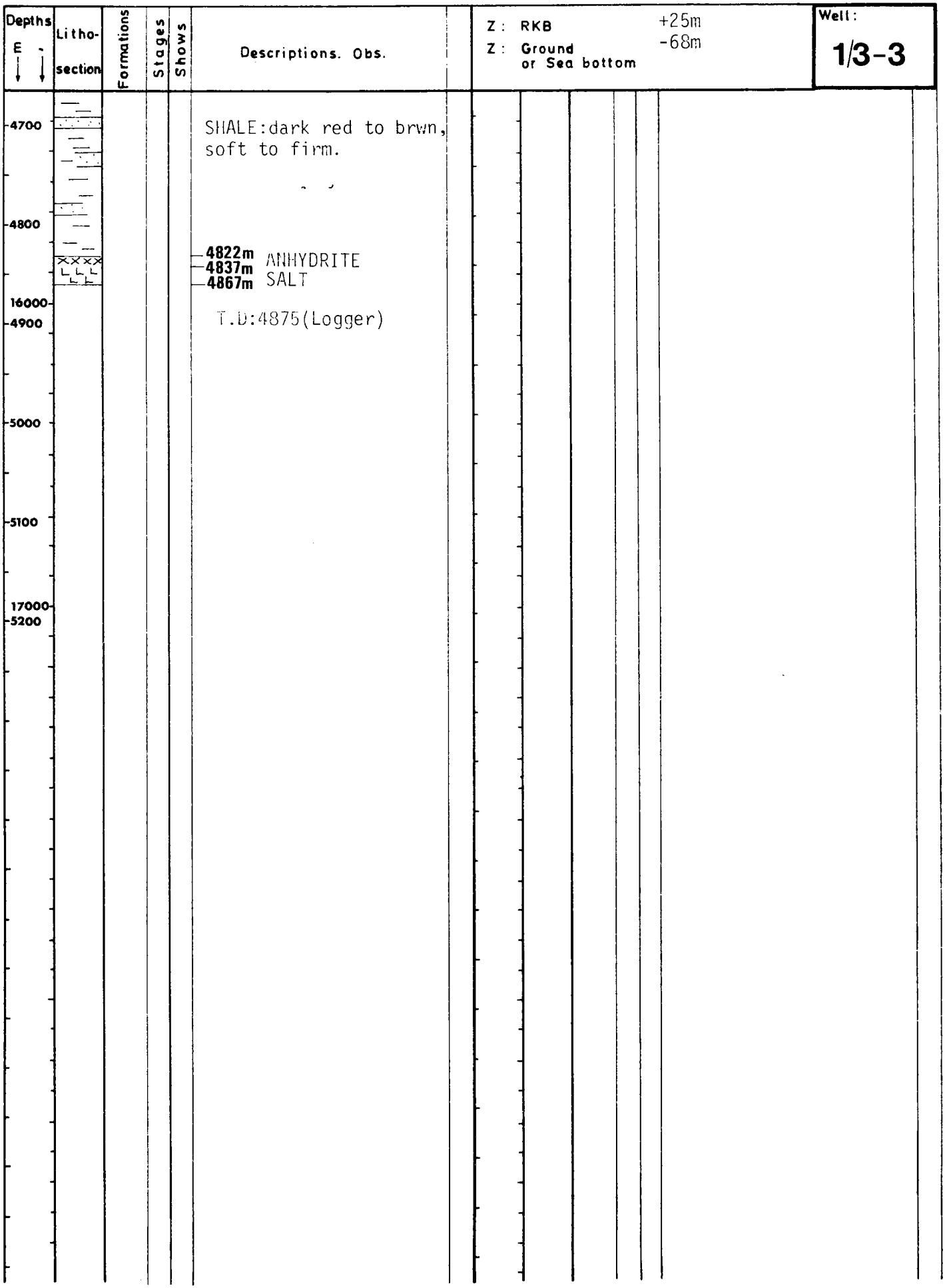
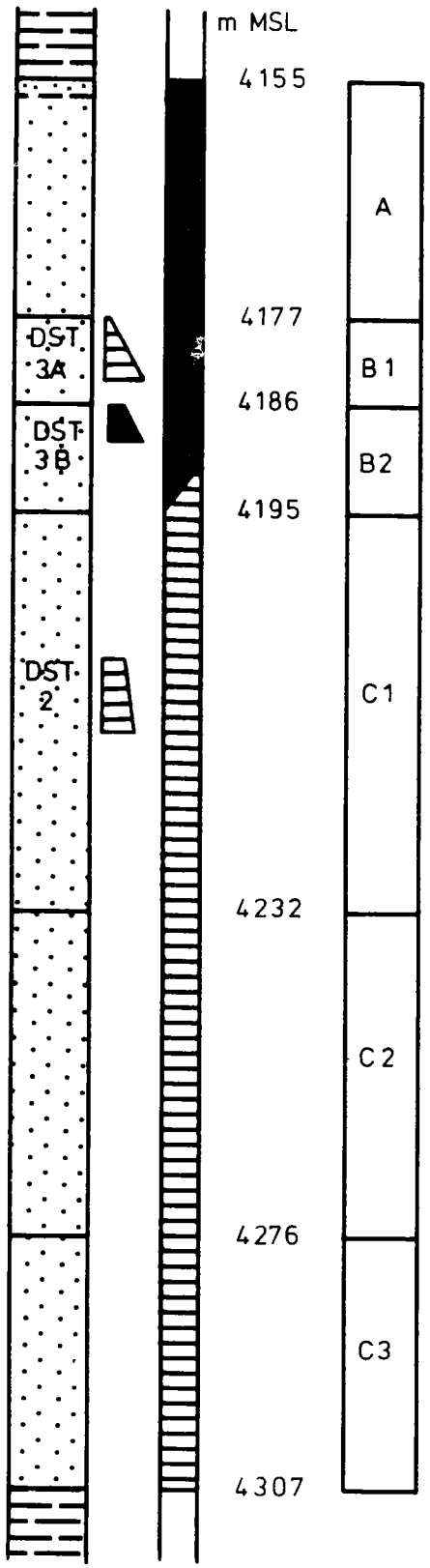

Depths
m
Litho-section
Formations
Stages
Shows
Descriptions. Obs.
Z: RKB +25m
Z: Ground or Sea bottom -68m
Well:
1/3-3
4700
4800
16000
4900
5000
5100
17000
5200
SHALE:dark red to brwn, soft to firm.
4822m ANHYDRITE
4837m SALT
4867m
T.D:4875(Logger)

FIG. 3 c



LAYERS

LAYERS	LOG POROSITY (%)	LOG WATER SATURATION (%)	CORE POROSITY (%)	CORE PERMEABILITY (mD)
A	13	73	12	0.3
B1	15	48	15.5	1.4
B2	18	40	20	12
C1	20	100	22.5	140
C2	9	100		
C3	16	100		

Block / Licence:
Operator:
Field:

elf aquitaine
recherche
RESERVOIR DEPT.

1/3-3

SKETCH OF UPPER JURASSIC RESULTS

Attached to report no:
Title:
Author:
Original filing plan:

PL 4

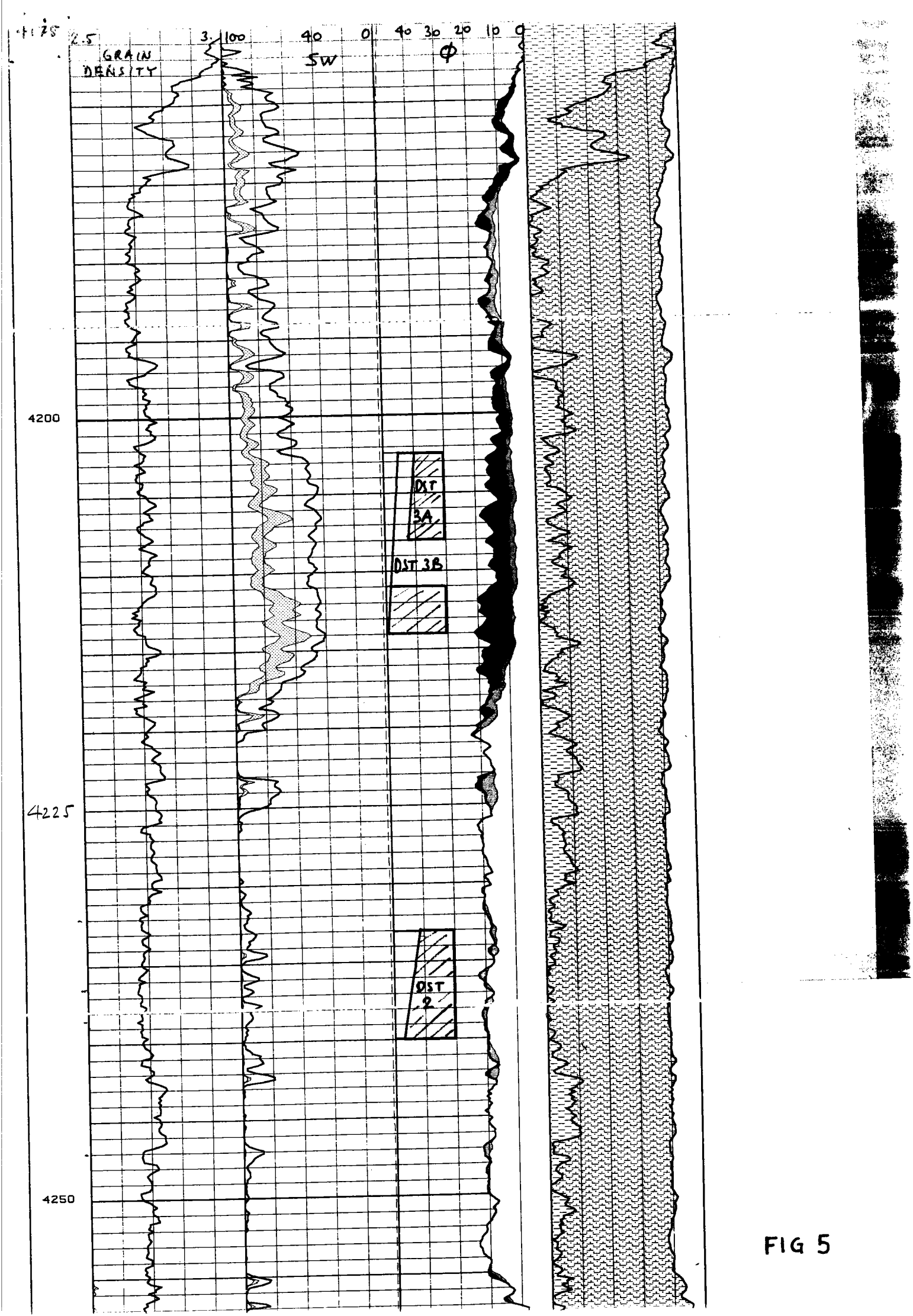
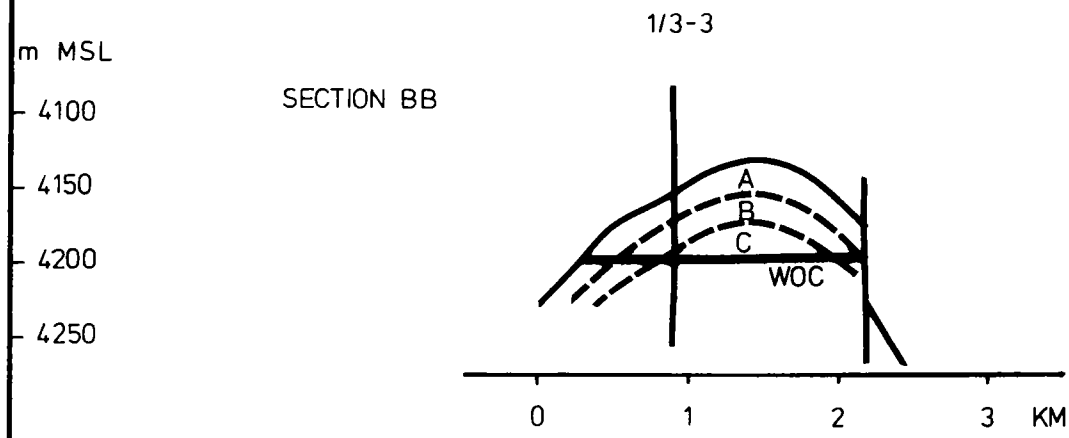
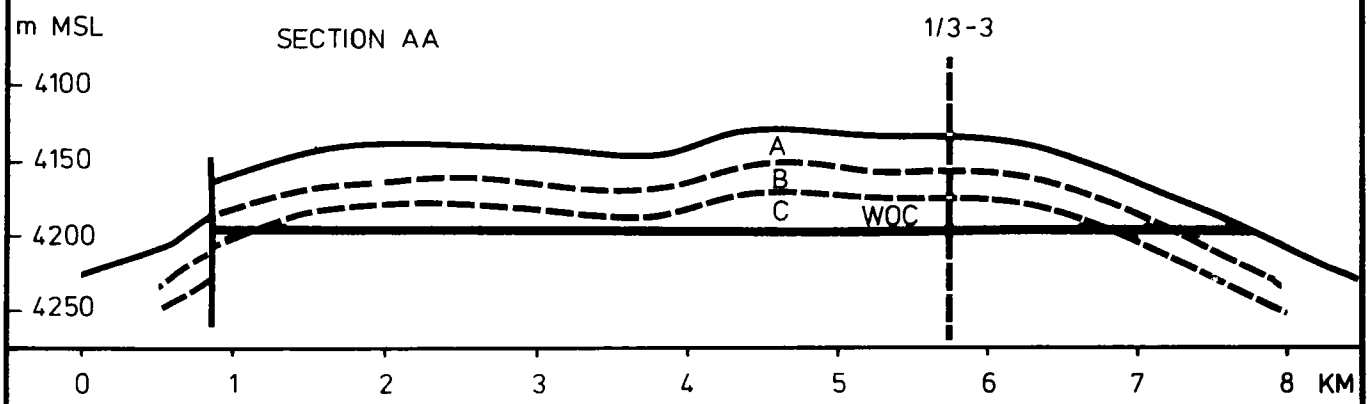

2.5
3.
GRAIN DENSITY
100
40
SW
0
40
30
20
10
0
Φ
4200
DST 3A
DST 3B
4225
DST 2
4250

FIG 5

1/3-3 STRUCTURE





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1/3-3 STRUCTURE

CROSS SECTIONS OF UPPER JURASSIC SANDSTONES

(Top from isobath map of P.Perfetti March82)

Attached to report no:	PL. 6	Date: [redacted]
Title:		Author: [redacted]
Author:		Drawing: [redacted]
Original filing plan:		Filing no:

Block / Licence:
Operator:
Field:

elf aquitaine norge as
reservoir dept.

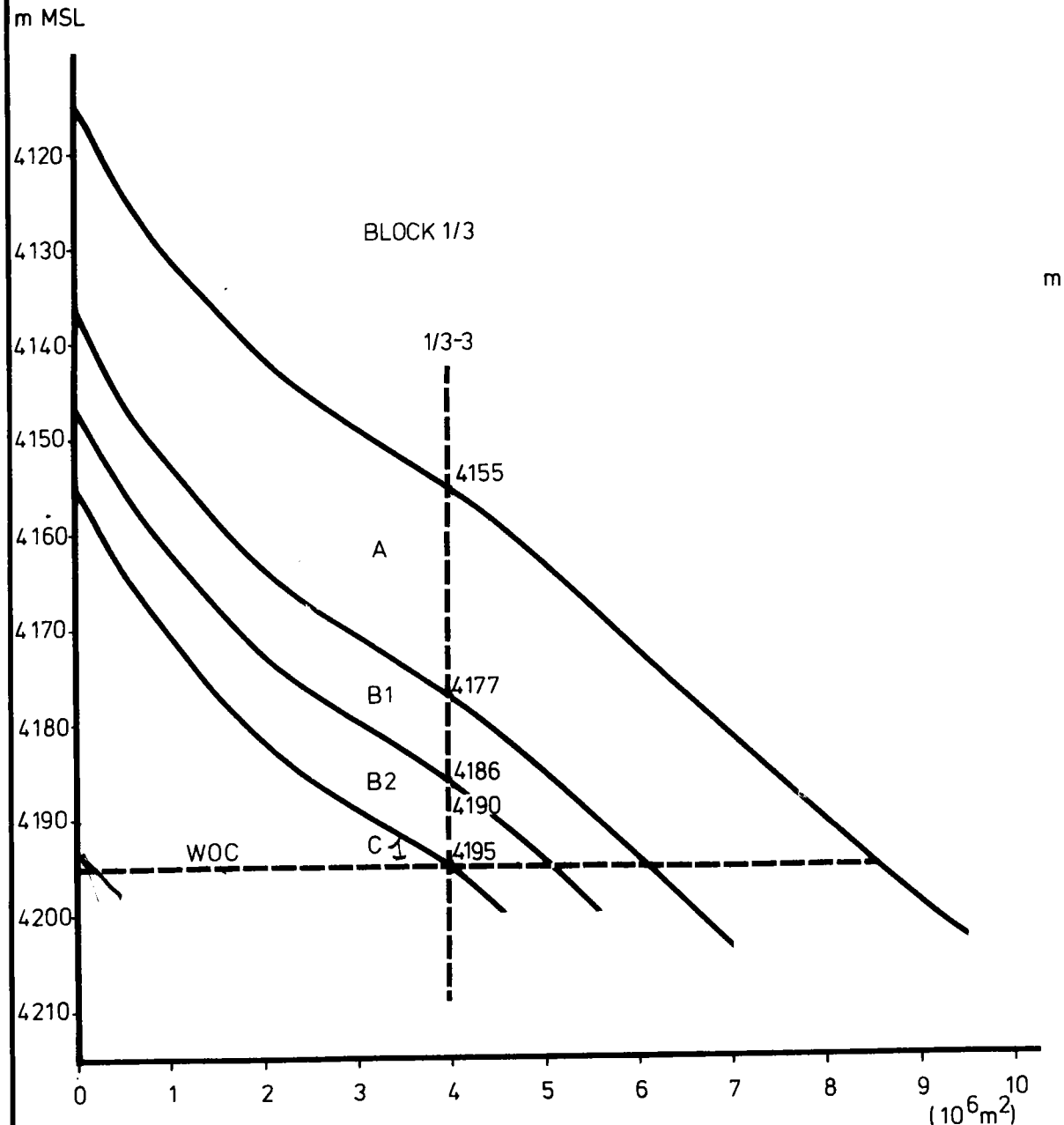
1/3-3 STRUCTURE

PLANIMETRY

Attached to report no:
Title:
Author:
Original filing plan:

PL. 7

Date: 26.3.85
Author: GS
Drawing: RMF
Filing no:



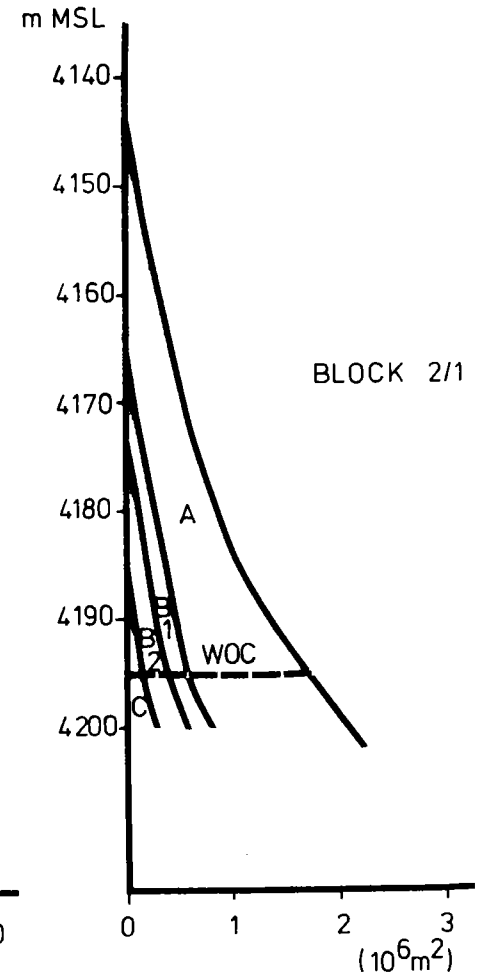


FIG. 7

Fig. 8a: 1/3-3 OIP CALCULATIONS

1/3 BLOCK

LAYER	A			B1			B2			C	
	PROVED		UPDIP	PROVED		UPDIP	PROVED		UPDIP	PROVED	
	TZ	Above TZ		TZ	Above TZ		TZ	Above TZ		TZ	Above TZ
Rock. Vol (10^6m^3)	12.5	95.8	51.7	5.7	37.6	6.7	5.5	34.0	1.8	17.2	45.3
Net/Gross		0.90			1			1			1
Ø (%)		13			15			18			20
Sw log (%)	85	73	73	75	48	48	75	45	45	70	40
HCPV	0.22	3.03	1.63	0.21	2.93	0.52	0.25	3.37	0.18	1.03	5.44
OIP(10^6m^3)		1.91	0.96		1.85	0.31		2.13	0.11		3.80

2/1 BLOCK

Layer	A			B1		B2		C	
	PROVED		UPDIP	PROVED		PROVED		PROVED	
	TZ	Above TZ		TZ	Above TZ	TZ	Above TZ	TZ	Above TZ
Rock. Vol (10^6m^3)	5.0	16.8	1.5	1.0	4.0	1.0	2.0	0.75	0.5
Net/Gross		0.90			1		1		1
Ø (%)		13			15		18		20
Sw log(%)	85	73	73	75	48	75	45	70	40
HCPV	0.09	0.53	0.05	0.04	0.31	0.05	0.20	0.01	0.06
OIP(10^6m^3)		0.36	0.03		0.21		0.15		0.0 4

NB: TZ = Transition zone from oil to water

HCPV = Hydrocarbon Pore Volume

Oil formation volume fator: Bo = 1.7 (from correlations)

Fig. 8b: ROCK VOLUMES ($10^6 m^3$)

Layer / Block	A	B1	B2	C	Total
1/3	160	50.0	41.3	62.5	313.8
2/1	23.3	5.0	3.0	1.25	32.5
Total	183.3	55.0	44.3	63.7	346.3