statoil

Petrophysical Evaluation

Well 34/10-6

BY PETROLEUM ENGINEERING

PETROPHYSICAL GROUP

DATE: MARCH 1980

ENG.: J. RAFDAL

Den norske stats oljeselskap a.s

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CONTENTS

GENERAL WELL DATA

NORWAY OFFSHORE

Licence	:	050
Wildcat well	:	34/10-6
Location	:	61°14' 37.09"N 02°13' 43.71"E
Spudded	:	10.11.1979
Rig released	:	23.1.1980
KB-elevation	:	25 m
Waterdepth	:	222.5 m
Total depth	:	2363 m
Objective	:	Jurassic sandstone
Operator	:	Statoil
Partners	:	Norsk Hydro, Saga Petroleum
Status	:	Plugged and abandonned

Introduction

This is the fifth well drilled on the 34/10-Delta structure. The primary objective was to test the Jurassic formations for hydrocarbon accumulations. This report will evaluate the petrophysical parameters of the Brent section using electrical logs.

Summary

Brent formation (2075 - 2277) is below the o/w contact and is waterbearing. Statfjord formations was not penetrated. Brent formation encounter 144.75 m of net sand with an average porosity of 27.8%.

LITHOLOGY

BRENT FORMATION IS DIVIDED INTO THE FOLLOWING ZONES:

Ness (2075 - 2164):	Interbedded sand. silt, shale and coal.
Etive (2164 - 2198):	Fairly clean sandstone interbedded with some coalstreaks.
Rannoch (2198 - 2268):	Clean to argillaceous sandstone interbedded with some calcitic cemented streaks.
Broom (2268 - 2277):	Argillaceous silt sand. Non reservoir unit.

INPUT PARAMETERS

Input parameters have been picked from crossplots, measured data and empirical relations.

Shale parameters

The following shale parameters have been used:

ρbsh	$\emptyset_{NSH}$	GR min	GR max	R_{SH}	Intervall
2.35	0.45	40	80	1.5	2075 - 2198
		43	80		2198 - 2275

Temperature

The temperature is assumed to be constant through out the reservoir.

$160^{o}F$ has been used.

Mud properties

Rm = .737 Ωm $51^{o}F$ → 0.25 Ωm $160^{o}F$

Rmf = .5 ——"—— → 0.18 ——"——

Rmc = 2.28 ——"—— → 0.77 ——"——

Formation water resistivity

Rw = 0.075 @ $160^{o}F$ (45 000 ppm NaCl)

This was established from a watertest in 34/10-3.

Resistivity

Ild is used uncorrected for R_T

No Rxo tool was run.

Computations.

Shale volum

GR and FDC/CNL-crossplot have been used and the minimum values have been picked for VSH.

Porosity

A complex lithology approach has been used, applying the FDC/CNL-crossplot with the following matrix parameters:

		FDC	CNL
Quartz	:	2.65	-0.035
Heavy Mineral	:	2.90	0.25
Fluid	:	1.0	1.0

Formation Factor

The following relation measured on cores:

$$F = \Phi^{-2}$$

Saturation exponent

Core measurements suggest a satruation exponent of 1.95.

Watersaturation

The Nigeria-equation (Shclumberger) has been used for calculations of the watersaturation:

$$\frac{1}{\sqrt{R_T}} = \left[\frac{Vclay^C}{\sqrt{Rsh}} + \frac{\phi^{m/2}}{\sqrt{aRw}} \right] Sw^{n/2}$$

where

R_T = Resistivity in virgin zone

Sw = Watersaturation

Vclay = Shale volum

C = Shale exponent (1.6 used)

R_{SH} = Resistivity of shale

Φ = Porosity

m = Cementation exponent

a = Lithology factor

Rw = Formation water resistivity

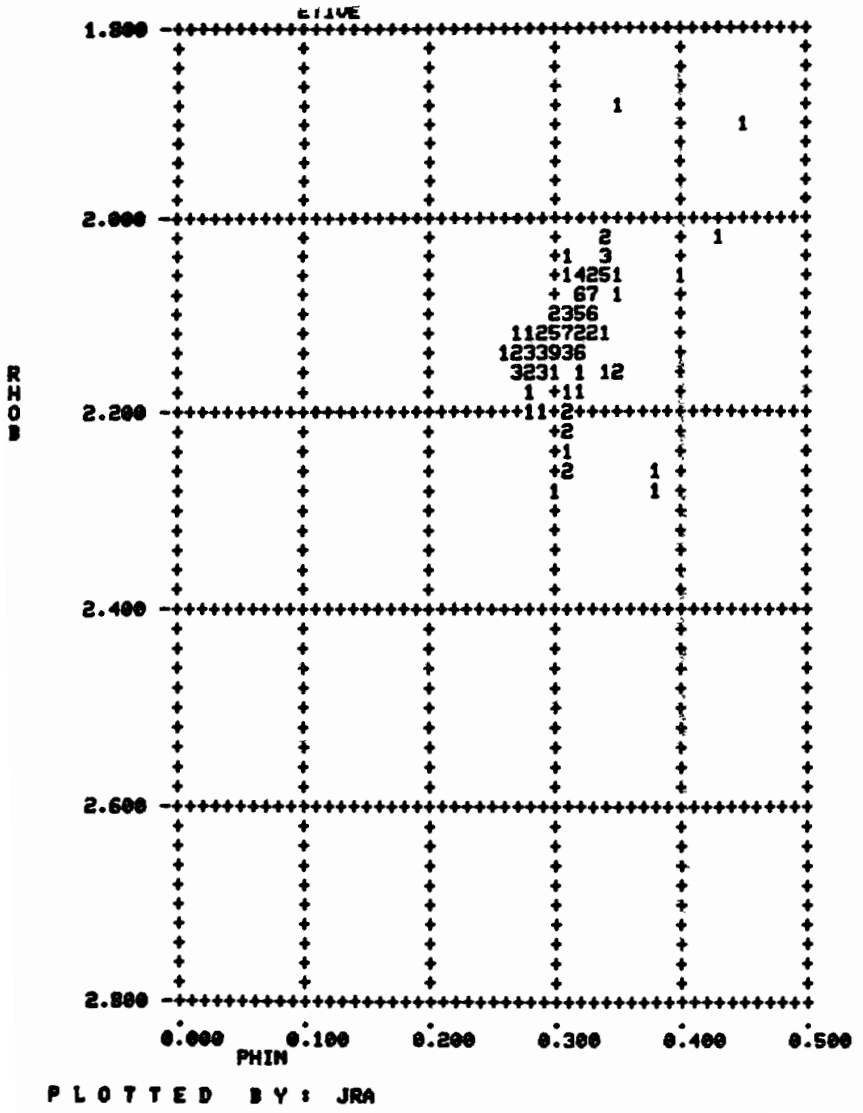
n = Saturation exponent

34/10-6 RESULTS PETROPHYSICAL PARAMETERS

ZONE	INTERVAL	NET SAND THICKNESS	AVG. POROSITY	AVG. WATER (calculated)	NET/GROSS RATIO
NESS	2075-2164	49.25	26.3	0.90	0.55
ETIVE	2164-2198	30.0	32.3	1.00	0.88
RANNOCH	2198-2268	65.5	26.8	0.96	0.93
BROOM	2268-2277	—	—	—	0
TOTAL BRENT	2075-2277	144.75	27.8	—	0.72

Cut off criterion : VSH > 40%
PHIF < 12%

ETIVE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2.000
2.200
2.400
2.600
2.800
RHOB
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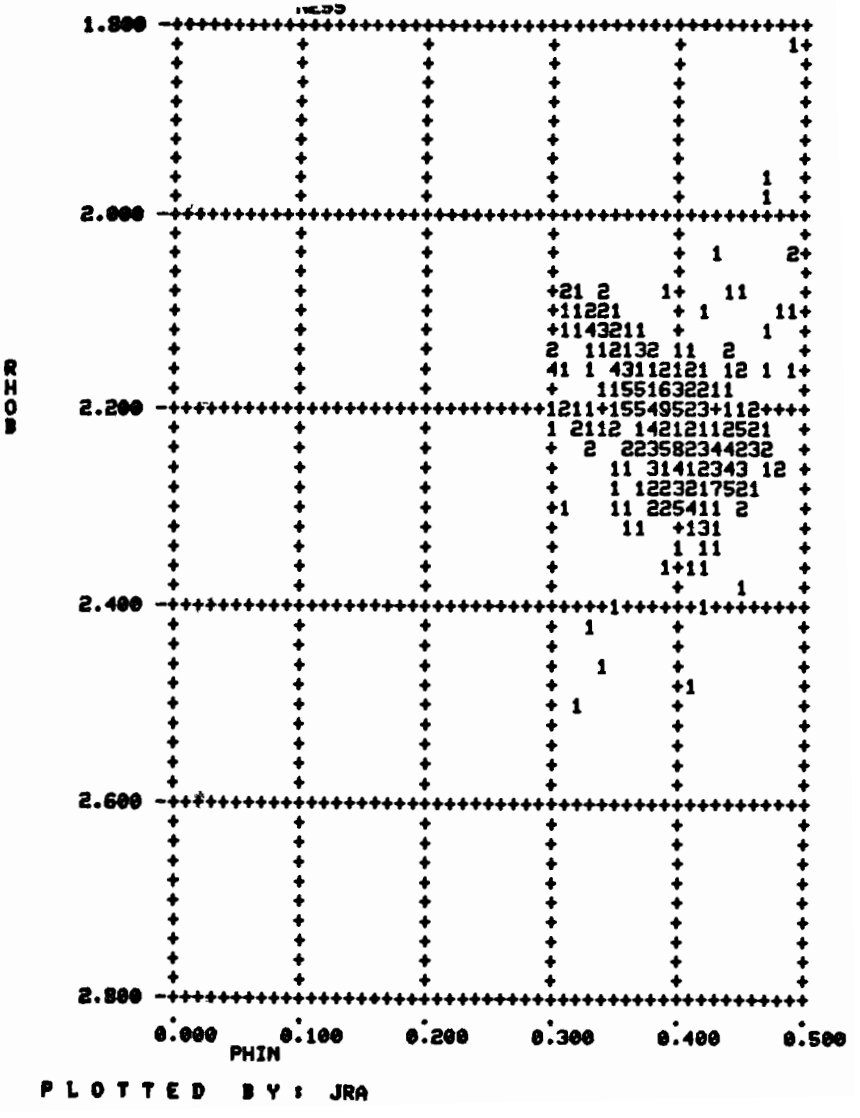
0.100
0.200
0.300
0.400
0.500
PHIN
PLOTTED BY: JRA

NESS


NESS
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2.000
2.200
2.400
2.600
2.800
RHOB
0.000
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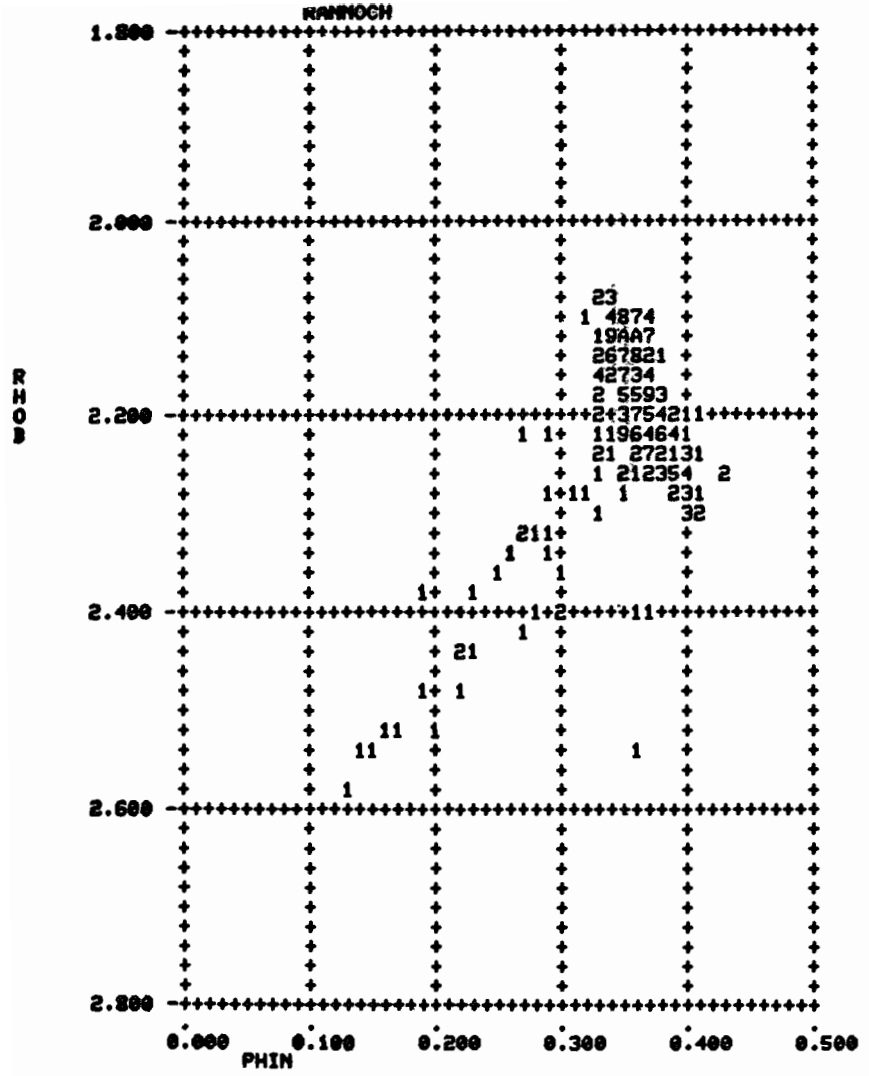
0.400
0.500
PHIN
PLOTTED BY: JRA


RANNOCH
RHOB
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2.000
2.200
2.400
2.600
2.800
0.000
0.100
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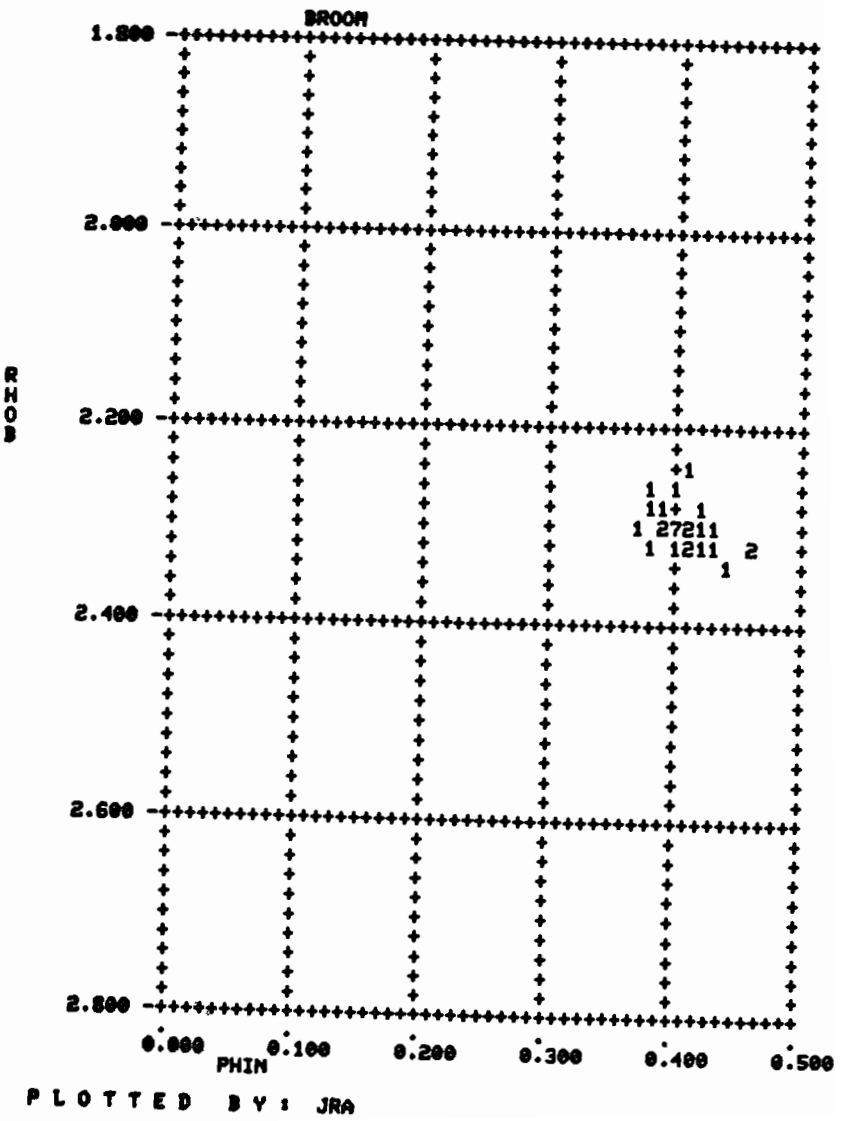
0.300
0.400
0.500
PHIN
PLOTTED BY: JRA


BROOM
RHOB
1.800
2.000
2.200
2.400
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2.800
0.000
0.100
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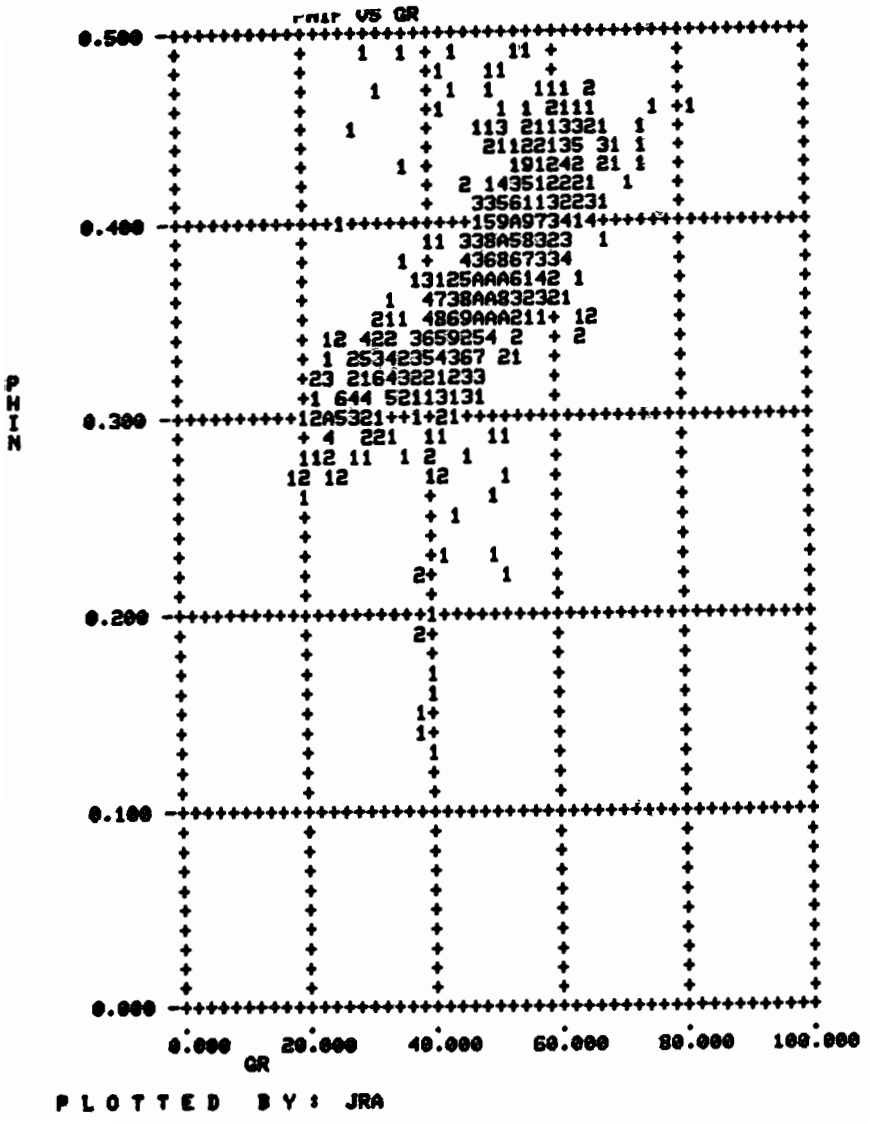
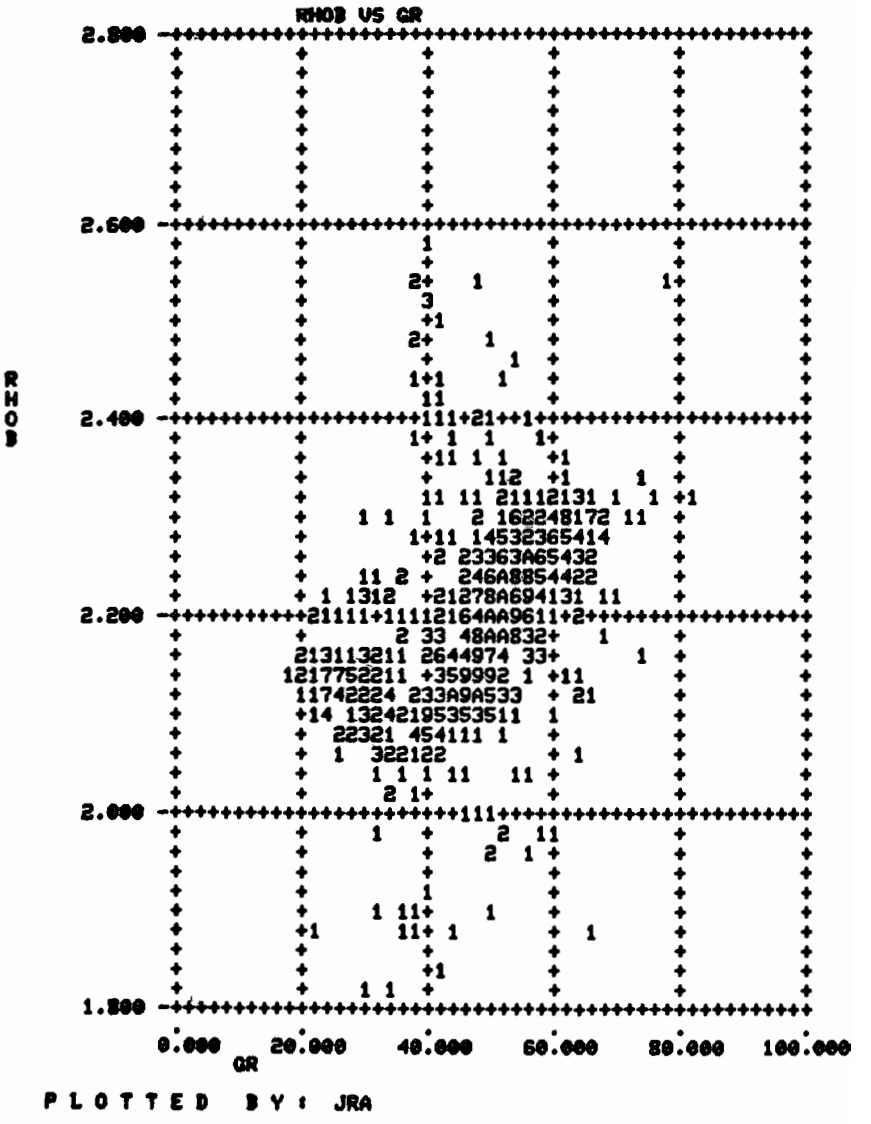
0.300
0.400
0.500
PHIN
PLOTTED BY: JRA


PHIN VS GR
PHIN
0.500
0.400
0.300
0.200
0.100
0.000
0.000
20.000
40.000
60.000
80.000
100.000
GR
PLOTTED BY: JRA


RHOB VS GR
RHOB
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2.600
2.400
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1.800
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20.000
40.000
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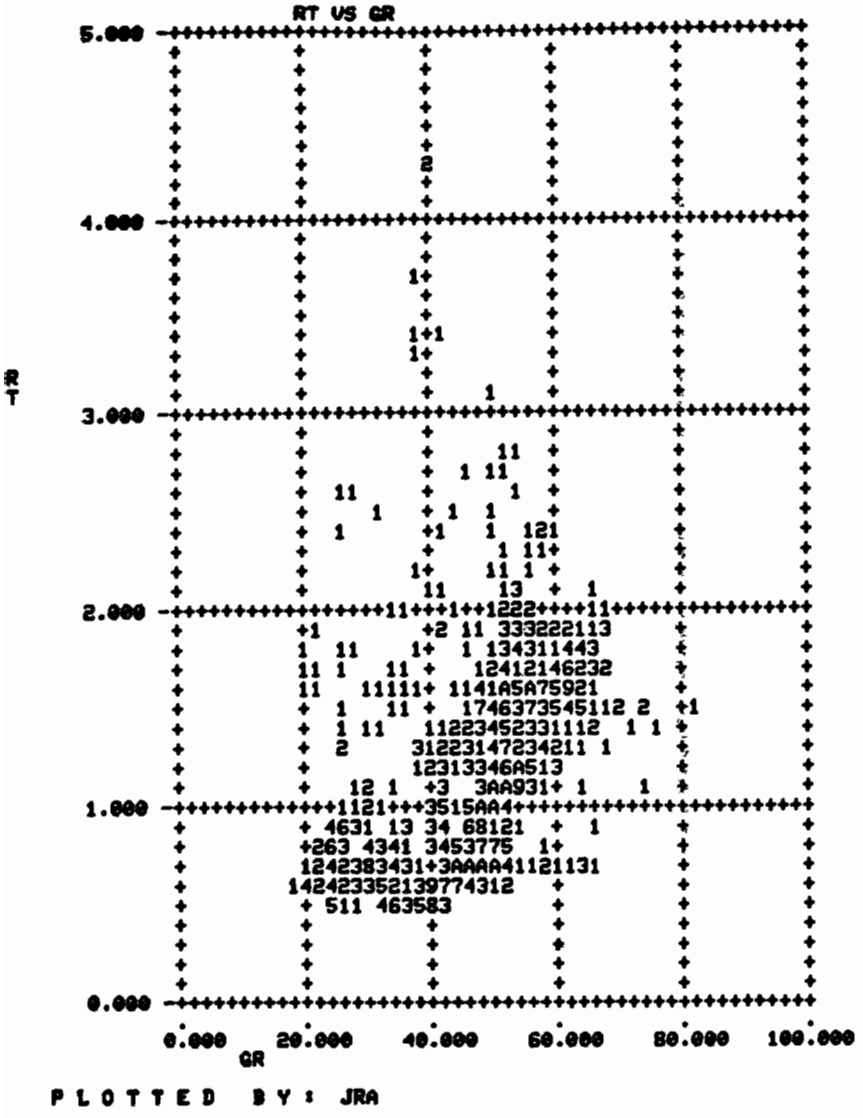
80.000
100.000
GR
PLOTTED BY: JRA


RT VS GR
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4.000
3.000
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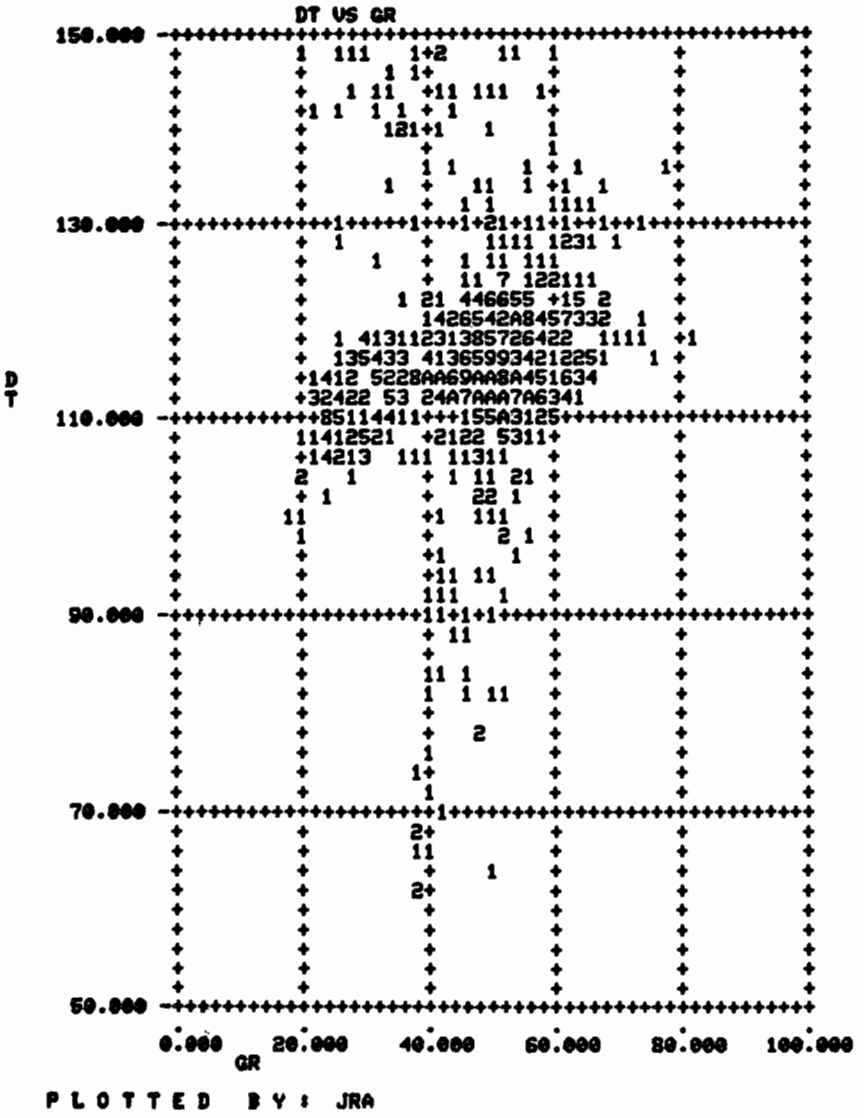
1.000
0.000
0.000
20.000
40.000
60.000
80.000
100.000
GR
PLOTTED BY: JRA


DT VS GR
DT
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130.000
110.000
90.000
70.000
50.000
0.000
20.000
40.000
60.000
80.000
100.000
GR
PLOTTED BY: JRA

COMPUTERIZED LOG INTERPRETATION

PROGRAM: PGM0377 VERSJON: 1 (20APR78) + BY: COP/OD-SEKSJONEN

WELL: 34/10-6
FIELD: WILDCAT
ENGINEER: J.RAFDAL
DATE: 5/3-80

DEPTH INTERVAL: 2075 - 2275 (METER)
RKB: 25.0 (METER)
PERMANENT DATUM: MSL
DEPTH REFERENCE: ISF/SONIC
SCALE: 1 : 200

INPUT PARAMETERS:

DEPTH INTERVAL	RW	RMF	RSH	RHOBSH	PHINSH	DTSH	FORM. TEMP. (DEG. F)
2075 - 2275	0.075	0.098	1.50	2.35	0.45	120.0	160