statoil

# WELLFILE

PRELIMINARY
FORMATION EVALUATION OF
WELL 1/9-3

DONE BY PETROPHYSICAL SECTION
PRODUCTION DEPARTMENT, STATOIL

DATE: 28/6 - 1978

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40.000 3-77 Litografen 8536

Contents

NORWAY OFFSHORE

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## WELL DATA

| | | |
|---|---|---|
| Well name | : | 1/9-3 |
| Location | : | 56° 24´<br>02° 54´ |
| Classification | : | Juassic test |
| Prospect | : | 1/9 Alpha Structure |
| Drilling period | : | re-entry 21. may 1978 |
| KB elevation | : | 35.77m |
| Water depth | : | 76. m |
| Objective | : | Ekofisk and Tor formations<br>Jurassic sandstone above salt. |

## 2. Abstracts

Well 1/9-3 is a delineation well on the Block 1/9 Alpha structure. The well is located 1.58 km. north of the 1/9-1 well and 3.23 km from the N/KK Median line.

The well was cored with 8 core barells in the Ekofisk/Tor formation.

A preliminary log-evaluation was done based upon the IEL/AL/GR/SP and the CDL/CNL/GR logs.

Depth is referred to IEL/AL/GR/SP.

## 3. Summary

Table 1 on the next page shows the zonation of well 1/9-3 with the average net pay values for porosity, watersaturation and the shale volume.

The preliminary Statoil CPF calculates a total net productive pay of 42.75m of oil/condensate.

Below 3225.5m no hydrocarbonsaturation is seen.

Table 1

Results Log interpretation, Well 1/9-3

| Zone | Depth (m) | Gros thickness (m) | Net sand (m) | Net pay (m) | Av. porosity (%) Net pay | Av. water sat. (%) Net pay | Av. shale volume (%) Net pay |
|---|---|---|---|---|---|---|---|
| 1 | 3050-3112.5 | 62.5 | 30.5 | 29.75 | 29.4 | 31.8 | .3 |
| 2 | 3112.5-3152 | 39.5 | 25.0 | 9.75 | 25.0 | 56.6 | .4 |
| 3 | 3152-3375 | 223. | 215.5 | 3.25 | 25.6 | 47.7 | 0. |

Cut-off values:

zone 1&2: $\phi \leq 20\%$, $SW \geq 60\%$, $V_{sh} \geq 30\%$

zone 3: $\phi \leq 15\%$, $SW \geq 50\%$, $V_{sh} \geq 30\%$

## 4. Cross-plots

The following cross-plots were used:

- Pickett plots
- CDL/CNL plots
- BHC/CNL plots

The crossplots are shown in chapter

### 4.1 Estimation of RW

The SP is not applicable in this well. Water resistivity is therefore picked from the sonic Pickett plots in the water-zone.

The following resistivities were used:

Ekofisk formation: .028 ohm-m
Tor formation: .025 ohm-m

### 4.2 $\rho b$ vs $\phi_N$ plot

Compared with the plots from surrounding wells (1/9-1, 1/9-2) the 1/9-3 plots (fig.1-3) are skifted against higher CNL values by approximately 10. p.m.

From the borehole correction chart (Dresser Atlas) approximately 5 p.u should be subtracted from the CNL readings due to $12^1/4$" hole.

The CNL is also shifted slightly on the before and after calibration, so that the total correction on the CNL is 6.porosity units. On the after calibration chart on the CDL it seems that there have been a shift in the CDL readings during logging.

One uncertainty is the sonic matrix respons (47.5 γs/ft).
It might be that this value is slightly too low, which means that
m = 1.9 is too low.

It is obvious from the Pickett-plots that the statistics on the CDL/CNL tools are larger because the sonic log gives a very good water-zone trend with little scattering.

To account for this shift,the new CDL readings (ρb) is calculated from:

$$\rho b' = .95\rho b + .08$$

These new plots (fig. 4-6) are then shifted and corresponds fairly well with the 1/9-1, 1/9-2 crossplots.

The ρb- $\phi_N$ plots shows greater scattering than seen from other wells. The reason might be that statistics on the tools are higher.

## 4.3 Δt vs $\phi_N$

Comparing these plots (fig. 7-9) with plots from 1/9-1, 1/9-2 seems to confirm the 6 porosity-unit correction needed on the CNL.

The sonic-log is then thought to be calibrated well and can be used without any correction.

## 4.4 ρb vs Δt

The CDL was plotted against the BHC AC (fig. 10-12). It is not possible to determine any appropriate corrections on the logs from these plots due to pure resolution for different lithologies.

## 4.5 Pickett - plots

Pickett-plots were plottet for all the porosity tools. The $R_t$-log is the inverse conductivity curve.

The CNL and CDL plots are for uncorrected data.

The BHC AL plot shows a very good water-zone trend. The waterresistivity and the m-value for the Tor-formation is picked from this plot:

RW = .025 ohm-m
M = 1.9

## 5. Log interpretation

The well was logged with:

- IEL/BHC AL/GR/SP
- CDL/CNL/GR

Data was digitized with the IEL/BHC AL as depth reference.

Input parameters and cut-off values to the log interpretation can be seen in table 2.

The porosity calculations is based upon the crossplots of corrected CNL/CDL values. The responses are corrected for shale volume calculated from the GR curve and then corrected for hydrocarbon effect in an iterative calculation procedure.

The residual watersaturation is calculated from the relationship:

$$Sxo = SW^{0.2}$$

Water saturation is calculated from the "Nigeria" watersaturation formula:

$$\frac{1}{R_t} = \frac{V_{sh}^{c} \cdot SW}{R_{sh}} + \frac{\phi^{m} \cdot SW^{n}}{a \cdot R_w}$$

The Statoil CPI is enclosed in Appendix A.

Table 2

Input parameters

| | | zone 1 | zone 2 |
|---|---|---|---|
| Interval (m) | | 3050. - 3152.m | 3152. - 3375.m |
| $\rho ma$ | (g/cc) | 2.72 | 2.72 |
| $\Delta tma$ | (ms/ft) | 47.5 | 47.5 |
| $\rho bsh$ | (g/cc) | 2.35 | 2.35 |
| $\phi_{sh}$ | (l.u.) | 35. | 35. |
| $\Delta t_{sh}$ | (ms/ft) | 130. | 130. |
| $Gr_{max}$ | (API) | 100. | 100. |
| $Gr_{min}$ | (API) | 30. | 30. |
| Rmf | (ohm-m) | .08 | .08 |
| RW | (ohm-m) | .028 | .025 |
| Rsh | (ohm-m) | .8 | .8 |
| g | | 1. | 1. |
| m | | 2. | 1.9 |
| n | | 2. | 1.9 |
| $\rho fl$ | (g/cc) | 1.02 | 1.02 |
| $\rho ny$ | (g/cc) | .65 | .65 |
| BHT | ($^{o}$F) | 225. | 230. |
| Cut-off: | | | |
| $\phi$ | (%) | 20. | 15. |
| $V_{sh}$ | (%) | 30. | 30. |
| SW | (%) | 60. | 50. |

# 6. Figures

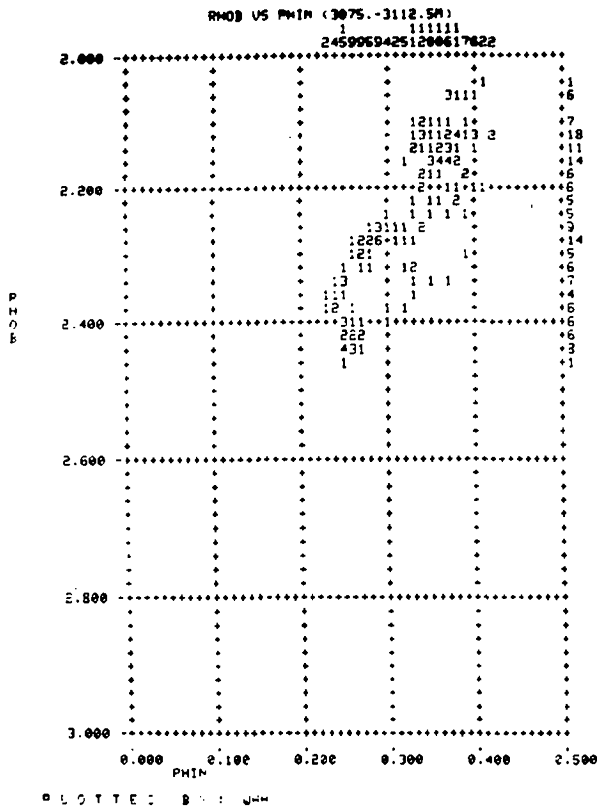

RHOB VS PHIN (3075.-3112.5M)
RHOB
PHIN
PLOTTED BY: WHH

Fig. 1

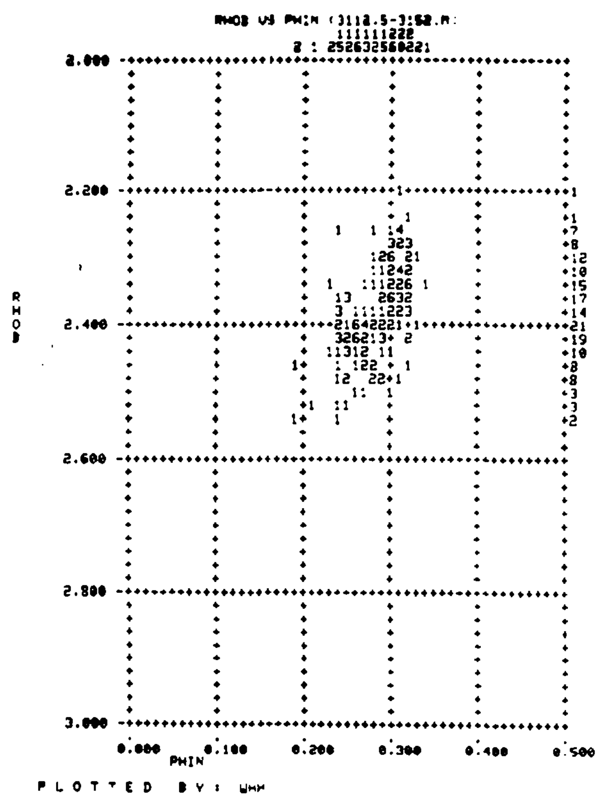

RHOB
PHIN
PLOTTED BY: WHH

Fig. 2

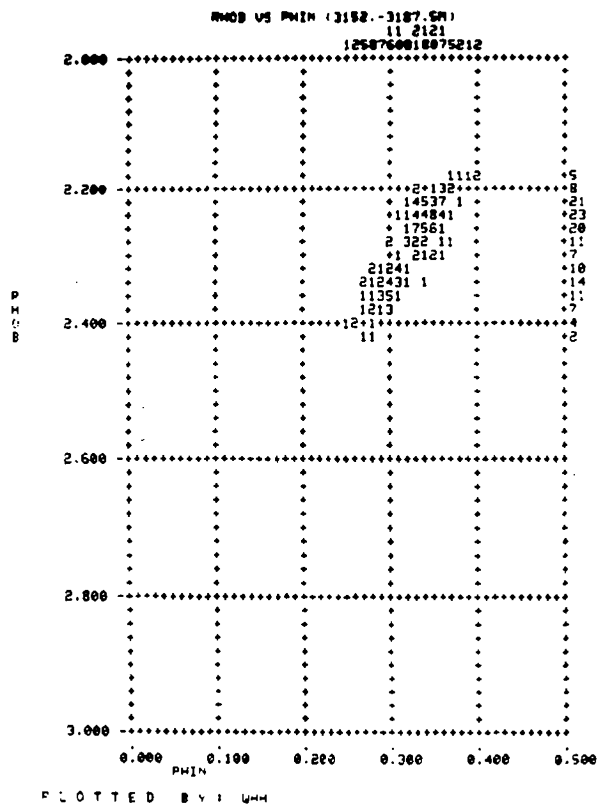

RHOB VS PHIN (3152.-3187.5M)
PHIN
RHOB
PLOTTED BY: UHH

Fig. 3

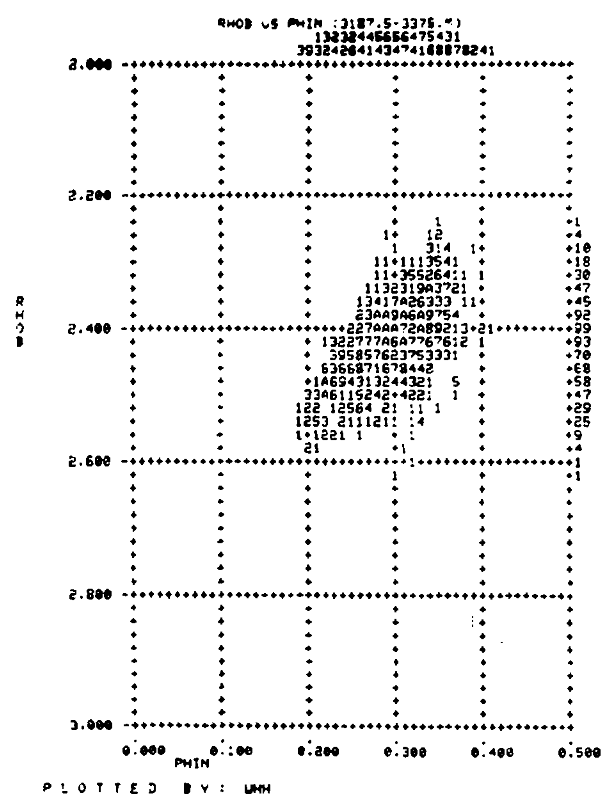

RHOB VS PHIN (3187.5-3375.*)
PHIN
RHOB
PLOTTED BY: UHH

Fig. 4

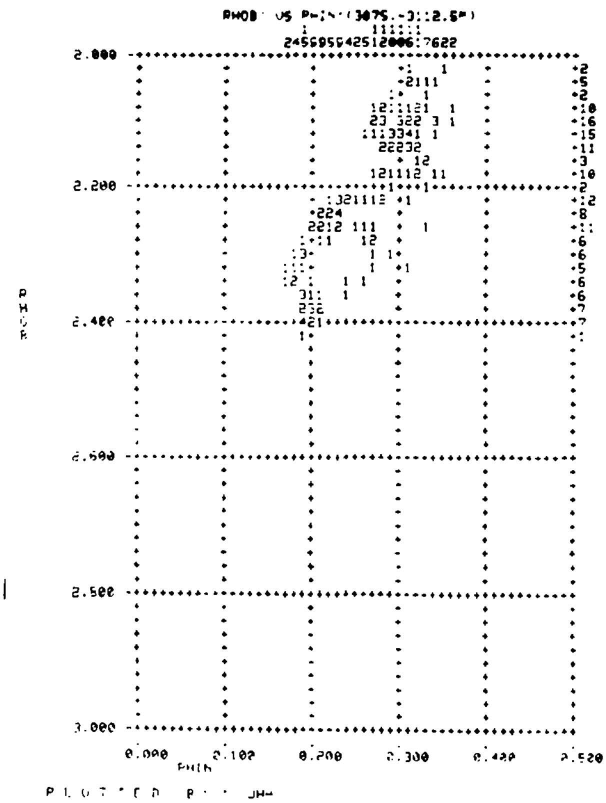

RHOB' VS PHIN'(3075.-3112.5M)
2.000
2.200
3.000
0.000
0.200
0.300
PHIN

Fig. 5

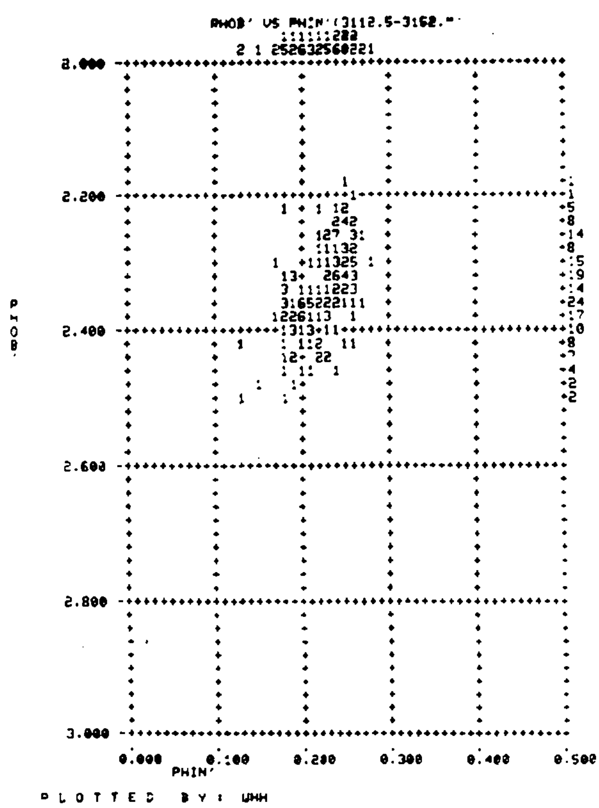

RHOB' VS PHIN'(3112.5-3162.M)
2.000
2.200
2.400
2.600
2.800
3.000
RHOB'
0.000
0.100
0.200
0.300
0.400
0.500
PHIN'
PLOTTED BY: UHH

Fig. 6

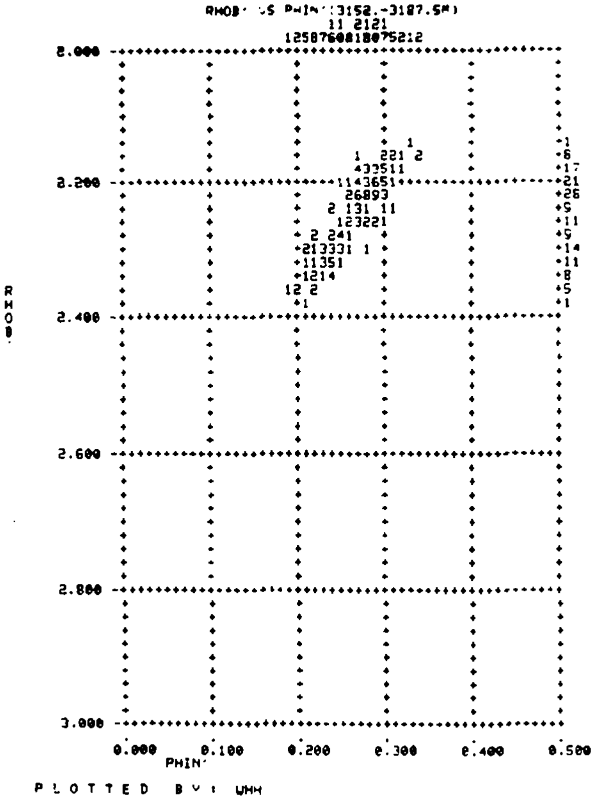

RHOB' VS PHIN' (3152.-3187.5M)
PHIN'
RHOB
PLOTTED BY: UHH

Fig. 7

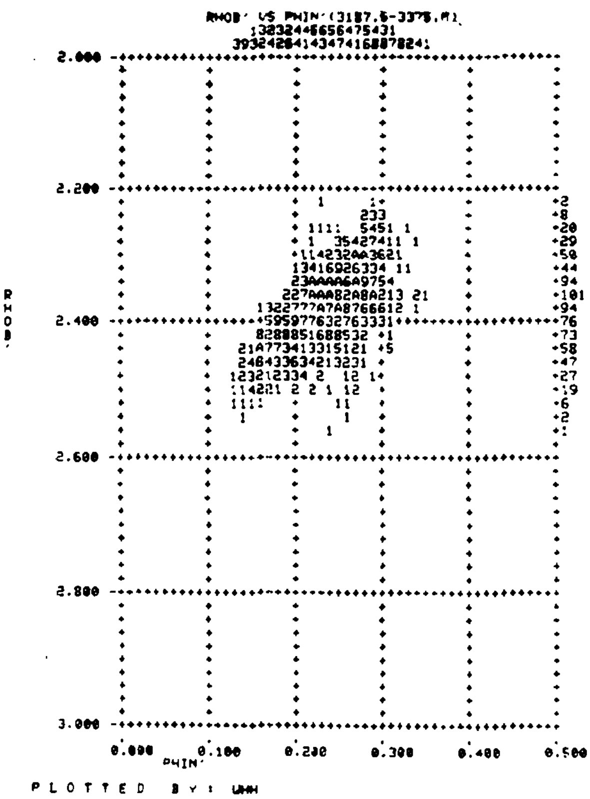

RHOB' VS PHIN' (3187.5-3375.M)
PHIN'
RHOB
PLOTTED BY: UHH

Fig. 8

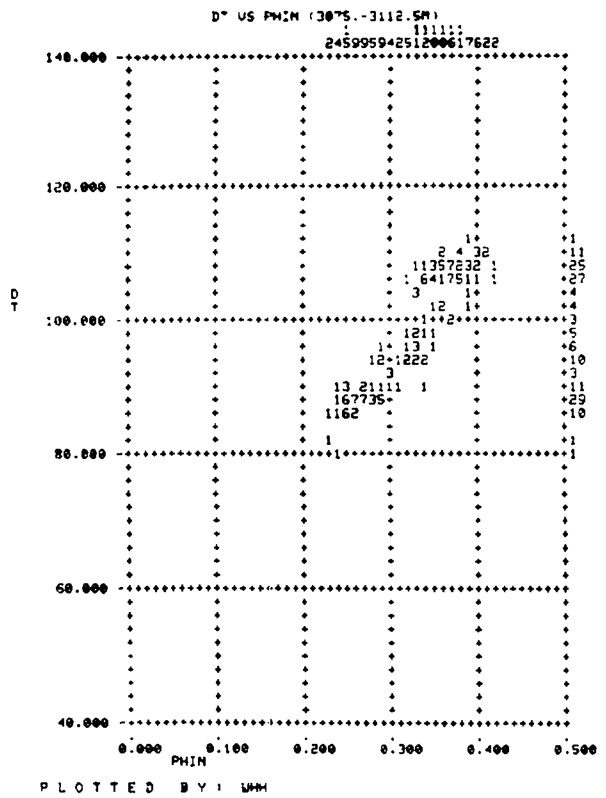

DT VS PHIN (3075.-3112.5M)
PHIN
PLOTTED BY: UHH

Fig. 9

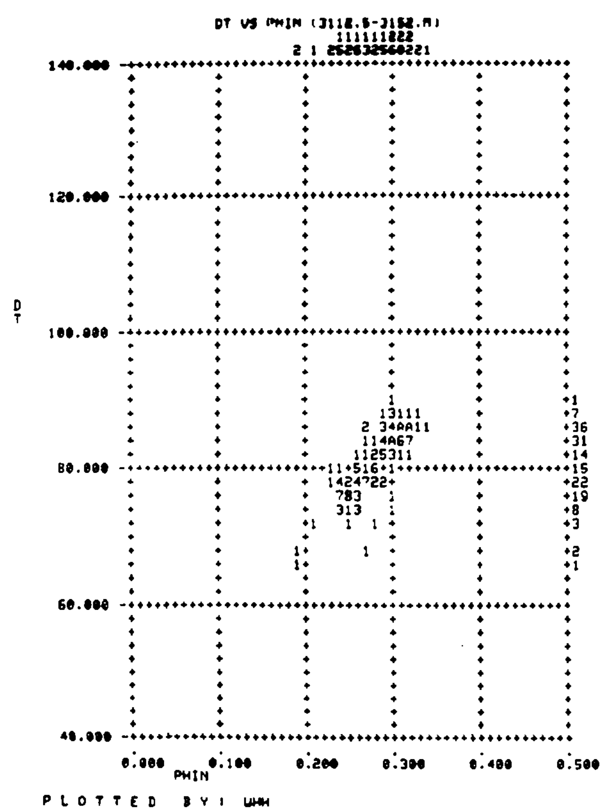

PHIN
PLOTTED BY: UHH

Fig. 10

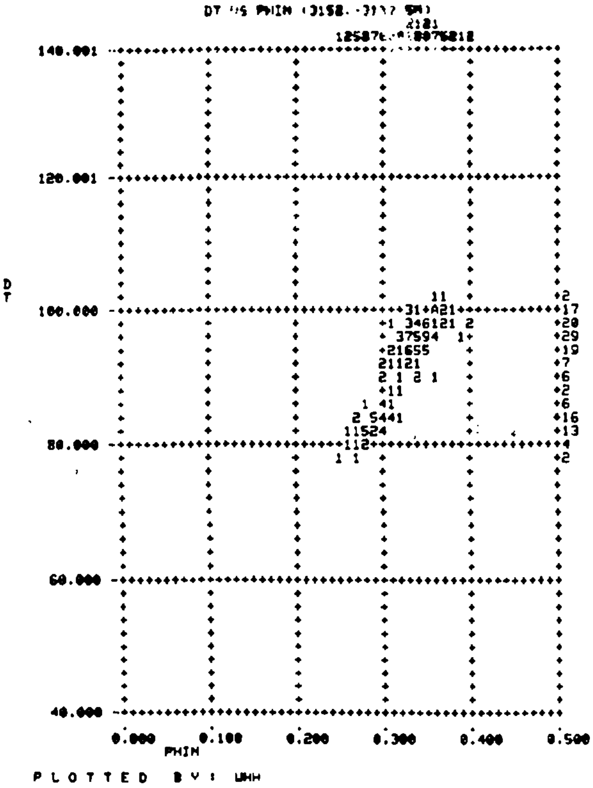

DT
PHIN
140.001
120.001
100.000
80.000
60.000
40.000
0.000
0.100
0.200
0.300
0.400
0.500
PLOTTED BY: UHH

Fig. 11

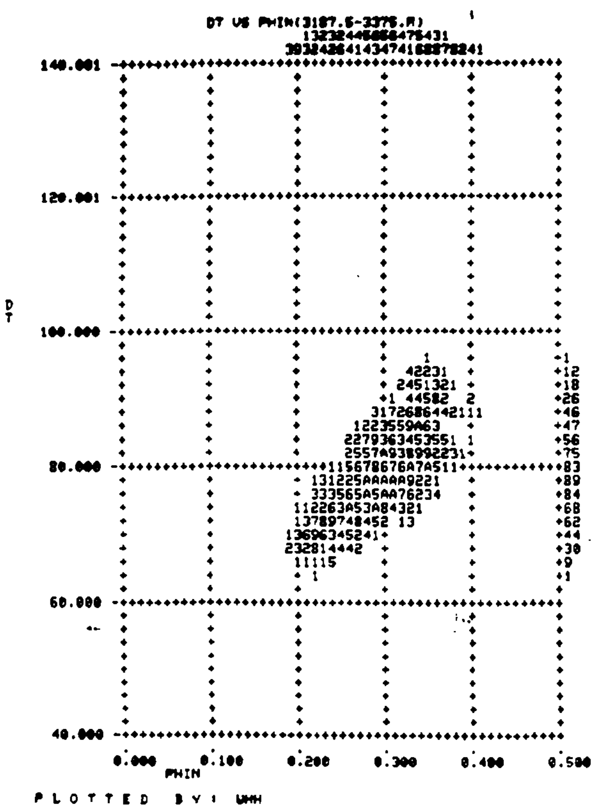

DT VS PHIN(3187.5-3375.R)
DT
PHIN
140.001
120.001
100.000
80.000
60.000
40.000
0.000
0.100
0.200
0.300
0.400
0.500
PLOTTED BY: UHH

Fig. 12

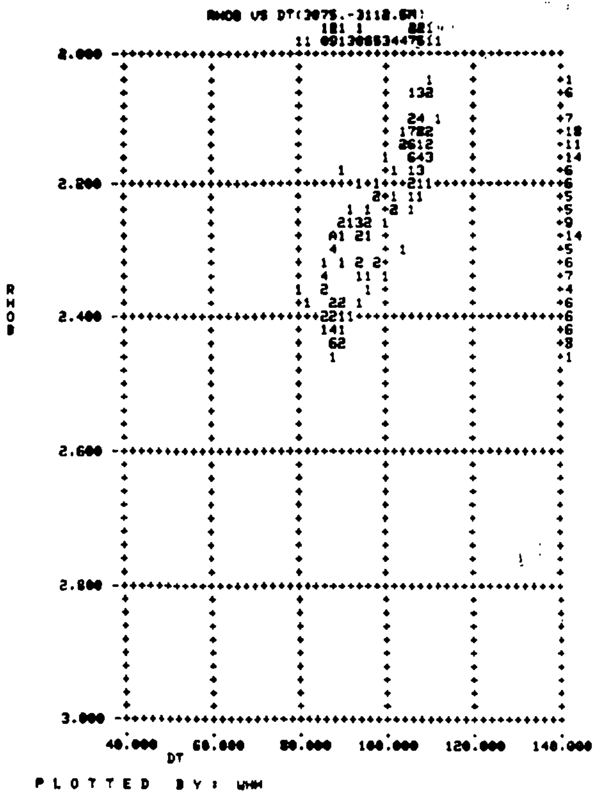

RHOB VS DT(3075.-3112.5M)
2.000
2.200
2.400
2.600
2.800
3.000
RHOB
40.000
60.000
80.000
100.000
120.000
140.000
DT
PLOTTED BY: WHM

Fig. 13

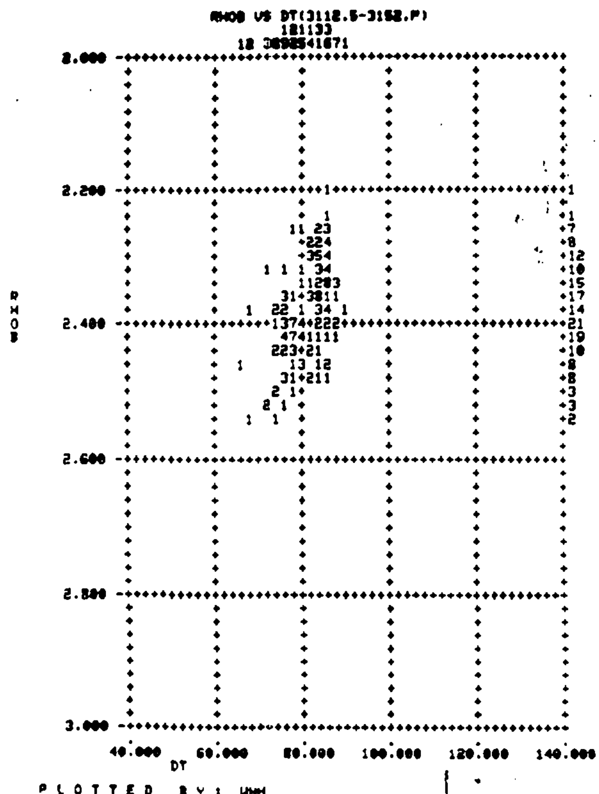

RHOB VS DT(3112.5-3152.F)
2.000
2.200
2.400
2.600
2.800
3.000
RHOB
40.000
60.000
80.000
100.000
120.000
140.000
DT
PLOTTED BY: WHM

Fig. 14

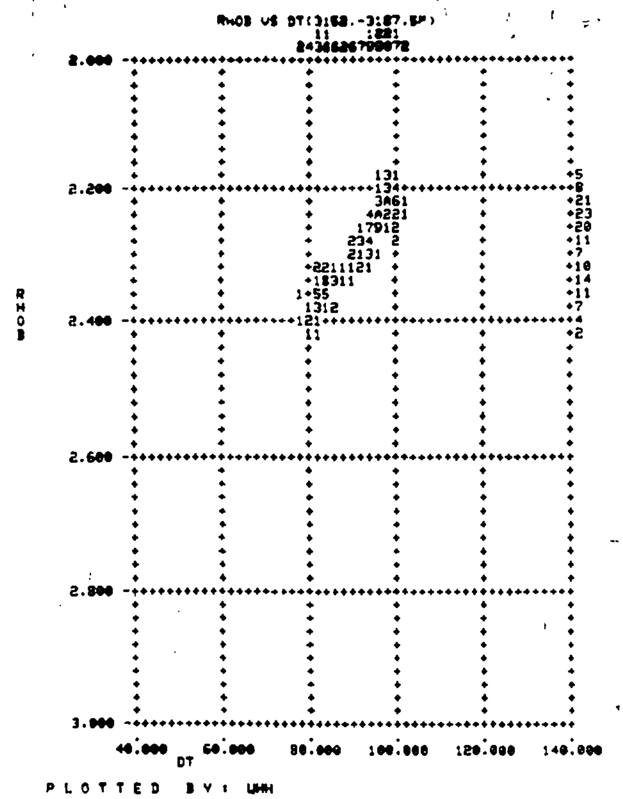


Fig. 15

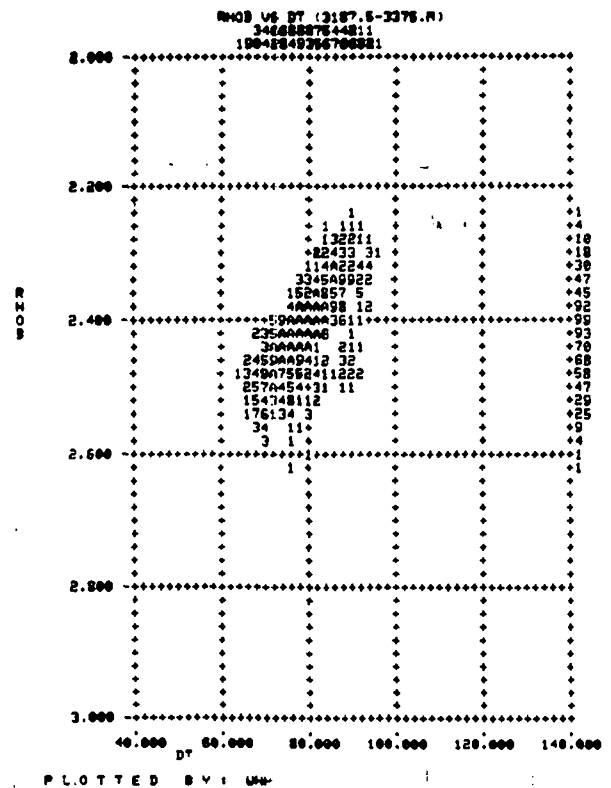
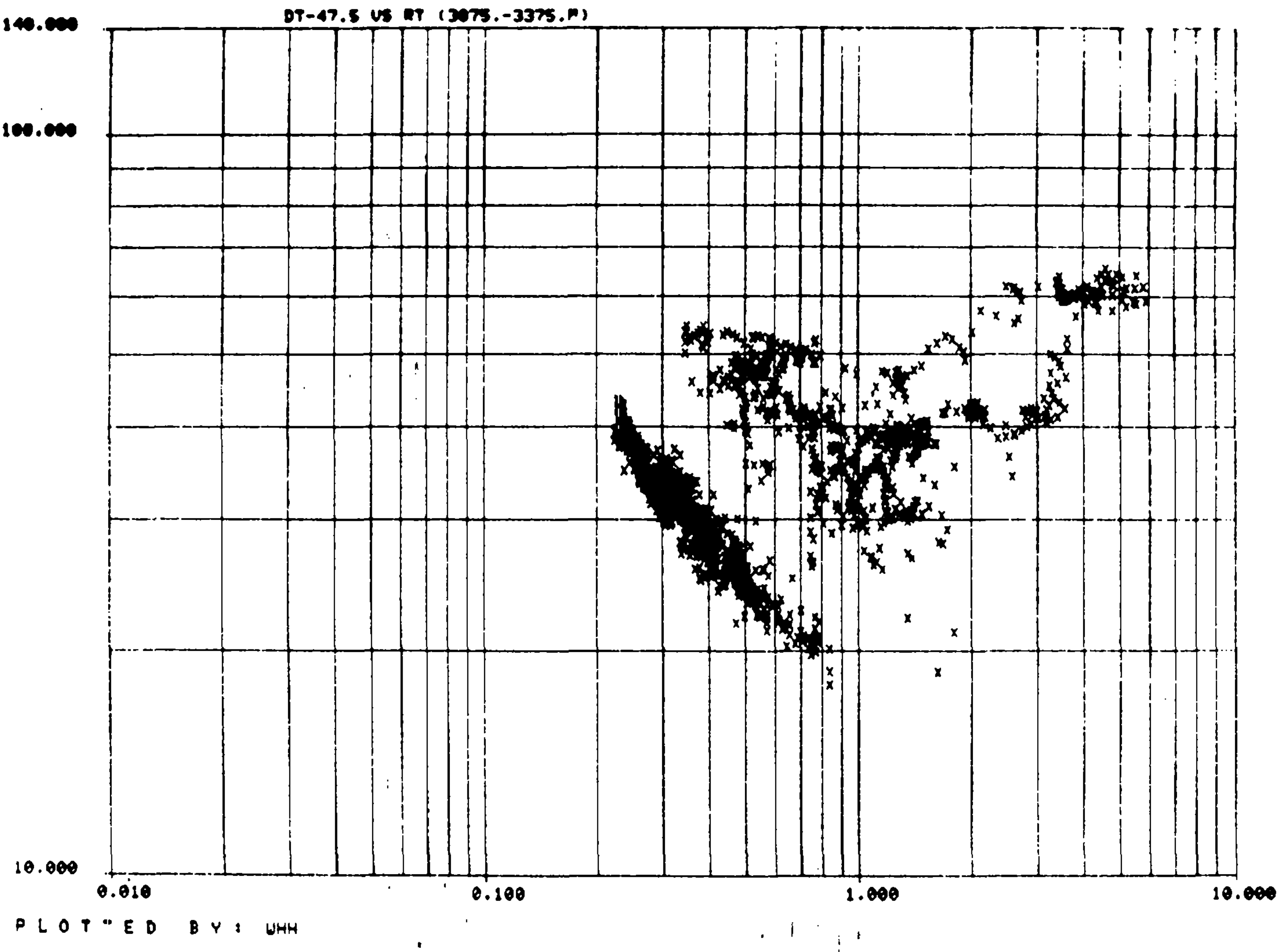


Fig. 16



DT-47.5 VS RT (3075.-3375.F)
140.000
100.000
10.000
0.010
0.100
1.000
10.000
PLOTTED BY: WHH


Fig. 17

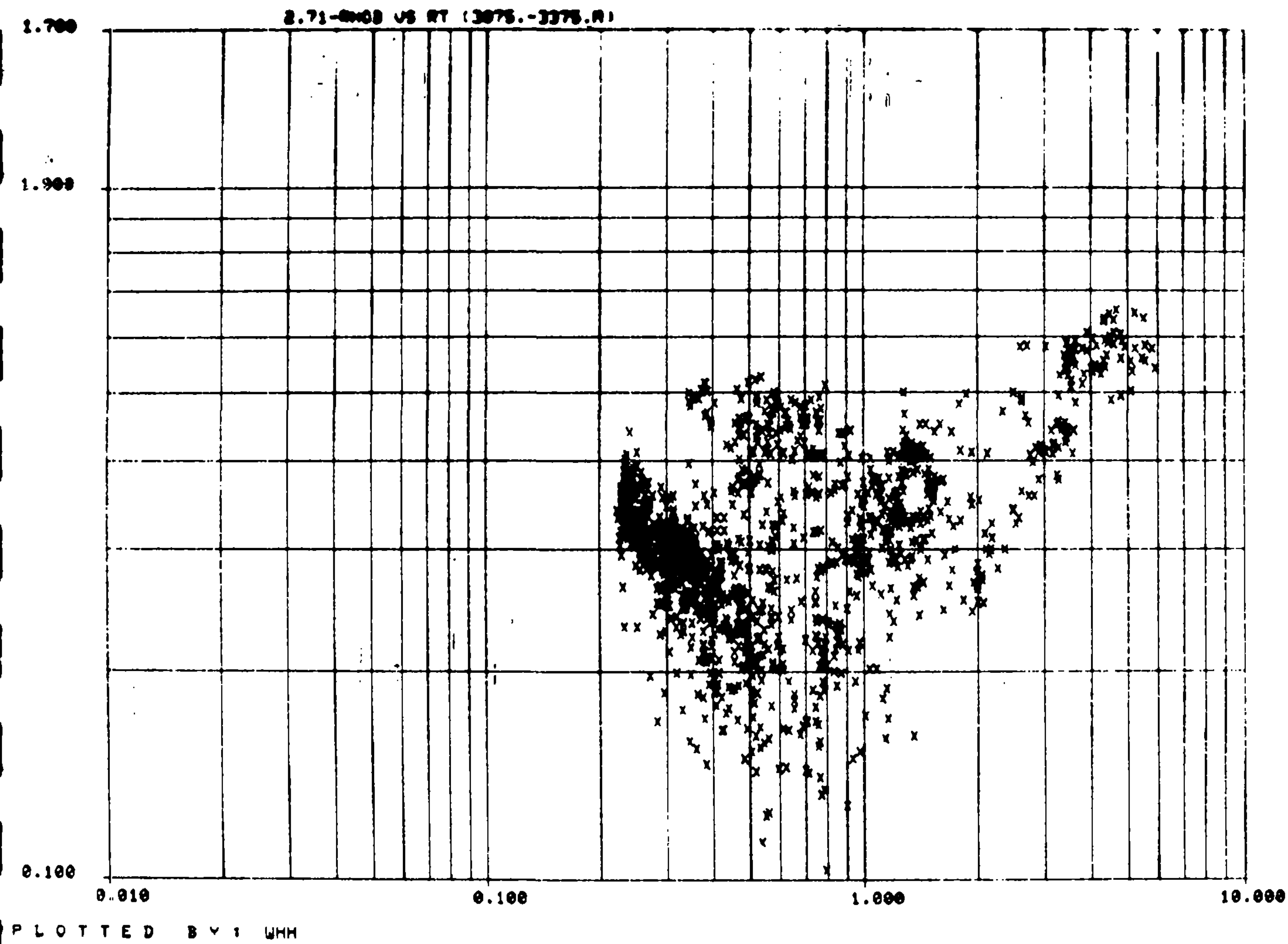
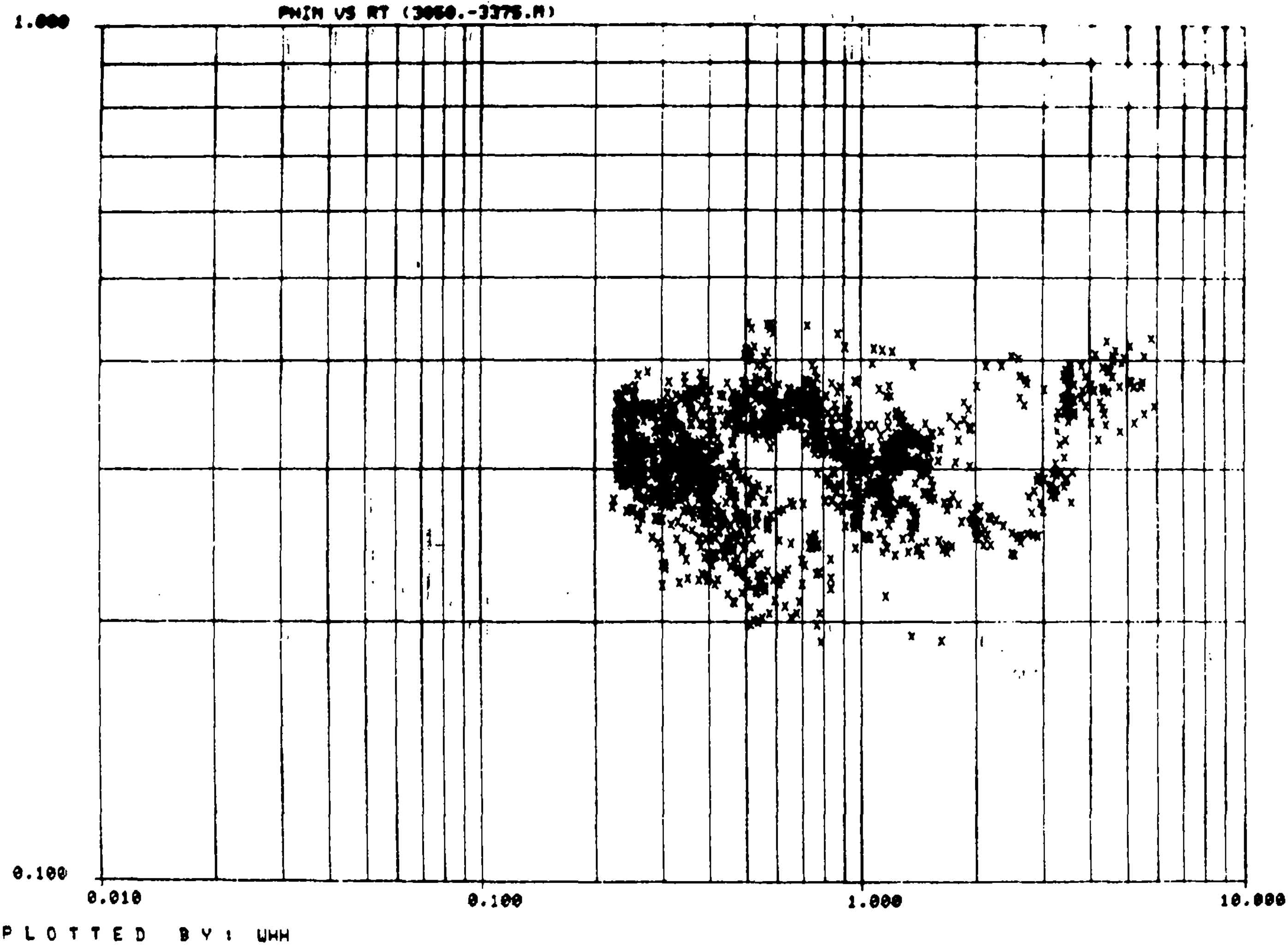



Fig. 18



PHIN VS RT (3050.-3375.M)
1.000
0.100
0.010
0.100
1.000
10.000
PLOTTED BY: WHH


Fig. 19

## 7. Appendix A