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Den norske stats oljeselskap a.s

WELL TESTING REPORT

PL 051

WELL 30/2-1

ENGINEER: K. GJERDE

LET-BERGEN, APRIL 1983

CONTENTS   Page

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- Sampling
- Sonic Sand Detector

A2.   Appendix A2
            - Same as appendix 1.

A3.   Appendix A3
            - Same as appendix 1.

A4.   Appendix A4
            - CPI Log from 30/2-1

1. INTRODUCTION

Well 30/2-1 is the first well drilled on the Alpha
structure in block 30/2.

The well penetrated gasbearing zones in sand of middle
Jurassic age.

The well was drilled to a total depth of 4243 m RKB in
the Triassic formation.

Three production tests were performed in the Rannoch
and Etive sands in Brent. The tests were designed with
a production packer, stinger, downhole choke, 2 APR-M
valves and a flexible flow line.

2.   WELL DATA

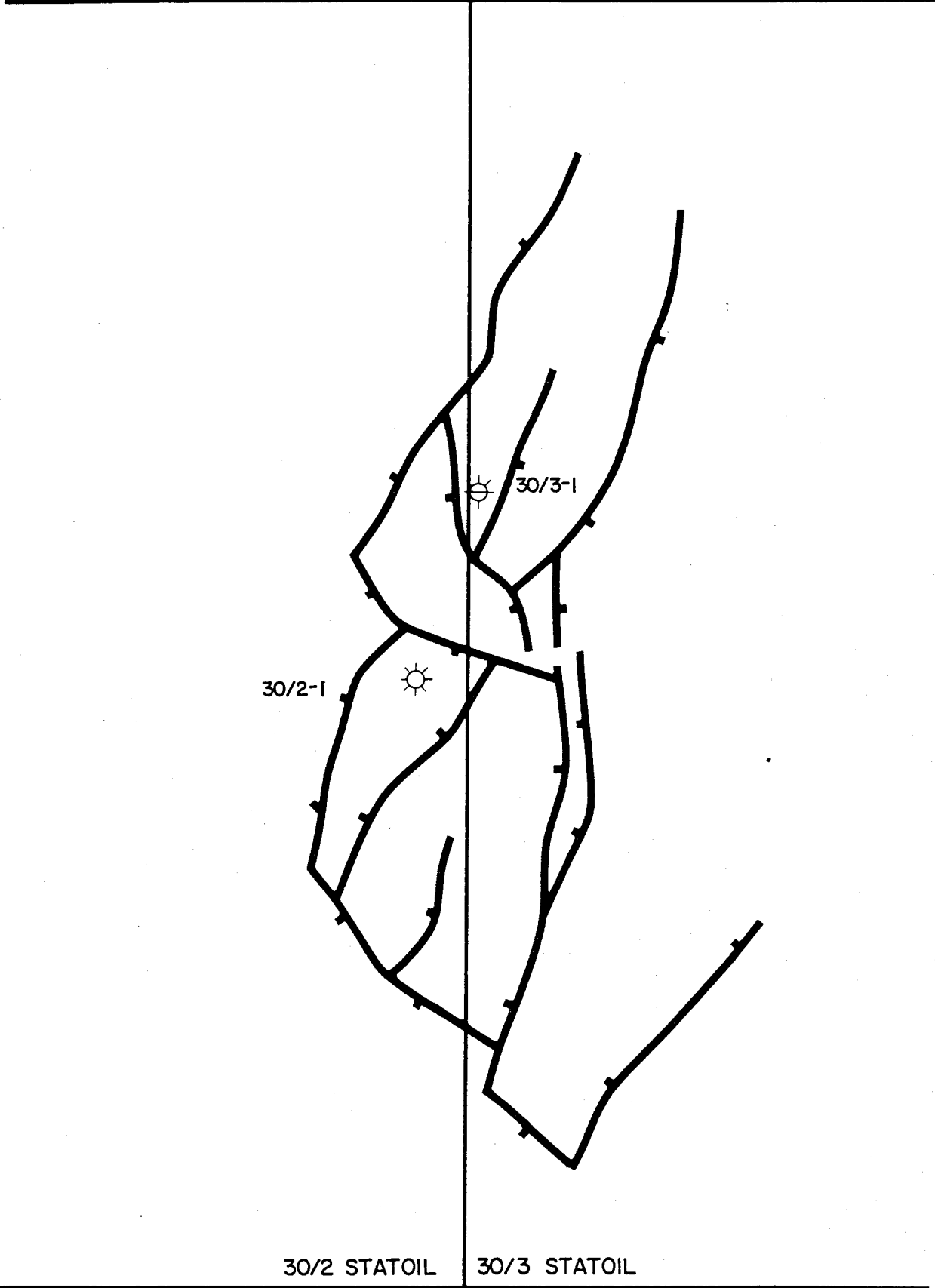|	
Licence:	PL 051
Well:	30/2-1
Location:	60° 52' 05.1" N 02° 38' 49.16" E
Classification:	Exploration (Wildcat)
Rig:	Dyvi Delta
Spudded:	17.05.82
Test Period:	14.09.82 - 07.10.82
Completed:	13.10.82
Rig Released:	14.10.82
Waterdepth:	125 m (MSL)
Total Depth:	4243 m RKB (driller) 4245 m RKB (loggers)
Status:	Plugged and abandoned.

30/3-I

30/2-I

30/2 STATOIL | 30/3 STATOIL

0   km   5

30/2 - 1 LITHOLOGY

		155
	HOLOCENE / PLEISTOCENE	
		365
	PLIOCENE	
		847
	MIOCENE	
		957
TERTIARY	OLIGOCENE	
		~1350
	EOCENE	
		1917
	PALEOCENE	
		2159
	CRETACEOUS	
	UPPER JURASSIC	
	MIDDLE JURASSIC	
LOWER JURASSIC	DUNLIN GROUP	
	STATFJORD FM	

500
1000
1500
2000
2500
3000
3500
4000

v — v — v

T.D. 4243 m KB

U JUR		KIMMERIDGE	3636
		HEATHER	3657
			3675
MIDDLE JURASSIC		NESS	
			3720
		ETIVE	
			3778
		RANNOCH	3793
LOWER JURASSIC	DUNLIN	DRAKE	
			3962
		COOK	
		BURTON/ AMUNDSEN	
			4110
		STATFJORD	

3500
3600
3700
3800
3900
4000
4100
4200

c

KB 30m

RFT/ DST PRESSURES
FOR
30/2 - 1 & 30/3 - 1
BRENT

▼ ETIVE
● RANNOCH

(?)
▼ DST no. 3 (0054)

30/2-1

GRAD. = 0.355 gm/cc

▼ DST no.2 (0054)
▼ DST no.2 (0022)

▼ DST no.2 (CRG 81708

● DST no.1 (0054)
● DST no.1 (0051)
● DST no.1 (0130)

30/3-1 ph Ⅱ

GRAD. = 1.12 gm/cc

STATOIL

Date: 24.05.83

Sign. KG

TVD
(mRKB)

3675

3700

3725

3750

3775

3800

3825

3850

FORMATION PRESSURE (BAR)

670   675   680   685   690

WELL: 30/2-1

Well Data Summary & Interpretation
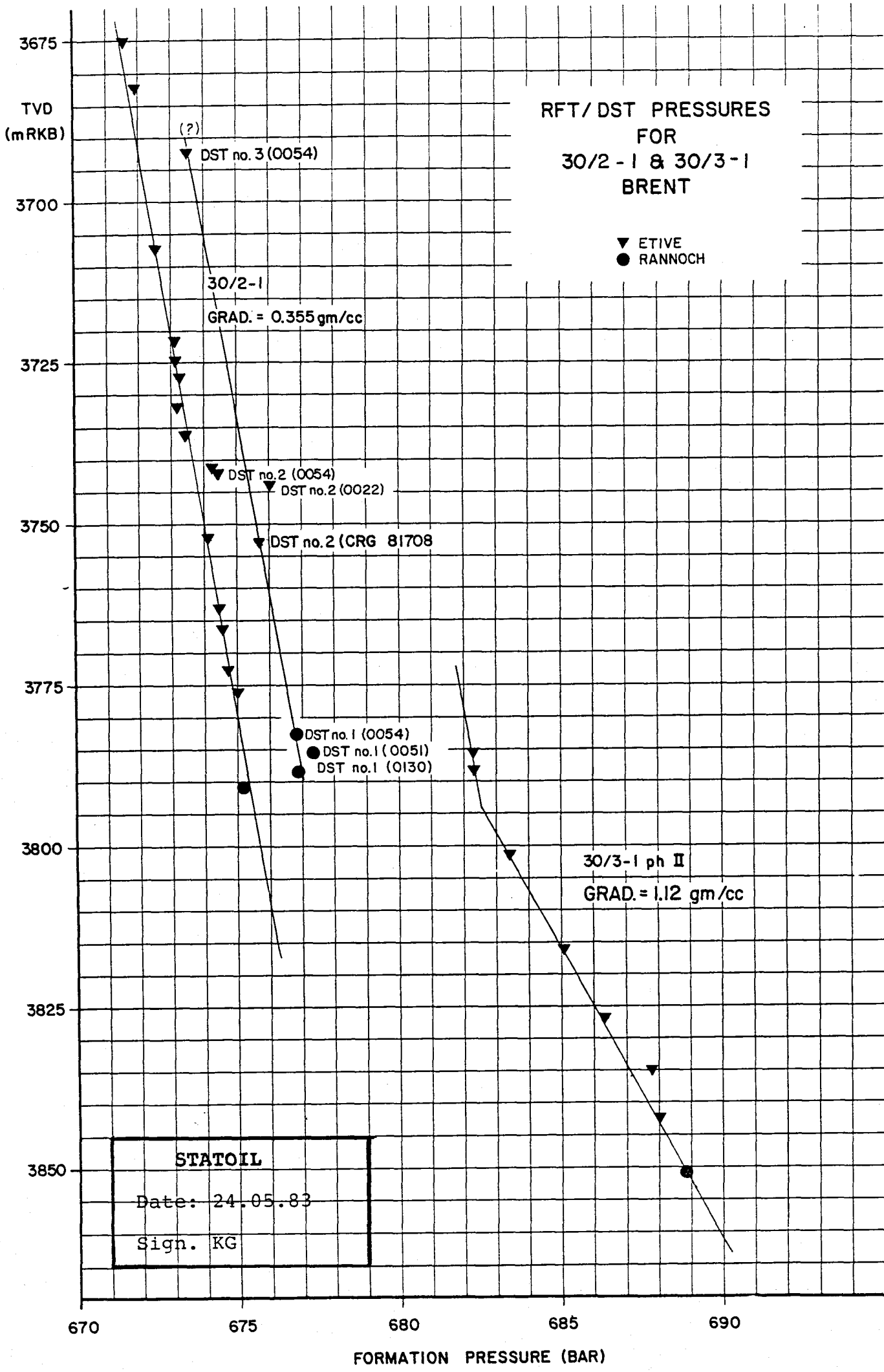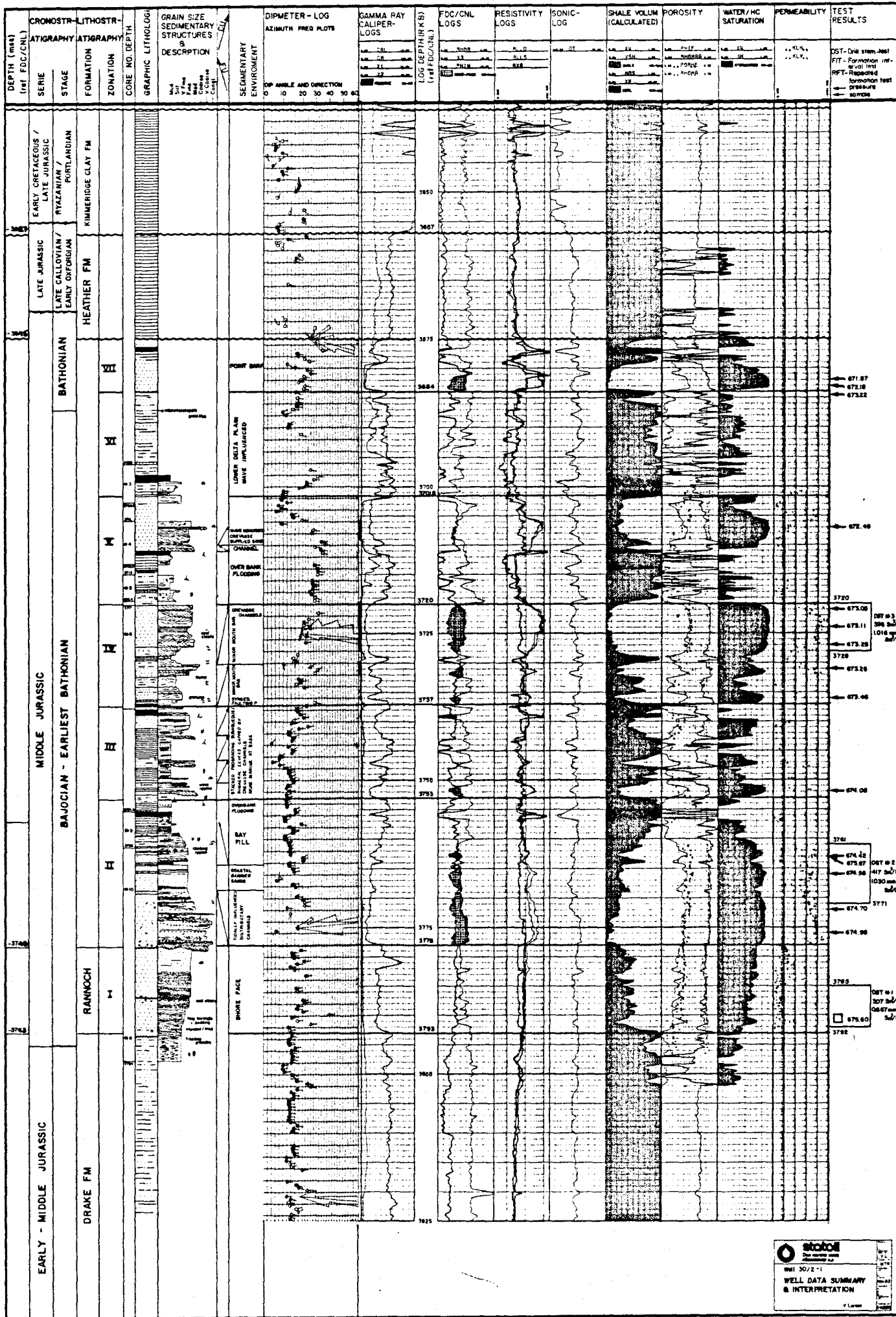
3.   OBJECTIVES

The objectives of testing well 30/2-1 were:

DST no. 1 (3785 - 3792 m RKB):

1. Estimate productivity of the Rannoch formation.
2. Obtain representative fluid samples.
3. Find average reservoir pressure and temperature.
4. Examine a possible GWC.

DST no. 2 (3761 - 3771 m RKB):

1. Estimate productivity of the Etive formation.
2. Obtain representative fluid samples and examine the
   the possibilities of using water instead of mercury
   when sampling.
3. Detect reservoir pressure barriers.
4. Examine the production for hydrate forming, sand
   production and wax production.
5. Find average reservoir pressure and temperature.

DST no. 3 (3720 - 3771 m RKB):

1. Estimate productivity for Etive formation.
2. Obtain representative fluid samples.
3. Detect reservoir pressure barriers.
4. Examine the production for hydrate forming
   sand production and wax production.
5. Find average reservoir pressure and temperature.

4.   CONCLUSIONS

DST No. 1

The RFT data gave a gradient of 0.355 g/cc and a pore
pressure of 675.3 bar at the midpoint of the Rannoch
perforations. An initial pressure of 676.9 bar at 3783
m RKB was estimated from the initial pressure build-up.
The pressure data indicate a permeability thickness of
2223 md m and a permeability of 247 md. The core data
indicate a permeability of 0.1 - 1 md.

This significant difference in permeability must be due
to production from the lower part of the Etive
formation and not from the Rannoch formation.

The bottomhole temperature readings show a high
reservoir temperature for this area. The maximum
recorded temperature was about $150^{\circ}C$ at 2788 m RKB.

The maximum gas production was about 0.677×10^{6}
Sm^{3}/d on a 32/64" choke with a GOR of about 2200
Sm^{3}/Sm^{3}. The condensate gravity was 0.804 g/cc and
the gas gravity was 0.695 (air = 1.0).

Some liberated wax was seen in the surface equipment
before the start-up of the heat exchanger.

No indication of water production which could indicate
a GWC was seen.

No sand was produced in this test.

DST No. 2

The RFT data gave a gradient of 0.355 gm/cc and a pore
pressure at 674.5 bar at the midpoint of the Etive
perforations.

An initial pressure of 675.5 bar at 3753 m RKB is
estimated from the final pressure build-up.

The pressure data indicate a permeability thickness of
2280 md m and a permeability of 152 md. The whole
interval 3761 - ~~3778~~ mRKB has probably contributed to
flow.   3771

The core data gave a calculated arithmetric average
permeability of 162 md.

The pressure data from the flow period show clean-up
effects for both flow rates. An increasing bottomhole
pressure through the whole flow period is seen.

The bottomhole temperature readings show a reservoir
temperature of $150^{\circ}C$ at 3753 m RKB.

The maximum production was about 1.030×10^{6} Sm^{3}/d on
a 48/64" choke with a GOR at about 2470 Sm^{3}/Sm^{3}.
The condensate gravity was 0.807 g/cc and the gas
gravity was 0.695 (air = 1.0)

Some liberated wax was seen in the fluid samples.

No sand was produced.

DST No. 3

The RFT data gave a gradient of 0.355 g/cc and a pore
pressure of 673.2 bar at the midpoint of the
perforations.

The pressure data indicate a permeability thickness of
2200 md m and a permeability of 275 md. Core data gave
a calculated geometric average permeability of 300 md.

It is difficult to estimate an initial pressure from
the pressure data recorded. But the initial pressure

is estimated to about 673.5 bar at 3693 m RKB based on DST/RFT data.

The bottomhole temperature readings show a reservoir temperature of approximately 150°C at 3693 m RKB.

The maximum production was about 1.016×10^{6} Sm^{3}/d at the 48/64" choke with a GOR of approximately 2564 Sm^{3}/Sm^{3}. The condensate gravity was 0.814 g/cc and the gas gravity was 0.692 (air = 1.0)

As in DST 1 and 2 some liberated wax was also here seen in the fluid samples.

No sand was produced.

The Horner plot shows boundary effects, which could indicate the first barriers approximately 1 km from the wellbore.

30/2-1 TEST – RESULTS

DST no.	FORMATION	PERF. INT (mRKB)	OPER.	DURATION (min.)	BHP (Bar)	CHOKE (1/64")	COND.RATE (Sm3/D)	GAS. RATE mm Sm3/D	GOR (Sm3/Sm3)	COND.GRAV	GAS GRAV. (AIR=1)
1	RANNOCH (?)	3785 – 3792	INITIAL FLOW	1	—	32 adj.			—	—	—
			INITIAL BUILD-UP	68	p*=676.9	—	—	—	—	—	—
			CLEAN-UP	11	—	28 adj.				—	—
			FINAL FLOW	668	586	32 fix. (BHC 48)	307	0.677	2205	0.804	0.695
			FINAL BUILD-UP	1450	p*=676.5	—	—	—	—	—	—
2	ETIVE	3761 – 3771	CLEAN-UP	7	—	8 adj.			—	—	—
			CLEAN-UP	3	—	32 adj.			—	—	—
			FIRST FLOW	496	630	32 fix.	319.6	0.729	2281	0.814	0.680
			SECOND FLOW	14	—	48 adj. (BHC 48)	—	—	—	—	—
			SECOND FLOW	306	619	48 fix.	417.0	1.030	2470	0.807	0.695
			FINAL BUILD-UP	1598	p*=676.5	—	—	—	—	—	—
3	ETIVE	3720 – 3728	CLEAN-UP	8	—	32 adj.			—	—	—
			FIRST FLOW	457	648	32 fix. (BHC 40)	312.6	0.738	2360	0.805	0.687
			SECOND FLOW	15	—	48 adj.	—	—	—	—	—
			SECOND FLOW	306	644	48 fix.	396.3	1.016	2564	0.814	0.692
			FINAL BUILD-UP	1457	p*≈673.5	—	—	—	—	—	—

5.   DISCUSSION

Design and Operations

Three tests were planned in the Brent formation of this
well and all of them were completed according to the
test program.

All tests were designed with a production packer, one
LPR-N valve and two APR-N valves. The idea behind this
design was the importance of getting good pressure data
with bottomhole shut-in.

Only the new type of 10000 psi strain gauges had the
necessary accuracy/resolution required. But, by using
these gauges, all data would most likely have been lost
due to a bullheading pressure over 10000 psi. The
production string saved the pressure data by stinging
out of the packer and leaving the well closed in at the
Baker model "D" packer (equipped with a flapper
valve). The gauges were then pulled out of the hole,
the squeeze equipment run in, stung in and the
formation squeezed.

Statoil's experience with the APR-N valve is rather
bad. Leaks in the valve have often spoiled pressure
data for the analysis. The APR-N valve is very
sensitive under operations with high differential
pressure, especially when sand or other debris is
present between the ball and the seat. The test
program on well 30/2-1 was therefore designed with a
new type of BH valve called LPR-N together with two
APR-M valves. With this setup the final shut-in
operation could be done by increasing the annulus
pressure to approximately 2500 psi. This operation was
done in two steps; first one of the APR-M valves was
closed, which created communication between the tubing
and the annulus, then the LPR-N valve closed directly
due to the drop in the annulus pressure after

communication. With two bottomhole valves closed the
chance of leakage was minimized. The pressure build-up
could be in progress while bleeding off the WHP and
circulating out the hydrocarbons in the string
immediately after the shut-in. The pressure data show
a successful closing of the LPR/APR.

The operations of downhole valves were minimized in the
program by using initial flow/build-up only on the
first test.

DST No. 1

The perforated interval was 3785 - 3792m RKB (ref.
FDC/CNL) in the Rannoch formation.

The core data show a low permeability but nevertheless
it was important to estimate the productivity in order
to define any reserves in the Rannoch formation in
addition to the reserves in Ness and Etive.

The permeability estimate shows that most of the
production has probably been from Etive.

Problems that arise when drilling a weak formation
combined with the high formation pressure could induce
damages like hydraulic fracturing between Rannoch and
Etive. The high total skin factor at about 80 could be
due to a vertical flow along the wellbore but it is
difficult to graduate the effect of plugged
perforations, partial penetration, mudfiltrate,
turbulent flow, cementbond and the abovementioned
hydraulic fracturing effect.

The RFT data gave a poor definition of the GWC. The
GWC was estimated from the RFT to about 3794 mRKB. An
examination of a possible GWC was one of the objectives
for test no. 1 but no indication of water production,
which could indicate a GWC, was seen.

The perforated interval was 3761 - 3771 m RKB (ref.
FDC/CNL) in the Etive formation.

This sandy section has a higher permeability in the
lower and higher part than the middle part. No clean
shale barriers are seen on the core or from the logs in
this part of Etive (3761 - 3778 mRKB).

Most likely the whole interval has contributed to
flow. This creates partial penetration effects on the
data. The calculated arithmetric average permeability
of 162 md from the core correlates well with the
calculated permeability of 152 md from the pressure
data.

Boundary effects can be seen on the Horner build-up,
but the data from this test are not good enough to
estimate the distance from the wellbore.

Geophysical data could indicate the same distance to
the boundaries for all three tests (see test number 3
which is used to find the distance to boundaries).

Some amount of liberated wax was seen in the surface
samples. The high fluid temperature and the use of the
heater solved all the problems with settling of wax in
the metering compartments on the separator.

A separate PVT report from our PVT laboratory will be
issued and will also cover an analysis of the wax
content.

A relatively large total skin factor at about 30 is
estimated from the pressure data. Skin due to partial
penetration is calculated to 7. Through the whole main
flow period clean-up effects were seen.

DST No. 3

The perforated interval was 3720 - 3728 m RKB (ref. FDC/CNL).

The zone consists of a fairly homogenous and consolidated sand. The actual production interval is well bounded by shale over and under the perforations. A uniform production over the whole interval was expected.

Only one of five pressure gauges gave pressure readings and this gauge was probably effected by the high temperature and pressure. The pressure data can not be fully relied on because there are no other gauge readings for comparison.

The late-time pressure data show the influence of several pressure barriers which most likely are faults.

The relatively large increase of the slope over a short interval on the time axis indicate several pressure barriers with about the same distance from the wellbore. It is more difficult to define the distance from the wellbore for the other pressure barriers than for the first registrated barrier. For a doubling of the straight line slope, the cross point between the slopes give:

$$\log \frac{t + \Delta t}{\Delta t} = 0.72$$

Calculation of the distance to the first boundary based on this Horner time (0.72) gives a distance of approximately 1 km.

A geometric permeability is calculated from the core data because of the uniform sand section in the actual testinterval. This geometric permeability of about 300

md correlate fairly well with the calculated
permeability of 275 md from the pressure data.

This correlation could indicate that the pressure
development in the build-up used to define the Horner m
value is correct. It is impossible to check the
accuracy of each pressure reading because of the
boundary effects on the late-time pressure data used to
estimate P* for the correlations.

Geophysical data indicate a fault about 150 m from the
wellbore. This fault can not be seen on the pressure
data, but the wellbore/skin effects can have masked
this information.

A total skin factor of about 12 is estimated from the
pressure data. The bottomhole pressure data also show
a better clean-up than the Etive test.

Clean-up and Skin Effects

All three tests were effected by a relatively high
skin, especially the two first tests.

Test number one gave a skin factor of about 80. A
large part of this skin can be due to the vertical flow
along the wellbore.

Test number two gave a skin factor of about 30. The
calculation of the partial penetration skin gave a skin
factor of about 7.

Test number three gave a skin factor of about 12. Most
likely this value only represents the skin created by
the flushed zone, turbulence, plugged perforation etc.

The combination of a high permeability, seen in most of
our tests, and the limited pressure draw-down we can
create over the flushed zone will always disturb the

test results. The ideal way to solve this problem
would be to start the test with a rate high enough to
clean up the formation before the actual test starts.
This should be followed by a build-up and a main flow
(or multi flow) which should have a lower rate than the
clean-up rate.

Many of Statoil's gas tests have been disturbed by
clean-up effects through the whole test. Multi-rate
tests show a new clean-up period at the beginning of
each new flow rate. The calculated skin factor has
been relatively high on most of the tests which could
indicate a bad clean-up before the final build-up.

Sampling

All three tests had a conventional gas sampling program
with two gas bottles and one condensate bottle for each
PVT set. All PVT samplings were taken at the
separator.

Water samples and dead condensate samples were also
collected from the separator. Samples from flowing
fluid were collected on the gooseneck at the wellhead.

Mud samples were collected in the mudpit of the mud
used in the hole while drilling.

Sampling of condensate is usually done by displacing
the mercury in the sampling bottles. Mercury spill has
often been seen. Therefore a separate set of
condensate was collected in test number 2 and 3 by
displacing water insted of mercury. If this sample has
not been effected by the water this method will
probably be the new Statoil procedure for sampling both
oil and condensate at the separator.

At the time this report is being written no PVT report
has yet been issued, so all calculations are based on
preliminary PVT data.

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Reservoir Temperature

The temperature recorded at the bottom and at the wellhead are high compared with other tests in the area.

The gauges used at the bottomhole had a limitation of 150°C. The gauges show different temperature readings but the reservoir temperature is estimated to approximately 150°C for the three tests. No gradient can be estimated from the temperature data. This variation in temperature has probably effected the pressure data from the gauges because the pressure readings are based on corrections from the temperature readings.

The maximum recorded wellhead temperature was about 93°C during the flow period.

APPENDIX A1

DST no. 1

BOTTOM HOLE PRESSURE REPORT

statoil

Well 30/2-1   Test no. DST no. 1

Test Date 10-25/9-82   Date of analysis _____

Gauge no. Sperry Sun MK III 0054
           Sperry Sun MK III 0130

SUMMARY OF THE RESULTS

	HORNER ANALYSIS	
Kh(md·m)	2223	
K (md)	247	
S_T	82	
$\bar{P}$ (bar) at 3783 m RKB	676.9	

Max recorded Temp. 150°C

Remarks

The data above are not representative
for the Rannoch formation, probably
because of a production from the
lower part of the Etive formation.

_____
Signature

Well __30/2-1, DST no. 1__   Test date __10-25/9-82__

Reservoir Parameters

Perforations __3785-3792 m RKB__   Zone(s) __RANNOCH__

ss _____   Wellbore radius __0.11__ m

_____   RKB Elev __30__ m

_____

Midpoint Production —__3758__ m ss   Bomb at 3__788.2__ m RKB —__3758.2__ m ss

Pressure Functions Evaluated at —_____ ss   Datum Depth —_____ ss

Delta P required to correct to datum ___—___ psig   Gradient ___—___ psi/ft

Estimated Average Pressure _____psig

Formation Volume Factor __3.15·10^{-3}__ res m^3/Sm^3 Viscosity __0.054__ cp

Thickness __9__ m (29.5) Porosity __15__ %   Drainage Area __—__

Oil Saturation __—__ %   Oil Compressibility __—__ bar^{-1}

Water Saturation __- 31__ %   Water Compressibility __4.35x10^{-5}__ bar^{-1}

Gas Saturation __- 69__ %   Gas Compressibility __64.7 x 10^{-5}__ bar^{-1}

          Formation Compressibility __4.35 x 10^{-5}__ bar^{-1}

System Compressibility $C_t = S_0C_0 + S_wC_w + S_gC_g + C_f$

$C_t =$ ____ x ____10^{-6}+ ____ x ____10^{-6}+ ____ x ____10^{-6}+ ____10^{-6}

$C_t =$ __50.3·10^{-5}__ bar^{-1}

Rates Reported on Test.   EQ GAS RATE = $0.73·10^{6}$ Sm^{3*}/D

Choke __32__ / __64"__ inches Cond Rate __311__ m^3/D   Gas Rate __0.69·10^{6}__ Sm3/D

FTP _____ psig Water Rate _____ m^3/D   GOR __2200__ Sm^3/ m^3

Temp: 150°C ^{O}API __44.7__   Gas Spec. Grav. __0.682__ (calc. 0.86)

Cumulative Production   Oil _____   Gas _____

          Water _____

*Q EQ = QG + QC · ZO + QW · 7390

Well $30/2-1$, DST no. 1   Test Date $10-25/9-82$

Horner Analysis

Effective Production Time tp = Cumulative Production / Rate Reported on Test.

$$tp = \underline{1440 \cdot 0.327} / \underline{0.677} = \underline{695} \text{ mins.}$$

Straight line starts at _____ hrs   Slope = _____ 1.13 _____ bar/cycle

$P_{wf's} =$ ___585.7___ bar

$P_{1hr} =$ ___675.3___ bar

$p* =$ ___676.9___ bar

Calculated Values

$$Kh = \frac{162.6 \; Q \; B\mu}{M} = \frac{162.6 \; (25.9 \cdot 10^6)^Q \; (5.45 \cdot 10^{-4})^{\dot{c}} \; (0.054)^\mu}{17} = \underline{7290} \text{ md.ft}$$

$$= \underline{2223} \text{ md. m}$$

$$K = Kh/h = \underline{2223} / \underline{9} = \underline{247} \text{ md.}$$

$$S = 1.1513 \left[\left[\frac{P_{1hr} - P_{wf\,s}}{M} \right] + \text{Log} \left[\frac{tp \; 1}{tp} \right] - \text{Log} \left[\frac{K}{\emptyset \mu C_t \, rw^2} \right] + 3.2275 \right]$$

$$S = 1.1513 \left[\left[\underline{\quad} \right] + \text{Log} \left[\underline{\quad} \right] - \text{Log} \left[\underline{\quad} \right] + 3.2275 \right]$$

$$S = \underline{+82}$$

$$t_{DA} = \frac{0.000264 \; Kt}{\emptyset \mu C_t A} = \frac{0.000264}{\qquad\qquad\qquad\qquad} = \underline{\quad}$$

$$P_{DMBH} = \underline{\quad -\quad}$$

$$\bar{P} = P* - P_{DMBH} \left[\frac{M}{2.303} \right] = \underline{676.9} \text{ bar @ } - \underline{3753.} \text{ m ss}$$

$$= \underline{\qquad} \text{ bar @ } - \underline{\qquad} \text{ m ss Datum}$$

P(bar.) vs. DELTA T(min)

WELL 30-2-1
DST# 1
BUILDUP No 1
GAUGE # 0054
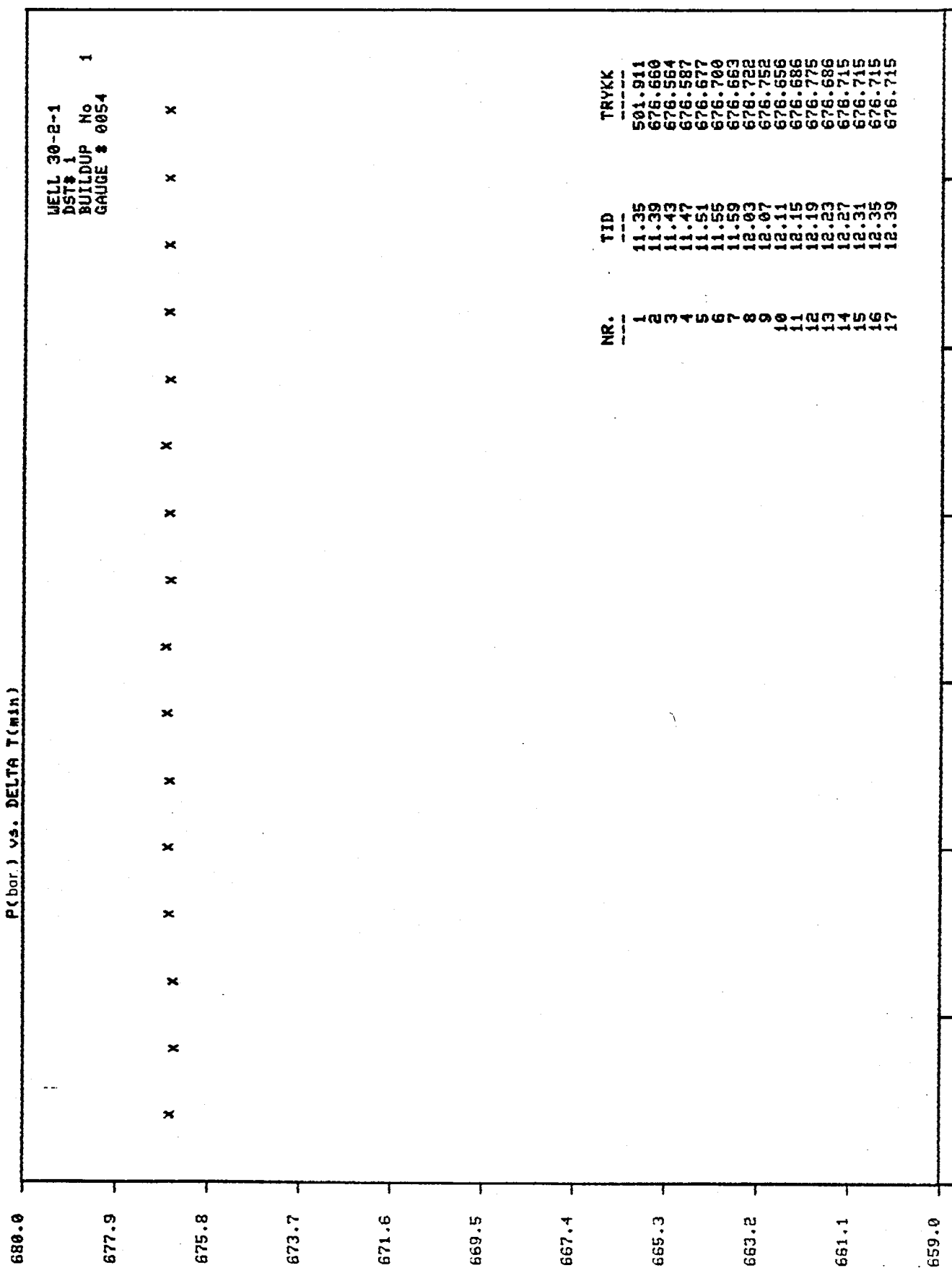
NR.	TID	TRYKK
1	11.35	501.911
2	11.39	676.660
3	11.43	676.564
4	11.47	676.587
5	11.51	676.677
6	11.55	676.700
7	11.59	676.663
8	12.03	676.722
9	12.07	676.752
10	12.11	676.656
11	12.15	676.686
12	12.19	676.775
13	12.23	676.686
14	12.27	676.715
15	12.31	676.715
16	12.35	676.715
17	12.39	676.715

Y-axis (P): 680.0, 677.9, 675.8, 673.7, 671.6, 669.5, 667.4, 665.3, 663.2, 661.1, 659.0

X-axis (DELTA T): 0.00, 10.00, 20.00, 30.00, 40.00, 50.00, 60.00, 70.00

P(bar) vs. LOG((T+DELTA T)/DELTA T)
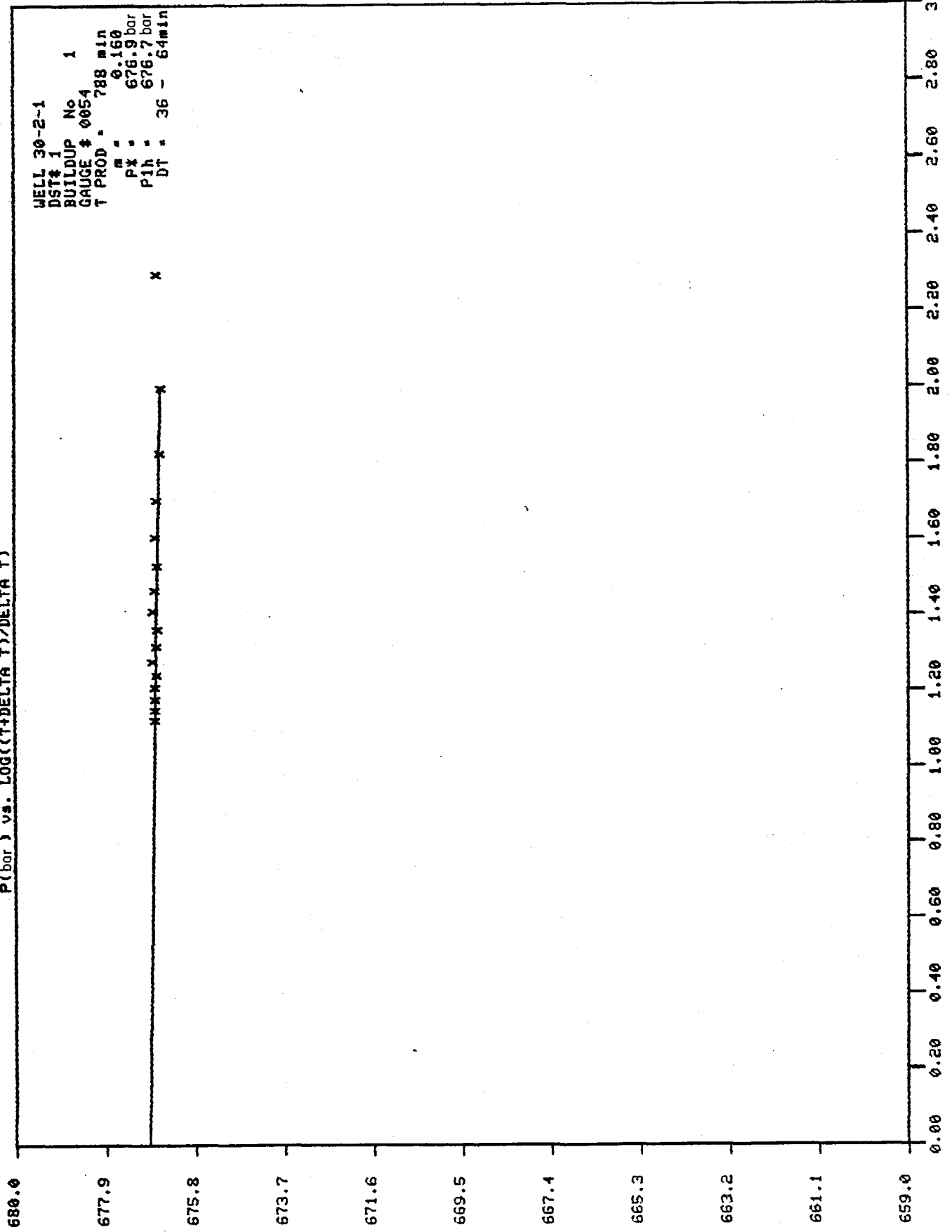
WELL 30-2-1
DST# 1
BUILDUP No 1
GAUGE # 0054
T PROD. = 788 min
m = 0.160
PX = 676.9 bar
P1h = 676.7 bar
DT = 36 - 64min

680.0
677.9
675.8
673.7
671.6
669.5
667.4
665.3
663.2
661.1
659.0

0.00   0.20   0.40   0.60   0.80   1.00   1.20   1.40   1.60   1.80   2.00   2.20   2.40   2.60   2.80   3.00

BRØNN 30-2-1   DST# 1
BUILDUP NUMMER   2
GAUGE SS0130

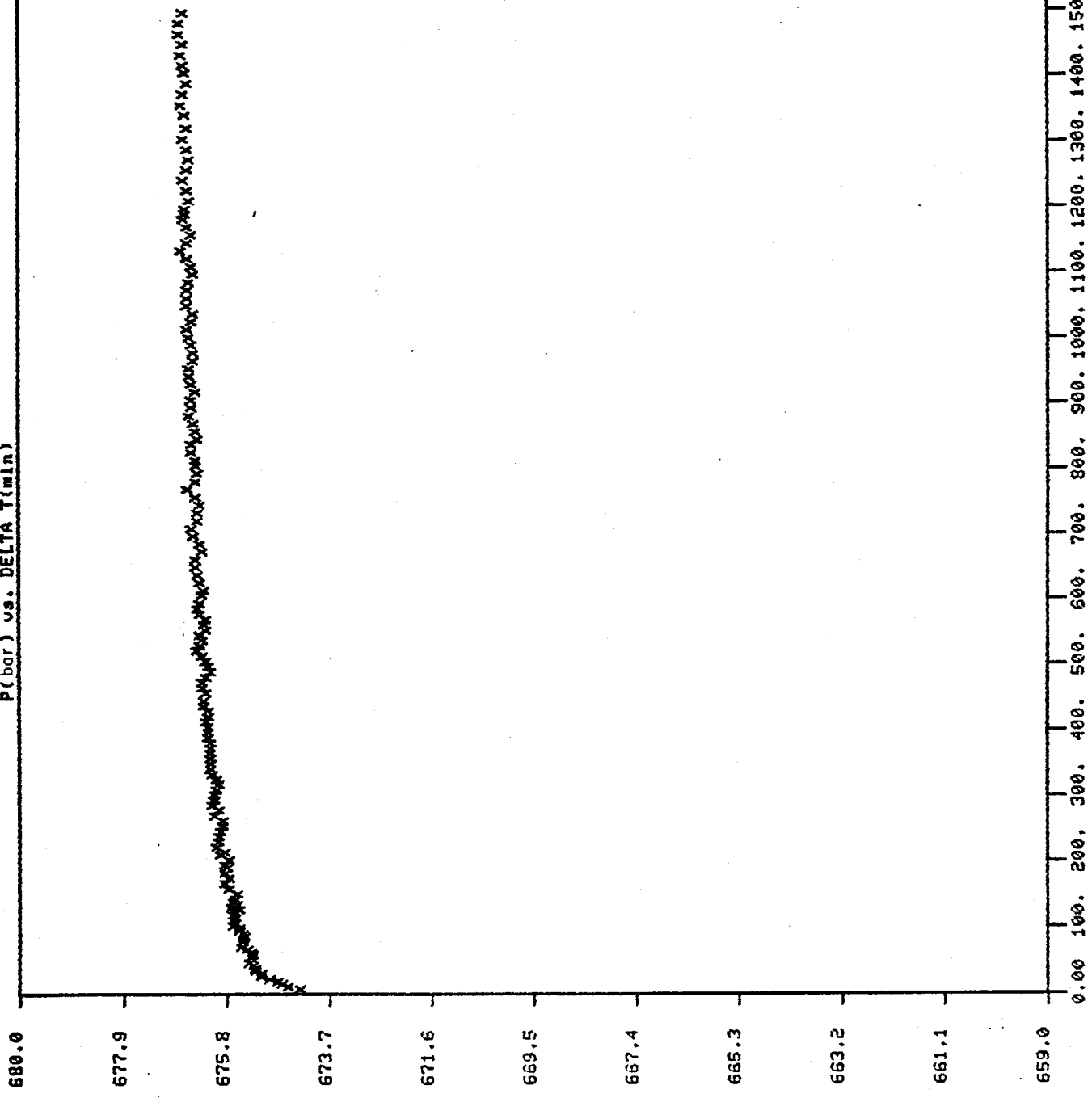| NR.	TID	TRYKK
1	0.08	674.307
2	0.12	674.555
3	0.16	674.679
4	0.20	674.761
5	0.24	674.927
6	0.28	675.092
7	0.32	675.092
8	0.36	675.216
9	0.40	675.216
10	0.44	675.258
11	0.48	675.340
12	0.52	675.299
13	0.56	675.299
14	1.00	675.258
15	1.04	675.299
16	1.08	675.382
17	1.12	675.506
18	1.16	675.464
19	1.20	675.464
20	1.24	675.423
21	1.28	675.464
22	1.32	675.464
23	1.36	675.547
24	1.40	675.547
25	1.44	675.671
26	1.48	675.630
27	1.52	675.671
28	1.56	675.630
29	2.00	675.671
30	2.04	675.630
31	2.08	675.547
32	2.12	675.713
33	2.16	675.588
34	2.20	675.671
35	2.24	675.630
36	2.28	675.588
37	2.32	675.754
38	2.36	675.837
39	2.40	675.754
40	2.44	675.837
41	2.48	675.795
42	2.52	675.837
43	2.56	675.754
44	3.04	675.919
45	3.12	675.837
46	3.16	676.002
47	3.24	675.961
48	3.32	675.961
49	3.36	675.919
50	3.52	675.878
51	4.40	675.961
52	4.48	676.085
53	4.56	676.043
54	5.04	676.043
55	5.12	676.002
56	5.20	675.961
57	5.28	676.002
58	5.36	676.085
59	5.44	676.126
60	5.52	676.126
61	6.00	676.126
62	6.08	676.126
63	6.16	676.126
64	6.24	676.167
65	6.32	676.167
66	6.40	676.167
67	6.48	676.209
68	6.56	676.167
69	7.04	676.167
70	7.12	676.250
71	7.20	676.250
72	7.28	676.209
73	7.40	676.291
74	7.48	676.291
75	7.56	676.209
76	8.04	676.126
77	8.12	676.167
78	8.20	676.209
79	8.28	676.291
80	8.36	676.374
81	8.44	676.333
82	8.52	676.333
83	9.00	676.209
84	9.08	676.250
85	9.16	676.209
86	9.24	676.333
87	9.32	676.374
88	9.40	676.333
89	9.48	676.291
90	9.56	676.250
91	10.08	676.333
92	10.16	676.374
93	10.28	676.416
94	10.40	676.291
95	10.52	676.333
96	11.16	676.457
97	11.28	676.416
98	11.40	676.291
99	11.48	676.333
100	11.52	676.457
100	11.52	676.498
101	12.04	676.374
102	12.16	676.374
103	12.28	676.333
104	12.40	676.416
105	12.52	676.581
106	13.04	676.416
107	13.16	676.374
108	13.28	676.416
109	13.36	676.498
110	13.48	676.498
111	14.00	676.374
112	14.08	676.416
113	14.20	676.457
114	14.32	676.540
115	14.44	676.498
116	14.56	676.498
117	15.08	676.416
118	15.20	676.498
119	15.32	676.540
120	15.44	676.540
121	15.56	676.457
122	16.08	676.457
123	16.20	676.498
124	16.32	676.540
125	16.44	676.498
126	16.56	676.581
127	17.08	676.498
128	17.20	676.457
129	17.32	676.581
130	17.44	676.581
131	17.56	676.540
132	18.08	676.457
133	18.20	676.498
134	18.32	676.581
135	18.44	676.705
136	18.56	676.581
137	19.08	676.498
138	19.20	676.581
139	19.32	676.581
140	19.44	676.664
141	19.52	676.622
142	20.00	676.622
143	20.12	676.540
144	20.28	676.581
145	20.44	676.664
146	21.00	676.581
147	21.16	676.540
148	21.32	676.581
149	21.48	676.664
150	22.04	676.581
151	22.24	676.622
152	22.40	676.705
153	22.56	676.664
154	23.12	676.581
155	23.28	676.622
156	23.40	676.664
157	23.56	676.705
158	0.12	676.664
159	0.28	676.416
160	0.44	676.746
161	1.00	676.664

P(bar) vs. DELTA T(min)
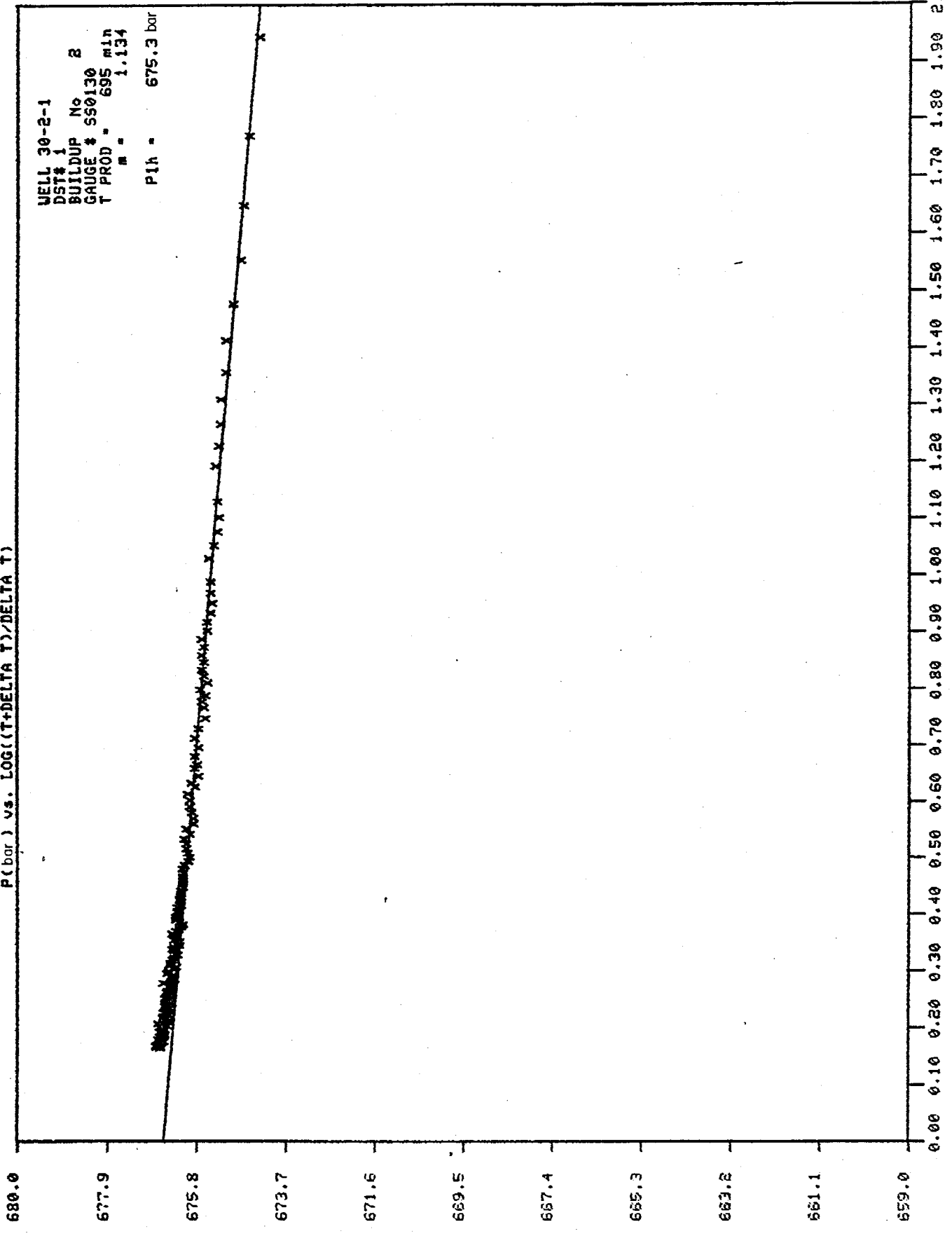
WELL 30-2-1
DST$ 1
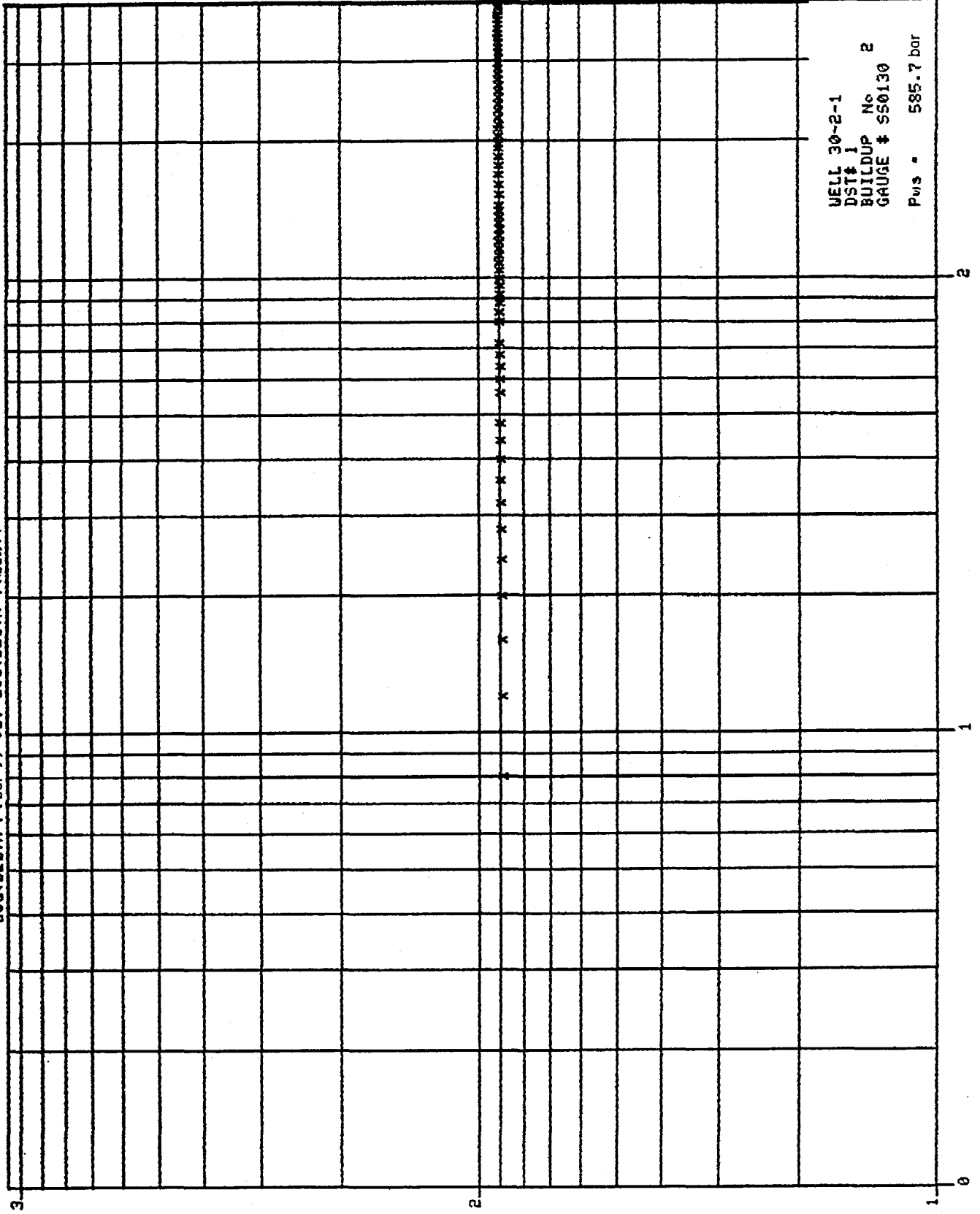BUILDUP No 2
GAUGE $ SS0130

P(bar) vs. LOG((T+DELTA T)/DELTA T)

WELL 30-2-1
DST# 1
BUILDUP No 2
GAUGE # SS0130
T PROD = 695 min
     m =   1.134

  Plh =   675.3 bar

LOG(DELTA P(bar)) vs. LOG(DELTA T(min))

WELL 30-2-1
DST# 1
BUILDUP No 2
GAUGE # SS0130

Pws = 585.7 bar

Well 30/2-1		DIARY OF EVENTS	CHP/PG A1-10
DST no. 1			Perfs.: 3785-92 mRKB
			Zone tested RANNOCH

Date	Time	OPERATIONS
		PERFORATING
20.09	01.00	Rigged up Schlumberger and RIH with perforating gun.
	03.30	Perforated 3785-92 mRKB, 4 shots/ft, 90° phasing.
	04.15	Out of hole, all 81 shots fired.
	04.45	RIH with Baker model D packer and sat the same at 3773 mRKB, ref. FDC/CNL.
	07.15	Rigged down Schlumberger.
		RUNNING TESTSTRING
	07.30	Started to pick up Halliburton bottom hole assembly.
	12.00	Pressure tested BHA, two leaks found on Halliburton equipment.
21.09	00.15	Out of hole with teststring, reset clock on the gauges and RIH again.
	08.30	Stopped RIH with teststring due to bad weather.
22.09	00.00	Started to POOH.
	02.30	Reset the clocks on the gauges.
	02.45	Started to RIH.
	06.00	Started to pressure test surface equipment.
23.09	11.18	Pressurized tubing to 220 bar at W.H.
	11.25	Pressurized annulus to 76 bar, LPR- valve opened.
	11.27	WHP = 255 bar.
		INITIAL FLOW/BUILD-UP
	11.35	Opened choke manifold on 32/64" adj. choke. Flowed 1m^3 to surge tank.
	11.36	Closed choke manifold.
	11.37	Closed LPR-valve.

Remarks :

Well 30/2-1		DIARY OF EVENTS	CHP/PG A1-11
DST no. 1			Perfs.: 3785-92 m RKB
			Zone tested RANNOCH

Date	Time	OPERATIONS
		CLEAN-UP/FINAL FLOW
2379-82	12.40	Opened the LPR-valve.
	12.43	Opened choke manifold on 28/64" adj. choke.
	12.50	Gas to surface.
	12.54	Changed to 32/64" fixed choke.
	14.45	Flowed through separator.
	18.00	Started 1. set of PVT-samples.
	21.30	Started 2. set of PVT-samples.
	22.35	Started 3. set of PVT-samples.
		FINAL BUILD-UP
24/9	00.02	Closed choke manifold.
	00.08	Sheared APR · M · valve with 235 bar on annulus and started reverse-circulating of mud to surface.
25/9	00.05	Pulled teststring out of packer.
		TEST ENDED

Remarks:
    Glycol was injected during the first part of the test.

statoil

SUMMARY OF DST NO 1

Perforated interval: 3785-3792 m RKB.
                     (depth reference FDC/CNL log)

- Initial flow   23.09.82   11:35-11:36
- Initial build-up   23.09.82   11:36-12:43
- Final flow   23.09.82   12:43-00:02
- Final build-up   23.09.82   00:02-24:00

Average flowrates

32/64" choke: Gas: 0.69 Sm^3/D
                      Cond.: 311 Sm^3/D
                      Water: 3% of condensate production

Pressure gauges

1. Wireline nipple: - 2 Sperry Sun MK III gauges
                      - 1 Sperry Sun MK I gauge
2. Wireline nipple: - None

                      - All gauges worked fairly good.

30/2 - 1, DST no. 1
PRESSURE, TEMPERATURE, CHOKE AND FLOWDIAGRAM

GAS RATE
($10^6 \cdot Sm^3/D$)

CONDENSATE RATE
(Sm^3/D)

CHOKE SIZE
($1/64"$)

GOR
(m^3/m^3)

PRESSURE
(BAR)

BHT
(°C)
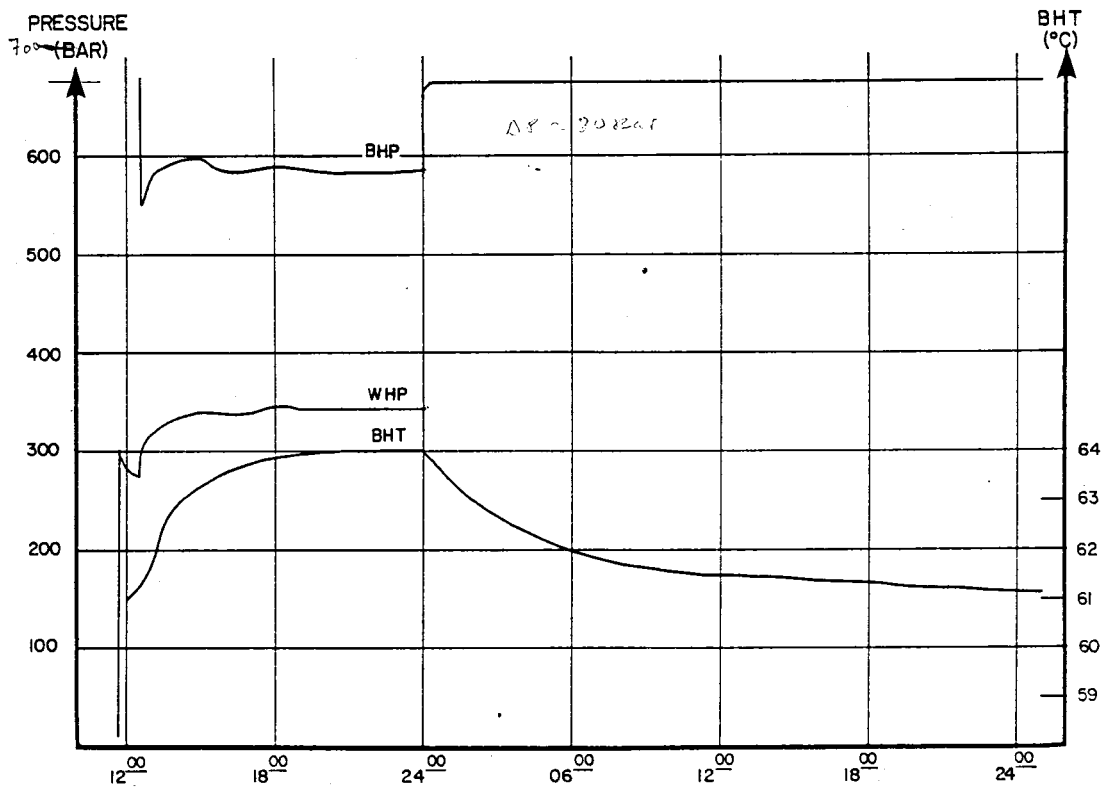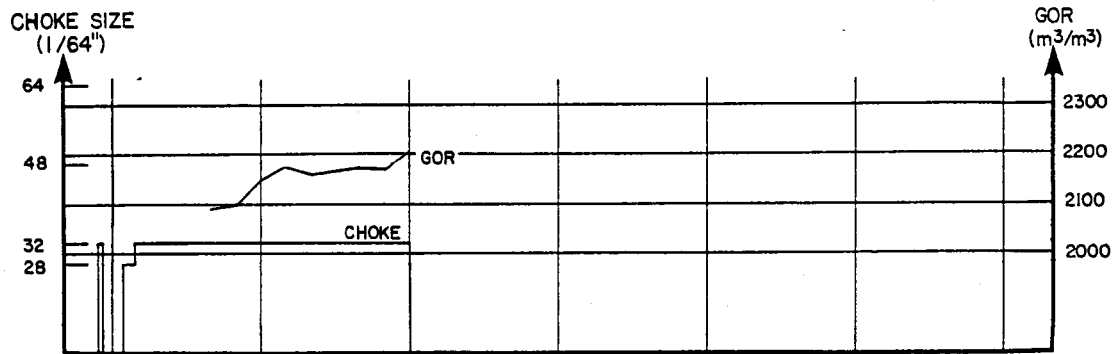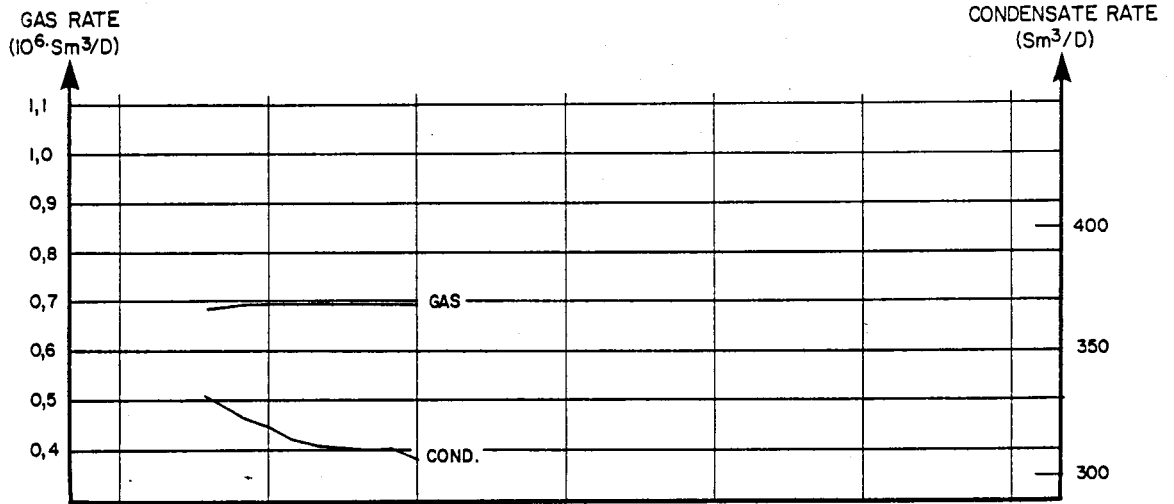
FLOW DATA

Well 30/2-1	CHP/PG A1-14	
DST no. 1	Perfs.: 3785–92 m RKB	
	Zone tested Rannoch	

Date/time 23/9	Bottom hole press. bar	Bottom hole temp °C	Well head press bar	Well head temp. °C	Chokes 1/64" mani-fold	Chokes 1/64" heat.	Separator press. bar	Separator temp. °C	gas rate 10⁶Sm³/D	oil rate Sm³/D	GOR Sm³/Sm³	sp.gr.oil	sp.gr.gas (Air=1)	Water %	Sedim. %	CO₂ %	H₂S ppm	BSW %
16:00	584.7	145.9	339.2	72.8	32		63.1	42.2	0.687	329	2088	0.806	0.689			1	–	2.0
16:30	584.6	145.9	337.8	74.4	"		63.1	40.0	0.083	325	2102	0.806	0.692					2.0
17:00	584.5	146.4	338.7	75.6	"		62.4	41.4	0.677	323	2096	0.806	0.692					1.8
17:30	588.1	146.4	342.7	77.2	"		61.3	42.8	0.687	324	2120	0.806	0.693					0.7
18:00	588.5	146.4	345.8	80.0	"		61.7	42.4	0.687	320	2147	0.806	0.693					1.8
18:30	587.4	146.4	343.3	78.3	"		61.3	45.6	0.682	318	2145	0.806	0.695			2	–	1.2
19:00	586.3	146.4	343.1	78.9	"		61.3	45.6	0.682	314	2172	0.806	0.695					1.3
19:30	584.8	146.4	343.3	81.7	"		61.0	46.7	0.684	312	2192	0.806	0.695					2.0
20:00	584.2	146.4	343.4	81.7	"		65.1	47.8	0.674	312	2160	0.806	0.695			2	–	2.0
20:30	583.0	146.9	342.8	81.1	"		65.1	47.8	0.674	312	2160	0.805	0.695					2.0
21:00	582.1	146.9	342.0	80.0	"		65.1	47.8	0.674	311	2167	0.804	0.695					2.0
21:30	581.2	146.9	342.1	80.0	"		65.1	47.2	0.675	311	2170	0.804	0.695					2.0
22:00	582.6	146.9	341.7	80.0	"		65.1	47.2	0.675	311	2170	0.804	0.695					2.0
22:30	581.7	146.9	340.2	79.4	"		65.1	47.2	0.675	308	2192	0.804	0.695			2	–	2.0
23:00	582.7	146.9	344.2	79.4	"		65.1	47.2	0.675	311	2170	0.804	0.695					2.0
23:30	584.4	146.9	344.7	81.7	"		65.1	47.2	0.675	308	2192	0.804	0.695					3.0
24:00	585.2	146.9	344.7	82.2	"		65.5	47.8	0.677	307	2205	0.804	0.695					3.0

Remarks

– Bottomhole temperature and pressure measurements from

Sperry Sun MK III nr. 0054

Well 30/2-1	LAYOUT OF TEST-STRING	CHP/PG A1-15
DST no 1		Perfs 3785 - 92m RKB
		Zone tested RANNOCH

TEST-STRING		ID inch	OD inch	LENGTH m	DEPTH mRKB
FLOWHEAD					-6,38
1 SINGLE		2,7	3,5	9,36	2,98
3 STANDS		2,7	3,5	83,55	86,53
3 PUPJOINTS	1,93 + 2,77 + 2,65	2,7	3,5	7,35	93,88
2 SINGLES	9,29 + 9,57	2,7	3,5	18,86	112,74
1 STAND		2,7	3,5	27,83	140,57
1 PUPJOINT		2,7	3,5	8,58	149,15
EZ - TREE V		-			-
1 PUPJOINT	TO RAM (140,57 + 6,28)= 146,85	2,7	3,5	2,52	151,67
1 PUPJOINT		2,7	3,5	3,93	155,60
121 STANDS OF TUBING		2,7	3,5	3367,44	3523,04
X-OVER 3½ IF PIN 3½TDS BOX				0.30	3523,34
SLIP JOINT (OPEN)		2,25	5	5,53	3528,87
SLIP JOINT (OPEN)		2,25	5	5,53	3534,40
12 JOINTS DRILL COLLARS				-	-
SLIP JOINT (CLOSED)		2,25	5	-	-
SLIP JOINT (CLOSED)		2,25	5	217,86	3752,26
11 JOINTS DRILL COLLARS				-	-
APR-M REVERSE CIRC./SAFETY VALVE		2,25	4,62	2,22	3754,48
X-OVER 3½IF BOX 3½ F.H. PIN				0,23	3754,71
HANDLING SUB CHOKE ASSEMBLY		0,75	5,0	1,37	3756,08
X-OVER 3½ F.H. BOX 3½IF PIN				0,20	3756,28
APR M REVERSE CIRC./SAFETY VALVE		2,25	4,62	2,22	3758,50
DRILL PIPE TESTER VALVE		2,25	5,0	1,46	3759,96
LPR TESTER VALVE		2,25	5,0	4,88	3764,84
FUL FLO HYDRAULIC BYPASS		2,25	4,62	2,48	3767,32
BIG JOHN JAR		2,37	4,625	1,53	3768,85
BAKER ROTARY SUB		2,375	4,75	0,25	3769,33
BAKER MOD 'G' LOCATER		2,406	3,406	0,32	3769,58
BAKER SEAL ASSEMBLY AND PERFORATED PUP		2,406	3,250	9,14	3769,90
BAKER MOD "F" NON PORTED SEATING NIPPLE		2,312	3,109	0,31	3779,04
BAKER SPACER TUBE 20'		2,375	2,875	6,10	3779,55
BAKER SPACER TUBES 3 x 4'		2,375	2,875	3,66	3785,45
BAKER WIRELINE ENTRY W/HALFMULE SHOE		2,375	2,875	0,21	3789,11

Remarks.

Baker mod. "D" production packer set at 3770m.

Top of packer 3769.33.

| Well 30/2-1	GAUGE ARRANGEMENT	CHP/PG A1-16
DST no. 1		Perfs.: 3785-92 m RKB
		Zone tested RANNOCH
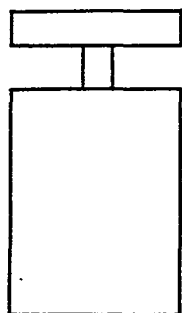
WIRELINE NIPPLE at 3779.35   mRKB

Gauge type and number : Sperry - Sun Mk. III nr. 0054

Depth, pressure elemement : 3782.82m   Range : 690 bar

Mode : 4 min.   Delay , 17 hrs

Actuated : time 02.25   date , 22.09.82

Will run out , time 11.25   date , 27.09.82
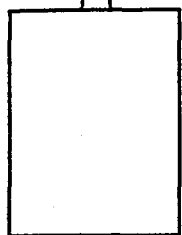
Gauge type and number : Sperry - Sun Mk. III nr. 0051

Depth, pressure elemement : 3785.40m   Range : 690 bar

Mode : 2 min.   Delay , 17 hrs

Actuated : time 02.27   date : 22.09.82

Will run out : time 03.27   date , 25.09.82
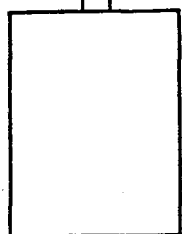
Gauge type and number : Sperry - Sun Mk. I nr. 0130

Depth, pressure elemement : 3788.23m   Range : 827 bar

Mode : 4 min.   Delay , 17 hrs

Actuated : time 02.31   date : 22.09.82

Will run out , time 11.31   date , 27.09.82
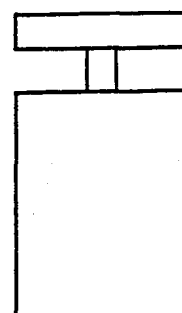
D.S.T. HANGER at   mRKB

Gauge type and number :

Depth, pressure elemement :   Range :

Mode :   Delay ,

Actuated : time   date :

Will run out , time   date ,
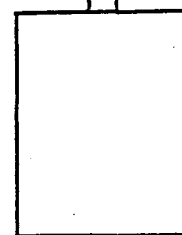
Gauge type and number :

Depth, pressure elemement :   Range :

Mode :   Delay ,

Actuated : time   date :

Will run out , time   date ,
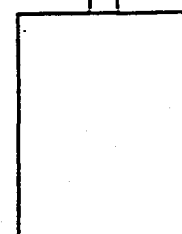
Gauge type and number :

Depth, pressure elemement :   Range :

Mode :   Delay ,

Actuated : time   date :

Will run out , time   date ,

Well 30/2-1	SAMPLING	CHP/PG A1-17
DST no 1		Perfs.: 3785-92 m RKB
		Zone tested RANNOCH

SEPARATOR SAMPLES.

Time/date	Sample no.	Type of sample	Transfer time	Bottle no
18.15 23/9	1	Condensate	39	8207316
18.15	2	Gas	30	A-14086
18.48	3	Gas	30	A-14085
21.30	4	Condensate	35	8207506
21.30	5	Gas	30	A-14067
22.05	6	Gas	25	A-14065
22.35	7	Condensate	35	8207503
22.35	8	Gas	30	A-14074
23.10	9	Gas	35	A-14061

BOTTOM HOLE SAMPLES

Time/date	Sample depth mRKB	Estimated PB bar/°C	Transfering pressure(bar)	Bottle no

WELLHEAD SAMPLES

Time/date	Sampling point	Sampling equipment		Remarks
	Separator	2 x 20 L	Jerry Cans	Condensat
	Separator	1 x 10 L	Jerry Canc	Condensat
	Separator	7 x 1 L	Jars	Condensat
	Separator	3 X 1 L	Plastic bottl	Water

SONIC-SAND-DETECTOR
WELL 30/2-1, DST NO. 1 (RANNOCH)
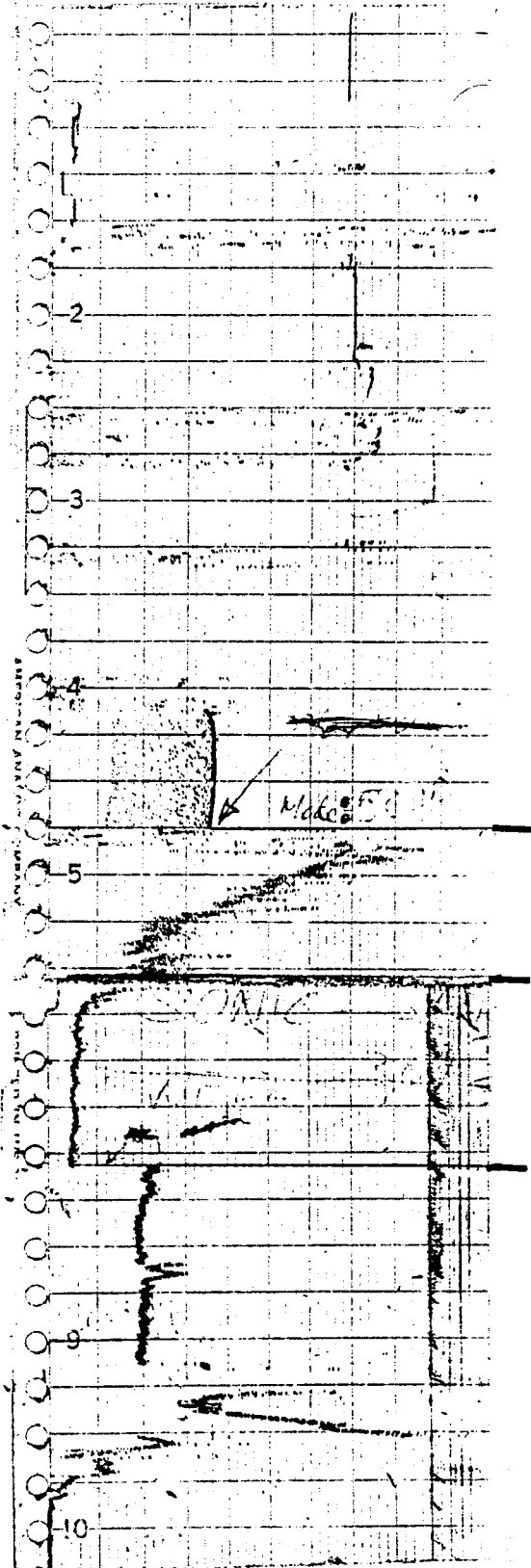
Start at 12.50 hours, 23/9

Mode: 5000

Failure on winding-mechanism

New mode: 10 000

statoil

APPENDIX A2

DST no. 2

BOTTOM HOLE PRESSURE REPORT

statoil

Well __30/2-1__   Test no. __DST no. 2__

Test Date __25-30/9-82__   Date of analysis _____

Gauge no. __Flopetrol CRG 81708__

SUMMARY OF THE RESULTS

	HORNER ANALYSIS	
Kh (md·m)	2280	
K (md)	152	
S_T	30	
$\bar{P}$ (bar) at __3753 m__ RKB	675.5	

Max recorded Temp. __150°C__

Remarks

_____
                                    Signature

Well __30/2-1, DST no. 2__   Test date __25-30/9-82__

Reservoir Parameters

Perforations __3761-3771 m RKB__   Zone(s) __ETIVE__

ss _____   Wellbore radius __0.11__ m

_____   RKB Elev __30__ m

_____

_____

Midpoint Production — __3736 m ss__   Bomb at __3753 m RKB__   — __3723__ m ss

Pressure Functions Evaluated at — __-__ ss   Datum Depth — __-__ ss

Delta P required to correct to datum __-__ psig   Gradient __-__ psi/ft

Estimated Average Pressure _____ psig

Formation Volume Factor __$3.16 \cdot 10^{-3}$__ m^3/Sm^3 Viscosity __0.054__ cp

Thickness __15__ m   Porosity __21__ %   Drainage Area __-__ acres

Oil Saturation __-__ %   Oil Compressibility __-__ bar^{-1}

Water Saturation __18__ %   Water Compressibility __$4.35 \cdot 10^{-5}$__ bar^{-1}

Gas Saturation __82__ %   Gas Compressibility __$64.7 \cdot 10^{-5}$__ bar^{-1}

     Formation Compressibility __$4.35 \cdot 10^{-5}$__ bar^{-1}

System Compressibility $C_t = S_0 C_0 + S_w C_w + S_g C_g + C_f$

$C_t =$ ____ x ____ 10^{-6} + ____ x ____ 10^{-6} + ____ x ____ 10^{-6} + ____ 10^{-6}

$C_t =$ __$58.1 \cdot 10^{-5}$__ bar^{-1}

Rates Reported on Test.

Choke __48__/__64__ inches Cond Rate __416__ m^3/D Gas Rate __$1.03 \cdot 10^6$__ Sm^3/D

FTP _____ psig   Water Rate _____   GOR __2470__ Sm^3/Sm^3

Temp: 150°C ^{0}API __43.8__   Gas Spec. Grav. __0.69__

Cumulative Production   Oil _____   Gas __$0.4784 \cdot 10^6$__ Sm^3

     Water _____

* $Q\ EQ = QG + QC \cdot ZO + QW \cdot 7390$

Well **30/2-1, DST no. 2**   Test Date **25-30/9-82**

Horner Analysis

Effective Production Time tp = Cumulative Production / Rate Reported on Test.

$$tp = \underline{1440 \cdot 0.4784} / \underline{1.030} = \underline{669 \text{ mins}}$$

Straight line starts at _____ hrs   Slope = __1.71__ bar/cycle

$P_{wf's}$ = __620.5__ bar

P_{1hr} = __672.1__ bar

P^{*} = __675.5__ bar

Calculated Values

$$Kh = \frac{162.6 \ Q \ B\mu}{M} = \frac{162.6 \times 38.99 \times 10^{6} \times 5.46 \times 10^{4} \times 0.054}{25} = \underline{7477} \text{ md.ft}$$

$$= \underline{2280} \text{ md. m}$$

$$K = Kh/h = \underline{2280} / \underline{15} = \underline{152} \text{ md.}$$

$$S = 1.1513 \left[\left[\frac{P1hr - Pwf \ s}{M} \right] + Log \left[\frac{tp \ 1}{tp} \right] - Log \left[\frac{K}{\emptyset \mu C_{t} \ rw^{2}} \right] + 3.2275 \right]$$

$$S = 1.1513 \left[\left[\underline{\quad} \right] + Log \left[\underline{\quad} \right] - Log \left[\underline{\quad} \right] + 3.2275 \right]$$

$$S = \underline{30}$$

$$t_{DA} = \frac{0.000264 \ Kt}{\emptyset \mu C_{t} A} = \frac{0.000264}{\underline{\qquad\qquad}} = \underline{\quad}$$

$$P_{DMBH} = \underline{\quad}$$

$$\bar{P} = P^{*} - P_{DMBH} \left[\frac{M}{2.303} \right] = \underline{676.5} \text{ bar @ } - \underline{3723} \text{ m ss}$$

$$= \underline{\quad} \text{ bar @ } - \underline{\quad} \text{ m ss Datum}$$

Well __30/2-1__

Test no. 2

PARTIAL PENETRATION SKIN FACTOR

h_t = __21 m__ (68.9 ft)

h_p = __10 m__ (32.8 ft)

y = __4 m__ (13.1 ft)

r_w = __0.11 m__ (0.35 ft)

K_H/K_V = __1.3__
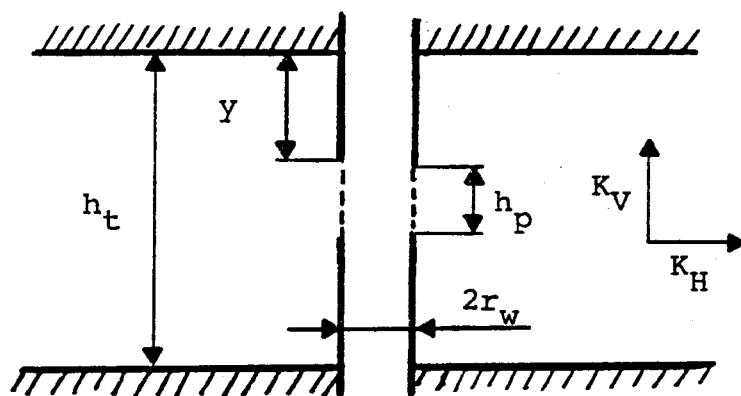
$z_m = y + h_p/2$

$r_{wc} = r_w e^{0.2126(z_m/h_t + 2.753)}$

$S_p = 1.35((h_t/h_p - 1)^{0.825}(\ln(h_t(K_H/K_V)^{0.5} + 7)$

$- (0.49 + 0.1\ln(h_t(K_H/K_V)^{0.5}))\ln r_{wc} - 1.95))$

S_p = __7__

S_t = __30__

$S_f = S_t - S_p = 30 - 7 = \underline{23}$

BRØNN 30-2-1   DST# 2
BUILDUP NUMMER 1
GAUGE CRG81708

NR.	TID	TRYKK
1	21.31	620.521
2	21.32	635.935
3	21.33	658.141
4	21.34	661.571
5	21.35	663.340
6	21.36	664.675
7	21.37	665.672
8	21.38	665.896
9	21.39	666.119
10	21.40	666.343
11	21.41	666.567
12	21.42	666.790
13	21.43	667.014
14	21.44	667.237
15	21.45	667.967
16	21.46	668.498
17	21.47	668.913
18	21.48	669.247
19	21.49	669.516
20	21.50	669.746
21	21.51	669.942
22	21.52	670.107
23	21.53	670.254
24	21.54	670.382
25	21.55	670.496
26	21.56	670.598
27	21.58	670.785
28	22.00	670.941
29	22.02	671.072
30	22.04	671.207
31	22.06	671.319
32	22.08	671.351
33	22.10	671.443
34	22.12	671.527
35	22.14	671.606
36	22.16	671.682
37	22.18	671.695
38	22.20	671.757
39	22.22	671.815
40	22.24	671.873
41	22.26	671.924
42	22.28	671.903
43	22.30	671.949
44	22.31	671.992
45	22.34	672.040
46	22.40	672.155
47	22.50	672.244
48	23.00	672.376
49	23.10	672.412
50	23.20	672.511
51	23.30	672.524
52	23.40	672.599
53	23.50	672.668
54	0.00	672.659
55	0.10	672.713
56	0.20	672.764
57	0.30	672.812
58	0.40	672.786
59	0.50	672.827
60	1.00	672.867
61	1.10	672.905
62	1.20	672.874
63	1.30	672.907
64	1.40	672.941
65	1.55	673.181
66	2.10	673.022
67	2.40	673.032
68	3.10	673.114
69	3.40	673.181
70	4.10	673.240
71	4.40	673.222
72	5.10	673.280
73	5.40	673.323
74	6.10	673.382
75	6.40	673.418
76	7.10	673.448
77	7.40	673.494
78	8.10	673.457
79	8.50	673.505
80	9.10	673.525
81	9.40	673.549
82	10.10	673.579
83	10.40	673.604
84	11.10	673.629
85	11.40	673.658
86	12.15	673.685
87	13.00	673.711
88	13.45	673.749
89	14.30	673.776
90	15.15	673.813
91	16.00	673.773
92	16.45	673.796
93	17.30	673.816
94	17.45	673.816
95	18.15	673.841
96	18.45	673.851
97	19.15	673.867
98	19.45	673.887
99	20.15	673.900
100	21.15	673.922
101	22.00	673.948
102	23.00	673.964
103	0.00	673.976
104	0.54	674.004

P(bar) vs. DELTA T(min)

WELL 30-2-1
DST# 2
BUILDUP   No   1
GAUGE # CRG81708

P(bar) vs. LOG((T+DELTA T)/DELTA T)

WELL 30-2-1
DST# 2
BUILDUP   No 1
GAUGE # CRG81708
T PROD. =   669 min
        m =   1.711bar

        Plh =   672.1 bar

LOG(DELTA P(bar)) vs. LOG(DELTA T(min))

WELL 30-2-1
DST# 2
BUILDUP No 1
GAUGE # CRG81708

Pws = 620.5 bar

Well 30/2-1 DST no. 2	DIARY OF EVENTS	CHP/PG A2-9 Perfs.: 3761-71mRKB Zone tested ETIVE

Date	Time	OPERATIONS
		PERFORATING
27.09	21.30	Rigged up Schlumberger and RIH with CBL-VDL Cementbond OK for DST no.2.
28.09	00.30	Ran gauge ring/junkbasket to 3750 m RKB.
	04.20	RIH with perforating gun, 4 sh/ft, 90°phasing. Perforated 3761-71 m RKB, interval changed 1m from program due to insufficient depth of well (Plug back at 3771.5 mRKB).
	06.20	RIH with Baker model D packer and set same at 3733.7 mRKB.
	10.30	Rigged down Schlumberger.
		RUNNING TESTSTRING
	10.40	Started to pick up Halliburton bottom hole assembly.
	12.00	Actuated gauges and installed same in tail pipe.
29.09	14.00	Started pressure testing $\int$ surface equipment x-o from STT to 3.5"TDS tubing leaked. Replaced same.
	21.30	Finished pessure testing and waited for daylight to open well for flow.
		FLOW/BUILD-UP PERIOD
30.09	06.50	Pressurized flowhead to 207 bar to reduce differential pressure across LPR-n valve.
	06.55	Closed kill valve.
	07.00	Attemted to set pressure on annulus, mud pump failed.
	07.35	Pressurized annulus with Halliburton cement pump.
	07.37	Annulus pressure 76 bar, LPR-n valve opened WHP = 290 bar
	07.45	*Opened adjustable choke to 8/64".
	07.52	*Increased adjustable choke to 32/64".
	07.54	Gas to surface.
	07.55	Changed to 32/64" fixed choke.
30.09	08.50	Flow diverted through heater.
	09.15	Flow diverted through separator.
	09.55	Stopped glycol injection.

Remarks :

* Adjustable choke not accurate

Well 30/2-1	DIARY OF EVENTS	CHP/PG A2-10
DST no. 2		Perfs.: 3761-71 mRKB
		Zone tested ETIVE

Date	Time	OPERATIONS
30.09	10.48	Flowed to surge tank.
	11.05	Stopped steam to heater
	11.14	Bypassed surge tank, meter factor=0.8402 at21^{O}C included shringkage of separator condensate.
	11.20	Started to drain surge tank.
	12.07	Flowed to surge tank.
	12.30	Bypassed surge tank, meter factor=0.8609 at30^{O}C included shrinkage.
	13.30	Flowed to surge tank.
	13.38	Started to take first set of PVT sample (1 condensate and 2 gas bottles) and one condensate bottle using water as transferring fluid.
	13.52	Bypassed surge tank, meter factor=0.8749 at31^{O}C. included shrinkage.
	15.16	Started to take second set of PVT samples. (one condensate and two gas samples).
	15.21	Flowed to surge tank.
	15.40	Bypassed surge tank, meter factor=0.8545 at34^{O}C included shrinkage.
	15.46	Took two jerry cans and 3x11 glass bottles of condensate from separator oil outlet.
	16.00	Finished PVT sampling.
	16.07	Bypassed separator.
	16.11	*Changed to 48/64" adjustable choke.
	16.25	Changed to 48/64" fixed choke.
	17.02	Flowed through separator.
	17.44	Flowed to surge tank.
	18.00	Bypassed surge tank, meter factor=0.8658 at 40°C included shrinkage.
	19.00	Flowed to surge tank.
	19.15	Bypassed surge tank, meter factor=0.8593 at 47°C included shrinkage.
	19.52	Started to take third set of PVT samples. (one condensate and two gas bottles) and one condensate bottle using water as transferring fluid.
	21.00	Finished sampling.
	21.30	Bypassed separator.
	21.31	Closed choke manifold. Increased annulus pressure to 200 bar. No indication that APR-m valve sheared.

Remarks :

* Adjustable choke not accurate.

Well 30/2-1 DST no. 2		DIARY OF EVENTS	CHP/PG A2-11 Perfs.: 3761-71 mRKB Zone tested ETIVE

Date	Time	OPERATIONS
02.10	21.36	Bled off surface pressure through choke manifold. APR-m valve still open.
	21.43	Annulus increased to 320 bar, APR-m valve sheared and reversed mud to surface.
	00.09	Started to lift teststring, weight indicator indicated drag.
	00.48	Lifted teststring 5-6m, disconnected STT and pulled out of packer. Circulated bottoms up. Pressure gauges on surface. Finish test.

Remarks:

statoil

SUMMARY OF DST NO 2

Perforated interval: 3761-3771 m RKB

                (depth reference FDC/CNL log)

- First flow: 30.09.82   07:45-21:31
- Final build-up: 01.10 82   21:31-00:48

Average flowrates:

32/64" choke: Gas rate   = 740×10^3 Sm^3/D

                     Cond. rate = 314 Sm^3/D

                     Water rate = 2.5% of cond. prod.

48/64" choke: Gas rate   = 1020×10^3 Sm^3/D

                     Cond. rate = 396 Sm^3/D

                     Water rate = 1.8% of cond. prod.

Pressure gauges:

1. Wireline nipple: - 3 Sperry Sun MK III gauges

2. Wireline nipple: - 1 Flopetrol SSDR-1 CRG gauge

                           - 1 Sperry-Sun gauge and 1 Flopetrol gauge failed due to the high reservoir temperature. The rest of the gauges were partly effected by the temperature.

30/2-1, DST no. 2

PRESSURE, TEMPERATURE, CHOKE AND FLOWDIAGRAM

FLOW DATA

Well	30/2-1
DST no.	2

CHP/PG	A2-14
Perfs.:	3761-71 m RKB
Zone tested	Etive

Date/time	Bottom hole press. bar	Bottom hole temp °C	Well head press bar	Well head temp °C	Chokes 1/64" mani-fold	Chokes 1/64" heat.	Separator press. bar	Separator temp °C	gas rate 10⁶Sm³/D	oil rate Sm³/D	GOR Sm³/Sm3	sp.gr.oil	sp.gr.gas (Air=1)	Water %	Sedim. %	CO₂ %	H₂S ppm	BSW %
10.00			372.2	75.0	32		64.1	48.9	0.747	334.2	2238	0.813	0.68					4
10.30			374.0	80.6	32		64.1	46.7	0.733	315.1	2328					4	0	5
11.00			377.4	85.0	32		64.1	46.7	0.731	336.2	2174	0.804	0.68					4
11.30			378.1	84.4	32		64.1	46.7	0.731	330.0	2217							
12.00			379.5	88.9	32		64.1	46.7	0.730	331.3	2205	0.804				4	0	3
12.30			380.1	89.4	32		64.5	47.8	0.734	331.8	2213							
13.00			380.3	89.4	32		64.5	47.8	0.732	327.9	2234					3	0	3
13.30			383.8	92.2	32		64.5	47.8	0.730	323.5	2258	0.802	0.68					
14.00			383.8	92.8	32		64.5	47.8	0.728	325.7	2238					3	0	3
14.30			383.4	92.8	32		64.5	48.9	0.734	324.4	2263	0.814						
15.00			384.1	92.8	32		64.1	48.9	0.732	319.6	2293		0.68					
15.30			384.1	92.8	32		64.1	48.9	0.730	324.7	2251	0.816				3	0	3
16.00			384.8	93.9	32		64.1	48.9	0.729	319.6	2281					3	0	3

Remarks

WHP from Sperry Sun surface gauge

FLOW DATA

Well 30/2-1
DST no. 2

CHP/PG A2-15
Perfs.: 3761-3771 m RKB
Zone tested Etive

Date/ time 30/9	Bottom hole		Well head		Chokes 1/64"		Separator data							Liq. and gas analysis				
	press. bar	temp °C	press bar	temp. °C	mani- fold	heat.	press. bar	temp. °C	gas rate 10³Sm³/D	oil rate Sm³/D	GOR Sm³/Sm³	sp.gr.oil	sp.gr.gas (Air=1)	Water %	Sedim. %	CO₂ %	H₂S ppm	BSW %
17.30	617	143	244	96	48	–	65	71	1.040	417.1	2474		0.690			4	0	3.0
18.00	618	143	244	96	48	–	65	71	1.032	418.4	2445	0.807						
18.30	618	143	243	97	48	–	65	70	1.023	416.9	2454							
19.00	618	143	243	98	48	–	65	70	1.023	417.6	2552	0.800						
19.30	619	143	244	99	48	–	65	72	1.024	411.4	2494	0.807	0.695			3	0	2.5
20.00	620	143	243	99	48	–	64	72	1.026	415.1	2472	0.807	0.700					3.0
20.30	620	143	244	99	48	–	64	72	1.026	415.7	2471							2.5
21.00	620	143	244	99	48	–	65	73	1.026	415.0	2470							
21.30	621	143	244	100	48	–	65	73	1.030									

Remarks

Well 30/2-1	LAYOUT OF TEST-STRING	CHP/PG A2-16
DST no 2		Perfs 3761-71 m RKB
		Zone tested ETIVE

TEST-STRING	ID inch	OD inch	LENGTH m	DEPTH mRKB
FLOWHEAD				-4.70
SINGLE BELOW	2.7	3.5	9.34	
LANDING STRING (4 stand + 2 single + 2 pups)	2.7	3.5	135.86	140.50
28.17 + 9.41 + 9.46 + 2.77 + 2.65 +				
27.48 + 28.05 + 27.87				
EZ TREE WITH PUP ABOVE (6.28 TO RAM)	2.7	3.5	8.58	149.08
119 STAND + 2 SINGLE + PUP (3.93)	2.7	3.5	3334.46	3483.54
XO 3½ TDS BOX x 3½ IF PIN			0.30	3483.84
SLIP JOINT (OPEN)	2.25	5	5.53	3489.37
SLIP JOINT (OPEN)	2.25	5	5.53	3494.90
12 JOINTS DRILL COLLARS				
SLIP JOINT (CLOSED)	2.25	5	217.86	3712.76
SLIP JOINT (CLOSED)	2.25	5		
11 JOINTS DRILL COLLARS				
APR-M REVERSE CIRC. VALVE	2.25	4.62	2.22	3714.98
XO 3½ IF BOX x 3½" F.H. PIN			0.23	3715.21
HANDLING CHOKE AND SUB ASSY	0.75	5.0	1.48	3716.69
X-O 3½ F.H. BOX x 3½ I.F. PIN			0.20	3716.89
APR-M REVERSE CIRCULATING VALVE	2.25	4.62	2.29	3719.18
DRILL PIPE TESTER VALVE	2.25	5.00	1.34	3720.52
LPR-TESTER VALVE	2.25	5.00	4.88	3725.40
FUL-FLO HYDRAULIC BYPASS	2.25	4.62	2.48	3727.88
BIG JOHN JAR	2.37	4.62	1.53	3729.41
BAKER ROTARY SUB	2.37	4.75	0.25	3729.66
BAKER MOD "G" LOCATOR	2.406	3.406	0.32	3729.98
BAKER SEAL-ASSEMBLY AND PERFORATED JOINT	2.406	3.250	8.23	3738.21
BAKER MOD "F" SEATING NIPPLE	2.312	3.109	0.31	3738.52
BAKER SPACER TUBE 34 ft	2.375	2.875	10.67	3749.19
BAKER MOD "F" NON PORTED SEATING NIPPLE	2.312	3.109	0.31	3749.50
BAKER SPACER TUBE 24 ft	2.375	2.875	7.59	3757.09
BAKER WIRELINE ENTRY W/HALF MULESHOE	2.375	2.875	0.21	3757.30

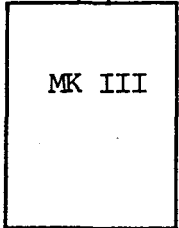**Remarks.**

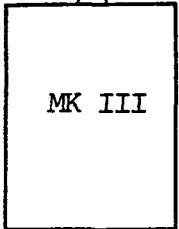PACKER TO BE SET AT 3730.65, <u>DRILLERS DEPTH</u> (RUBBER ELEMENT)

| Well 30/2-1 | GAUGE ARRANGEMENT | CHP/PG   A2-17 |
| DST no. 2 | | Perfs.: 3761-71 m RKB |
| | | Zone tested   ETIVE |

WIRELINE NIPPLE at   3738.5   mRKB

MK III

Gauge type and number : Sperry Sun, MK III   no. 0054

Depth, pressure elemement : 3741.9 m RKB   Range : 690 bar

Mode : 2 min   Delay , 17

Actuated : time 12.02   date : 28.09.82

Will run out , time 13.00   date , 01.10.82

MK III

Gauge type and number : Sperry Sun, Mk III no. 0022

Depth, pressure elemement : 3744.4 m RKB   Range : 690 bar

Mode : 4 min.   Delay , 17

Actuated : time 12.04   date : 28.09.82

Will run out , time 21.00   date , 03.10.82
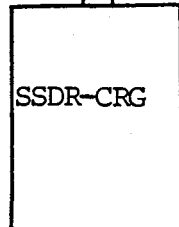
MK III
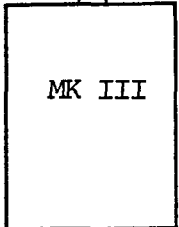
Gauge type and number : Sperry Sun, Mk no. 0092

Depth, pressure elemement : 3747.2 m RKB   Range : 690 bar

Mode : 4 min   Delay , 17

Actuated : time 12.06   date : 28.10.82

Will run out , time 21.00   date , 03.10.82

F-nipple

DISPLACEMENT at   3749.5   mRKB

SSDR-CRG

Gauge type and number : FLOPETROL SSDR-CRG no. 81065/81708

Depth, pressure elemement :   3752.85   Range : 690 bar

Mode : 0 min   Delay , 0

Actuated : time 12.47   date , 28.09.82

Will run out , time 22.47   date , 01.10.82
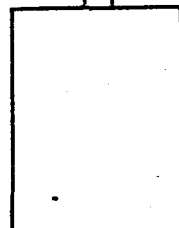
Gauge type and number :

Depth, pressure elemement :   Range :

Mode :   Delay ,

Actuated : time   date ,

Will run out , time   date ,
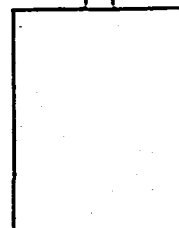
Gauge type and number :

Depth, pressure elemement :   Range :

Mode :   Delay ,

Actuated : time   date ,

Will run out , time   date ,

Well	30/2-1	SAMPLING	CHP/PG A2-18

DST no	2		Perfs.: 3761-71 m RKB
			Zone tested Etive

SEPARATOR SAMPLES

Time/date	Sample no.	Type of sample	Transfer time	Bottle no
13.38/30.9	1	Condensate	30 min.	8208521
13.38	2	*Condensate	30 min.	8207505
13.38	3	Gas	30 min.	A-14072
14.25	4	Gas	30 min.	A-14055
15.16	5	Condensate	30 min.	8207420
15.17	6	Gas	30 min.	A-14073
15.49	7	Gas	30 min.	A-14063
19.52	8	Condensate	30 min.	8207608
19.52	9	*Condensate	30 min.	8207324
19.53	10	Gas	30 min.	A-14081
20.29	11	Gas	30 min.	A-14070

*Sample taken using water as transfering fluid

BOTTOM HOLE SAMPLES

Time/date	Sample depth mRKB	Estimated PB bar/°C	Transfering pressure(bar)	Bottle no

WELLHEAD SAMPLES

Time/date	Sampling point	Sampling equipment	Remarks
	Separator	1 x 10 1 jerry can	Condensat
	Separator	3 x 1 1 glass bottles	Condensat
	Separator	1 x 20 1 jerry can	Condensat
	Separator	3 x 1 1 glass bottles	Condensat
	Separator	2 x 1 1 plastic bottles	Water

SONIC-SAND-DETECTOR
WELL 30/2-1, DST NO. 2 (ETIVE)
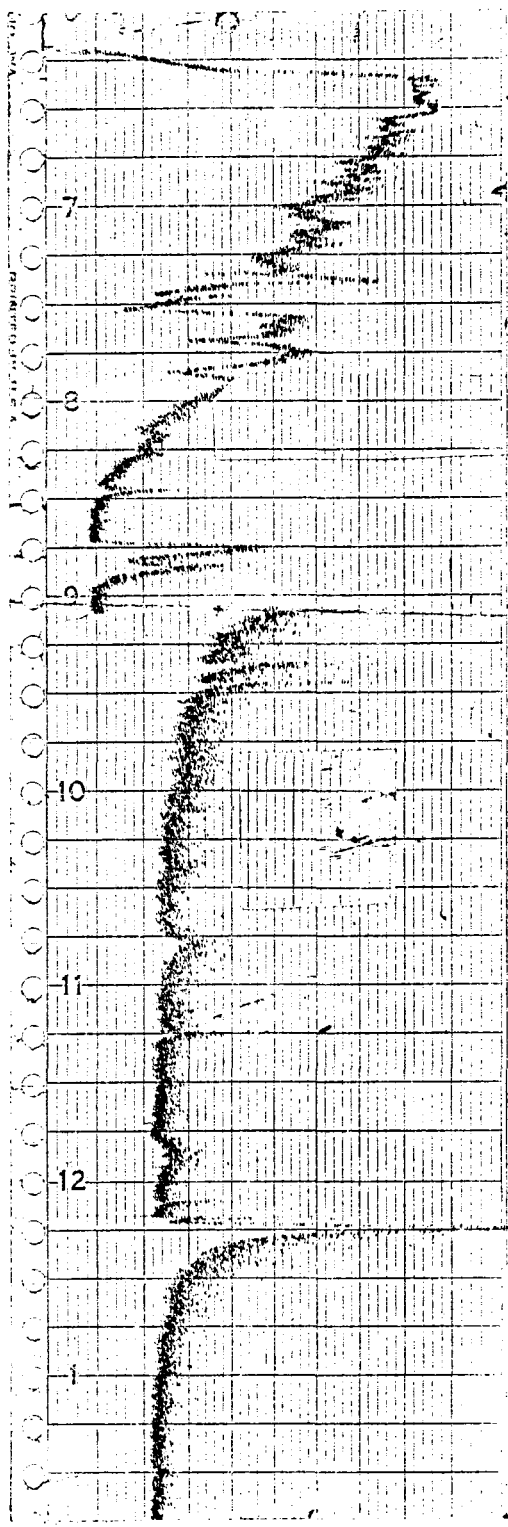
START AT 7.45 HOURS, 30/9,

CHOKESIZE= 32/64"

NEW MODE

CLEAN-UP EFFECT

SONIC-SAND-DETECTOR
WELL 30/2-1, DST NO. 2 (ETIVE)
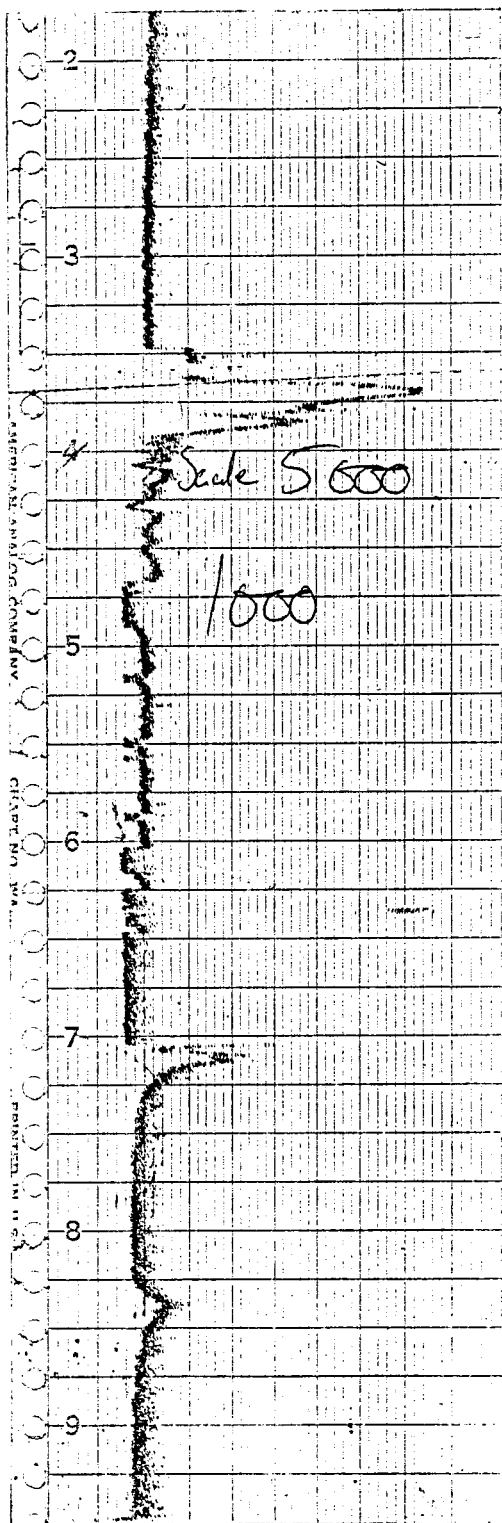
— CHANGE TO 48/64" CHOKESIZE

— END OF FLOW PERIOD

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APPENDIX A3

DST no. 3

BOTTOM HOLE PRESSURE REPORT

Well ___30/2-1___   Test no. ___DST no. 3___

Test Date ___5-8/10-82___   Date of analysis _____

Gauge no. ___Sperry Sun MK III 0054___

SUMMARY OF THE RESULTS

	HORNER ANALYSIS	
Kh (md·m)	2200	
K (md)	275	
S_T	12	
$\bar{P}$ (bar) at 3693 m RKB	～ 673.5	

Max recorded Temp. ___150°C___

Remarks

_____
                        Signature

Well   30/2-1, DST no. 3   Test date   5-8/10-82

Reservoir Parameters

Perforations   3720-3728 m RKB   Zone(s)   ETIVE

ss   Wellbore radius   0.11   m

                                                  RKB Elev   30   m

Midpoint Production — 3694 m ss   Bomb at · 3693 m RKB   —   3663   m ss

Pressure Functions Evaluated at —_____ ss   Datum Depth —_____ ss

Delta P required to correct to datum _____ psig   Gradient _____ psi/ft

Estimated Average Pressure _____ psig

Formation Volume Factor $3.23 \cdot 10^3$ m^3/Sm^3 Viscosity   0.051   cp

Thickness   8   m   Porosity   25   %   Drainage Area _____ acres

Oil Saturation _____ %   Oil Compressibility   —   bar

Water Saturation   10   %   Water Compressibility $4.35 \cdot 10^5$ bar

Gas Saturation   90   %   Gas Compressibility $64.7 \cdot 10^5$ bar

                                Formation Compressibility $4.35 \cdot 10^5$ bar

System Compressibility $C_t = S_0 C_0 + S_w C_w + S_g C_g + C_f$

C_t = _____ x _____ 10^{-6} + _____ x _____ 10^{-6} + _____ x _____ 10^{-6} + _____ 10^{-6}

C_t = $62.9 \cdot 10$ 10^{-6} bar^{-1}

Rates Reported on Test.   EQ GAS RATE = $1.101 \cdot 10^6$ SCF*/D

Choke   48 / 64 inches Cond.Rate   396   m^3/D   Gas Rate $1.02 \cdot 10^6$ Sm^3/D

FTP _____ psig   Water Rate _____ BWD   GOR   2570   Sm^3/ m^3

Temp: 150°C   °API   42.3   Gas Spec. Grav.   0.692

Cumulative Production   Oil _____   Gas _____

                           Water _____

*QEQ = QG + QC · ZO + QW · 7390

Well ___30/2-1 , DST no. 3___   Test Date ___5-8/10-82___

Horner Analysis

Effective Production Time t_p = Cumulative Production / Rate Reported on Test.

$$t_p = \underline{\frac{1440 \cdot 0.4518}{}} \Big/ \underline{1.016} = \underline{640 \text{ mins}}$$

Straight line starts at _____ hrs   Slope = ___1.694___ bar/cycle

$P_{wf's}$ = ___643.9___ bar

P_{1hr} = ___663.3___ bar

p^* = ___~673.5___ bar

Calculated Values

$$Kh = \frac{162.6 \quad Q \, B\mu}{M} = \frac{162.6 \cdot 38.95 \cdot 10^6 \cdot 5.58 \cdot 10^4 \cdot 0.051}{25} = \underline{7209} \text{ md.ft}$$

$$= \underline{2200} \text{ md. m}$$

$$K = Kh/h = \underline{2200} \Big/ \underline{8} = \underline{275} \text{ md.}$$

$$S = 1.1513 \left[\left[\frac{P_{1hr} - P_{wf \, s}}{M} \right] + Log \left[\frac{t_p \quad 1}{t_p} \right] - Log \left[\frac{K}{\emptyset \, \mu \, C_t \, r_w^2} \right] + 3.2275 \right]$$

$$S = 1.1513 \left[\left[\underline{\quad\quad} \right] + Log \left[\underline{\quad\quad} \right] - Log \left[\underline{\quad\quad\quad\quad} \right] + 3.2275 \right]$$

$$S = \underline{\quad\quad\quad}$$

$$t_{DA} = \frac{0.000264 \, Kt}{\emptyset \, \mu \, C_t \, A} = \underline{0.000264 \quad\quad\quad\quad\quad} = \underline{\quad\quad}$$

$$P_{DMBH} = \underline{\quad\quad\quad}$$

$$\bar{P} = P^* - P_{DMBH} \left[\frac{M}{2.303} \right] = \underline{\quad \sim 673.5 \quad} \text{ bar } @ - \underline{3663} \text{ m ss}$$

$$= \underline{\quad\quad\quad} \text{ bar } @ - \underline{\quad\quad\quad} \text{ m ss Datum}$$

BRØNN 30-2-1 DST# 3
BUILDUP NUMMER 1
GAUGE 580054

NR.	TID	TRYKK
1	2.05	660.526
2	2.07	661.065
3	2.09	661.424
4	2.11	661.693
5	2.13	661.933
6	2.15	662.083
7	2.17	662.262
8	2.19	662.382
9	2.21	662.472
10	2.23	662.591
11	2.25	662.651
12	2.27	662.741
13	2.29	662.771
14	2.31	662.831
15	2.33	662.861
16	2.35	662.891
17	2.37	662.920
18	2.39	662.980
19	2.41	663.079
20	2.43	663.109
21	2.45	663.139
22	2.47	663.139
23	2.49	663.169
24	2.51	663.169
25	2.53	663.169
26	2.55	663.199
27	2.57	663.199
28	2.59	663.328
29	3.01	663.328
30	3.03	663.328
31	3.05	663.358
32	3.07	663.358
33	3.09	663.358
34	3.11	663.358
35	3.13	663.388
36	3.15	663.358
37	3.23	663.487
38	3.27	663.517
39	3.31	663.517
40	3.35	663.547
41	3.39	663.675
42	3.43	663.675
43	3.51	663.705
44	3.55	663.705
45	3.59	663.705
46	4.03	663.834
47	4.07	663.864
48	4.11	663.864
49	4.15	663.864
50	4.19	663.864
52	4.23	663.894
53	4.27	663.894
54	4.31	663.894
55	4.35	663.924
56	4.39	664.023
57	4.43	664.023
58	4.47	664.053
59	4.51	664.083
60	4.55	664.083
61	4.59	664.083
62	5.03	664.113
63	5.07	664.113
64	5.11	664.143
65	5.15	664.241
66	5.19	664.271
67	5.23	664.271
68	5.27	664.301
69	5.31	664.301
70	5.35	664.331
71	5.39	664.331
72	5.43	664.361
73	5.47	664.361
74	5.51	664.490
75	5.55	664.490
76	5.59	664.490
77	6.03	664.520
78	6.09	664.520
79	6.15	664.550
80	6.17	664.580
81	6.23	664.610
82	6.29	664.610
83	6.33	664.640
84	6.39	664.640
85	6.45	664.768
86	6.51	664.768
87	6.55	664.798
88	6.59	664.798
89	7.05	664.828
90	7.11	664.828
91	7.15	664.858
92	7.21	664.858
93	7.25	664.888
94	7.29	664.888
95	7.35	664.918
96	7.41	664.948
97	7.45	664.948
98	7.51	664.978
99	7.57	664.978
100	8.03	664.978
101	8.07	665.077
102	8.13	665.107
103	8.17	665.107
104	8.23	665.137
105	8.29	665.167
106	8.33	665.167
107	8.41	665.197
108	8.49	665.227
109	8.53	665.287
110	8.59	665.257
111	9.03	665.287
112	9.09	665.287
113	9.13	665.317
114	9.17	665.317
115	9.21	665.347
116	9.25	665.347
117	9.29	665.377
118	9.33	665.377
119	9.39	665.407
120	9.45	665.506
121	9.51	665.536
122	9.55	665.536
123	10.07	665.596
124	10.15	665.626
125	10.21	665.626
126	10.27	665.656
127	10.33	665.686
128	10.39	665.716
129	10.45	665.716
130	10.51	665.746
131	10.57	665.776
132	11.03	665.776
133	11.09	665.806
134	11.17	665.806
135	11.23	665.836
136	11.29	665.896
137	11.37	665.896
138	11.43	665.926
139	11.51	665.956
140	11.59	665.956
141	12.07	666.084
142	12.15	666.114
143	12.23	666.144
144	12.31	666.174
145	12.43	666.204
146	12.51	666.234
147	12.59	666.264
148	13.07	666.294
149	13.15	666.324
150	13.23	666.354
151	13.31	666.384
152	13.39	665.077
153	13.47	665.107
154	13.53	665.107
155	14.03	665.137
156	14.15	665.167
157	14.23	665.197
158	14.31	665.197
159	14.41	665.227
160	14.49	665.257
161	14.59	665.287
162	15.07	665.287
163	15.15	665.287
164	15.23	665.317
165	14.33	665.317
166	15.49	665.347
167	15.57	665.347
168	16.05	665.377
169	16.11	665.377
170	16.21	665.407
171	16.31	665.506
172	16.41	665.536
173	16.51	665.536
174	17.01	665.596
175	17.11	665.626
176	17.19	665.626
177	17.27	665.656
178	17.35	665.686
179	17.47	665.716
180	17.55	665.716
181	18.05	665.746
182	18.15	665.776
183	18.25	665.776
184	18.35	665.806
185	18.45	665.806
186	18.59	665.836
187	19.09	665.866
188	19.23	665.896
189	19.35	665.896
190	19.49	665.926
191	19.59	665.956
192	20.09	666.084
193	20.25	666.114
194	20.35	666.144
195	20.47	666.174
196	20.59	666.204
197	21.09	666.234
198	21.21	666.264
199	21.31	666.324
200	21.41	666.354
201	21.51	668.074
202	22.01	668.104
203	22.11	668.134
204	22.21	668.164
205	22.31	668.194
206	22.41	668.224
207	22.51	668.254
208	23.01	668.284
209	23.09	668.314
210	23.19	668.344
211	23.29	668.374
212	23.37	668.404
213	23.45	668.434
214	23.55	668.464
215	0.05	668.494
216	0.15	668.524
217	0.25	668.554
218	0.35	668.584
219	0.45	668.614
220	0.55	668.674
221	1.13	668.704
222	1.23	668.734
223	1.33	668.863
224	1.37	668.794
225	1.45	668.794
226	1.49	668.893
227	1.53	668.794
228	1.55	668.893
229	1.57	668.794
230	1.59	668.794
231	2.01	668.923
232	2.03	668.824
233	2.05	668.923
234	2.07	668.824
235	2.09	668.923
236	2.11	668.854
237	2.13	668.854
238	2.15	668.854
239	2.17	668.854
240	2.19	668.854

P(bar) vs. DELTA T(min)

WELL 30-2-1
DST# 3
BUILDUP No 1
GAUGE # SS0054

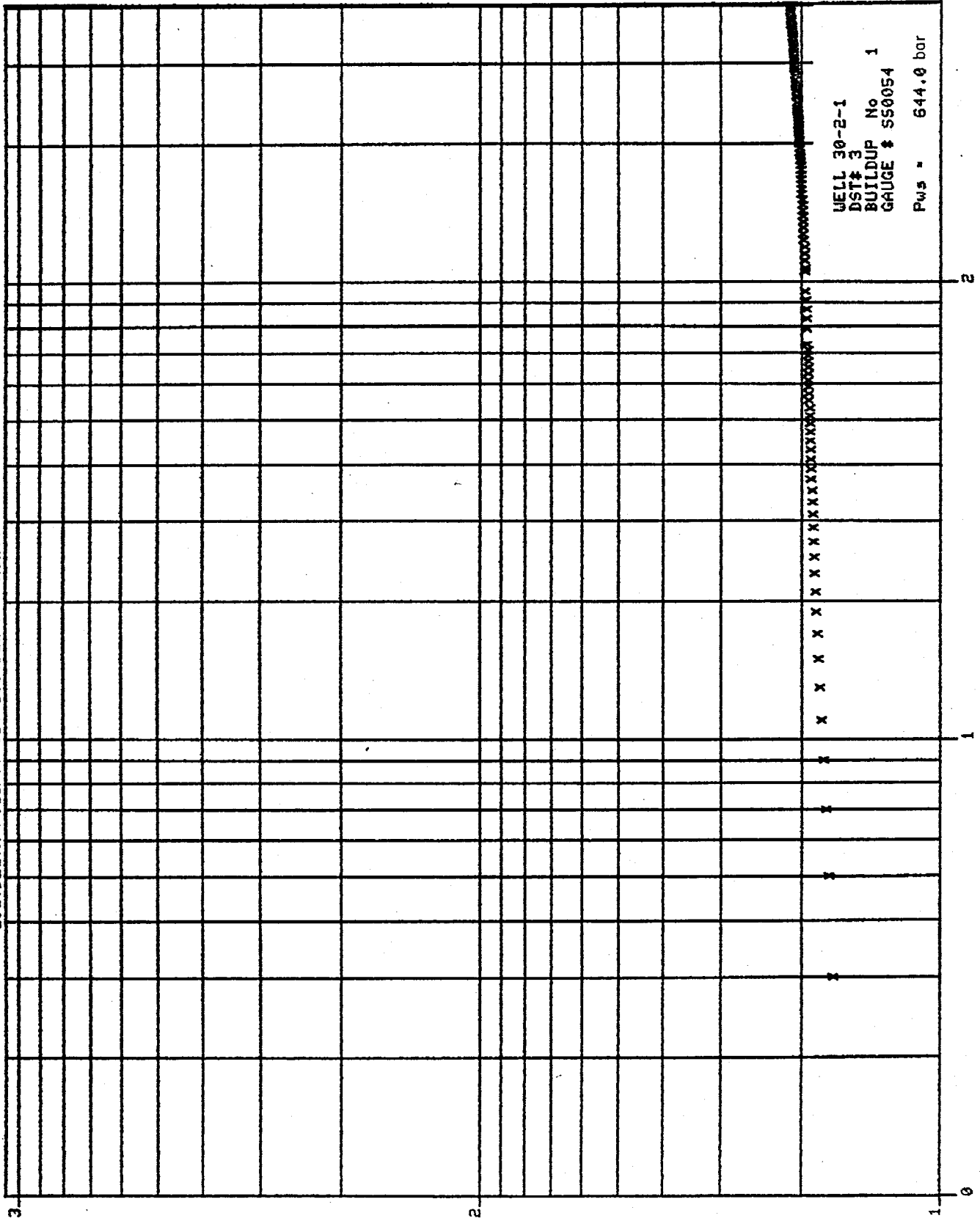P(bar) vs. LOG((T+DELTA T)/DELTA T)

WELL 30-2-1
DST# 3
BUILDUP No 1
GAUGE # SS0054
T PROD = 640 min
m = 1.694

P1h = 663.3 bar.

END OF THE STRAIGHT LINE

LOG(DELTA P(bar)) vs. LOG(DELTA T(min))

WELL 30-2-1
DST# 3
BUILDUP No 1
GAUGE # 550054

Pws =   644.0 bar
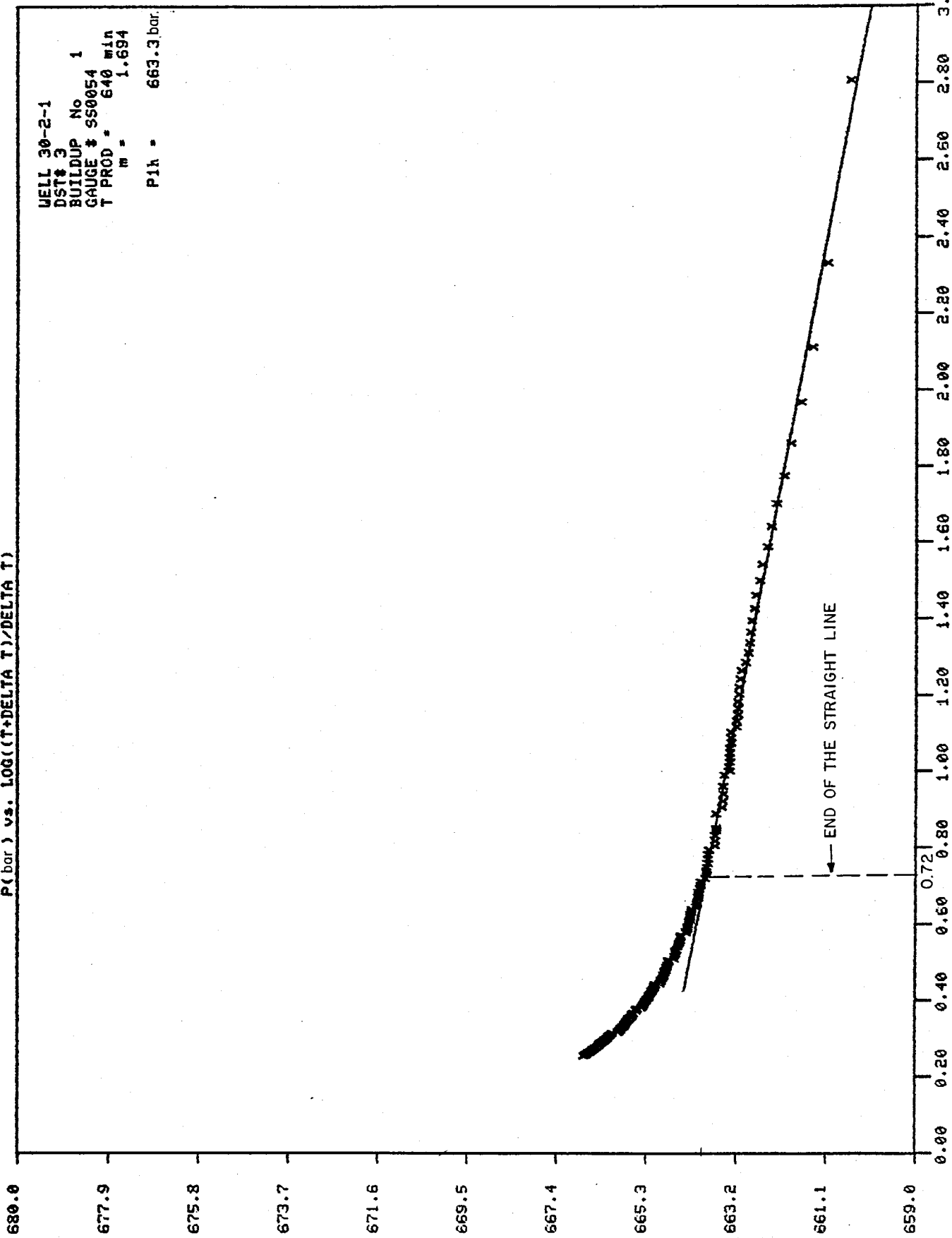
Well 30/2-1		DIARY OF EVENTS	CHP/PG A3-8
DST no. 3			Perfs.: 3720-28mRKB
			Zone tested ETIVE

Date	Time	OPERATIONS
		PERFORATING
04.10	23.45	Rigged up Schlumberger
05.10	00.02	RIH with CBL/VDL/GR
		Out of hole, cementbond OK.
	02.28	RIH with perforating gun, 4 sh/ft, 90°phasing
		Perforated 3720-28 mRKB ref. FDC/CNL
	04.00	Out of hole, only 57 of 95 shots fired,i.e.
		only the interval 3720-28 was perforated
	06.00	Loaded new gun, RIH and perforated 3720-23mRKB.
	08.09	Out of hole, all shoots fired.
	08.22	RIH with Baker model D packer and sat same at
		3685.5mRKB.
	10.39	Out of hole.
	11.00	Tightened up all connections on Flopetrol SSTT.
		RUNNING TESTSTRING
	12.00	Installed pressure gauges in tail pipe and RIH
		with Halliburton bottom hole assembly.
06.10	09.30	Finished pressure testing on surface equipment.
	09.37	Landed teststring in packer
	09.55	Pressurized flowhead to 207 bar.
	09.58	Closed kill valve.
	10.01	Bled off on cement unit.
	10.03	Increased pressure on annulus to 130 bar.
		No response.
	10.15	Bled off surface pressure through choke.
		Bled off annulus pressure.
	10.20	Lifted teststring 5 m and landed same to open
		DP-tester valve.
	10.38	Open kill valve and pressured up on flowhead
		to 207 bar.
	10.45	Increased annulus pressure to 135 bar.
	11.02	Bled off pressure.
	11.05	Opened kill valve and increased surface pressure
		to 290 bar.
	11.09	Closed kill valve.
	11.10	Increased annulus pressure to 145 bar,
		no response.

Remarks :

Well 30/2-1		DIARY OF EVENTS	CHP/PG A3-9
DST no. 3			Perfs.: 3720-28mRKB
			Zone tested ETIVE

Date	Time	OPERATIONS
	11.30	Checked that EZ-tree was opened.
		Picked up teststring 7m and landed same in packer again.
	12.44	Increased annulus pressure with 290 bar on tubing.
	12.51	Opened LPR-valve with 115 bar on annulus.
		FLOW/BUILD-UP PERIOD
	12.57	Opened choke manifold on 32/64" adj. choke.
	13.05	Changed to 32/64" fixed choke.
	14.30	Flowed through separator.
	18.30	Started to take first set of separator samples.
	19.40	Started to take second set of " "
	20.40	Bypassed separator.
	20.42	Changed to 32/64" adj. choke.
	20.44	Increased choke to 48/64".
	20.57	Changed to 48/64" choke.
	21.26	Flowed through separator.
07.10	00.20	Started to take third set of separator samples.
	02.01	Bypassed separator.
	02.03	Closed choke manifold.
	02.05	Sheared APR-m valve with 228 bar on annulus.
	02.07	Bled off pressure on choke manifold and circulated mud to surface.

Remarks:

SUMMARY OF DST NO 3

Perforated interval: 3720-3728 m RKB
                         (depth reference FDC/CNL log)

Sequence

- First flow: 06.10.82, 12:57 - 07.10.82, 02:03
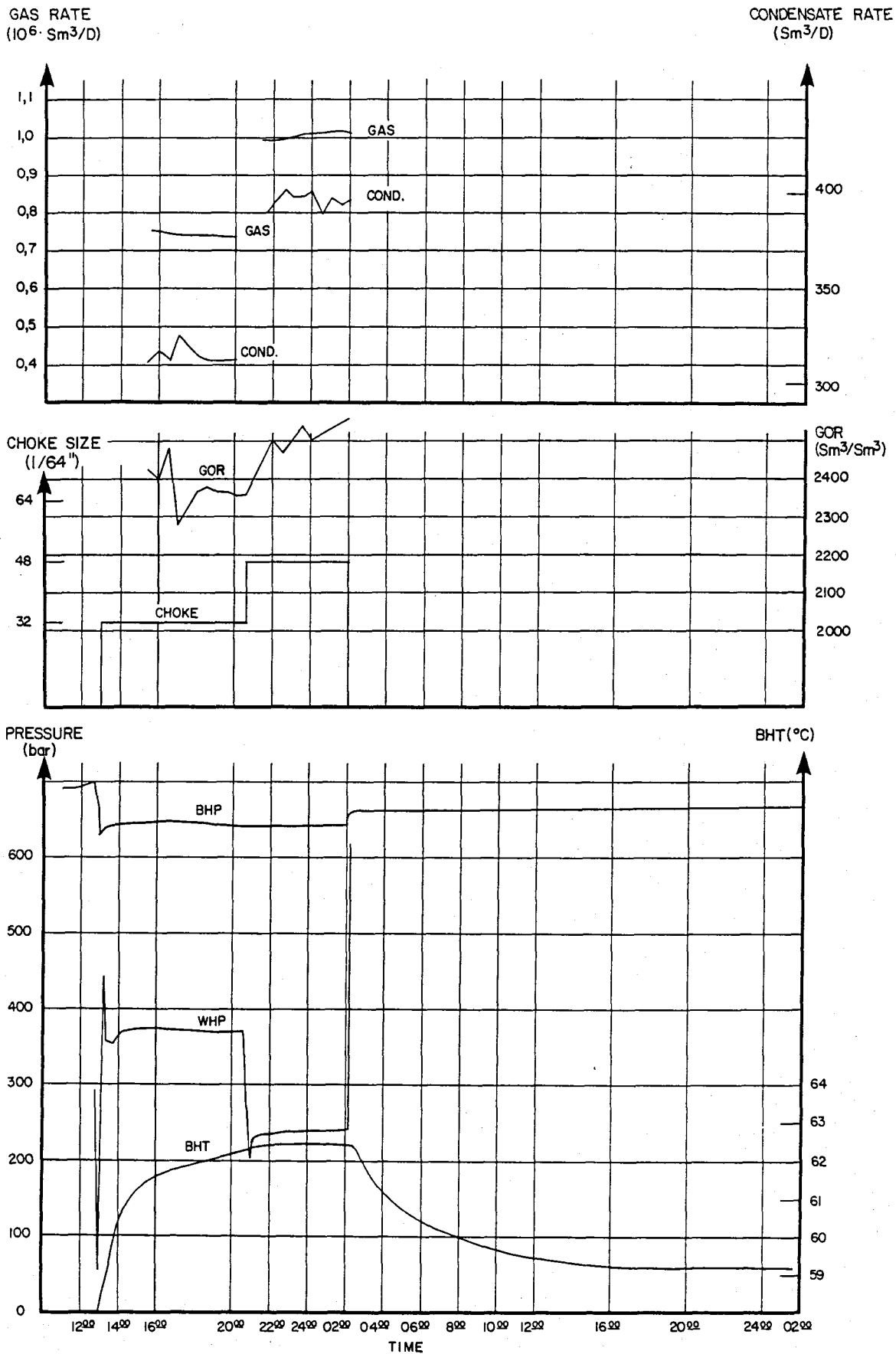- Final build-up: 07.10.82, 02:03 - 08.10.82, 02:20

Average flowrates

32/64" choke   Gas rate   = 740×10^3 Sm^3/D
                    Cond. rate = 314 Sm^3/D
                    Water rate = 2.5% of cond. prod.

48/64" choke: Gas rate   = 1020×10^3 Sm^3/D
                    Cond. rate = 396 Sm^3/D
                    Water rate = 1.8% of cond. prod.

Pressure gauges

1. Wireline nipple: - 1 Sperry-Sun MK III
                        - 1 Flopetrol Amerada

2. Wireline nipple: - 2 Sperry-Sun MK III
                        - 1 Sperry-Sun MK I

                        - 3 Sperry-Sun gauges and 1 Flopetrol
                          Amerada failed due to the high
                          temperature.
                          1 Sperry-Sun MK III gauge was partly
                          effected by the temperature.

30/2-1, DST no.3

PRESSURE, TEMPERATURE, CHOKE AND FLOWDIAGRAM

GAS RATE
($10^6 \cdot Sm^3/D$)

CONDENSATE RATE
(Sm^3/D)

CHOKE SIZE
($1/64$")

GOR
(Sm^3/Sm^3)

PRESSURE
(bar)

BHT(°C)

TIME

Well	30/2-1			CHP/PG	A3-12
DST no.	3			Perfs.:	3720-3728 m RKB
				Zone tested	ETIVE

FLOW DATA

Date/ time 6/10	Bottom hole		Well head		Chokes 1/64"		Separator data							Water %	Sedim. %	Liq. and gas analysis		BSW %
	press. bar	temp °C	press bar	temp °C	manifold	heater	press. bar	temp °C	gas rate 10⁶SM³/D	oil rate Sm³/D	GOR Sm³/Sm³	sp.gr.oil	sp.gr.gas (Air=1)			CO₂ %	H₂S ppm	
1600	546.7	141.9	375.4	83	32		61	48	751.3	317.5	2403	0.805	0.682			5		2.5
1700	546.8	142.4	378.6	83	32		61	52	743.0	325.8	2281	0.807	0.684			4		2.6
1800	547.3	142.9	380.8	85	32		61	54	742.4	314.0	2364	0.806	0.684			3.7		2.5
1900	547.5	142.9	381.8	87	32		61	56	740.5	313.0	2366	0.794	0.684			4		2.5
1930	547.6	142.9	382.4	87	32		61	56	737.6	311.3	2369	0.806	0.687			4		2.5
2000	547.7	142.9	382.4	87	32		61	56	737.6	313.0	2357	0.806	0.687			4		1.8
2030	547.6	143.4	234.3	87	32		61	56	737.6	312.6	2360	0.805	0.687			4		1.8
2230	542.3	143.4	240.6	89	48		63	66	996.9	403.5	2471	0.809	0.692			4		1.5
2330	542.5	143.5	241.5	91	48		63	68	1012	398.9	2537	0.809	0.692			4		1.5
7/10																		
2400	542.6	143.9	242.5	93	48		63	69	1017	406.4	2502	0.809	0.692			4		1.5
0030	542.7	143.9	242.2	93	48		63	69	1016	389.1	2611	0.809	0.692			4		1.8
0100	542.8	143.9	242.7	95	48		63	71	1013	398.3	2543	0.814	0.692			4		1.8
0130	543.8	143.9	243.6	95	48		63	69	1020	395.0	2582	0.814	0.692			3		1.8
0200	544.0	143.9	243.8	95	48		63	71	1016	396.3	2564	0.814	0.692			3		1.8

Remarks

Well 30/2-1	LAYOUT OF TEST-STRING	CHP/PG A3-13
		Perfs 3720-3728 m RKB
DST no 3		Zone tested ETIVE

TEST-STRING	ID inch	OD inch	LENGTH m	DEPTH mRKB
Flowhead				- 4.50
Single below	2.7	3.5	9.35	4.85
Landing string (4 stand+2 single+2 pups)	2.7	3.5		
28.17+9.41+9.46+2.77+2.65+				
27.48+28.05+27.87			135.86	140.71
Ez-tree with pup above (6.30m to ram)	3.0	10.0	8.60	147.01/149.3
118 stands+2 singles + pup (3.93)	2.7	3.5	3306.43	3455.74
x/o 3 1/2" tds box x 3 1/2" if pin			0.30	3456.04
Slip joint (open)	2.25	5.0	5.53	3461.57
Slip joint (open)	2.25	5.0	5.53	3467.10
10 joints drill collars	2.25	4.75		
Slip joint (closed)	2.25	5.0	199.61	3666.71
Slip joint (closed)	2.25	5.0		
11 joints drill collar	2.25	4.75		
Apr-m reverse circ. valve	2.25	5.0	2.04	3668.75
x/o 3 1/2" if box x 3 1/2" f.h. pin			0.23	3668.98
Handling choke and sub assy. 40/64	2.25	5.0	1.45	3670.43
x/o 3 1/2" f.h. box x 3 1/2" if pin			0.20	3670.63
Apr-m rev. circ. valve	2.25	4.62	2.29	3672.92
Drill pipe tester valve	2.25	5.0	1.56	3674.48
Lpr tester valve	2.25	5.0	4.98	3679.46
Ful-flo hydraulic bypass	2.25	4.62	2.07	3681.53

Remarks.

Well 30/2-1	LAYOUT OF TEST-STRING	CHP/PG A3-14
DST no 3		Perfs 3720-3728 m RKB
		Zone tested ETIVE

TEST-STRING	ID inch	OD inch	LENGTH m	DEPTH mRKB
Big john jar	2.37	4.62	1.57	3683.10
Baker rotary sub	2.37	4.75	0.25	3683.35
Baker mod 'g'-locator	2.406	3.406	0.32	3683.67
Baker seal-assy. and perf. jt.	2.406	3.25	8.07	3691.74
Baker mod 'f' seating nipple	2.312	3.109	0.31	3692.05
Baker spacer tube				
34' (20'+10'+4)	2.375	2.875	10.62	3702.67
Baker mod 'f' non ported				
seating nipple	2.312	3.109	0.31	3702.98
Baker spacer tube				
28' (20'+4'+4')	2.375	2.875	9.00	3711.98
Baker wireline entry guide w/				
half muleshoe	2.375	2.875	0.21	3712.19

Remarks.

Well 30/2-1	GAUGE ARRANGEMENT	CHP/PG A3-15
DST no. 3		Perfs.: 3720-28m RKB
		Zone tested ETIVE

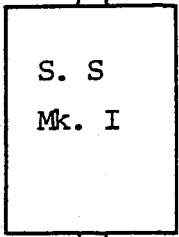**WIRELINE NIPPLE at** 3690,10m   mRKB

Gauge type and number : Sperry Sun Mk.III nr 0054

Depth, pressure elemement : 3693,50m   Range : 690 bar

Mode : 2 min.   Delay , 17 hrs.

Actuated : time 10.54   date : 5/10

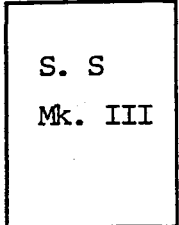Will run out : time 11.54   date , 8/10

Gauge type and number : Sperry Sun Mk. I nr 0125

Depth, pressure elemement : 3696,14m   Range : 828 bar

Mode : 4 min   Delay , 17 hrs

Actuated : time 10.56   date : 5/10

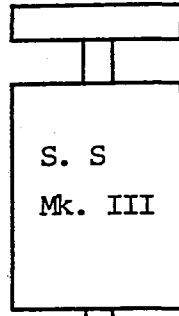Will run out : time , 19.56   date , 10/10

Gauge type and number : Sperry Sun Mk. III nr 0092

Depth, pressure elemement : 3698.87m   Range : 690 bar

Mode : 4 min   Delay , 17 hrs

Actuated : time 10.58   date , 5/10

Will run out : time 19.58   date , 10/10

D.S.T. HANGER at 3701.08m   mRKB
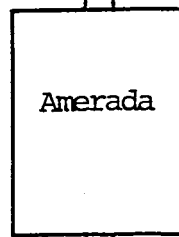
Gauge type and number : Sperry Sun Mk. III nr. 0016

Depth, pressure elemement : 3703.81m   Range :

Mode : 4 min.   Delay , 17 hrs.

Actuated : time 11.00   date : 5/10

Will run out : time 20.00   date , 10/10
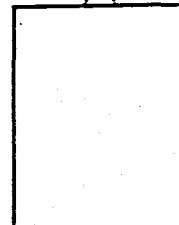
Gauge type and number : Amerada

Depth, pressure elemement : 3705.81m   Range : 1035 bar

Mode : 120 hrs. clock   Delay ,

Actuated : time 12.11   date : 5/10

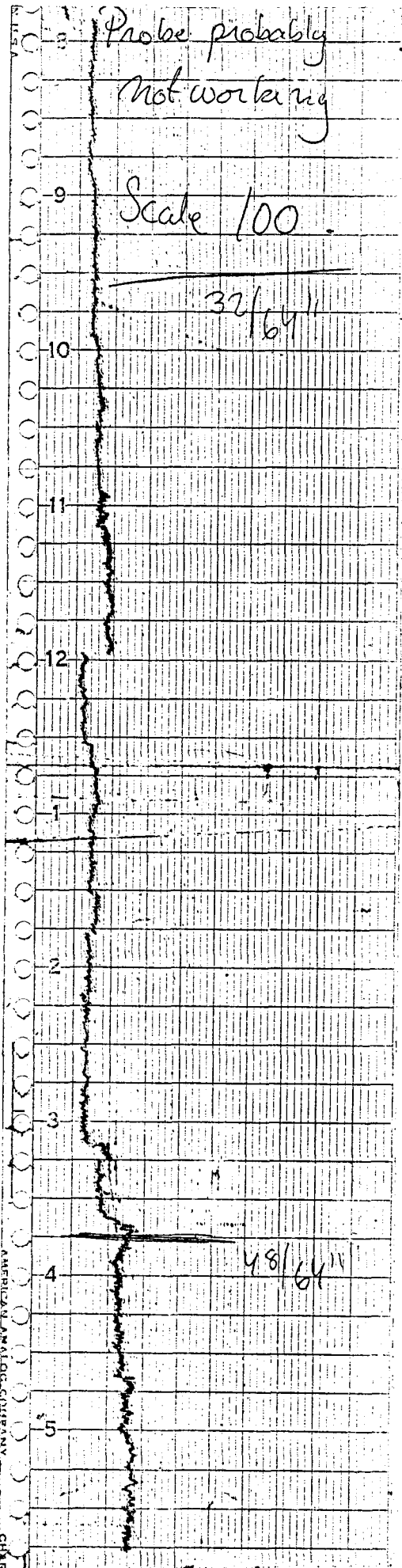Will run out : time 12.11   date , 10/10

Gauge type and number :

Depth, pressure elemement :   Range :

Mode :   Delay ,

Actuated : time   date ,

Will run out : time   date ,

SONIC-SAND-DETECTOR
WELL 30/2-1, DST NO.3

Probe probably
not working

Scale 100

32/64"

48/64"

Probe probably
not working

statoil

APPENDIX A4

CPI Log with Test Intervals