

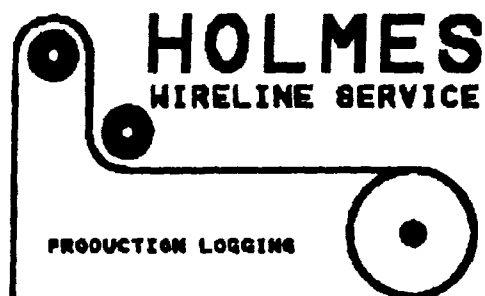
STEP RATE TESTS

Avon has conducted Step Rate Tests on three wells in the Turner "B" Waterflood Expansion Area. These wells originally had injection into the Premier Sand of the Grayburg with cumulative injection ranging from 1.8 to 2.0 MM BW per well. These three wells were those agreed for testing by Mike Williams, OCD Artesia. Perforations were added in the Vacuum (San Andres) and in the Premier, Square Lake, Metex and Loco Hills in the Grayburg. All new perforations were broken down with acid but were not fraced. The wells were then completed with a single string of tubing and a packer set above all perforations. It is probable that the Premier interval took most of the injection water during the tests as it has been injected into before and, on average, has the best permeability.

Following is a summary of the results of the Step Rate Tests

Well No. -----	Parting Pressure PSI -----	Parting Pressure Plus 450 PSI PSI -----
47	1250	1700
50	1075	1525
61	1300 ----	1750 ----
Average	1208	1658

BEFORE EXAMINER CATANACH	
OIL CONSERVATION DIVISION	
Avon	EXHIBIT NO. 8
CASE NO.	10290



Digital Data Acquisition System

COMPANY.....:AVON ENERGY

WELL NAME/#....:TURNER B # 47

FIELD.....:PREMIER

COUNTY.....:EDDY

STATE...:NEW MEXICO

FJCE NAME...:91070285

LOCATION.....:660' FNL & 1980' FEL

BLOCK.....:

SECTION.:29 TWS: 17-S RGE: 31-E

PERM. DAT.....:GROUND LEVEL

ELEV.....:3707'

L.M.F.:GROUND LEVEL

DATE.....: 7/10/1991

TYPE SURVEY...:STEP RATE TESTS

DEPTH DRILLER.:PB 3419'

DEPTH LOGGER.:TD TBG AT 1152'

WELL STATUS...:INJECTION

HOLE FLUID....:WATER

INJ. RATE.....:0 - 6000 BPD

PROD: OIL bpd.: -

WATER bpd...: -

GAS mcf.: -

MAX. REC. TEMP: -

PRESS: TUBING.:450 - 2100 PSI

CASING.....:0 PSI

CASING SIZE...:7" 20#

DEPTH.....:3450'

TUBING SIZE...:2 3/8" SALTA

DEPTH.....:APPRX. 2990'

PACKER @.....:2990'

TUBING TAIL:

TRUCK NO.....:T-104

TOOL SIZE...:1 1/2"

TOOL NO.:SIE PSI

RECORDED BY...:MONTY HOLMES

WITNESSED BY...:ROBERT SETZLER, JOHNNY ROBINSO

ENGINEER.....:PERRY HUGHES

PERFORATIONS...:3045,54,56,87,

: 3110,17,38,40,41,

: 56,58, 3224, 43-70,

: 90-94, 3324,38,44,

: 50-62, 64-66, 87, 92

: 3396-3412.

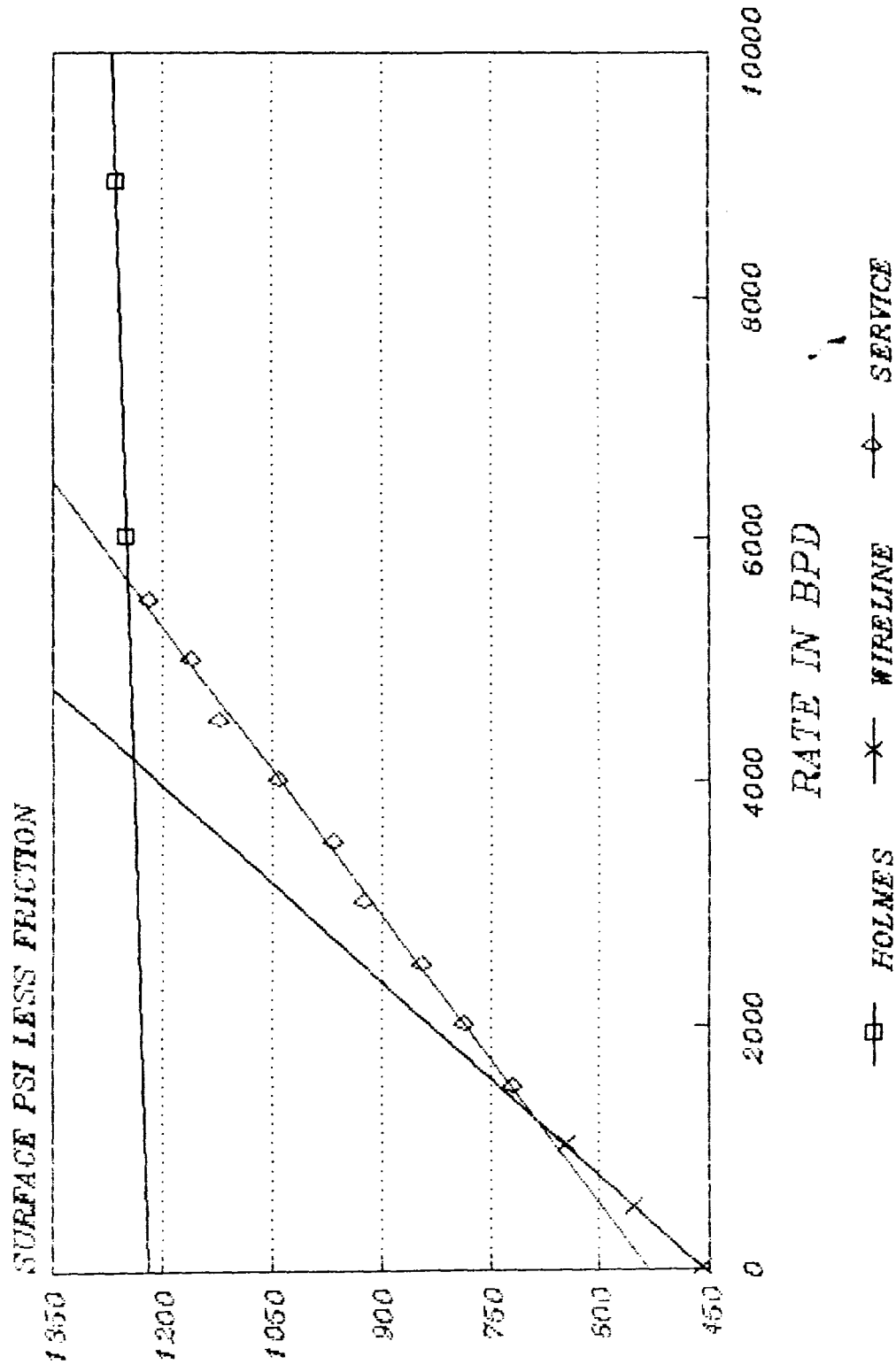
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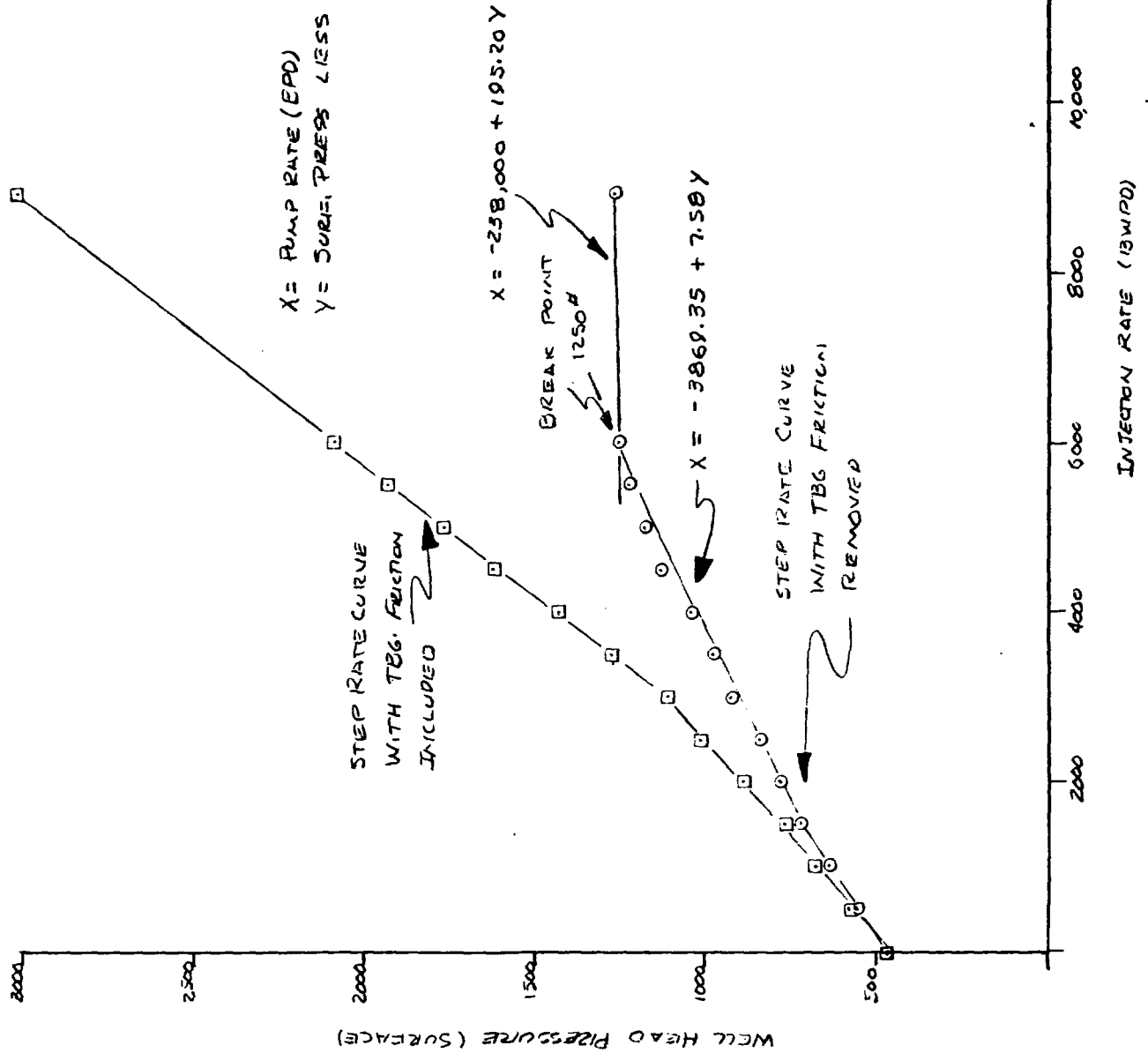
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AVON: TURNER "B" #47



MAJOR FRACTURE POINT AT 1250 PSI

TURNER "B" 47
STEP RATE TEST
JULY 10, 1991



NOTE:
STEP RATE TEST RUN IN 2 3/8"
SATA LINING TBG IN WELLS.

TURNER "B" #47
INTERCEPT OF STEP RATE CURVES

Eq of line before parting pressure

X = Pump rate (BPD)

Y = Surf press less friction (PSI)

X = -3869.35 + 7.58 Y

Eq of line after parting pressure

X = -238,000 + 195.20 Y

Intercept of two curves

-238,000 + 195.20 Y = -3869.35 + 7.58 Y

187.62 Y = 234,130.65

Y = 1247.9 PSI surf press w/o friction

X = 5589.7 BPD = 3.9 BPM



"The New Edge in Production Logging"

STEP RATE TEST EVALUATION

AVON ENERGY, INC.

TURNER "B" #50

7/18/91

OBJECTIVE: DETERMINE FRAC PRESSURE AND PLOT RESULTS.

PROCEDURE: STARTED STEP RATE TEST @ 6200 BPD, RAN STEPS @ 1000 BPD. MAXIMIZED PUMPS @ 11,200 BPD, SHUT DOWN UNTIL FOLLOWING DAY.

BEGAN STEP RATE @ 11,200 BPD UNTIL PREVIOUS BOTTOM HOLE PRESSURE WAS ACHIEVED, THEN FOLLOWED PREVIOUS PROCEDURE.

CONCLUSION: FORMATION PARTING PRESSURE - 2639 BHP, 1075 PSI PLUS FRICTION SURFACE PRESSURE.

STEPS #4 AND #5 PLOTTED HIGH DUE TO INCONSISTENT PUMP RATE.

GRADIENT PRESSURES:	<u>DEPTH</u>	<u>PRESSURE</u>	<u>TIME</u>
	SURFACE	474.1	10:38 AM
	500'	708.87	10:43 AM
	1000'	944.46	10:48 AM
	1500'	1179.16	10:52 AM
	2000'	1413.08	10:55 AM
	3000'	1881.15	11:00 AM
	3325'	2037.91	11:28 AM

GRADIENT: .470 PSI/FT

GAUGE: 3325'

STATIC: 1563.81 PSI

BHP PARTING PRESSURE: 2639 PSI

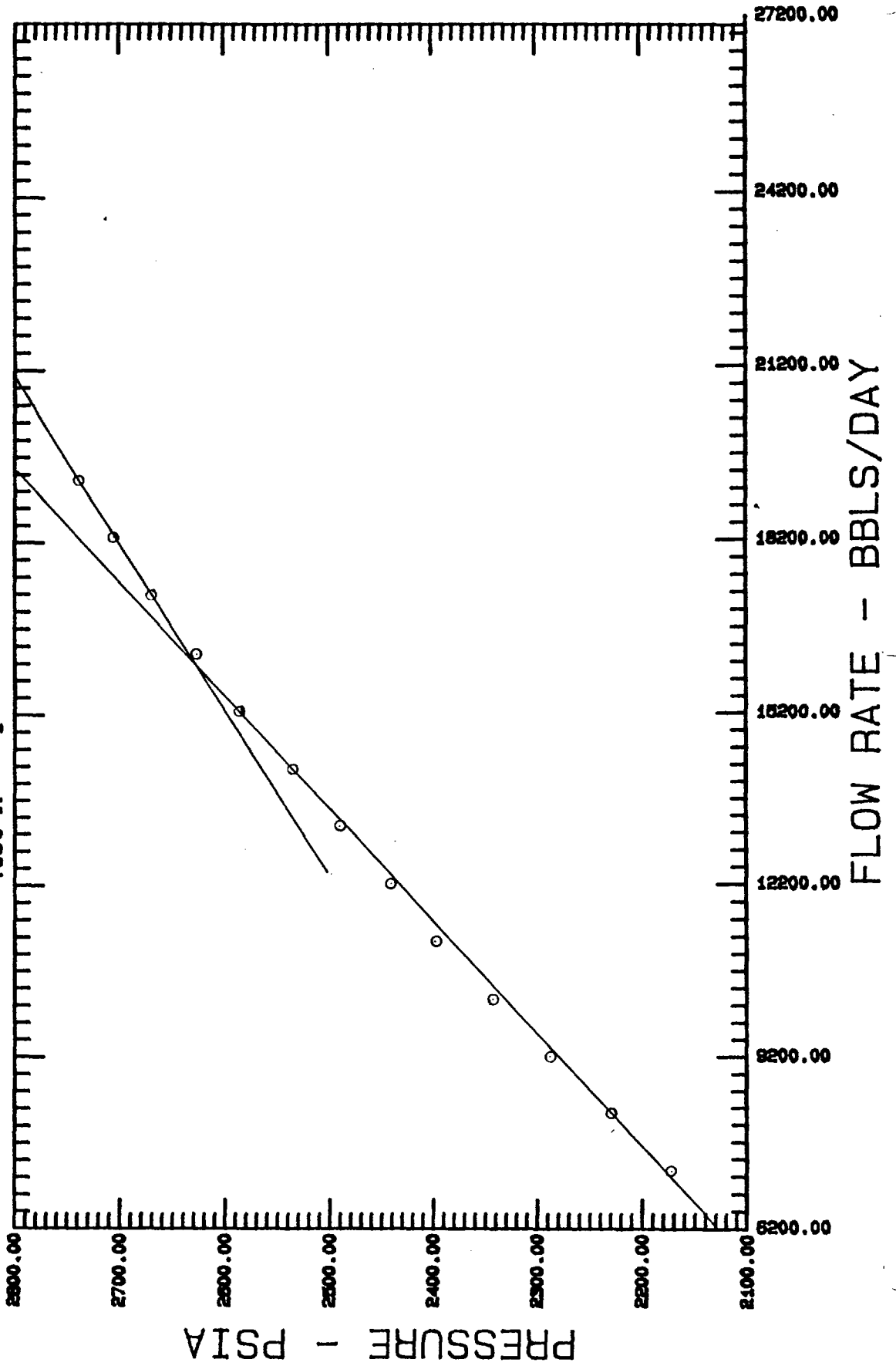
SURFACE PARTING PRESSURE: 1075 PSI PLUS FRICTION

I.S.I.P.: 1200 PSI

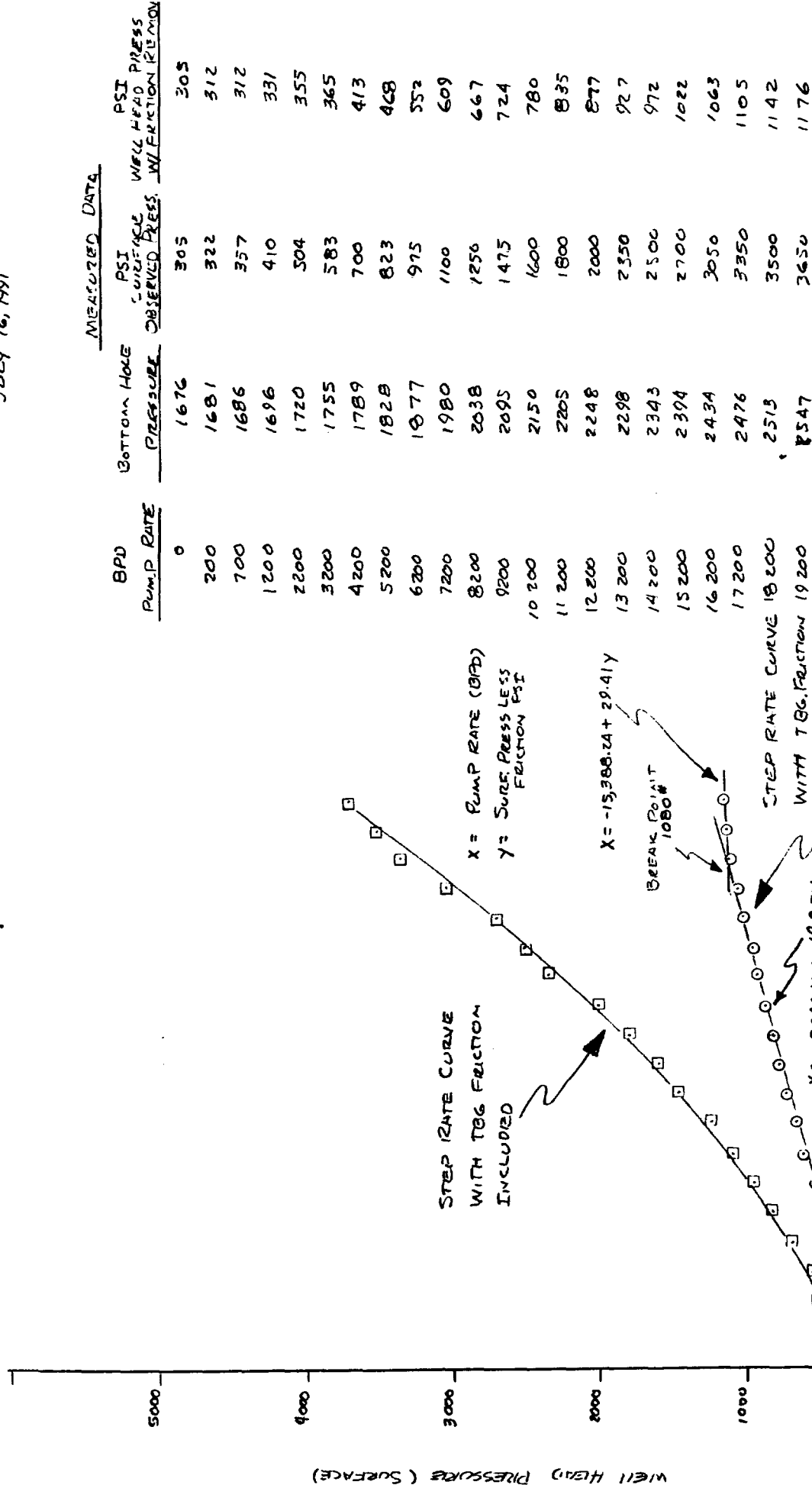
SURFACE PRESSURE

RATE	SURFACE	FRICTION
6200	975 PSI	423 PSI
7200	1100	491
8200	1250	584
9200	1475	751
10200	1600	821
11200	1800	965
12220	2000	1123
13200	2350	1423
14200	2500	1520
15200	2700	1678
16200	3050	1987
17200	3350	2245
18200	3500	2350
19200	3650	2475

Plot starting date: 7/18/91
 time: 0: 0: 0
 Gauge S/N
 Company: DOWNHOLE INVESTIGATIONS INC. Location: EDDY, NEW MEXICO
 Client: AVON ENERGY INC. Operator: EVANS
 Well name: TURNER "B" Comments: STEP RATE TEST, GRADIENT, TEST
 Well #: 50 PRESSURE GAUGE 3325"
 Test #: 1



TURNER "B" 50
STEP RATE TEST
JULY 16, 1991



INJECTION RATE (BPD)

EXHIBIT NO. 2

TURNER "B" #50
INTERCEPT OF STEP RATE CURVES

Eq of line before parting pressure

X = Pump rate (BPD)

Y = Surf press less friction (PSI)

$$X = 5044.11 + 19.83 Y$$

Eq of line after parting pressure

$$X = -15,388.24 + 29.41 Y$$

Intercept of two curves

$$-15,388.24 + 29.41 Y = -5044.11 + 19.83 Y$$

$$9.58 Y = 10,344.13$$

$$Y = 1079.76 \text{ PSI surf press w/o friction}$$

$$X = 16,367.60 \text{ BPD} = 11.37 \text{ BPM}$$



"The New Edge in Production Logging"

STEP RATE TEST EVALUATION

AVON ENERGY, INC.

TURNER "B" #61

7/19/91

OBJECTIVE: DETERMINE FRAC PRESSURE AND PLOT RESULTS.

PROCEDURE: FLOW WELL TO "0" PSI @ SURFACE, RAN STEP
RATE TEST @ 1 BPM STEPS - 10 MINUTE INCREMENTS.

CONCLUSION: FORMATION PARTING PRESSURE - 3004 BHP,
1302 PSI PLUS FRICTION SURFACE PRESSURE.

STEPS #3 AND #4 PLOTTED HIGH DUE TO INCONSISTENT
PUMP RATE.

GRADIENT PRESSURES:	<u>DEPTH</u>	<u>PRESSURE</u>	<u>TIME</u>
	SURFACE	"0"	9:11 AM
	500'	"0"	9:17 AM
	1000'	185.49	9:21 AM
	1500'	419.20	9:25 AM
	2000'	653.00	9:29 AM
	3000'	1120.65	9:34 AM
	3645'	1416.86	10:39 AM

GRADIENT: .467 PSI/FT

GAUGE: 3645'

STATIC: 1702.22 PSI

BHP PARTING PRESSURE: 3004 PSI

SURFACE PARTING PRESSURE: 1302 PSI PLUS FRICTION

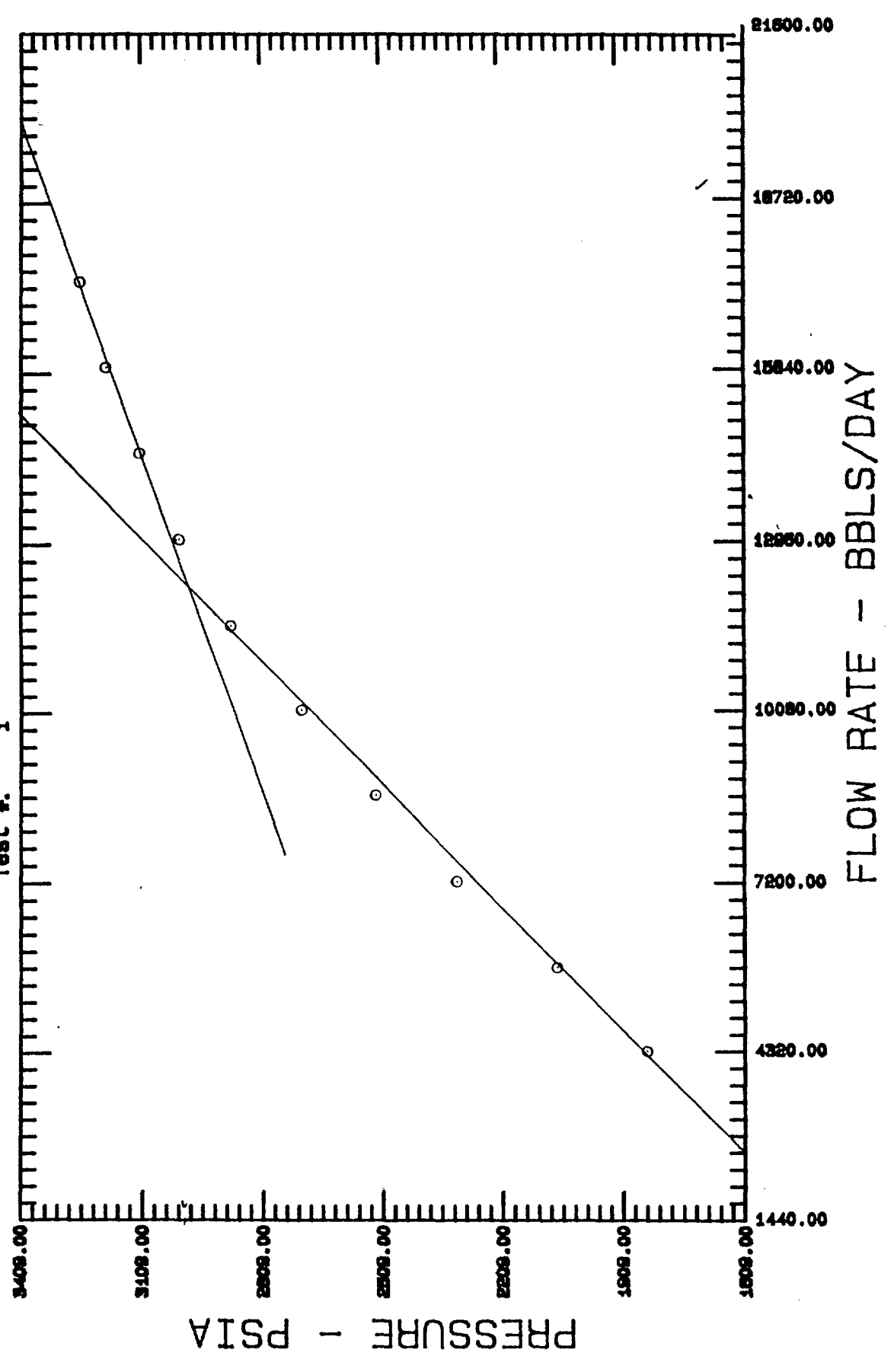
I.S.I.P.: 1650 SPI

FLUID LEVEL: 603'

SURFACE PRESSURE

RATE	SURFACE	FRICTION
2880	"0" PSI	"0" PSI
4320	340	193
5760	750	379
7200	1100	481
8640	1500	676
10080	2200	989
11520	2450	1365
12960	2800	1486
14400	3200	1789
15840	3650	2157
17280	4000	2439

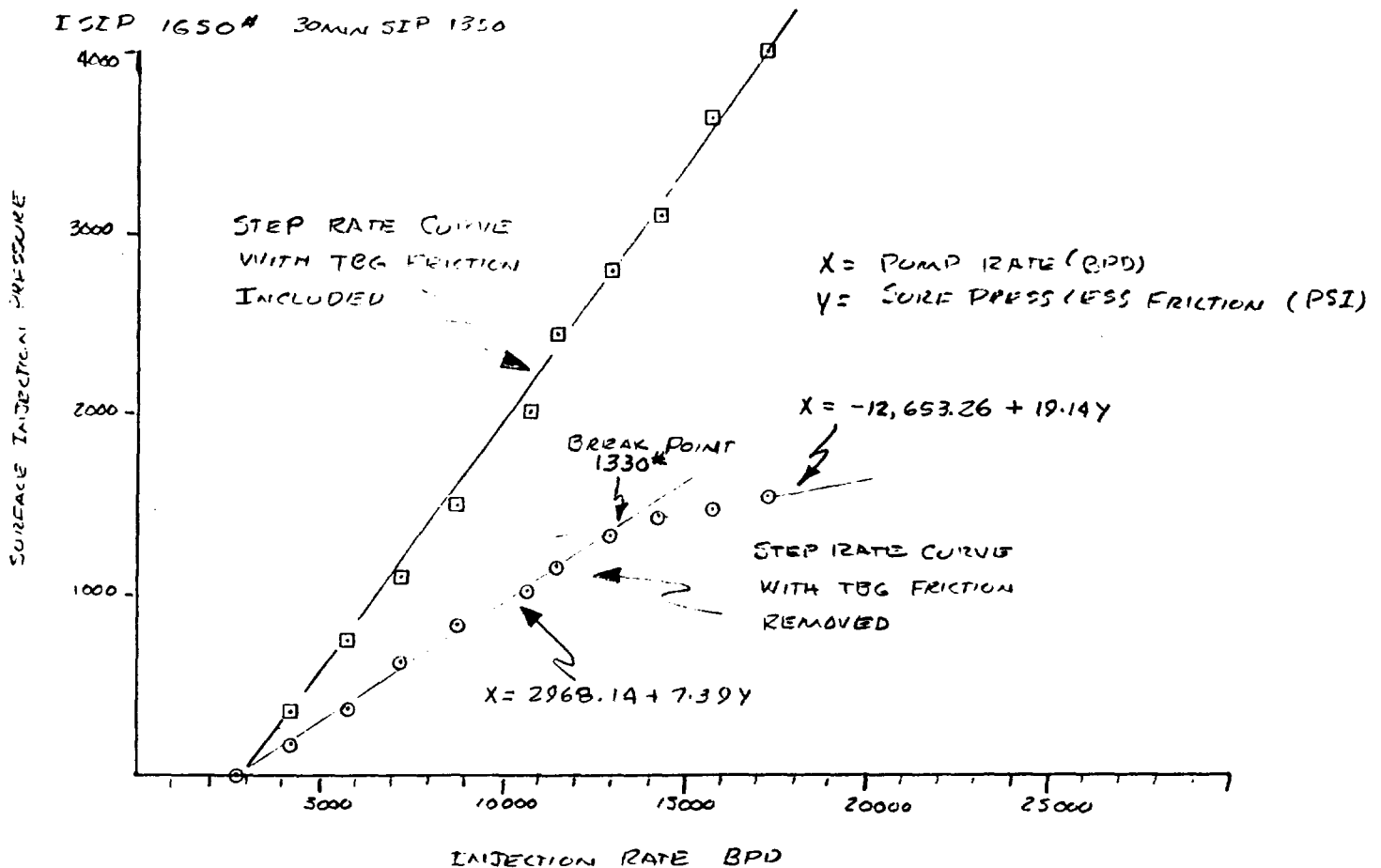
Plot starting date: 7/19/91
 time: 0: 0: 0
 Gauge S/N
 Company: DOWNHOLE INVESTIGATIONS INC. EDDY, NEW MEXICO
 Client: AVON ENERGY INC. Operator: EVANS
 Well name: TURNER "B" Comments: STEP RATE TEST, GRADIENT, TEM
 Well #: 61 PRESSURE GAUGE 3645"
 Test #: 1



TURN 12 "13" G1
STEP RATE TEST
7.19.91

DATE BPM	RATE BPD	SURF PRESS PSI	BHP PSI	ΔP FRICTION LOSS	SURF PRESS LESS ΔP	ΔP/100'
1	1440	0	1417			
2	2880	0	1610			
3	4320	340	1849	193	147	4.8
4	5760	750	2073	379	371	12.2
5	7200	1100	2321	481	619	20.4
6	8640	1500	2526	676	824	27.2
7	10,800	2000	2712	990	1010	33.3
8	11,520	2450	2887	1265	1185	39.1
9	12,960	2800	3016	1486	1314	43.3
10	14,400	3200	3113	1789	1411	46.5
11	15,840	3650	3195	2157	1493	49.2
12	17,280	4000	3263	2439	1561	51.5

BOTTOM HOLE PRESS BUMP @ 3034'
HYDRASTATIC PRESS 1702 #
GRADIENT 0.467 #/FT
ISIP 1650 # 30MIN SIP 1350



TURNER "B" #61
INTERCEPT OF STEP RATE CURVES

Eq of line before parting pressure

X = Pump rate (BPD)
Y = Surf press less friction (PSI)
X = 2968.14 + 7.39 Y

Eq of line after parting pressure

X = 12,653.26 + 19.14 Y

Intercept of two curves

-12,653.26 + 19.14 Y = 2968.14 + 7.39 Y
11.75 Y = 15,621.40
Y = 1329.48 PSI surf press w/o friction
X = 12,793.00 BPD = 8.88 BPM

M E M O R A N D U M

To: Ken Peters

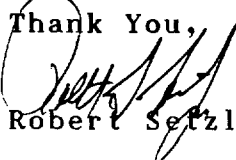
From: Robert Setzler

Date: July 29, 1991

Re: Step rate test Turner "B" #47, #50 & #61, Turner "B"
Waterflood, Eddy County, New Mexico

Attached are copies of the step rate test for the subject wells. Also attached are my calculations for the break point and analysis of the field data. Both sets of data agree closely with an average break point of 1220 PSI (surface pressure less friction) calculated using my data & 1209 PSI (surface pressure less friction) using the data gathered by Holmes Wireline & Downhole Investigators. Should there be any questions, please call.

Thank You,


Robert Setzler

RS:pr

cc: Perry Hughes