PRO WELL TESTING & WIRELINE

P.O. Box 791
Hobbs, New Mexico 88241
(505) 397-3590

June 10, 2004

Mr. Nolan VonRoeder
Patterson Petroleum
P.O. Drawer 1416
Snyder, Texas 79550

Mr. VonRoeder,

I have looked at the data from the 96-hour buildup that was run on the **J. F. Cooper 19 St. #1** well in Eddy County, New Mexico. I have analyzed the data as a **Homogeneous Reservoir with changing well bore storage and skin.**

The third page is the results page, which has the parameters that were used and the answers that were calculated. The pressure that was calculated was **6381.64 psi**. The permeability was **0.0636 md., skin was +.813,** and the radius of investigation was **171 feet.** These calculations used **152 mcf/day**. The **net interval of 10 feet** was used for the reservoir height. The **porosity** that was used was **8%.**

The fourth page is the Cartesian simulation plot, which takes the model and plots it against the data. The pressure is in green and the model is in red. When this plot, the Semi-Log plot and the Log-Log with derivative plot match the data, then we have an increased confidence level as to the model that we have chosen. This model matches the data fairly well.

The fifth and sixth pages are the Semi-Log plots. This plot has data in green and the model in red. The model matched the data fairly well. You can see from the plot that the data has the normal "S" curve, but did not end up in a shallow slope. I have drawn a straight line on the plot for comparison purposes. The straight line gives us a pressure of **6395.26 psi**, a **permeability of 0.0454 md.**, and a **skin of –0.918**. These numbers are close to the Log-Log analysis and are considered a good comparison.

The seventh page is the Log-Log plot with derivative. The data is in green, the derivative is in red, the delta pressure model is the solid red line and the derivative model is the solid black line. The dotted horizontal line is the radial flow line as indicated by the model. The model follows the data fairly well and is a good match. There is changing well bore storage in the early time. It should be noted that the derivative does go up a little at the end of the buildup. This could be an indication of boundary effects. Normally, a Morrow zone is a channel sand and parallel boundaries would be expected. There is not enough data to model this portion of the test.

I ran nodal plots for a frac on this well. The plot assumes that if you are able to achieve a **200 ft. fracture half-length, then the well should make 800 mcf/day after 30 days, 700 mcf/day after 60 days and 600 mcf/day after 90 days. If we use the 19 feet of perforated interval as the net pay, then the permeability changes to 0.0335 md., but the nodal plot changes to 1000 mcf/day after 30 days, 800 mcf/day after 60 days and 700 mcf/day after 90 days.**

We appreciate this work and look forward to working more with you in the near future. If you have any questions, please give me a call at 432-697-2932 or at our office in Hobbs, New Mexico at (505) 397-3590. Thank you.

Sincerely,

Robert E. Shafer Jr.
Pro Well Testing and Wireline

Disclaimer:
We do not accept any responsibility for any actions taken as a result of this interpretation. This is a best estimate of reservoir parameters and due to the short flow time of this well, conditions could change.

Main Results	Analysis 1
Company Patterson Petroleum, LP.	Field
Well J. F. Cooper 19 St. #1	Test Name / #

Test date / time	
Formation interval	13466-70, 13535-40, 13553-83
Perforated interval	
Gauge type / #	
Gauge depth	
TEST TYPE	Standard
Porosity Phi (%)	8
Well Radius rw	0.33 ft
Pay Zone h	10 ft
Water Salt (ppm)	10000
Form. compr.	3E-6 psi-1
Reservoir T	181 °F
Reservoir P	6500 psia
FLUID TYPE	Gas

Gas

Gas Gravity	0.7
Pseudo-Critical P	663.573 psia
Pseudo-Critical T	377.584 °R

Sour gas composition

Hydrogen sulphide	0
Carbon dioxide	0
Nitrogen	0

Water

Salinity, ppm	10000
Temperature	181 °F
Pressure	6500 psia
Properties	@ Reservoir T&P

Gas

Z	1.11777
Mug	0.0323346 cp
Bg	0.00311521 cf/scf
cg	7.43671E-5 psi-1
Rhog	0.275214 g/cc

Water

Rsw	24.7415 cf/bbl
Bw	1.00796 B/STB
cw	3.17917E-6 psi-1
Muw	0.366307 cp
Rhow	0.999729 g/cc
Total Compr. ct	5.60107E-5 psi-1
Connate Water (%)	30

Selected Model

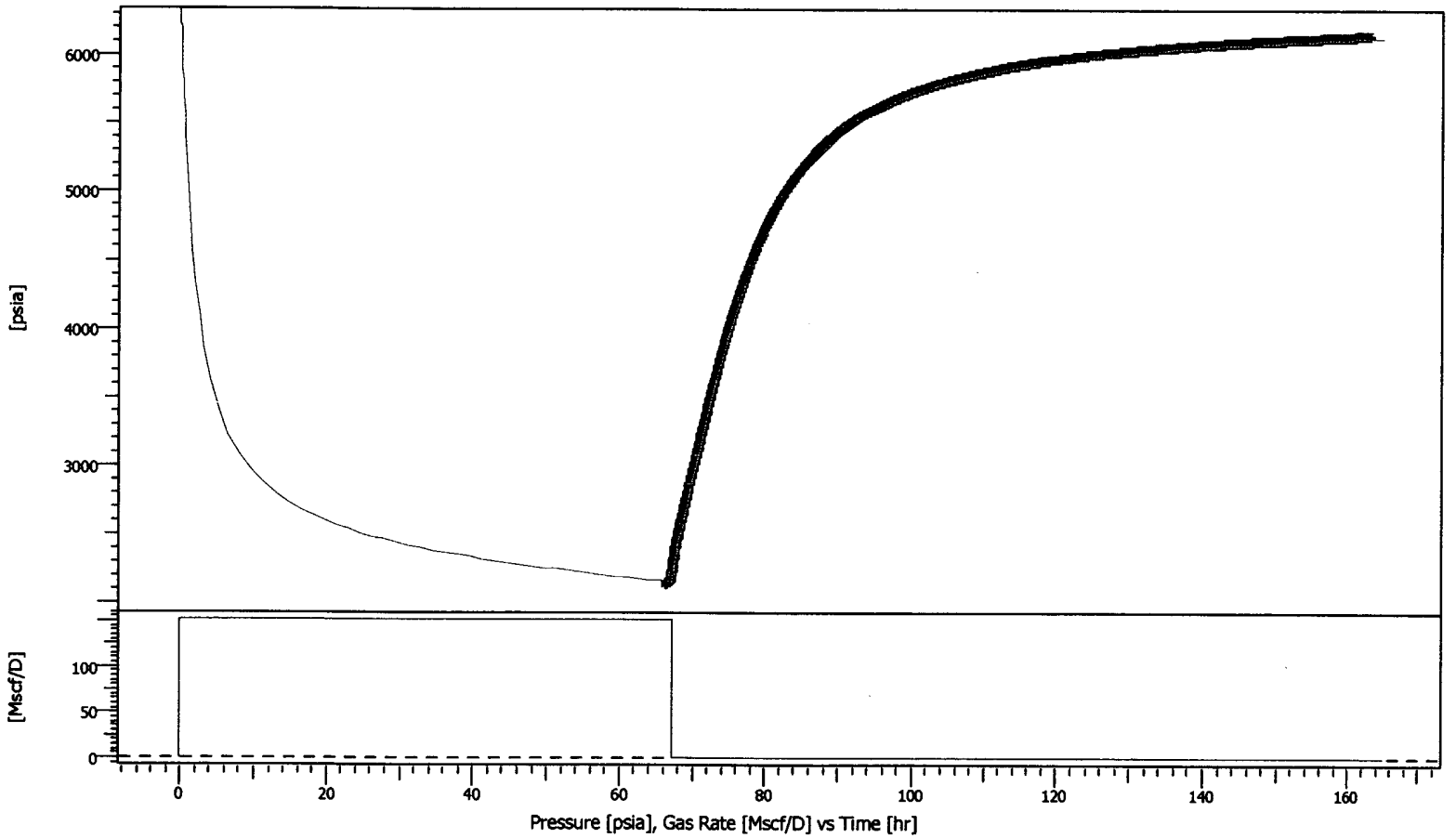
PseudoTime used

Model Option	Standard Model
Well	Storage + Skin
WBS Type	Changing
Reservoir	Homogeneous
Boundary	Infinite
Time Transform	Pseudo-Time

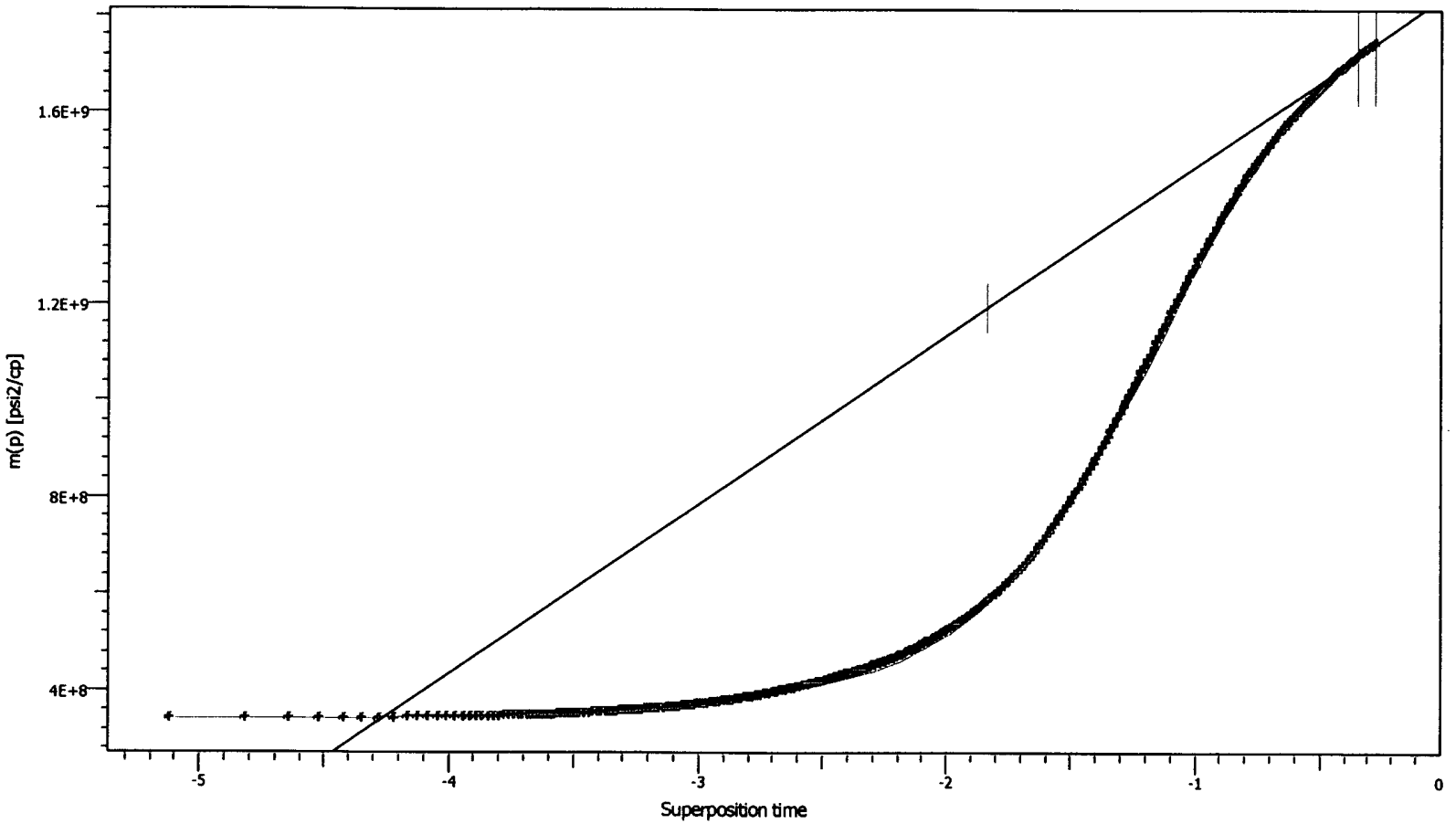
Results

TMatch	0.961 [hr]**-1
PMatch	4.59E-9 [psi2/cp]**-1
C	0.00604 bbl/psi
Cl/Cf	0.594
Alpha	175
Skin	0.813
Delta P Skin	489.321 psi
Pi	6381.64 psia
k.h	0.636 md.ft
k	0.0636 md
Rinv	171 ft
Test. Vol.	13061.5 Barrels

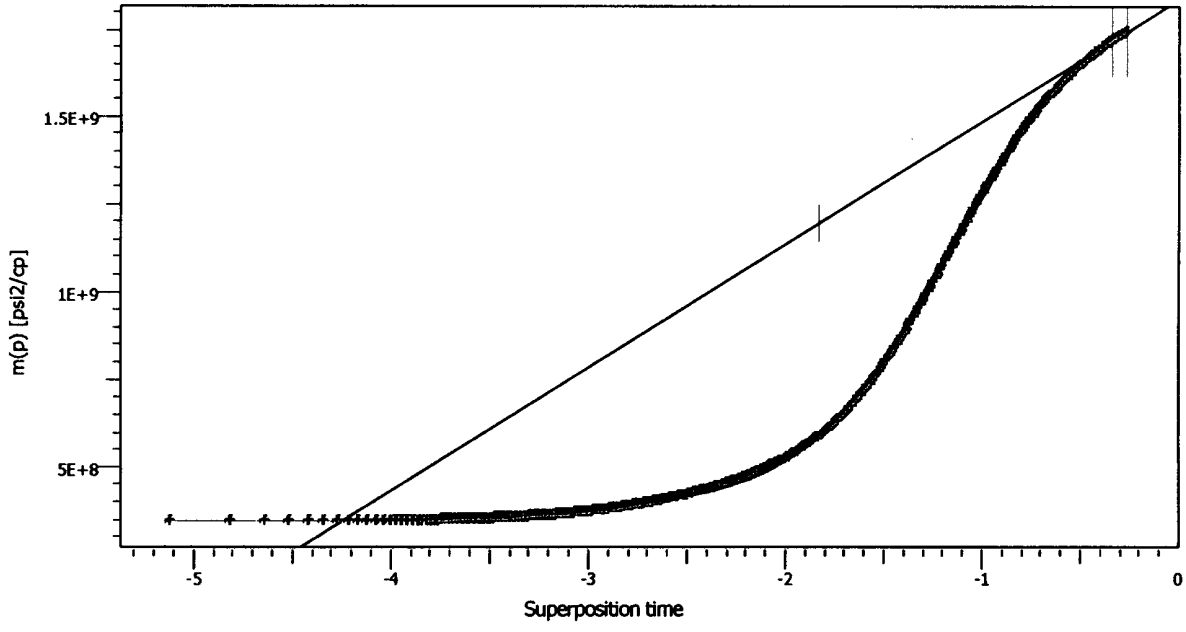
History plot	Analysis 1
Company Patterson Petroleum, LP. Well J. F. Cooper 19 St. #1	Field Test Name / #



Semi-Log plot	Analysis 1
Company Patterson Petroleum, LP. Well J. F. Cooper 19 St. #1	Field Test Name / #



Semi-Log plot	Analysis 1
Company Patterson Petroleum, LP.	Field
Well J. F. Cooper 19 St. #1	Test Name / #



J. F. Cooper 19 St. #1 build-up #1

Rate	0 Mscf/D
Rate Change	152 Mscf/D
P@dt=0	2151.48 psia
Pi	6381.64 psia
Smoothing	0.05

Selected Model

PseudoTime used	
Model Option	Standard Model
Well	Storage + Skin
WBS Type	Changing
Reservoir	Homogeneous
Boundary	Infinite
Time Transform	Pseudo-Time

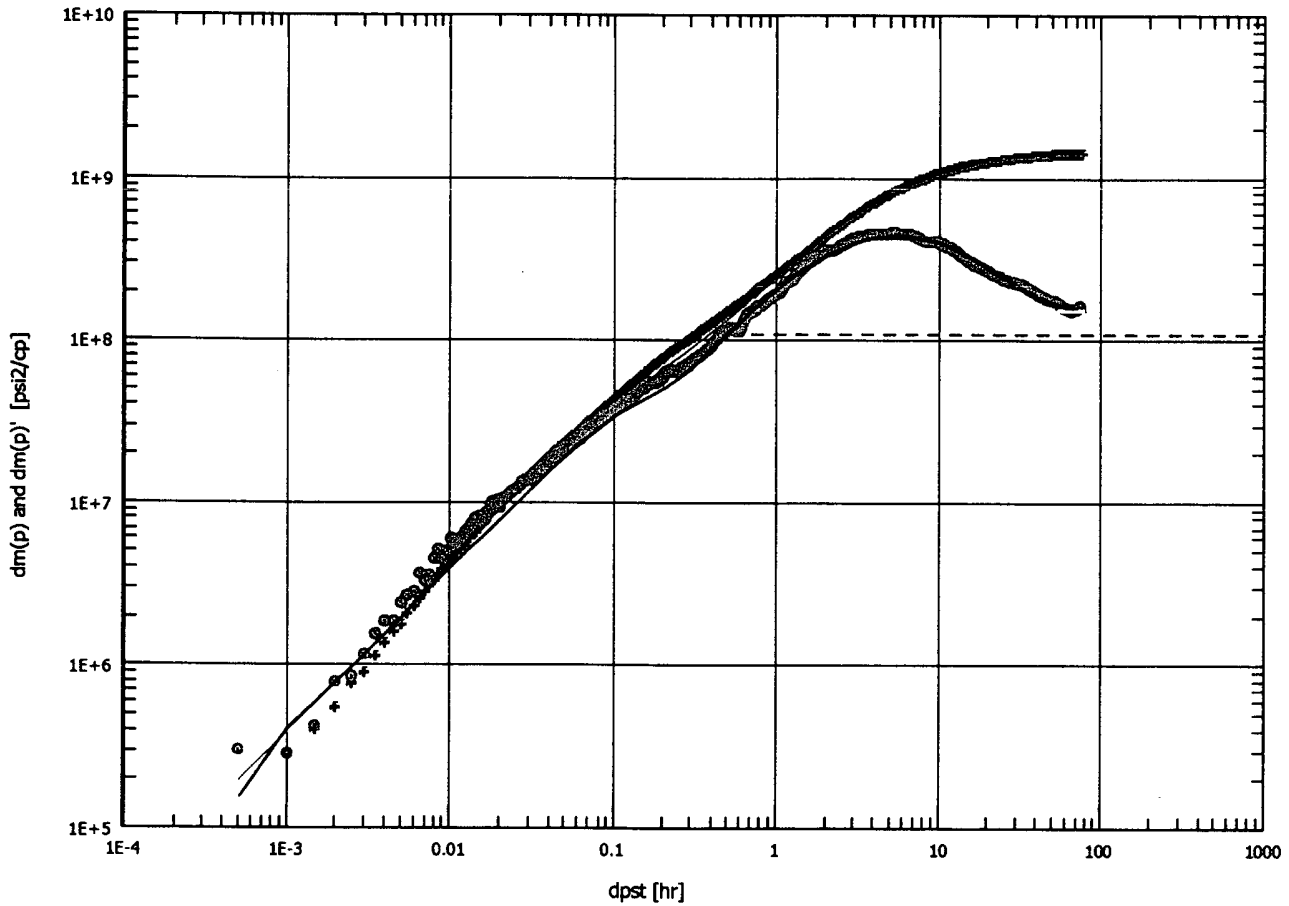
Results

TMatch	0.961 [hr]**-1
PMatch	4.59E-9 [psi2/cp]**-1
C	0.00604 bbl/psi
Ci/Cf	0.594
Alpha	175
Skin	0.813
Delta P Skin	489.321 psi
Pi	6381.64 psia
k.h	0.636 md.ft
k	0.0636 md
Rinv	171 ft
Test. Vol.	13061.5 Barrels

Semilog Line (J. F. Cooper 19 St. #1 build-up #1)

From	137.632 hr
To	161.923 hr
Slope	3.51253E+8 psi2/cp
Intercept	1.83686E+9 psi2/cp
M(p)@1hr	1.1926E+9 psi2/cp
PMatch	3.28E-9 [psi2/cp]**-1
k.h	0.454 md.ft
k	0.0454 md
p*	6395.26 psia
Skin	-0.918
Delta P Skin	-782.899 psi

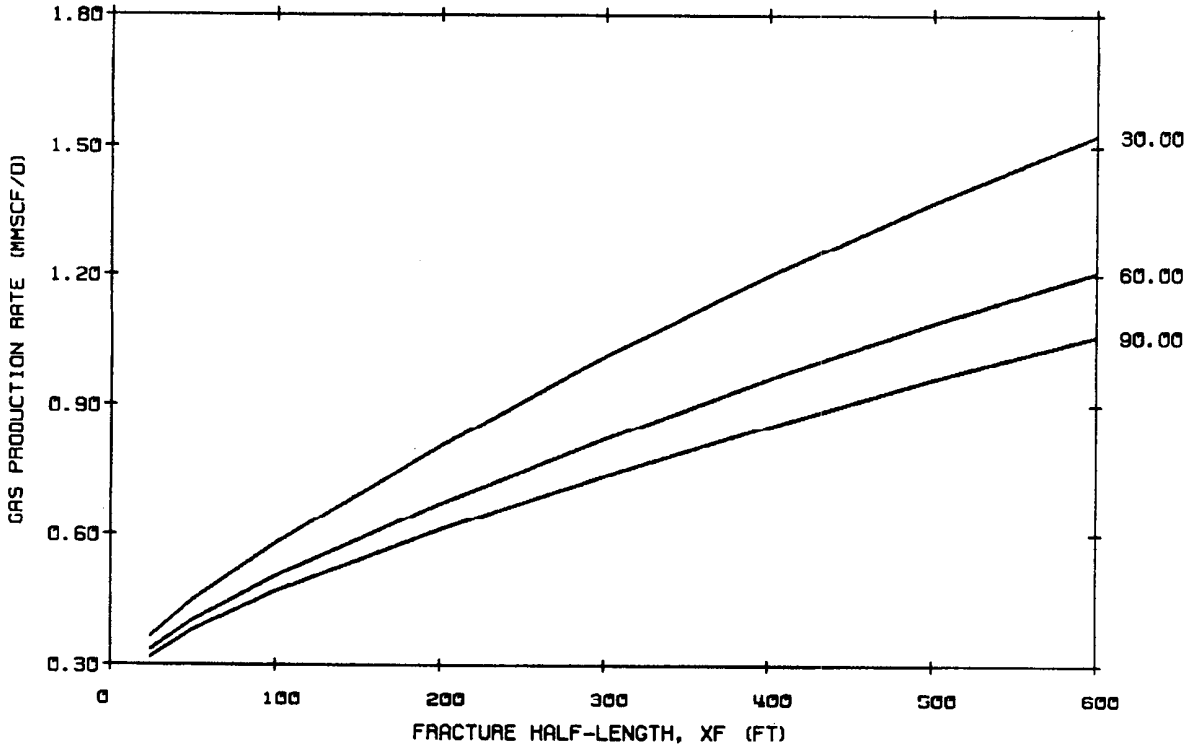
Log-Log plot	Analysis 1
Company Patterson Petroleum, LP. Well J. F. Cooper 19 St. #1	Field Test Name / #



WELL TEST INTERPRETATION REPORT *:cooper CLIENT : Pattereon Petroleum, LP		PAGE: 30, 11-JUN-**
REGION : DISTRICT: BASE : ENGINEER:	SENSITIVITY ANALYSIS RATE VS. XF (VS. TIME)	FIELD: ZONE :Morrow WELL :J. F. Cooper 1 LOCATION:

RESERVOIR PRESSURE: 6382 PSI LIQUID/GAS RATIO: 0.0 STB/MMSCF
PERMEABILITY: 0.064 MD TUBING SIZE: 2.441 IN (ID)
NET THICKNESS: 10 FT WELLHEAD PRESSURE: 160 PSI

FRACTURE CONDUCTIVITY, KF*W: 500 MD.FT



PRODUCTION RATE VS. FRAC. HALF-LENGTH, TRANSIENT CONDITIONS
30.00 TO 90.00 DAYS: