

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

RECEIVED

Form C-122
Revised 10-1-78

MULTIPOINT AND ONE POINT BACK PRESSURE TEST FOR GAS WELL

DEC 11 '87

Type Test 4 Point ☒ Initial ☐ Annual ☐ Special				Test Date 11-23-87		O. C. D. ARTESIA, OFFICE	
Company Santa Fe Operating Partners				Connection To Air			
Pool Cedar Canyon Horizon				Formation Mudstone		Unit	
Completion Date 11-17-87		Total Depth 13933 13985		Plug Back TD 13718		Elevation	
Csg. Size 4.500		Wt. 13.5		Set At 3.920		13933	
Thq. Size 2.375		Wt. 4.7		Set At 1.995		12930	
Type Well - Single - Bradenhead - G.G. or G.O. Multiple Single				Packer Set At 12930		County Eddy	
Producing Thru Tubing		Reservoir Temp. °F 230 # 13268		Mean Annual Temp. °F 60		Baro. Press. - P _a 13.2	
L 13268		H 13268		G _g 0.576		% CO ₂ 1.07	
						% N ₂ 0.21	
						% H ₂ S 0	
						Prover 0	
						Meter Run 3.1	
						Taps Flng.	

FLOW DATA						TUBING DATA		CASING DATA		Duration of Flow	
NO.	Prover Line Size	X	Orifice Size	Press. p.s.i.g.	Diff. h _w	Temp. °F	Press. p.s.i.g.	Temp. °F	Press. p.s.i.g.	Temp. °F	
Sl.							4739	70	6091	230	72 Hrs.
1.	3.068	0.750	605	8.5	76	4460	71	5726	230	60 Min.	
2.	3.068	0.750	620	11.0	67	4202	71	5447	230	60 Min.	
3.	3.068	0.750	630	28.5	85	3805	70	4984	230	60 Min.	
4.	3.068	0.750	655	50.0	83	3307	69	4396	230	60 Min.	
5.											

RATE OF FLOW CALCULATIONS							
NO.	Coefficient (24 Hour)	$\sqrt{h_w P_m}$	Pressure P _m	Flow Temp. Factor Ft.	Gravity Factor F _g	Super Compress. Factor, F _{pv}	Rate of Flow Q, Mcfd
1.	2.672	72.00	618.2	0.9850	1.3176	1.0438	262
2.	2.672	83.46	633.2	0.9933	1.3176	1.0479	306
3.	2.672	135.39	643.2	0.9768	1.3176	1.0426	485
4.	2.672	182.78	668.2	0.9786	1.3176	1.0449	658
5.							

NO.	P _t	Temp. °R	T _r	Z	Gas Liquid Hydrocarbon Ratio	A.P.I. Gravity of Liquid Hydrocarbons	Specific Gravity Separator Gas	Specific Gravity Flowing Fluid	Critical Pressure	Critical Temperature
1.	0.91	536	1.54	.918	0	0	.576	X X X X X X X X	678	349
2.	0.93	527	1.51	.911						
3.	0.95	545	1.56	.920						
4.	0.99	543	1.56	.916						
5.										

P _c 4834.8 P _c ² 23375				
NO.	P _i ²	P _w	P _w ²	P _c ² - P _w ²
1.		4516	20398	2977
2.		4276	18286	5090
3.		3882	15068	8307
4.		3391	11501	11874
5.				

(1) $\frac{P_c^2}{P_c^2 - P_w^2} = 1.9686$ (2) $\left[\frac{P_c^2}{P_c^2 - P_w^2} \right]^n = 1.9017$

AOF = Q $\left[\frac{P_c^2}{P_c^2 - P_w^2} \right]^n = 1251.3$

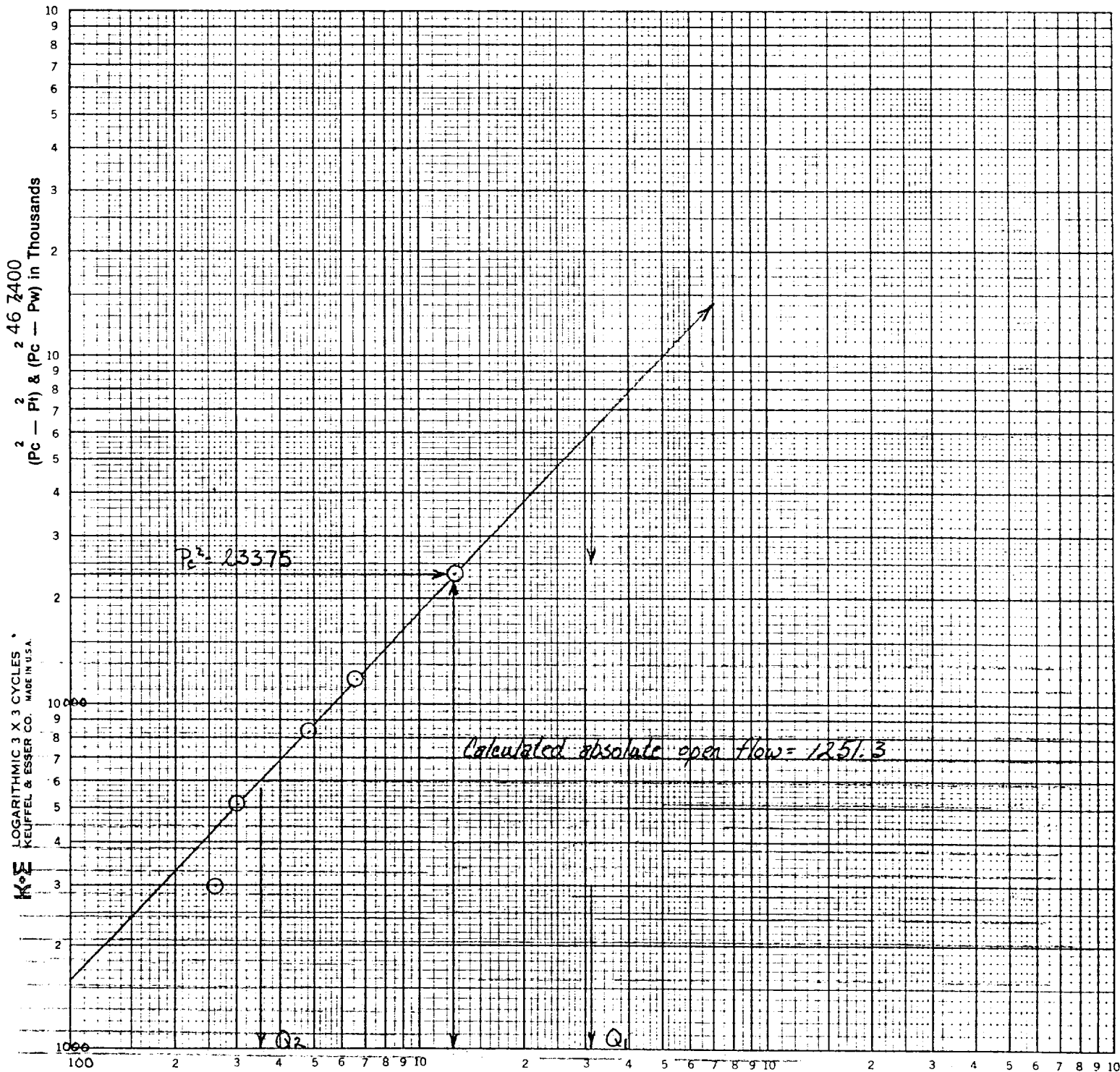
Post ID-2
1-29-88
comp & BK

Absolute Open Flow 1251 Mcfd @ 15.025		Angle of Slope 46.5		Slope, n 0.949	
Remarks: Bottom Hole Pressure w/ Amarada Pressure Bombs					
Approved By Division		Conducted By:		Calculated By:	
				Checked By:	

BENNETT & CATHEY PRODUCTIVE TESTING BACK PRESSURE CURVE

Operator Santa Fe Operating Partners Lease H B 3 Federal Well No. 1
 County Eddy Field _____ Location 3 24S 29E
 Date of Test 11-23-87 Slope "n" 0.949 Angle of Slope 46.5

Calc. Abs. Potential 1251 MCF/D



$$\Delta P_1^2 \quad P_c^2 - P_w^2 = 60000$$

$$\Delta P_2^2 \quad P_c^2 - P_w^2 = 6000$$

$$Q_1 = 3112$$

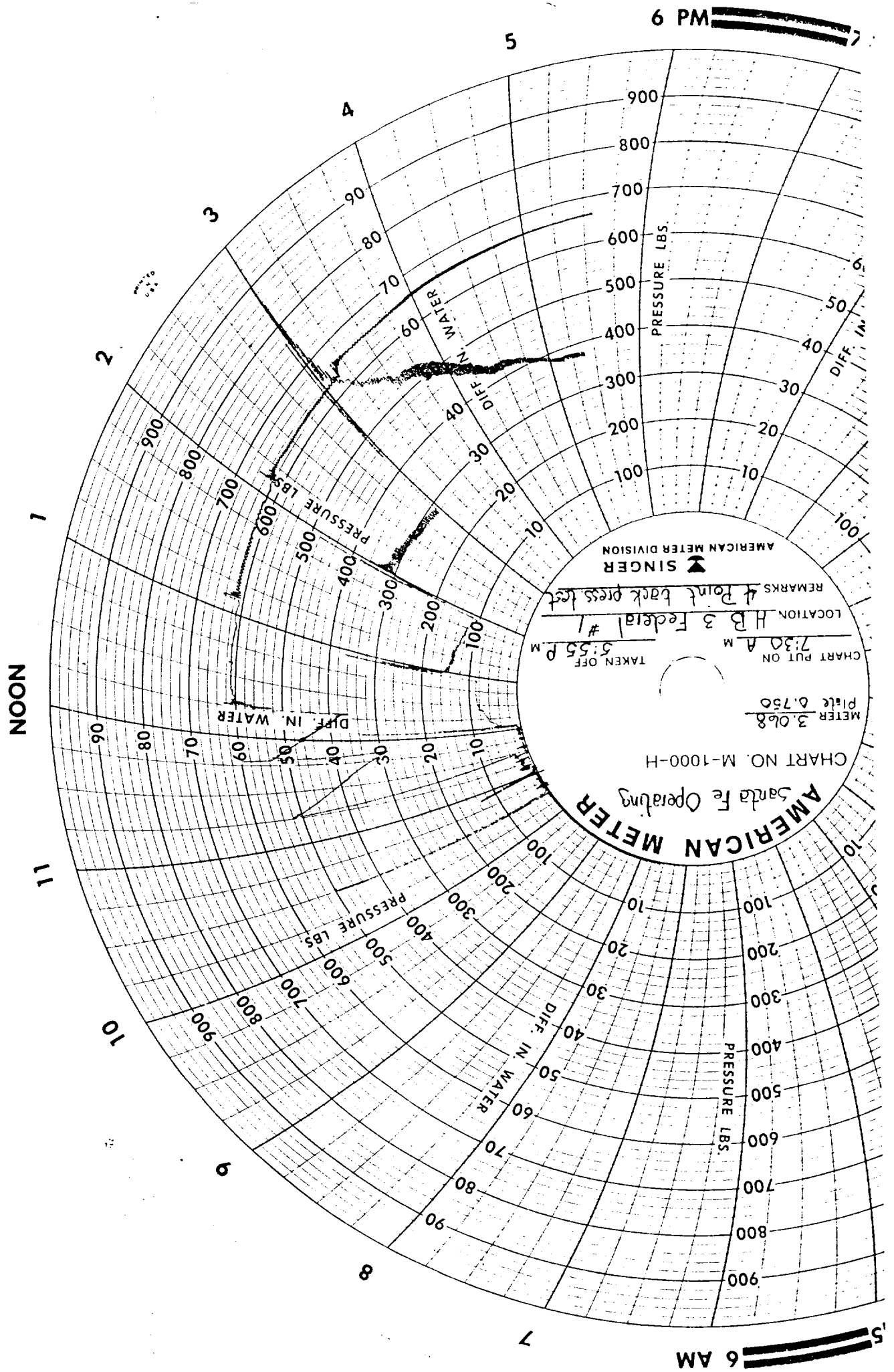
$$Q_2 = 350$$

Q , Mcfd

$$\text{LOG } Q_1 = 3.4931$$

$$\text{LOG } Q_2 = 2.5441$$

$$n = 0.9490$$



REPORT NO.
103005 DST 1

PAGE NO. 1

TEST DATE:

7-Aug-1987

WELL PERFORMANCE TESTING™

REPORT

A Production System Analysis (NODAL™)
Based On Model Verified™ Interpretation

FLOPETROL JOHNSTON

Schlumberger

Company: SANTA FE ENERGY COMPANY

Well: H.B. 3 FEDERAL #1

TEST IDENTIFICATION

Test Type MFE OH SPRO DST
Test No. One
Formation Bone Springs
Test Interval (ft) ... 7865 to 8056
Reference Depth Kelly Bushing

WELL LOCATION

Field Cedar Cyn. W/C
County Eddy
State New Mexico
Sec/Twn/Rng 3/ 24s/ 29e
Elevation (ft) n/a

HOLE CONDITIONS

Total Depth (MD/TUD)(ft) . 8056
Hole Size (in) 8 1/2
Casing/Liner I.D. (in) ... --
Perf'd Interv./Nt Pay(ft). -- / 34
Shot Density/Diameter(in). --

MUD PROPERTIES

Mud Type Cut Brine
Mud Weight (lb/gal) 8.7+
Mud Resistivity (ohm.m) .. 0.22 at 78 F
Filtrate Resistiv.(ohm.m). --
Filtrate Chlorides (ppm) . 41,000

INITIAL TEST CONDITIONS

Initial Hydrostatic (psi). 3589
Gas Cushion Type None
Surface Pressure (psi) ... --
Liquid Cushion Type Fresh Water
Cushion Length (ft) 90

TEST STRING CONFIGURATION

Pipe Length (ft)/I.D.(in). 7243 / 3.83
Collar Length ft/I.D.(in). 572 / 2.25
Packer Depths (ft) 7859, 7865
Bottomhole Choke Size(in). 1/2
Gauge Depth (ft)/Type 7815 / SPRO

NET PIPE RECOVERY

Volume	Fluid Type	Properties
90 feet	Cushion	
Trace	Condensate	

NET SAMPLE CHAMBER RECOVERY

Volume	Fluid Type	Properties
3.49 SCF	Gas	
600 cc	Condensate	n/a 44° API @ 60°F
550 cc	Mud	Emulsion
Press. 850	GOR:	GLR:

VALIDATION RESULTS

Model of Behavior Homogeneous
Fluid Type Used Gas
Reservoir Pressure (psi) . 3786
Transmissivity (md.ft/cp) 18.64
Permeability (md) 0.013
Skin Factor/Damage Ratio . 5.43 / 2.88
Storativity Ratio
Interporosity Flow Coeff..
Distance to Anomaly (ft).
Investigation Radius (ft). 9
Potentiometric Surf. (ft).

ROCK/FLUID/WELLBORE PROPERTIES

Oil Density (deg. API) ...
Basic Solids (%)
Gas Gravity 0.65 (est)
Water Cut (%) None
Viscosity (cp) 0.024
Tot. Compress. (1/psi) ... 1.24 E-04
Porosity (%) 10 (est)
Reservoir Temperature (F). 132
Form.Vol.Factor (bbl/STB).

PRODUCTION RATE DURING TEST: 44 mcf/day

COMMENTS:

The results of the interpretation indicate that the well is in an apparent homogeneous system with low effective permeability and with some wellbore damage at the time and conditions of the test. NODAL(tm) plots were included to show the effect of perforation shot density (after the skin has been removed) and the effect of a propped hydraulic fracture.

REPORT NO.
103010 DST 2

PAGE NO. 1

WELL PERFORMANCE TESTING™ REPORT

FLOPETROL JOHNSTON

Schlumberger

TEST DATE:

27-Aug-1987

Based On Model Verified™ Interpretation

Company: SANTA FE ENERGY

Well: H.B. 3 FEDERAL #1

TEST IDENTIFICATION

Test Type MFE OH SPRO TEL
Test No. Two
Formation Atoka
Test Interval (ft) ... 12514 to 12533
Reference Depth Kelly Bushing

WELL LOCATION

Field Wildcat
County Eddy
State New Mexico
Sec/Twn/Rng 3/ 24s/ 29e
Elevation (ft)

HOLE CONDITIONS

Total Depth (MD/TUD)(ft) . 12538
Hole Size (in) 6
Casing/Liner I.D. (in) ... --
Perf'd Interv./Nt Pay(ft). -- / 24
Shot Density/Diameter(in). --

MUD PROPERTIES

Mud Type XC / Drispac
Mud Weight (lb/gal) 11.4
Mud Resistivity (ohm.m) ..
Filtrate Resistiv.(ohm.m).
Filtrate Chlorides (ppm) .

INITIAL TEST CONDITIONS

Initial Hydrostatic (psi). 7312
Gas Cushion Type None
Surface Pressure (psi) ... --
Liquid Cushion Type Water
Cushion Length (ft) 5516

TEST STRING CONFIGURATION

Pipe Length (ft)/I.D.(in). 11598 / 2.74
Collar Length ft/I.D.(in). 867 / 2.125
Packer Depths (ft) 12509, 12514
Bottomhole Choke Size(in). 1/2
Gauge Depth (ft)/Type 12467 / SPRO

NET PIPE RECOVERY

Volume	Fluid Type	Properties

NET SAMPLE CHAMBER RECOVERY

Volume	Fluid Type	Properties
2500 cc	Mud	
Press.	GOR:	GLR:

VALIDATION RESULTS

Model of Behavior
Fluid Type Used
Reservoir Pressure (psi) ..
Transmissivity (md.ft/cp)
Permeability (md)
Skin Factor/Damage Ratio .
Storativity Ratio
Interporosity Flow Coeff..
Distance to Anomaly (ft).
Investigation Radius (ft).
Potentiometric Surf. (ft).

ROCK/FLUID/WELLBORE PROPERTIES

Oil Density (deg. API) ...
Basic Solids (%)
Gas Gravity
Water Cut (%)
Viscosity (cp)
Tot. Compress. (1/psi) ...
Porosity (%)
Reservoir Temperature (F). 190
Form.Vol.Factor (bbl/STB).

PRODUCTION RATE DURING TEST: --

COMMENTS:

This test was mechanically unsuccessful due to packer seat failure.

REPORT NO.
102393 DST 3

PAGE NO. 1

TEST DATE:

28-Aug-1987

WELL PERFORMANCE TESTING REPORT

A Production System Analysis (NODAL)
Based On Model VerifiedTM Interpretation

Company: SANTA FE ENERGY

Well: H.B. R. FLEMING

TEST IDENTIFICATION

Test Type MFE OH SPRO TEL
Test No. Three
Formation Atoka
Test Interval (ft) ... 12390 to 12538
Reference Depth Kelly Bushing

WELL LOCATION

Field
County
State
Sec/Twp/Rng
Elevation (ft)

HOLE CONDITIONS

Total Depth (MD/TUD)(ft) . 12538
Hole Size (in) 6
Casing/Liner I.D. (in) ... --
Perf'd Interv./Nt Pay(ft). -- / 24
Shot Density/Diameter(in). --

MUD PROPERTIES

Mud Type
Mud Weight (lb/gal)
Mud Resistivity (ohm-in)
Filtrate Resistivity (ohm-in)
Filtrate Chloride (ppm)

INITIAL TEST CONDITIONS

Initial Hydrostatic (psi). 7243
Gas Cushion Type None
Surface Pressure (psi) ... --
Liquid Cushion Type Water
Cushion Length (ft) 7720

TEST STRING

Pipe Length (ft)
Collar Length (ft)
Packer Depth (ft)
Bottomhole (Shots)
Gauge Depth (ft)

NET PIPE RECOVERY

Volume	Fluid Type	Properties
Not measured	, recovery	circulated out.
Sample #1	Rw 0.12 at	64 F 107,000 PPM
Sample #2	Rw 0.15 at	66 F 55,000 PPM
Sample #3	Rw 1.45 at	66 F 6,000 PPM
Top of Tool	Rw 0.08 at	90 F 90,000 PPM

NET SAMPLE

Volume
10.1 SCF
150 cc
Press. 1600

VALIDATION RESULTS

Model of Behavior Heterogeneous
Fluid Type Used Gas
Reservoir Pressure (psi) . 6898 (ISI)
Transmissivity (md.ft/cp) 44.91
Permeability (md) 0.06
Skin Factor/Damage Ratio . 2.86 / 1.59 1.61
Storativity Ratio 0.29
Interporosity Flow Coeff..
Distance to Anomaly (ft).
Investigation Radius (ft). 41 *ANOMALY @ 21 ft*
Potentiometric Surf. (ft).

ROCK/FLUID PROPERTIES

Oil Density (deg API)
Basic Solids (%)
Gas Gravity
Water Cut (%)
Viscosity (cp)
Tot. Compress. (%)
Porosity (%)
Reservoir Temperature (°F)
Form.Vol.Factor (bbl/bbl)

PRODUCTION RATE DURING TEST: 1000 bbl/d

COMMENTS:

The results of the interpretation indicate that the well is a low permeability system with low effective permeability and with some wellbore storage conditions of the test. The general character of the final buildup curve (the system is naturally fractured. It should be noted that the pressure gradient increases at late times) could also be due to boundaries in the test interval. Additional evaluation techniques (logs, cores, etc.) should be consulted to help verify the system description. NODAL (1m) plots show the effect of shot density and fracture half-length, assuming that the system is naturally fractured.