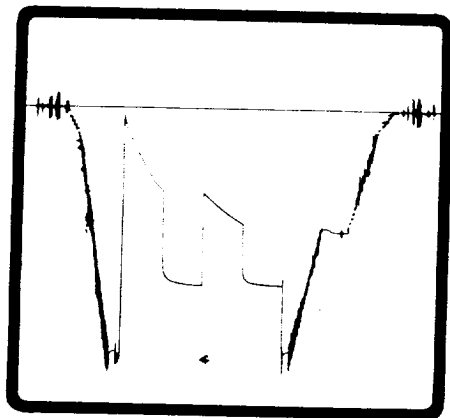


FORMATION TESTING SERVICE REPORT



EXPLORATION WELL FILE



Duncan, Oklahoma 73536



A Halliburton Company

GRAHAM 4 FEDERAL
LEASE NAME

WELL NO. 1

TEST NO. 1

8378.1 - 8450.1
TESTED INTERVAL

HELMERICH AND PAYNE INCORPORATED
LEASE OWNER/COMPANY NAME

NOMENCLATURE

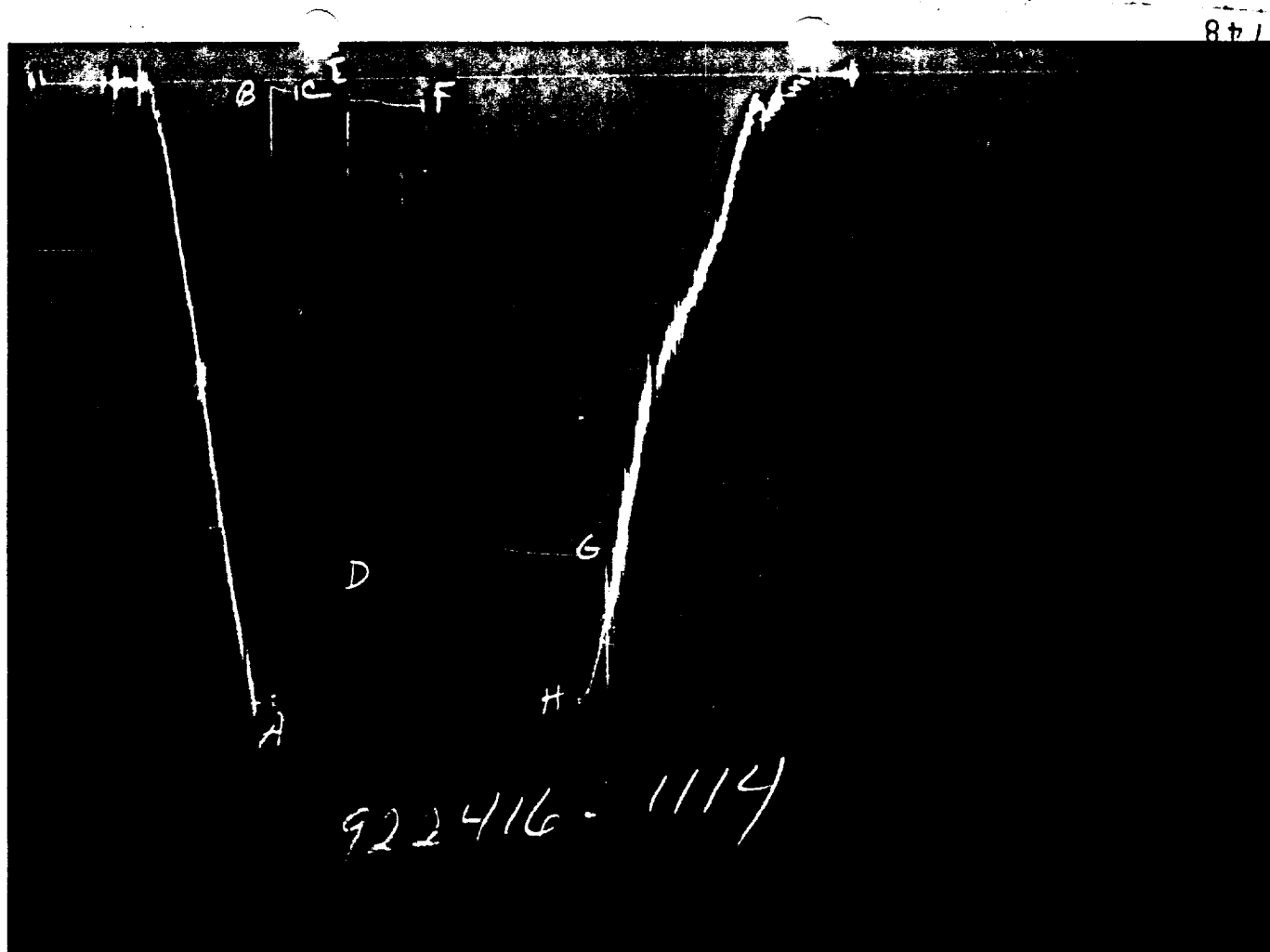
B	= Formation Volume Factor (Res Vol / Std Vol)	—
C _t	= System Total Compressibility	(Vol / Vol) · psi
DR	= Damage Ratio	—
h	= Estimated Net Pay Thickness	Ft
k	= Permeability	md
m	{ = (Liquid) Slope Extrapolated Pressure Plot	psi cycle
	{ = (Gas) Slope Extrapolated m(P) Plot	MM psi ² cp cycle
m(P*)	= Real Gas Potential at P*	MM psi ² cp
m(P _f)	= Real Gas Potential at P _f	MM psi ² cp
AOF ₁	= Maximum Indicated Absolute Open Flow at Test Conditions	MCFD
AOF ₂	= Minimum Indicated Absolute Open Flow at Test Conditions	MCFD
P*	= Extrapolated Static Pressure	Psig
P _f	= Final Flow Pressure	Psig
Q	= Liquid Production Rate During Test	BPD
Q ₁	= Theoretical Liquid Production w/ Damage Removed	BPD
Q _g	= Measured Gas Production Rate	MCFD
r _i	= Approximate Radius of Investigation	Ft
r _w	= Radius of Well Bore	Ft
S	= Skin Factor	
t	= Total Flow Time Previous to Closed-in	Minutes
Δt	= Closed-in Time at Data Point	Minutes
T	= Temperature Rankine	°R
φ	= Porosity	—
μ	= Viscosity of Gas or Liquid	cp
Log	= Common Log	



TICKET NO. 92241600
07-DEC-84
ARTESIA

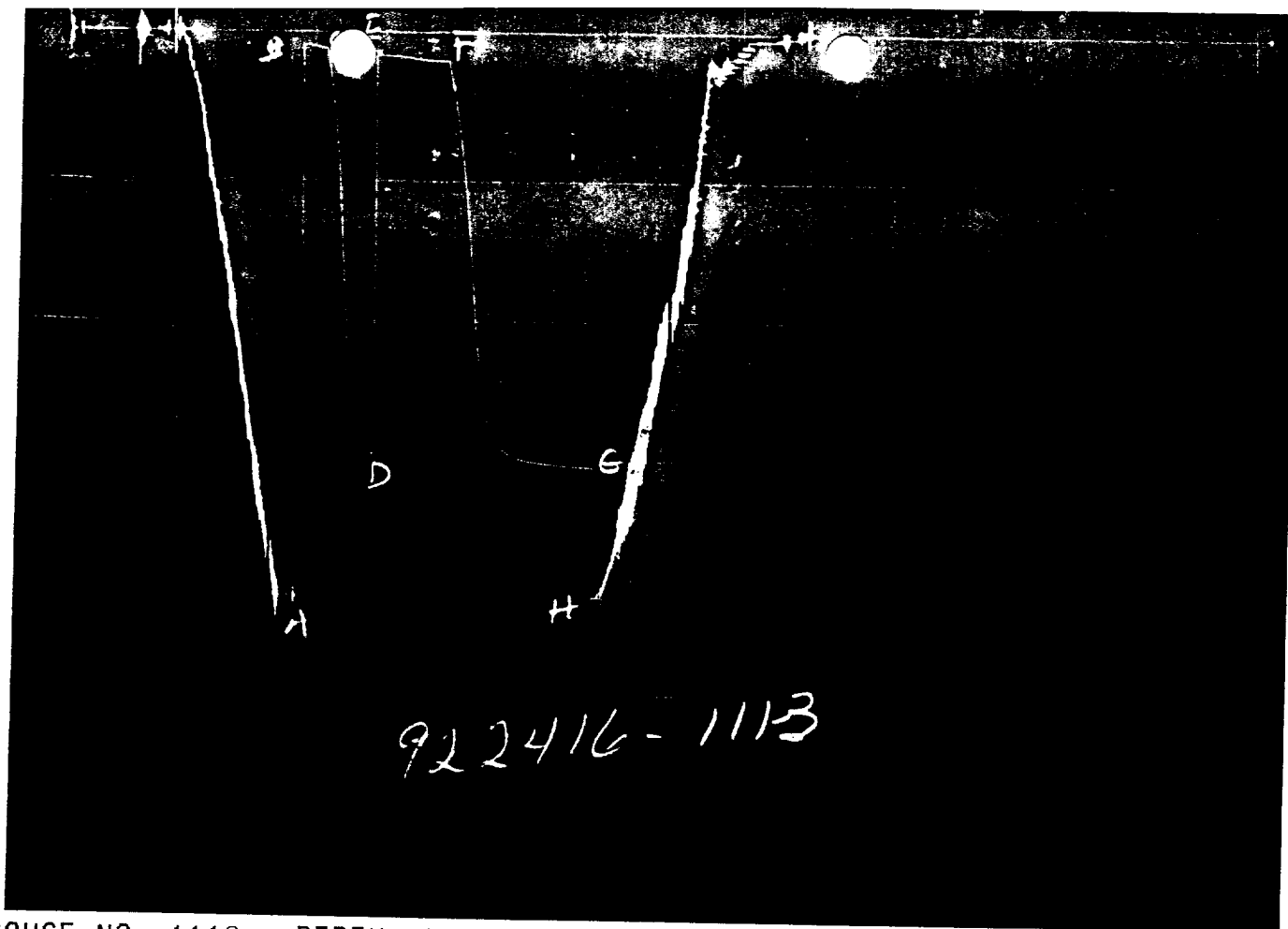
FORMATION TESTING SERVICE REPORT

GRAHAM 4 FEDERAL		1	1	8378.1 - 8450.1	HELMERICH AND PAYNE INCORPORATED	
LEASE NAME		WELL NO.	TEST NO.	TESTED INTERVAL	LEASE OWNER/COMPANY NAME	
LEGAL LOCATION SEC. - TWP. - RMC.	7-18S-32E	FIELD AREA	NORTH YOUNG	COUNTY	LEA	STATE NEW MEXICO IC



GAUGE NO: 1114 DEPTH: 8357.0 BLANKED OFF: NO HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	3989	3976.0			
B	INITIAL FIRST FLOW	32	46.4			
C	FINAL FIRST FLOW	96	78.3	30.0	29.6	F
C	INITIAL FIRST CLOSED-IN	96	78.3			
D	FINAL FIRST CLOSED-IN	2947	2955.0	60.0	60.5	C
E	INITIAL SECOND FLOW	96	91.6			
F	FINAL SECOND FLOW	192	172.5	90.0	88.6	F
F	INITIAL SECOND CLOSED-IN	192	172.5			
G	FINAL SECOND CLOSED-IN	3027	3041.2	180.0	181.2	C
H	FINAL HYDROSTATIC	3989	3972.9			



GAUGE NO: 1113 DEPTH: 8447.0 BLANKED OFF: YES HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	4009	4020.9			
B	INITIAL FIRST FLOW	90	96.2			
C	FINAL FIRST FLOW	108	116.6	30.0	29.6	F
C	INITIAL FIRST CLOSED-IN	108	116.6			
D	FINAL FIRST CLOSED-IN	3004	2992.2	60.0	60.5	C
E	INITIAL SECOND FLOW	108	130.0			
F	FINAL SECOND FLOW	181	204.0	90.0	88.6	F
F	INITIAL SECOND CLOSED-IN	181	204.0			
G	FINAL SECOND CLOSED-IN	3040	3076.1	180.0	181.2	C
H	FINAL HYDROSTATIC	3973	4019.1			

EQUIPMENT & HOLE DATA

FORMATION TESTED: BONE SPRINGS
 NET PAY (ft): 35.0
 GROSS TESTED FOOTAGE: 72.0
 ALL DEPTHS MEASURED FROM: KELLY BUSHING
 CASING PERFS. (ft):
 HOLE OR CASING SIZE (in): 7.875
 ELEVATION (ft): 3803
 TOTAL DEPTH (ft): 8450.0
 PACKER DEPTH(S) (ft): 8372. 8378
 FINAL SURFACE CHOKE (in):
 BOTTOM HOLE CHOKE (in): 0.750
 MUD WEIGHT (lb/gal): 9.20
 MUD VISCOSITY (sec): 28
 ESTIMATED HOLE TEMP. (°F): 121
 ACTUAL HOLE TEMP. (°F): @ ft

TICKET NUMBER: 92241600DATE: 12-2-64 TEST NO: 1TYPE DST: OPEN HOLEHALLIBURTON CAMP:
ARTESIATESTER: DANNY PANZER
TOMMY FLETCHERWITNESS: PEE WEE THORNTONDRILLING CONTRACTOR:
MC VAY #4FLUID PROPERTIES FOR
RECOVERED MUD & WATER

SOURCE	RESISTIVITY	CHLORIDES
MUD PIT	0.090 @ 63 °F	93000 ppm
MIDDLE	0.065 @ 0 °F	86000 ppm
TOP OF TOOLS	0.065 @ 0 °F	86000 ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm

SAMPLER DATA

Pstg AT SURFACE: 208
 cu.ft. OF GAS: 0.47
 cc OF OIL: 800
 cc OF WATER: 1150
 cc OF MUD: 0
 TOTAL LIQUID cc: 1950

HYDROCARBON PROPERTIES

OIL GRAVITY (°API): 35.8 @ 60 °F
 GAS/OIL RATIO (cu.ft. per bbl):
 GAS GRAVITY:

CUSHION DATA

TYPE	AMOUNT	WEIGHT

RECOVERED:

10 FEET OF OIL
 170 FEET OF OIL CUT DRILLING WATER
 90 FEET OF DRILLING WATER

MEASURED FROM
TESTER VALVE

REMARKS:

6" POSITIVE CHOKER

TYPE & SIZE MEASURING DEVICE:

[illegible]

TICKET NO: 92241600

CLOCK NO: 13528 HOUR: 24


HALLIBURTON
SERVICES

GAUGE NO: 1114

DEPTH: 8357.0

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
FIRST FLOW					
B 1	0.0	46.4			
2	2.0	41.6	-4.7		
3	4.0	47.2	5.6		
4	6.0	51.5	4.3		
5	8.0	54.9	3.4		
6	10.0	58.7	3.8		
7	12.0	61.6	2.9		
8	14.0	64.3	2.7		
9	16.0	66.5	2.2		
10	18.0	68.8	2.2		
11	20.0	71.0	2.2		
12	22.0	73.6	2.6		
13	24.0	75.5	1.9		
14	26.0	77.1	1.6		
15	28.0	78.2	1.1		
C 16	29.6	78.3	0.1		
FIRST CLOSED-IN					
C 1	0.0	78.3			
2	1.0	159.1	80.7	1.0	1.488
3	2.0	208.1	129.8	1.9	1.200
4	3.0	251.7	173.4	2.7	1.034
5	4.0	296.8	218.5	3.5	0.926
6	5.0	349.0	270.7	4.2	0.844
7	6.0	393.8	315.4	5.0	0.777
8	7.0	448.7	370.4	5.7	0.720
9	8.0	504.4	426.1	6.3	0.671
10	9.0	557.3	479.0	6.9	0.632
11	10.0	611.6	533.3	7.5	0.597
12	12.0	727.6	649.3	8.5	0.540
13	14.0	892.0	813.6	9.5	0.493
14	16.0	1077.4	999.1	10.4	0.456
15	18.0	1317.7	1239.4	11.2	0.422
16	20.0	1529.0	1450.6	12.0	0.394
17	22.0	1795.1	1716.8	12.6	0.371
18	24.0	1968.0	1889.7	13.3	0.349
19	26.0	2147.7	2069.4	13.8	0.331
20	28.0	2313.3	2235.0	14.4	0.314
21	30.0	2436.9	2358.6	14.9	0.298
22	35.0	2641.0	2562.7	16.0	0.267
23	40.0	2763.3	2685.0	17.0	0.241
24	45.0	2837.2	2758.9	17.9	0.220
25	50.0	2890.1	2811.8	18.6	0.202
26	55.0	2928.5	2850.2	19.3	0.187
D 27	60.5	2955.0	2876.7	19.9	0.173
SECOND FLOW					
E 1	0.0	91.6			

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
SECOND FLOW - CONTINUED					
2	5.0	115.9	24.3		
3	10.0	134.0	18.1		
4	15.0	133.3	-0.6		
5	20.0	134.1	0.8		
6	25.0	135.1	1.0		
7	30.0	136.1	1.0		
8	35.0	141.8	5.8		
9	40.0	144.7	2.9		
10	45.0	156.5	11.8		
11	50.0	160.0	3.5		
12	55.0	165.0	5.0		
13	60.0	166.9	1.9		
14	65.0	168.7	1.8		
15	70.0	169.3	0.6		
16	75.0	171.2	1.9		
17	80.0	171.4	0.2		
18	85.0	172.7	1.3		
F 19	88.6	172.5	-0.2		
SECOND CLOSED-IN					
F 1	0.0	172.5			
2	1.0	213.9	41.4	1.0	2.088
3	2.0	245.2	72.7	2.0	1.771
4	3.0	278.1	105.6	3.0	1.601
5	4.0	310.4	137.9	3.9	1.481
6	5.0	341.4	168.9	4.8	1.388
7	6.0	370.3	197.8	5.7	1.315
8	7.0	399.4	226.9	6.6	1.253
9	8.0	427.0	254.6	7.5	1.198
10	9.0	458.8	286.4	8.4	1.149
11	10.0	492.4	319.9	9.3	1.107
12	12.0	564.7	392.2	10.9	1.036
13	14.0	653.9	481.4	12.5	0.976
14	16.0	737.1	564.6	14.1	0.925
15	18.0	833.7	661.2	15.6	0.879
16	20.0	929.4	756.9	17.1	0.840
17	22.0	1037.4	864.9	18.5	0.805
18	24.0	1175.3	1002.9	20.0	0.773
19	26.0	1315.7	1143.2	21.3	0.744
20	28.0	1456.5	1284.1	22.6	0.719
21	30.0	1615.1	1442.6	23.9	0.694
22	35.0	2049.4	1876.9	27.0	0.641
23	40.0	2375.0	2202.5	29.9	0.597
24	45.0	2600.6	2428.1	32.6	0.559
25	50.0	2730.4	2557.9	35.1	0.527
26	55.0	2808.6	2636.2	37.6	0.498
27	60.0	2862.0	2689.5	39.8	0.473
28	70.0	2925.8	2753.3	44.0	0.430
29	80.0	2960.3	2787.8	47.7	0.394
30	90.0	2982.4	2809.9	51.1	0.364
31	100.0	2997.6	2825.1	54.2	0.339
32	110.0	3008.2	2835.7	57.0	0.317

REMARKS:

TICKET NO: 92241600

GAL NO: 1114

CLOCK NO: 13528 HOUR: 24


HALLIBURTON
SERVICES

DEPTH: 8357.0

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
SECOND CLOSED-IN - CONTINUED					
33	120.0	3016.1	2843.6	59.6	0.298
34	135.0	3025.0	2852.6	63.0	0.273
35	150.0	3031.4	2859.0	66.1	0.252
36	165.0	3036.6	2864.1	68.9	0.235
G 37	181.2	3041.2	2868.7	71.6	0.218

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$

REMARKS:

TICKET NO: 92241600

CLOCK NO: 7282 HOUR: 24


HALLIBURTON
SERVICES

GAUGE NO: 1113

DEPTH: 8447.0

REF	MINUTES	PRESSURE	AP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$	REF	MINUTES	PRESSURE	AP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
FIRST FLOW						SECOND FLOW - CONTINUED					
B	1	0.0	96.2			2	5.0	161.4	31.4		
	2	2.0	89.2	-6.9		3	10.0	164.7	3.3		
	3	4.0	88.4	-0.9		4	15.0	165.4	0.7		
	4	6.0	89.4	1.1		5	20.0	166.3	0.9		
	5	8.0	92.0	2.5		6	25.0	169.0	2.7		
	6	10.0	95.4	3.4		7	30.0	172.6	3.6		
	7	12.0	98.1	2.7		8	35.0	176.1	3.4		
	8	14.0	101.5	3.4		9	40.0	178.8	2.7		
	9	16.0	103.5	2.0		10	45.0	185.1	6.3		
	10	18.0	105.9	2.3		11	50.0	188.7	3.6		
	11	20.0	108.2	2.3		12	55.0	192.3	3.6		
	12	22.0	109.8	1.6		13	60.0	195.6	3.3		
	13	24.0	111.8	2.0		14	65.0	197.9	2.3		
	14	26.0	113.3	1.4		15	70.0	199.6	1.6		
	15	28.0	115.1	1.8		16	75.0	200.1	0.5		
C	16	29.6	116.6	1.5		17	80.0	200.3	0.2		
						18	85.0	201.0	0.7		
						F	19	88.6	204.0	3.0	
FIRST CLOSED-IN						SECOND CLOSED-IN					
C	1	0.0	116.6			F	1	0.0	204.0		
	2	1.0	159.7	43.1	1.0	2	1.0	232.4	28.4	1.0	2.067
	3	2.0	196.9	80.3	1.8	3	2.0	263.1	59.1	1.9	1.783
	4	3.0	244.2	127.6	2.7	4	3.0	294.9	90.9	2.9	1.610
	5	4.0	286.4	169.8	3.5	5	4.0	327.4	123.4	3.9	1.483
	6	5.0	327.1	210.5	4.2	6	5.0	359.0	155.0	4.8	1.388
	7	6.0	376.0	259.4	5.0	7	6.0	387.4	183.3	5.7	1.318
	8	7.0	417.2	300.6	5.7	8	7.0	417.5	213.5	6.6	1.253
	9	8.0	461.6	345.0	6.3	9	8.0	446.2	242.2	7.5	1.197
	10	9.0	513.2	396.6	6.9	10	9.0	476.0	272.0	8.3	1.153
	11	10.0	569.1	452.5	7.5	11	10.0	507.7	303.7	9.2	1.109
	12	12.0	673.6	557.0	8.6	12	12.0	581.5	377.5	10.9	1.035
	13	14.0	809.4	692.8	9.5	13	14.0	657.1	453.0	12.5	0.975
	14	16.0	974.8	858.2	10.4	14	16.0	748.9	544.8	14.1	0.924
	15	18.0	1164.9	1048.3	11.2	15	18.0	832.3	628.3	15.6	0.879
	16	20.0	1384.0	1267.4	11.9	16	20.0	927.4	723.3	17.1	0.840
	17	22.0	1615.8	1499.2	12.6	17	22.0	1034.0	830.0	18.6	0.804
	18	24.0	1825.7	1709.1	13.3	18	24.0	1148.3	944.3	20.0	0.773
	19	26.0	2031.8	1915.2	13.9	19	26.0	1276.8	1072.8	21.3	0.744
	20	28.0	2223.8	2107.2	14.4	20	28.0	1414.9	1210.9	22.6	0.718
	21	30.0	2368.3	2251.7	14.9	21	30.0	1561.3	1357.3	24.0	0.693
	22	35.0	2627.5	2510.9	16.1	22	35.0	1955.6	1751.6	27.0	0.641
	23	40.0	2773.3	2656.7	17.0	23	40.0	2296.7	2092.7	29.9	0.598
	24	45.0	2865.1	2748.5	17.9	24	45.0	2549.3	2345.3	32.6	0.560
	25	50.0	2922.1	2805.5	18.6	25	50.0	2715.6	2511.5	35.1	0.527
	26	55.0	2961.8	2845.2	19.3	26	55.0	2812.4	2608.4	37.5	0.498
D	27	60.5	2992.2	2875.6	19.9	27	60.0	2877.8	2673.7	39.8	0.473
						28	70.0	2949.9	2745.8	44.0	0.430
						29	80.0	2991.9	2787.8	47.7	0.394
						30	90.0	3014.3	2810.2	51.1	0.364
						31	100.0	3029.4	2825.3	54.2	0.339
						32	110.0	3042.0	2837.9	57.0	0.317
SECOND FLOW											
E	1	0.0	130.0								

TICKET NO: 92241600

CLOCK NO: 7282 HOUR: 24

HALLIBURTON
SERVICES

GAUGE NO: 1113

DEPTH: 8447.0

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
SECOND CLOSED-IN - CONTINUED					
93	120.0	3049.0	2845.0	59.6	0.298
34	135.0	3058.9	2854.8	63.0	0.273
35	150.0	3065.7	2861.7	66.1	0.252
36	165.0	3071.7	2867.6	68.9	0.235
G 37	181.2	3076.1	2872.1	71.6	0.218

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
-----	---------	----------	------------	--	--------------------------------------

REMARKS:

		O.D.	I.D.	LENGTH	DEPTH	
1		DRILL PIPE.....	4.500	3.826	7710.2	
3		DRILL COLLARS.....	6.250	2.250	542.0	
50		IMPACT REVERSING SUB.....	6.750	3.000	1.0	8252.0
3		DRILL COLLARS.....	6.250	2.250	90.0	
5		CROSSOVER.....	5.750	2.500	1.0	
13		DUAL CIP SAMPLER.....	5.000	0.750	6.8	
60		HYDROSPRING TESTER.....	5.000	0.720	5.0	8355.0
80		AP RUNNING CASE.....	5.000	3.060	4.0	8357.0
15		JAR.....	5.030	1.750	5.0	
16		VR SAFETY JOINT.....	5.000	1.000	3.0	
70		OPEN HOLE PACKER.....	6.750	1.530	5.8	8372.0
70		OPEN HOLE PACKER.....	6.750	1.530	5.8	8378.0
19		ANCHOR PIPE SAFETY JOINT.....	5.750	1.500	4.3	
5		CROSSOVER.....	5.750	2.500	1.0	
3		DRILL COLLARS.....	6.250	2.250	30.0	
5		CROSSOVER.....	5.750	1.500	1.0	
20		FLUSH JOINT ANCHOR.....	5.750	2.870	30.0	
81		BLANKED-OFF RUNNING CASE.....	5.750		4.0	8447.0
TOTAL DEPTH					8450.0	

EQUATIONS FOR DST LIQUID WELL ANALYSIS

Transmissibility	$\frac{kh}{\mu} = \frac{162.6 QB}{m}$	$\frac{\text{md-ft}}{\text{cp}}$
Indicated Flow Capacity	$kh = \frac{kh}{\mu} \mu$	md-ft
Average Effective Permeability	$k = \frac{kh}{h}$	md
Damage Ratio	$DR = .183 \frac{P^* - P_f}{m}$	—
Theoretical Potential w / Damage Removed	$Q_1 = Q DR$	BPD
Approx. Radius of Investigation	$r_i = 4.63 \sqrt{kt}$	ft

EQUATIONS FOR DST GAS WELL ANALYSIS

Indicated Flow Capacity	$kh = \frac{1637 Q_g T}{m}$	md-ft
Average Effective Permeability	$k = \frac{kh}{h}$	md
Skin Factor	$S = 1.151 \left[\frac{m(P^*) - m(P_f)}{m} - \text{LOG} \frac{k(t/60)}{\phi \mu c_f r_w^2} + 3.23 \right]$	—
Damage Ratio	$DR = \frac{m(P^*) - m(P_f)}{m(P^*) - m(P_f) - 0.87 mS}$	—
Indicated Flow Rate (Maximum)	$AOF_1 = \frac{Q_g m(P^*)}{m(P^*) - m(P_f)}$	MCFD
Indicated Flow Rate (Minimum)	$AOF_2 = Q_g \sqrt{\frac{m(P^*)}{m(P^*) - m(P_f)}}$	MCFD
Approx. Radius of Investigation	$r_i = 0.032 \sqrt{\frac{k(t/60)}{\phi \mu c_f}}$	ft