

APPENDIX 3

DRILL STEM TEST RESULTS

# DRILL STEM TEST REPORT

OPERATOR: MOONIE OIL NL DATE: 25 JUNE 1985  
WELL NAME: EAST MEREENIE NO. 17 BASIN: AMADEUS  
FIELD: MEREENIE STRUCTURE:  
TEST NO: 1 FORMATION: PACOOTTA SAND NO: P3 120-130  
ELEVATIONS GL: 2338 FT KB: 2358 FT PACKER AT: 4660 FT  
INTERVAL: 4660 TO 4735 FT TEST TYPE: OPEN HOLE

## TEST STATISTICS

COMPANY: HALLIBURTON OPERATOR: V. BLATT  
TOOL: 5" HYDROSPRING CHOKE SIZE TOP: .5 INS BOTTOM: .75 INS  
ANCHOR LENGTH: 31 FT QD: 5 INS  
PERFORATED: 4699.94 TO 4730.94 FT LENGTH: 31FT  
PRESSURE RECORDER:

	TYPE	POSITION	DEPTH	CLOCK
1.	BOURDON TUBE	TOP	4637.8 FT	24 HR
2.	BOURDON TUBE	BOTTOM	4731.94 FT	12 HR

## CAPACITIES

HOLE SIZE: 7.625 INS INTERVAL: 4578 TO 4735 FT  
RAT HOLE: 7.625 INS INTERVAL: 4660 TO 4735 FT  
DRILL PIPE: .0142 BLS/FT COLLARS: BLS/FT

## TIME RECORD

### ACTUAL

START CLOCK: 2346 HRS  
START IN HOLE: 0215 HRS  
TOOL OPENED: 0653 HRS  
TOOL SHUT: 0708 HRS  
TOOL OPENED: 0739 HRS  
TOOL SHUT: 0913 HRS  
PACK PULLED: 0958 HRS  
OUT OF HOLE: 1530 HRS

### ELAPSED TIMES

START TO SEPERATOR: 0825 HRS  
STOP SEPERATOR: 0913 HRS  
IF: 15 MINS  
ISI: 30 MINS  
FF: 94 MINS  
FSI: 45 MINS  
TOTAL FLOW: 109 MINS  
SEPERATOR FLOW: 48 MINS

## PRESSURE RECORD

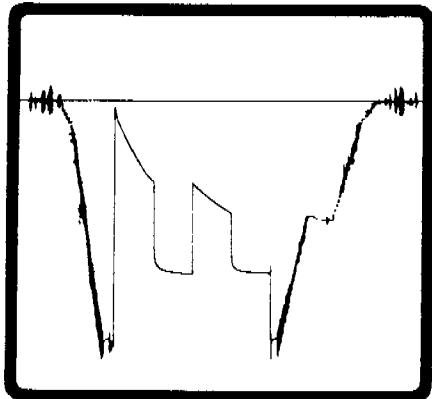
CHART: BOTTOM CLOCK: 12 HR  
IHP: 2205.8 PSI  
IFP: 973.7 PSI  
ISIP: 1732.3 PSI  
FFP: 1261.1 PSI  
FSIP: 1706.0 PSI  
FHP: 2232.2 PSI  
WHFP: 94.0 PSI

## RECOVERY

GTS: 11 MIN AT 609980 CU FT/D  
OTS: 21 MIN AT 926 BLS/D (US)  
WTS: NIL MIN  
GOR: 658 CU FT/BL  
ORIFICE SIZE: .75 INS  
FLOW PROVER PRESSURE: 43 PSI  
SG OF GAS: .86 GM/CC  
SG OF OIL: 49.8 API AT 60°F  
WATER SALINITY: PPM  
MAXIMUM TEMP: 146°F

NATURE OF BLOW/REMARKS: TOOL OPENED WITH MODERATE BLOW INC TO STRONG AFTER 90 SEC GAS BUBBLE TO SURFACE 11 MINS. MAX MANIFOLD PRESSURE 36 PSI. GTS 5 MIN IN FFP OIL TO SURFACE 6 MIN FFP. WELL SLUGGED OIL AND MUD 15 MIN THEN FLOWED OIL. WELL STABILIZED ENOUGH TO FLOW TO SEPERATOR AFTER 46 MIN. FLOWED TO SEPERATOR FOR 48 MIN. TEST ABORTED AT 0813 HRS DUE TO SLOW FLOW IN ANNULUS. ANNULAR FLOW THOUGHT TO BE DUE TO HIGHER THAN NORMAL THERMAL EXPANSION. TEST WAS MECHANICALLY SUCCESSFUL.

# FORMATION TESTING SERVICE REPORT



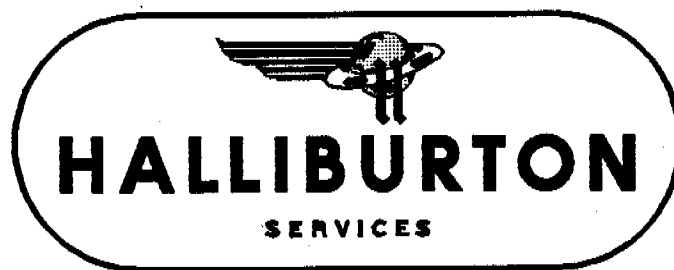
Duncan, Oklahoma 73536



A Halliburton Company

# 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 <sup>2</sup> /cp/cycle
m(P*)	= Real Gas Potential at P* .....	MM psi <sup>2</sup> /cp
m(P <sub>f</sub> )	= Real Gas Potential at P <sub>f</sub> .....	MM psi <sup>2</sup> /cp
AOF <sub>1</sub>	= Maximum Indicated Absolute Open Flow at Test Conditions .....	MCFD
AOF <sub>2</sub>	= Minimum Indicated Absolute Open Flow at Test Conditions ..	MCFD
P*	= Extrapolated Static Pressure .....	Psig
P <sub>f</sub>	= Final Flow Pressure .....	Psig
Q	= Liquid Production Rate During Test .....	BPD
Q <sub>1</sub>	= Theoretical Liquid Production w/ Damage Removed .....	BPD
Q <sub>g</sub>	= Measured Gas Production Rate .....	MCFD
r <sub>i</sub>	= Approximate Radius of Investigation .....	Ft
r <sub>w</sub>	= 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. 34641300  
02-JUL-85  
ALICE SPRINGS

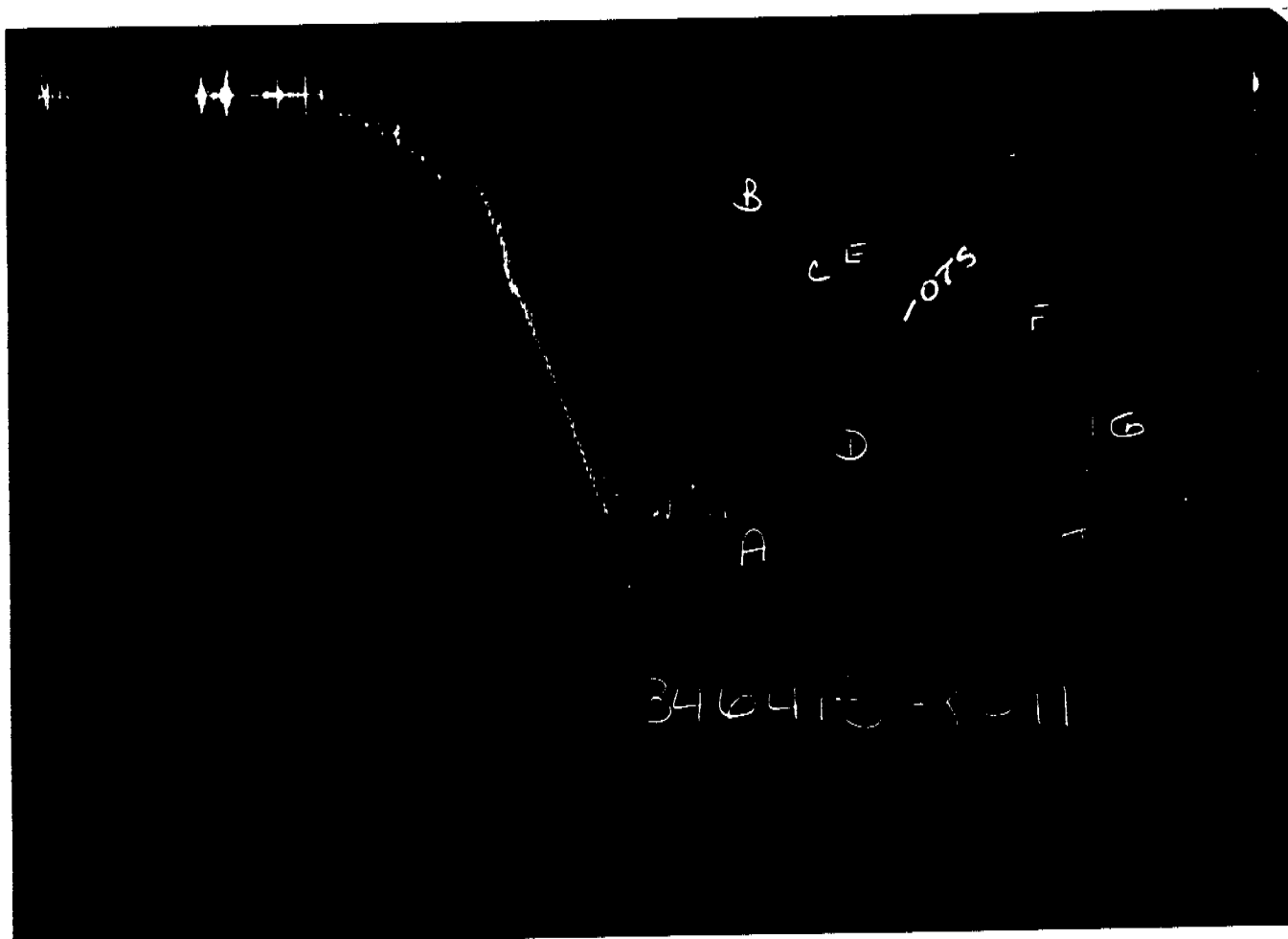
# FORMATION TESTING SERVICE REPORT

LEASE NAME		WELL NO.	TEST NO.	TESTED INTERVAL		LEASE OWNER/COMPANY NAME	
ERST MERENIE		17	1	4660.3 - 4735.0		MOONIE OIL N.L.	
LEGAL LOCATION SEC. - TWP. - RANG.	SEE REMARKS	FIELD AREA	MERENIE	COUNTY	NORTH TERRITORY	STATE	AUSTRALIA
							PY

346413-8-31

GAUGE NO: 8531 DEPTH: 4637.8 BLANKED OFF: NO HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	2154	2158.9			
B	INITIAL FIRST FLOW	645	424.9	17.0	15.7	F
C	FINAL FIRST FLOW	951	930.4			
C	INITIAL FIRST CLOSED-IN	951	930.4	29.0	29.1	C
D	FINAL FIRST CLOSED-IN	1704	1704.5			
E	INITIAL SECOND FLOW	1035	1044.2	97.0	97.0	F
F	FINAL SECOND FLOW	1257	1253.3			
F	INITIAL SECOND CLOSED-IN	1257	1253.3	42.0	43.2	C
G	FINAL SECOND CLOSED IN	1676	1700.4			
H	FINAL HYDROSTATIC	2154	2137.0			



GAUGE NO: 8511 DEPTH: 4731.9 BLANKED OFF: YES HOUR OF CLOCK: 12

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	2206	2202.9			
B	INITIAL FIRST FLOW	626	460.3	17.0	15.7	F
C	FINAL FIRST FLOW	674	985.4			
C	INITIAL FIRST CLOSED-IN	674	985.4	29.0	29.1	C
D	FINAL FIRST CLOSED-IN	1732	1734.1			
E	INITIAL SECOND FLOW	1052	1077.9	97.0	97.0	F
F	FINAL SECOND FLOW	1261	1285.0			
F	INITIAL SECOND CLOSED IN	1261	1285.0	42.0	43.2	C
G	FINAL SECOND CLOSED IN	1706	1724.8			
H	FINAL HYDROSTATIC	2232	2175.7			

## EQUIPMENT &amp; HOLE DATA

FORMATION TESTED: P-3  
 NET PAY (ft): \_\_\_\_\_  
 GROSS TESTED FOOTAGE: 74.7  
 ALL DEPTHS MEASURED FROM: KB  
 CASING PERFS. (ft): \_\_\_\_\_  
 HOLE OR CASING SIZE (in): 7.625  
 ELEVATION (ft): 2358.0 KELLY BUSHING  
 TOTAL DEPTH (ft): 4735.0  
 PACKER DEPTH(S) (ft): 4653. 4660  
 FINAL SURFACE CHOKE (in): 0.50000  
 BOTTOM HOLE CHOKE (in): 0.750  
 MUD WEIGHT (lb/gal): 8.50  
 MUD VISCOSITY (sec): 54  
 ESTIMATED HOLE TEMP. (°F): \_\_\_\_\_  
 ACTUAL HOLE TEMP. (°F): 146 @ 4731.0 ft

TICKET NUMBER: 34641300

DATE: 6-25-85 TEST NO: 1

TYPE DST: OPEN HOLE

HALLIBURTON CAMP:  
ALICE SPRINGS

TESTER: VANCE BLATT

WITNESS: ???

DRILLING CONTRACTOR:  
MERENIE #1FLUID PROPERTIES FOR  
RECOVERED MUD & WATER

SOURCE	RESISTIVITY	CHLORIDES
_____	_____ @ _____ °F	_____ ppm
_____	_____ @ _____ °F	_____ ppm
_____	_____ @ _____ °F	_____ ppm
_____	_____ @ _____ °F	_____ ppm
_____	_____ @ _____ °F	_____ ppm
_____	_____ @ _____ °F	_____ ppm

## SAMPLER DATA

Psig AT SURFACE: \_\_\_\_\_  
 cu.ft. OF GAS: \_\_\_\_\_  
 cc OF OIL: \_\_\_\_\_  
 cc OF WATER: \_\_\_\_\_  
 cc OF MUD: \_\_\_\_\_  
 TOTAL LIQUID cc: \_\_\_\_\_

## HYDROCARBON PROPERTIES

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

## CUSHION DATA

TYPE	AMOUNT	WEIGHT
_____	_____	_____
_____	_____	_____

## RECOVERED:

960 BBLs./DAY - 650,000 CU. FT. GAS PER DAY

MEASURED FROM  
TESTER VALVE

## REMARKS:

SHORTENED FINAL FLOW PERIOD BECAUSE OF SLIGHT ANNULUS FLOW.....

TEST WAS CONDUCTED ON 25-JUNE, 1985

LEGAL LOCATION: 24 DEGREES - 2' - 15" SOUTH  
 131 DEGREES - 38' - 19" EAST



TYPE &amp; SIZE MEASURING DEVICE: .50" SURFACE CHOKE

TICKET NO: 34641300

TIME	CHOKE SIZE	SURFACE PRESSURE PSI	GAS RATE MCF	LIQUID RATE BPD	REMARKS
6-24-85					
2340					LOADED CLOCKS
6-25-85					
0045					STARTED PICKING UP TOOLS
0210					FINISHED RUNNING TOOLS
0600					MADE-UP SURFACE EQUIPMENT
0645					FINISHED
0647					SET PACKER
0653					OPENED TOOL - MODERATE TO
					STRONG BUBBLE SHOW - ANNULUS
					GOOD.
0655	.50"				OPENED MANIFOLD TO FLARE
0656		6			
0657		10			STRONG BUBBLES SHOWING THROUGH-
					OUT.
0658		12			
0659		17			
0700		21			
0701		27			
0702		30			
0703		34			GAS TO THE SURFACE
0704		36			
0705		36			
0706		30			
0707		26			
0708		23			START CLOSING TOOL
0709		22			
0710		20			CLOSED TOOL
0739					REOPENED TOOL
0740		5			
0744		5			GAS TO THE SURFACE
0746		5			
0752		5			
0756		7			
0803		8			
0810		8			
0814		10			

[illegible]

TICKET NO: 34641300

CLOCK NO: 30361 HOUR: 24


**HALLIBURTON**  
SERVICES

GAUGE NO: 8531

DEPTH: 4637.8

REF	MINUTES	PRESSURE	AP	$\frac{1 \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
FIRST FLOW					
B 1	0.0	424.9			
2	2.0	570.6	145.8		
3	4.0	616.7	46.1		
4	6.0	656.8	40.1		
5	8.0	701.9	45.1		
6	10.0	754.9	52.9		
7	12.0	811.4	56.5		
8	14.0	881.1	69.6		
C 9	15.7	930.4	49.3		

## FIRST CLOSED-IN

C 1	0.0	930.4			
2	1.0	1629.3	698.9	0.9	1.228
3	2.0	1665.4	735.0	1.8	0.940
4	3.0	1675.5	745.1	2.5	0.799
5	4.0	1682.1	751.8	3.2	0.694
6	5.0	1686.5	756.1	3.8	0.619
7	6.0	1689.3	758.9	4.3	0.559
8	7.0	1692.5	762.2	4.8	0.511
9	8.0	1694.1	763.7	5.3	0.471
10	9.0	1696.1	765.7	5.7	0.437
11	10.0	1696.9	766.5	6.1	0.411
12	12.0	1698.5	768.1	6.8	0.363
13	14.0	1700.0	769.6	7.4	0.325
14	16.0	1701.5	771.2	7.9	0.297
15	18.0	1702.1	771.8	8.4	0.271
16	20.0	1702.8	772.5	8.8	0.251
17	22.0	1703.4	773.0	9.1	0.234
18	24.0	1703.9	773.6	9.5	0.218
19	26.0	1703.9	773.6	9.8	0.205
20	28.0	1703.9	773.6	10.1	0.193
D 21	29.1	1704.5	774.1	10.2	0.187

## SECOND FLOW

E 1	0.0	1044.2			
2	5.0	1180.0	135.8		
3	10.0	1256.0	76.0		
4	15.0	1276.3	20.3		
5	20.0	1283.3	7.1		
6	25.0	1282.1	-1.3		
7	30.0	1276.1	-6.0		
8	32.6	1275.0	-1.1		
9	35.0	1285.4	10.4		
10	40.0	1294.0	8.6		
11	45.0	1288.5	-5.6		
12	50.0	1283.3	-5.1		
13	55.0	1278.6	-4.7		

REF	MINUTES	PRESSURE	AP	$\frac{1 \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
SECOND FLOW - CONTINUED					
14	60.0	1274.6	-4.0		
15	65.0	1270.8	-3.7		
16	70.0	1267.8	-3.1		
17	75.0	1264.3	-3.5		
18	80.0	1261.7	-2.6		
19	85.0	1259.4	-2.2		
20	90.0	1256.9	-2.5		
21	95.0	1254.7	-2.2		
F 22	97.0	1253.3	-1.4		

## SECOND CLOSED-IN

F 1	0.0	1253.3			
2	1.0	1651.5	398.2	1.0	2.046
3	2.0	1668.2	414.8	2.0	1.761
4	3.0	1676.6	423.3	2.9	1.593
5	4.0	1681.0	427.7	3.9	1.464
6	5.0	1684.6	431.3	4.8	1.372
7	6.0	1686.3	433.0	5.7	1.297
8	7.0	1687.9	434.6	6.6	1.234
9	8.0	1689.4	436.1	7.4	1.181
10	9.0	1690.7	437.4	8.3	1.131
11	10.0	1691.5	438.2	9.2	1.089
12	12.0	1692.5	439.2	10.8	1.017
13	14.0	1693.9	440.6	12.4	0.957
14	16.0	1695.2	441.9	14.0	0.906
15	18.0	1695.8	442.4	15.5	0.861
16	20.0	1696.8	443.4	17.0	0.822
17	22.0	1697.2	443.8	18.4	0.787
18	24.0	1698.0	444.7	19.8	0.756
19	26.0	1698.9	445.5	21.1	0.728
20	28.0	1698.9	445.5	22.4	0.701
21	30.0	1699.2	445.8	23.7	0.677
22	35.0	1699.6	446.2	26.7	0.625
23	40.0	1700.0	446.7	29.5	0.582
G 24	43.2	1700.4	447.1	31.2	0.557

## LEGEND:

☐ OPEN TO SEPARATOR

REMARKS:

TICKET NO: 34641300

CLOCK NO: 7368 HOUR: 12



GAUGE NO: 8511

DEPTH: 4731.9

REF	MINUTES	PRESSURE	ΔP	$\frac{1 \times \Delta t}{1 + \Delta t}$	$\log \frac{1 + \Delta t}{\Delta t}$
FIRST FLOW					
B 1	0.0	460.3			
2	2.0	620.9	160.7		
3	4.0	666.1	45.1		
4	6.0	702.6	36.6		
5	8.0	748.0	45.4		
6	10.0	797.1	49.1		
7	12.0	849.9	52.8		
8	14.0	929.9	80.0		
C 9	15.7	985.4	55.5		
FIRST CLOSED-IN					
C 1	0.0	985.4			
2	1.0	1659.3	673.9	0.9	1.218
3	2.0	1699.0	713.6	1.8	0.942
4	3.0	1709.6	724.2	2.5	0.792
5	4.0	1716.0	730.6	3.2	0.688
6	5.0	1719.3	733.9	3.8	0.617
7	6.0	1721.7	736.3	4.3	0.558
8	7.0	1723.8	738.4	4.9	0.509
9	8.0	1724.9	739.5	5.3	0.472
10	9.0	1726.6	741.2	5.7	0.438
11	10.0	1727.8	742.4	6.1	0.410
12	12.0	1729.3	743.9	6.8	0.362
13	14.0	1730.2	744.8	7.4	0.326
14	16.0	1731.2	745.8	7.9	0.297
15	18.0	1732.2	746.8	8.4	0.272
16	20.0	1732.9	747.5	8.8	0.251
17	22.0	1733.5	748.1	9.2	0.233
18	24.0	1734.0	748.6	9.5	0.219
19	26.0	1734.4	749.0	9.8	0.205
20	28.0	1734.4	749.0	10.0	0.193
D 21	29.1	1734.1	748.7	10.2	0.187
SECOND FLOW					
E 1	0.0	1077.9			
2	5.0	1210.6	132.6		
3	10.0	1289.9	79.4		
4	15.0	1309.4	19.5		
5	20.0	1315.3	5.9		
6	25.0	1313.6	-1.7		
7	30.0	1306.4	-7.2		
8	32.6	1306.0	-0.4		
9	35.0	1318.7	12.7		
10	40.0	1326.1	7.4		
11	45.0	1319.8	-6.3		
12	50.0	1314.4	-5.5		
13	55.0	1309.8	-4.6		
























REF	MINUTES	PRESSURE	ΔP	$\frac{1 \times \Delta t}{1 + \Delta t}$	$\log \frac{1 + \Delta t}{\Delta t}$
SECOND FLOW - CONTINUED					
14	60.0	1307.0	-2.7		
15	65.0	1302.6	-4.4		
16	70.0	1299.1	-3.5		
17	75.0	1296.0	-3.1		
18	80.0	1293.2	-2.7		
19	85.0	1290.7	-2.5		
20	90.0	1288.1	-2.6		
21	95.0	1286.6	-1.6		
F 22	97.0	1285.0	-1.6		
SECOND CLOSED-IN					
F 1	0.0	1285.0			
2	1.0	1682.8	397.8	1.0	2.051
3	2.0	1702.0	417.0	2.0	1.751
4	3.0	1708.0	423.0	3.0	1.580
5	4.0	1712.3	427.3	3.8	1.467
6	5.0	1714.7	429.7	4.8	1.375
7	6.0	1717.1	432.1	5.7	1.296
8	7.0	1718.0	433.0	6.6	1.233
9	8.0	1718.9	433.9	7.5	1.180
10	9.0	1720.2	435.2	8.3	1.131
11	10.0	1721.1	436.1	9.2	1.088
12	12.0	1722.4	437.5	10.8	1.017
13	14.0	1723.8	438.8	12.5	0.956
14	16.0	1724.5	439.6	14.0	0.906
15	18.0	1724.9	439.9	15.5	0.860
16	20.0	1724.9	439.9	17.0	0.822
17	22.0	1726.4	441.4	18.4	0.786
18	24.0	1726.8	441.8	19.8	0.756
19	26.0	1727.4	442.4	21.1	0.728
20	28.0	1727.4	442.4	22.4	0.701
21	30.0	1727.4	442.4	23.7	0.678
22	35.0	1728.5	443.5	26.7	0.625
23	40.0	1728.5	443.5	29.5	0.582
G 24	43.2	1729.8	444.8	31.2	0.557

LEGEND:

☐ OPEN TO SEPARATOR

REMARKS:

TICKET NO. 34641300

		O.D.	I.D.	LENGTH	DEPTH
1		DRILL PIPE.....	4.500	3.826	3918.0
4		FLEX WEIGHT.....	5.880	2.880	182.8
3		DRILL COLLARS.....	6.380	2.880	487.3
50		IMPACT REVERSING SUB.....	6.000	3.000	1.0
3		DRILL COLLARS.....	6.380	2.880	31.0
5		CROSSOVER.....	5.750		1.0
5		CROSSOVER.....	5.000	2.200	1.0
12		DUAL CIP VALVE.....	5.000	0.870	4.9
97		SAMPLE CHAMBER.....	5.000	2.500	4.1
33		DRAIN VALVE.....	5.000	2.200	0.9
60		HYDROSPRING TESTER.....	5.000	0.750	5.3
80		AP RUNNING CASE.....	5.000	2.250	4.1
15		JAR.....	5.000	1.750	5.0
16		VR SAFETY JOINT.....	5.000	1.000	2.8
70		OPEN HOLE PACKER.....	5.000	1.530	5.8
18		DISTRIBUTOR VALVE.....	5.000	1.680	2.0
70		OPEN HOLE PACKER.....	5.000	1.530	5.8
19		ANCHOR PIPE SAFETY JOINT.....	5.000	1.500	4.3
5		CROSSOVER.....	5.875	2.500	1.0
3		DRILL COLLARS.....	6.380	2.880	31.0
5		CROSSOVER.....	6.000	2.313	1.0
20		FLUSH JOINT ANCHOR.....	5.000	2.370	31.0
81		BLANKED-OFF RUNNING CASE.....	5.000		4.1
TOTAL DEPTH					4735.0

EQUIPMENT DATA

## 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
Skin Factor	$S = 1.151 \left[ \frac{P^* - P_f}{m} - \text{LOG} \left( \frac{k(t/60)}{\phi \mu c_f r_w^2} \right) + 3.23 \right] -$	—
Damage Ratio	$DR = \frac{P^* - P_f}{P^* - P_f - 0.87 mS}$	—
Theoretical Potential w / Damage Removed	$Q_1 = Q DR$	BPD
Approx. Radius of Investigation	$r_i = 0.032 \sqrt{\frac{k(t/60)}{\phi \mu c_f}}$	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	$S = 1.151 \left[ \frac{m(P^*) - m(P_f)}{m} - \text{LOG} \left( \frac{k(t/60)}{\phi \mu c_f r_w^2} \right) + 3.23 \right] -$	—
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