WORK SHEET FOR STEPWISE CALCULATION

PRESSURE (SURFACE) (P_c & P_w)

Rate #1

Form C-122-E

COMPANY Grace Petroleum Company LEASE New Mexico Federal "F" WELL NO. 1 DATE 1-25-79

LOCATION: UNIT SECTION 1 TOWNSHIP RANGE

13464 H 13464 L/H 1.0 G .636 % CO_2 .90 %N_2 .36 %H_2S 0

d 2.441 F_r Q_m .780 M^2cfd (L/H) $(F_rQ_m)^2$ P_{cr} 670 T_{cr} 372

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		13464	6732			0					
2	GH		8563	4281			0					
3	37.5GH		32116	160558			0					
4	P_c or P_n		5298.2	4624.6	4609	4595.3	3902.9	3880.6	3856.8			
5	P_r		7.89	6.90	6.88	6.86	5.83	5.79	5.76			
6	T		632	576	576	576	520	520	520			
7	T_r		1.70	1.55	1.55	1.55	1.40	1.40	1.40			
8	Z		1.011	.928	.927	.926	.815	.812	.810			
9	P/Z P/Z	$\overline{4} \div \overline{8}$	5231.6	4983.4	4973.0	4962.6	4788.9	4779.1	4761.4			
10	P/TZ	$\overline{9} \div \overline{6}$	8.2779	8.6518	8.6337	8.6156	9.2095	9.1906	9.1566			
11	$(P/TZ^2/1000$	$(10^2/1000$										
12	$L/H(F_rQ_m)^2$											
13		$\overline{11} + \overline{12}$										
14	I_n	$\overline{10} \div \overline{13}$	120.803	115.582	115.825	116.068	108.583	108.805	109.210			
15	$M=P_n-P_{n-1}$			665	679	694	692	715	739			
16	$N=I_n+I_{n-1}$			241.606	236.385	231.407	231.893	224.651	217.389			
17	M x N	$\overline{15}$ x $\overline{16}$			160596				160650			
18	$\sum$ (M x N)	$\sum \overline{17}$			160596				321246			

delta P = $\frac{3\ (321116)}{120.803 + 4(116.068) + 109.210} = \frac{963348}{694.285} = 1387.5$ P = 5298.2-1387.5 = 3901.6

WORK SHEET FOR STEPWISE CALCULATION

(SURFACE)
Rate #4

PRESSURE
(P_c & P_w)

Form C-122-E

COMPANY Grace Petroleum Company LEASE New Mexico Federal "F" WELL NO. 1 DATE 1-25-79

LOCATION: UNIT SECTION 1 TOWNSHIP RANGE

13464 H 13464 L/H 1.0 G .636 % CO_2 .90 %N_2 .36 %H_2S 0

d 2.441 F_r Q_m .780 M^2cfd (L/H) $(F_r Q_m)^2$ P_{cr} 670 T_{cr} 372

LINE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		13464	6732	0							
2	GH		8563	4282	0							
3	37.5GH		321116	160558	0							
4	P_c or P_n		1600.2	1368.9	1143.8	1153.9	1157.9					
5	P_r		2.39	2.04	1.71	1.72	1.73					
6	T		632	583	535	535	535					
7	T_r		1.70	1.57	1.44	1.44	1.44					
8	Z		.879	.859	.816	.817	.818					
9	P/Z P/Z	$\overline{4} \div \overline{8}$	1820.4	1593.6	1401.8	1412.4	1415.5					
10	P/TZ	$\overline{9} \div \overline{6}$	2.8805	2.7312	2.6201	2.6399	2.6458					
11	$(P/TZ^2/1000$	$(10^2/1000$										
12	$L/H(F_r Q_m)^2$											
13		$\overline{11} + \overline{12}$										
14	I_n	$\overline{10} \div \overline{13}$	347.161	366.138	381.654	378.798	377.951					
15	$M=P_n - P_{n-1}$			231	225	215	211					
16	$N=I_n + I_{n-1}$			694.323	713.299	747.792	760.452					
17	M x N	$\overline{15} \times \overline{16}$		160388			160455					
18	$\sum$ (M x N)	$\sum \overline{17}$		160388			320843					

delta P = $\frac{3(321116)}{347.161 + 4(366.138) + 377.951} = \frac{963349}{2189.664}$ P = 1600.2 - 439.9 = 1160.3

WORK SHEET FOR STEPWISE CALCULATION — PRESSURE (SURFACE) Rate #3 (P_c & P_w) — Form C-122-E

COMPANY Grace Petroleum Company LEASE New Mexico Federal "F" WELL NO. 1 DATE 1-25-79

LOCATION: UNIT ____ SECTION 1 TOWNSHIP ____ RANGE ____

13464 H 13464 L/H 1.0 G .636 % CO_2 .90 %N_2 .36 %H_2S 0

d 2.441 F_r ____ Q_m .780 M^2cfd (L/H) $(F_rQ_m)^2$ ____ P_{cr} 670 T_{cr} 372

NE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		13464	6732								
2	GH		8563	4282								
3	37.5GH		321116	160558								
4	P_c or P_n		2860.2	2437.7	2013.9							
5	P_r		4.27	3.64	3.01							
6	T		632	582	532							
7	T_r		1.70	1.56	1.43							
8	Z		.860	.791	.721							
9	P/Z P/Z	$\overline{4} \div \overline{8}$	3325.8	3081.8	2793.3							
0	P/TZ	$\overline{9} \div \overline{6}$	5.2623	5.2953	5.2505							
1	$(P/TZ^2/1000$	$(10^2/1000$										
2	$L/H(F_rQ_m)^2$											
3		$\overline{11} + \overline{12}$										
4	I_n	$\overline{10} \div \overline{13}$	190.028	188.847	190.455							
5	$M=P_n - P_{n-1}$			422	424							
6	$N=1_n + 1_{n-1}$			380.057	378.876							
7	M x N	$\overline{15} \times \overline{16}$		160384	160643							
8	$\sum$ (M x N)	$\sum \overline{17}$		160384	321027							

$$\text{delta P} = \frac{3(321116)}{190.028 + 4(188.847) + 190.455} = \frac{963349}{1135.871} = 848.1 \qquad P = 2860.2 - 848.1 = 2012.1$$

WORK SHEET FOR STEPWISE CALCULATION — PRESSURE (SURFACE) (P_c & P_w) — Form C-122-E

Rate #2

MPANY Grace Petroleum Company LEASE New Mexico Federal "F" WELL NO. 1 DATE 1-25-79

CATION: UNIT SECTION 1 TOWNSHIP RANGE

13464 H 13464 L/H 1.0 G .636 % CO_2 .90 %N_2 .36 %H_2S 0

d 2.441 F_r Q_m .780 M^2cfd (L/H) $(F_rQ_m)^2$ P_{cr} 670 T_{cr} 372

NE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		13464	6732	0							
2	GH		8563	4281	0							
3	37.5GH		321116	160558	0							
4	P_c or P_n		4207.2	3453.7	2881.4	2871.5	2861.1					
5	P_r		6.01	5.15	4.30	4.29	4.27					
6	T		632	580	528	528	528					
7	T_r		1.70	1.56	1.42	1.42	1.42					
8	Z		.892	.837	.738	.738	.737					
9	P/Z P/Z	$\overline{4} \div \overline{8}$	4514.7	4126.3	3904.3	3890.9	3882.0					
10	P/TZ	$\overline{9} \div \overline{6}$	7.1436	7.1143	7.3946	7.3693	7.3524					
	$(P/TZ^2/1000$	$(10^2/1000$										
	$L/H(F_rQ_m)^2$											
		$\overline{11} + \overline{12}$										
	I_n	$\overline{10} \div \overline{13}$	139.984	140.561	135.234	135.698	136.009					
	$M=P_n-P_{n-1}$			573	572	582	593					
	$N=1_n + 1_{n-1}$			279.968	280.545	275.795	270.932					
	M x N	$\overline{15} \times \overline{16}$		160422			160663					
	$\sum$(M x N)	$\sum \overline{17}$		160422			321085					

$$\text{delta P} = \frac{3(321116)}{139.984 + 4(140.561) + 136.009} = \frac{963349}{838.237} = 1149.2 \qquad P = 4027.2 - 1149.2 = 2878.0$$