

Formation Pressure



WELL NO: 34/7-22
PRESSURE UNITS: BARA

SAGA PETROLEUM A.S
FMT WELLSITE WORKSHEET
RKB-MSL: 29m RIG: WEST DELTA

PAGE 1 OF 1
WITNESSED BY: ToR
DATE: 11/9-93

RUN # 2A	DEPTH MD (RKB)	DEPTH MD (MSL)	INITIAL HYDROSTATIC PRESS		FORMATION PRESSURE		FINAL HYDROSTATIC PRESSURE		TEMP.	MOB IND.	REMARKS:
			SG(BARG)	QUARTZ (BARA)	SG(BARG)	QUARTZ (BARA)	SG(BARG)	QUARTZ (BARA)	°C	mD/eP	
1	2179.5	2150.5		356.6		336.77		356.6	68.4		NORMAL TEST
2	2181.0	2152.0		356.8		336.92		356.8	68.6		NORMAL TEST
3	2228.5	2199.5		364.5		336.18		364.5	70.5		SEGR. SAMPLE
4	2231.0	2202.0		365.0		336.30		365.0	71.0		NORMAL TEST
5	2238.5	2209.5		366.2		336.88		366.2	71.2		NORMAL TEST
6	2242.5	2213.5		366.9		337.18		366.9	71.7		NORMAL TEST
7	2246.3	2217.3		367.5		337.40		367.5	72.0		NORMAL TEST
8	2249.0	2220.0		367.9		337.70		367.9	72.2		NORMAL TEST
9	2251.5	2222.5		368.3		337.90		368.3	72.4		NORMAL TEST
10	2255.0	2226.0		368.9		338.29		368.9	72.7		NORMAL TEST
11	2260.5	2231.5		369.8		338.80		369.8	72.9		NORMAL TEST
12	2274.5	2245.5		372.1		339.74		372.1	73.2		NORMAL TEST
13	2317.5	2288.5		379.0		328.01		379.0	74.3		NORMAL TEST
14	2325.0	2396.0		380.3		329.44		380.3	75.2		NORMAL TEST
15	2350.5	2321.5		384.4		330.41		384.4	75.9		NORMAL TEST
16	2363.0	2334.0		386.4		331.60		386.4	76.9		NORMAL TEST
17	2372.0	2343.0		387.9		332.55		387.9	77.8		NORMAL TEST
18	2382.5	2353.5		389.6		333.65		389.6	78.5		NORMAL TEST
19	2409.5	2380.5		394.0		336.50		394.0	79.4		NORMAL TEST
20	2423.5	2394.5		396.2		337.67		396.2	80.2		NORMAL TEST

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Table 5.3a Formation Pressures, well 34/7-22

Formation Pressure



<p align="center">SAGA PETROLEUM A.S</p> <p align="center">FMT WELLSITE WORKSHEET</p> <p align="center">RKB-MSL: 29m RIG: WEST DELTA</p> <p> WELL NO: 34/7-22 PAGE 1 OF 1 WITNESSED BY: ToR PRESSURE UNITS: BARA DATE: 11/9-93 </p>											
RUN # 2B	DEPTH MD (RKB)	DEPTH MD (MSL)	INITIAL HYDROSTATIC PRESS		FORMATION PRESSURE		FINAL HYDROSTATIC PRESSURE		TEMP.	MOB IND.	REMARKS:
			SG(BARG)	QUARTZ (BARA)	SG(BARG)	QUARTZ (BARA)	SG(BARG)	QUARTZ (BARA)	°C	mD/cP	
1	2246.3	2217.3		367.5		337.50		367.4	72.5		SEGR. SAMPLE
2	2253.2	2224.2		368.6		338.10		368.6	73.0		NORMAL TEST
3	2340.5	2311.5		382.7		334.40		382.8	75.6		NORMAL TEST

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Table 5.3b Formation Pressures, well 34/7-22

9.11.93 ToR/ERF

FMT Samples



FORMATION FLUID SAMPLING			Well: 34/7-22	
			Rig: West Delta	
Pretest No. 3	Sample Depth:	2228.5 mRKB 2199.5 mMSL	Witnesses: ToR	
Run No.: 2A	Sample No.: 1	1st Chamber	2nd Chamber	3rd Chamber
Chamber volume (litres)		10	4	
Chamber No.			1900ZC331463	
Filling time (sec.)		480	180	
Reservoir press. (bara)/T°C		336.18/70.4	336.18/70.4	
Opening press. (bar)/T°C		165.5/	144.8/	
Gas volume (litres)		362		
Oil volume (litres)		7.3		
Filtrate density (g/cc)				
Water / Filtrate (litres)				
Water / Filtrate PPM CL ⁻				
Mud filtrate PPM CL ⁻				
Oil density (g/cc)				
Gas composition %	C ₁			
	C ₂			
	C ₃			
	IC ₄			
	NC ₄			
	H ₂ S			
	CO ₂			
REMARKS:				
PVT tank sent GECO PRAKLA for onshore laboratory analysis. Report pending (19/11-93).				

Table 5.4a Fluid Samples, 34/7-22

FMT Samples



FORMATION FLUID SAMPLING			Well: 34/7-22	
			Rig: West Delta	
Pretest No. 1	Sample Depth:	2246.3 mRKB 2217.3 mMSL	Witnesses: ToR	
Run No.: 2B	Sample No.: 2	1st Chamber	2nd Chamber	3rd Chamber
Chamber volume (litres)		10	4	
Chamber No.			1900ZC331584	
Filling time (sec.)		30	8	
Reservoir press. (bara)/T°C		337.50/72.5	337.50/72.5	
Opening press. (bar)/T°C		137.9/	120.7/	
Gas volume (litres)		656		
Oil volume (litres)		7.5		
Filtrate density (g/cc)				
Water / Filtrate (litres)				
Water / Filtrate PPM CL ⁻				
Mud filtrate PPM CL ⁻				
Oil density (g/cc)				
Gas composition %	C ₁			
	C ₂			
	C ₃			
	IC ₄			
	NC ₄			
	H ₂ S			
	CO ₂			
REMARKS:				
PVT tank sent GECO PRAKLA for onshore laboratory analysis. Report pending (19/11-93).				

Table 5.4b Fluid Samples, 34/7-22

5.4 Testing

The interval 2236.0-2242.0 mRKB was perforated and tested. The depth refer to the DPIL/MAC/FDL/CN/DSL-log; run no.1 on September 9, 1993.

The test objectives were:

- Investigate reservoir extension and continuity.
- Determine productivity, permeability and skin.
- Determine initial reservoir conditions.
- Obtain formation fluid samples.
- Investigate sand production potential.
- Investigate aquifer influence and possible water coning.

The test was performed as shown in table 5.5.

Table 5.5 Test performance for well 34/7-22.

Operation	Last choke size (mm)	Duration (hours)
Initial flow	9.5	1.7
Initial buildup		1.02
Multirate flow	14.3	65.09
Multirate buildup		24.1
Highbate no.1 flow	23.8	5.19
Highbate no.1 buildup		2.73
Highbate no.2 flow	20.6	8.58
Highbate no.2 buildup		2.83

The flow was switched through the separator after 1.4 hours of the multirate flow period. Started to produce water during the end of the multirate flow period and during the highrate flow periods.

The oilrate at the end of the multirate flow was measured to 1154 Sm³/D with corresponding wellhead pressure of 154.3 bar and a GOR of 67.9 Sm³/Sm³ at separator conditions of 40.3 bar and 54.7 degC.

No sand was produced during the test.

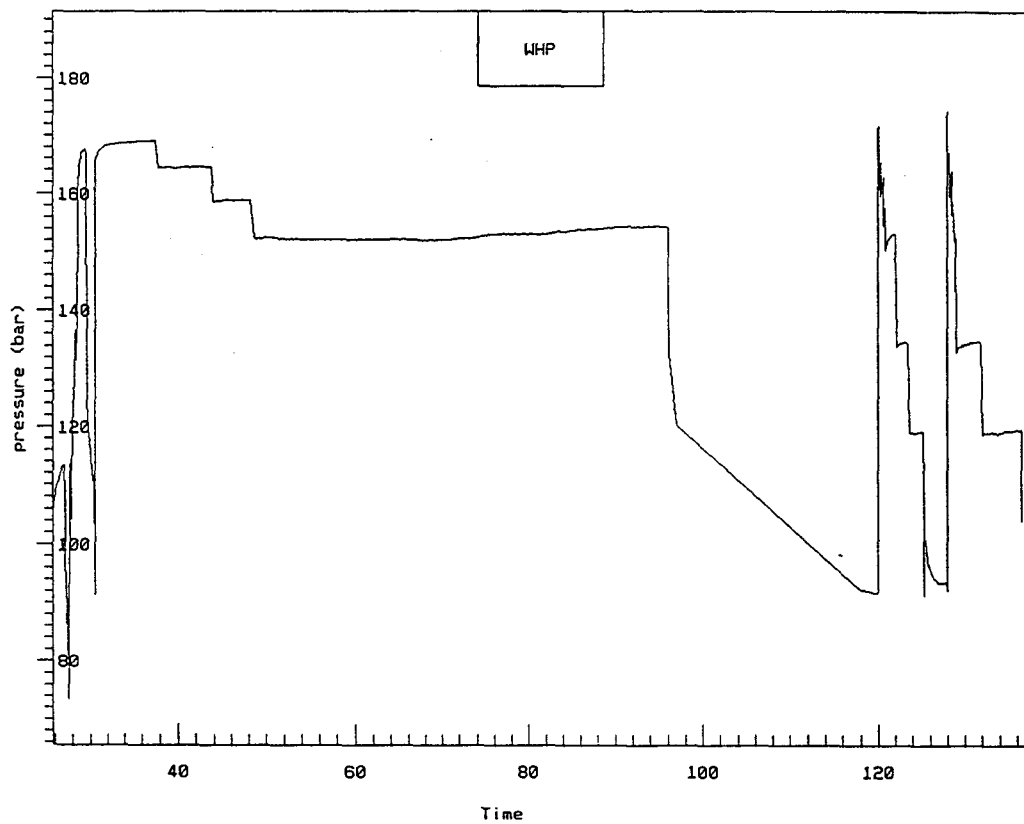
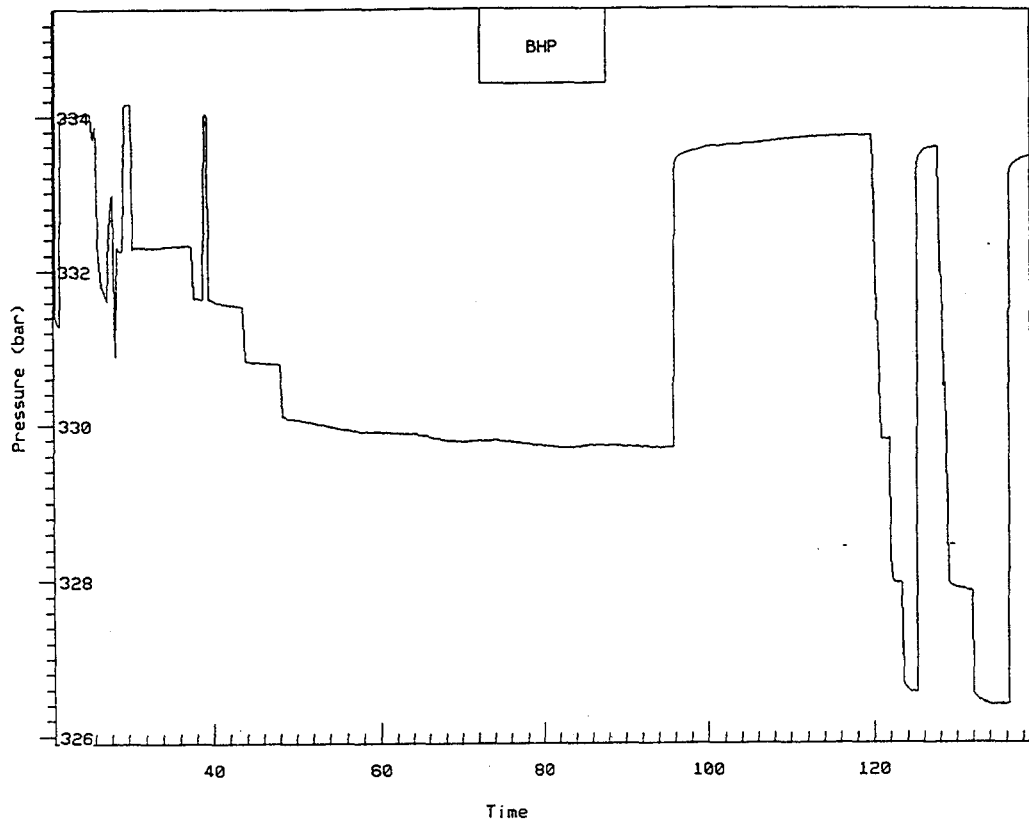


Figure 5.2 Bottomhole and wellhead pressures

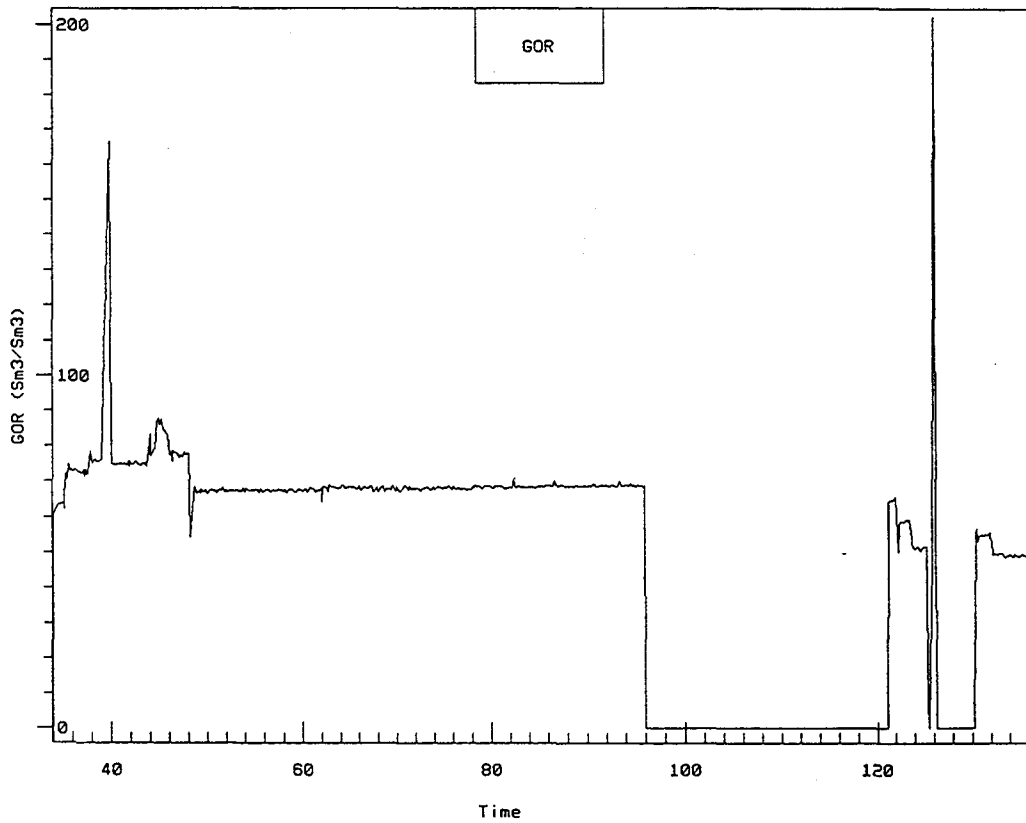
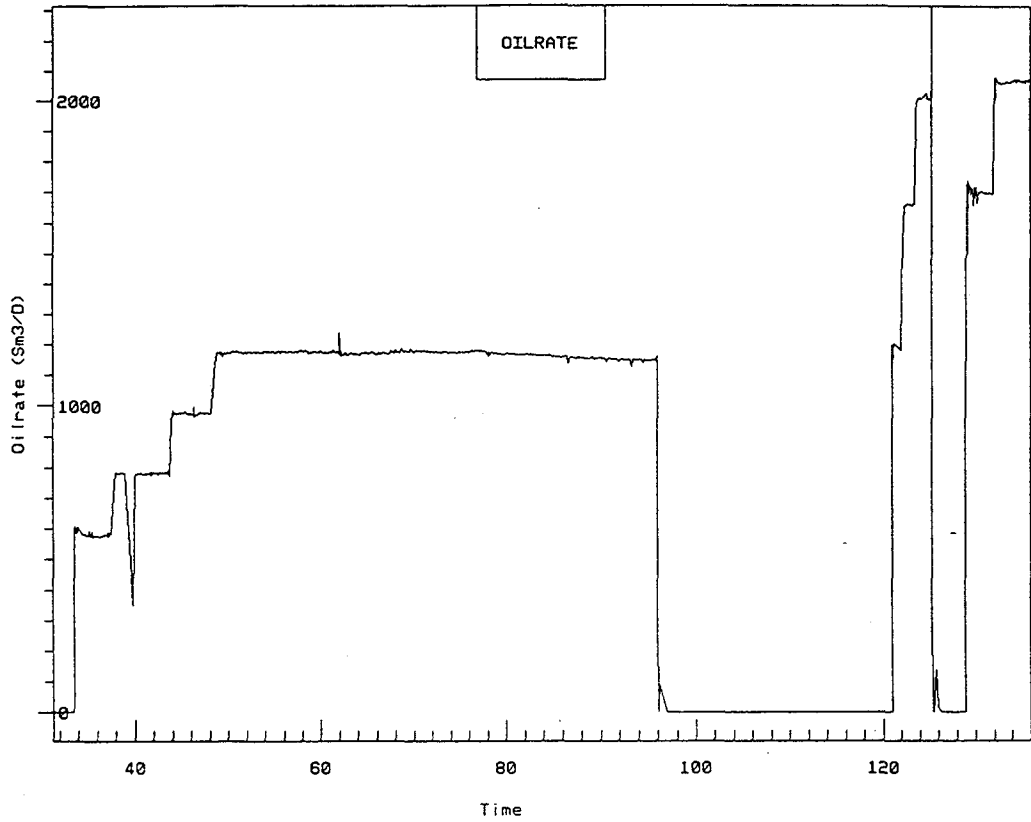


Figure 5.3 Oilrate and GOR



FORMATION	Tarbert
TEST NO.	1
FLUID	oil
PERFORATION INTERVAL (mRKB)	2236.0 - 2242.0
STABLE MAIN FLOW (at 23:54 21/09/93):	
LAST FLOWING RATE (Sm ³ /d)	1154
LAST FLOWING WELLHEAD PRESSURE (bar)	154.3
LAST FLOWING BOTTOMHOLE PRESSURE (bar)	330.3
- at DEPTH (mRKB)	2202.9
- CHOKE SIZE (mm)	14.3
At separator:	
DEAD OIL DENSITY (g/cm ³)	0.84
GAS GRAVITY (air=1)	0.695
GOR (Sm ³ /Sm ³)	67.9
- at SEPARATOR PRESSURE (bar)	40.3
- at SEPARATOR TEMPERATURE (degC)	54.7
RESERVOIR TEMPERATURE (degC)	85
RESERVOIR PRESSURE (bar)	334
- at DEPTH (mRKB)	2202.9

Table 5.5 Test results

5.5 Fluid Sampling

During the test the following pressurized hydrocarbon samples were taken:

Six monophasic wellhead samples, six separator PVT sets for recombination and three separator oil samples (on 20 litre gas bottles). Oil and gas samples for geochemical analysis were also taken.

Finally, a pressurized sample of produced water and several oil and water samples on atmospheric containers were taken.

For details concerning sampling (atmospheric samples not included), see Table 5.6. The samples were shipped to Geco-Prakla for validity check, analysis and distribution to other laboratories.

A PVT study, a crude oil assay and analysis of produced water are currently being carried out.

Final Well Report 34/7-22



SURFACE SAMPLING DATA WELL 34/7-22, TEST No. 1, TARBERT

Sample No.	Date	Sampling time [hr:min]		Fluid	Sampling			Bottle No.	Remarks
		start	finished		Point	Press. [bar]	Temp. [C]		
1	19.9.93	11:03	11:25	Oil	Wellhead	168,8	34,9	TS-3506	Upstream choke manifold
2	19.9.93	12:10	12:30	Oil	Wellhead	169,0	36,1	TS-3710	Upstream choke manifold
3	19.9.93	12:40	13:00	Oil	Wellhead	169,0	36,2	TS-2801	Upstream choke manifold
4	19.9.93	16:19	16:45	Oil	Wellhead	164,5	39,2	TS-4005	Upstream choke manifold
5	19.9.93	17:00	17:23	Oil	Wellhead	164,5	40,2	TS-3704	Upstream choke manifold
6	19.9.93	17:35	17:58	Oil	Wellhead	164,5	40,8	TS-4413	Upstream choke manifold
7	19.9.93	20:45	21:00	Oil	Separator	29,0	41,4	5578-A	Sep. oil on 20 l gas bottles
8	19.9.93	21:10	21:25	Oil	Separator	28,7	41,9	5501-A	Sep. oil on 20 l gas bottles
9	19.9.93	21:30	21:45	Oil	Separator	28,7	41,9	5488-A	Sep. oil on 20 l gas bottles
10	19.9.93	23:16	23:48	Oil	Separator	28,8	41,3	TS-3006	PVT set no. 1
11	19.9.93	23:16	23:48	Gas	Separator	28,8	41,3	5490-A	PVT set no. 1
12	19.9.93	23:16	23:48	Gas	Separator	28,8	41,3	5491-A	PVT set no. 1
13	20.9.93	8:36	9:10	Oil	Separator	39,2	43,2	TS-5012	PVT set no. 2
14	20.9.93	8:36	9:10	Gas	Separator	39,2	43,2	5485-A	PVT set no. 2
15	20.9.93	8:36	9:10	Gas	Separator	39,2	43,2	5581-A	PVT set no. 2
16	20.9.93	11:36	12:07	Oil	Separator	39,4	43,1	TS-6007	PVT set no. 3
17	20.9.93	11:36	12:07	Gas	Separator	39,4	43,1	5510-A	PVT set no. 3
18	20.9.93	11:36	12:07	Gas	Separator	39,4	43,1	5572-A	PVT set no. 3
19	20.9.93	14:14	14:48	Oil	Separator	39,4	41,3	TS-5109	PVT set no. 4
20	20.9.93	14:14	14:48	Gas	Separator	39,4	41,3	5508-A	PVT set no. 4
21	20.9.93	14:14	14:48	Gas	Separator	39,4	41,3	5560-A	PVT set no. 4
22	20.9.93	16:25	16:53	Oil	Separator	39,4	42,8	TS-3705	PVT set no. 5
23	20.9.93	16:25	16:53	Gas	Separator	39,4	42,8	5550-A	PVT set no. 5
24	20.9.93	16:25	16:53	Gas	Separator	39,4	42,8	5547-A	PVT set no. 5
25	20.9.93	18:57	19:30	Oil	Separator	38,9	42,4	TS-3903	PVT set no. 6
26	20.9.93	18:57	19:30	Gas	Separator	38,9	42,4	5551-A	PVT set no. 6
27	20.9.93	18:57	19:30	Gas	Separator	38,9	42,4	5573-A	PVT set no. 6
28	21.9.93	23:37	23:56	Water	Separator	39,4	54,8	PT-1015	Pressurized water sample
29	21.9.93	1:00	1:05	Gas	Separator	39,6	45,3	5EK084	0.5 l gas sample for geochemistry
30	21.9.93	1:10	1:15	Gas	Separator	39,9	45,4	4EK082	0.5 l gas sample for geochemistry

Table 5.6 Summary of Fluid Sampling, Well 34/7-22, Test No. 1

Well: 34/7-22

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
930814						/		/					SPUD MUD
930815	9 7/8"	591.0	1.20	4.0	13.0	10/17	9.3	/	480	11000			SPUD MUD
930816	9 7/8"	1068.0	1.20	5.0	14.0	11/18	9.3	/	480	11000			SPUD MUD
930817	9 7/8"	1086.0	1.20	4.0	14.0	11/16	9.3	/	480	11000			SPUD MUD
930818	36"	302.0	1.20	10.0	75.0	28/30	10.0	.3/.8		11000			SPUD MUD
930819	36"	358.0	1.20	11.5	5.0	11/16	9.0	.1/.2	480	11000		8.0	SPUD MUD
930820	26"	358.0	1.06	10.0	70.0	28/30	10.0	.3/.8	480	11000		4.0	SPUD MUD
930821	26"	588.0	1.06	11.0	72.0	29/31	10.0	.4/.9	480	11000		4.0	SPUD MUD
930822	26"	766.0	1.06	10.0	68.0	28/30	10.0	.4/.9	480	11000		4.0	SPUD MUD
930823	26"	812.0	1.20	6.0	13.0	12/18	9.0	.2/.2	480	11000		8.0	SPUD MUD
930824	26"	812.0	1.12	13.5	15.0	12/18	9.0	.2/.2	480	11000		5.0	SPUD MUD
930825	17 1/2"	812.0	1.12	14.0	16.0	12/18	9.0	.2/.2	480	11000		5.0	SPUD MUD
930826	17 1/2"	1113.0	1.16	4.0	22.0	20/25	9.0	.2/.2	400	8800		7.0	SPUD MUD
930827	17 1/2"	1329.0	1.20	5.0	24.0	25/32	8.6	.0/.3	240	13300	3.5	8.1	SPUD MUD
930828	17 1/2"	1329.0	1.22	6.0	21.0	22/30	8.4	.0/.3	240	13300	2.0	7.6	SPUD MUD
930829	12 1/4"	1332.0	1.29	27.5	15.0	4/8	9.2	.1/.6	120	81000		13.0	KCL MUD
930830	12 1/4"	1657.0	1.40	24.0	22.0	5/7	8.3	.1/.6	240	73000		16.5	KCL MUD
930831	12 1/4"	2049.0	1.56	34.0	26.0	5/7	8.3	/.6	680	71000		22.0	KCL MUD
930901	12 1/4"	2112.0	1.59	61.0	32.0	4/6	8.3	.0/.6	560	74000		13.0	KCL MUD
930902	12 1/4"	2117.0	1.59	34.0	22.0	4/6	8.4	.0/.6	560	73000		22.5	KCL MUD
930903	12 1/4"	2117.0	1.59	34.0	27.0	4/6	8.4	.0/.6	560	73000	.5	22.5	KCL MUD
930904	12 1/4"	2117.0	1.59	35.0	25.0	4/6	8.4	.0/.6	560	73000	.5	22.5	KCL MUD
930905	8 1/2"	2226.0	1.63	32.0	18.0	3/5	10.8	.3/.9	880	57000		23.5	KCL MUD
930906	8 1/2"	2255.0	1.63	32.0	16.0	3/5	9.2	.1/.9	720	57000		23.5	KCL MUD
930907	8 1/2"	2284.0	1.63	33.0	15.0	4/6	9.0	.1/.7	360	58000		23.5	KCL MUD
930908	8 1/2"	2303.0	1.63	34.0	17.0	4/6	8.7	.0/.9	360	60000	.5	23.5	KCL MUD
930909	8 1/2"	2345.0	1.63	35.0	16.0	4/6	8.5	.0/.8	320	58000	.5	23.5	KCL MUD

Well: 34/7-22

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
930910	8 1/2"	2507.0	1.63	34.0	21.0	4/9	8.4	.1/1.6	400	67000	.5	23.5	KCL MUD
930911	8 1/2"	2507.0	1.63	34.0	21.0	4/9	8.4	.1/1.6	400	67000	.5	23.5	KCL MUD
930912	8 1/2"	2507.0	1.66	40.0	23.0	4/9	8.5	.1/1.3	360	62000	.5	25.0	KCL MUD
930913	8 1/2"	2507.0	1.66	35.0	24.0	4/9	8.2	.1/1.6	400	60000	.5	25.0	KCL MUD
930914	8 1/2"	2507.0	1.66	40.0	26.0	4/10	8.3	.1/2.0	400	62000	.5	25.0	KCL MUD
930915	8 1/2"	2507.0	1.66	53.0	50.0	10/22	8.2	/1.4	144	60000		25.0	KCL MUD
930916	DST#1	2507.0	1.66	48.0	44.0	9/20	8.2	.1/1.8	360	60000		25.0	KCL MUD
930917	DST#1	2507.0	1.66	44.0	40.0	8/19	8.3	.1/1.8	360	57000		25.0	KCL MUD
930918	DST#1	2507.0	1.66	43.0	42.0	8/19	8.3	.1/1.8	360	57000		25.0	KCL MUD
930919	DST#1	2507.0	1.66	38.0	39.0	9/19	8.3	.1/1.7	360	50000		25.0	KCL MUD
930920	DST#1	2507.0	1.66	39.0	35.0	9/19	8.3	.1/1.8	400	49000		25.0	KCL MUD
930921	DST#1	2507.0	1.66	38.0	36.0	9/19	8.3	.1/1.8	400	50000	.5	25.0	KCL MUD
930922	DST#1	2507.0	1.66	38.0	35.0	9/19	8.3	.1/1.8	400	50000	.5	25.0	KCL MUD
930923	DST#1	2507.0	1.66	65.0	45.0	8/18	8.6	.1/1.8	360	59000		26.0	KCL MUD
930924	DST#1	2507.0	1.66	39.0	35.0	8/17	8.6	.1/1.8	360	59000		26.0	KCL MUD
930925	P&A	2507.0	1.66	39.0	35.0	8/17	8.6	.1/1.8	360	58000		26.0	KCL MUD
930926	P&A	2507.0	1.66	36.0	32.0	7/15	8.6	.1/1.6	400	59000		26.0	KCL MUD
930927	P&A	2507.0	1.66	35.0	33.0	7/16	8.6	.1/1.5	360	59000		26.0	KCL MUD
930928	P&A	2507.0	1.66	35.0	33.0	7/16	8.6	.1/1.5	360	59000		26.0	KCL MUD
930929	P&A	2507.0	1.46	24.0	29.0	7/12	9.1	.1/.9	360	76000		20.0	KCL MUD

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Materials	Unit	36" Hole	26" Hole	17 1/2" Hole	12 1/4" Hole	8 1/2" Hole	DST#1 Hole	Total
Barite	ton	284	24	127	415	85	48	983
Bentonite	ton	77	7	36	5	-	-	125
Citric Acid	25 kg	-	-	-	5	44	11	60
Defoamer	25 ltr	-	-	-	-	-	1	1
Glycol	m3	-	-	-	4	2	-	6
Idcide L	25 ltr	-	-	-	-	2	-	2
Idvis	25 kg	-	-	-	16	5	-	21
KCl	kg	-	-	-	6000	8500	-	14500
KCl Brine	m3	-	-	-	332	-	-	332
Lime	20 kg	37	19	4	-	-	-	60
Pot. Bicarbonat	25 kg	-	-	-	-	71	39	110
Prempac EX	25 kg	-	-	36	236	-	2	274
Prempac LV	25 kg	-	-	-	110	62	2	174
Soda Ash.	50 kg	19	3	4	3	-	7	36
Xanvis	kg	-	-	-	-	6	12	18

Table 6.2.2 Mud Materials Used