

# Well 34/7-19



## Formation Pressures (RFT)

WELL NO: 34/7-19		SAGA PETROLEUM A.S RFT WELLSITE WORKSHEET						PAGE OF: WITNESSED BY: BAa & TOR			
PRESSURE UNITS: PSIA		RKB-MSL: 18m RIG: WEST ALPHA						DATE: 11/11-91			
RUN # 2A	DEPTH MD (RKB)	DEPTH TVD (MSL)	INITIAL HYDROSTATIC PRESS		FORMATION PRESSURE		FINAL HYDROSTATIC PRESSURE		TEMP.	MOB IND.	REMARKS:
TEST #			SG(PSIA)	HP(PSIA)	SG(PSIA)	HP(PSIA)	SG(PSIA)	HP(PSIA)	DEG C	mD/CP	
1	2456,8	2438,8	5771,76	5771,76	5306,1	5307,00	5776,3	5773,9	69,9	14,4	NORMAL TEST
2	2459,5	2441,5	5780,56	5780,56	5308,6	5309,41	5781,3	5781,14	70,3	35	NORMAL TEST
3	2461,5	2443,5	5785,75	5785,75							LOST SEAL
4	2462,0	2444,0	5787,25	5787,25	5311,1	5311,81	5785,4	5787,36	71,2	233	NORMAL TEST
5	2465,0	2447,0	5794,50	5794,50	5314,2	5315,12	5790,1	5794,26	71,4	193	NORMAL TEST
6	2466,0	2448,0	5797,7	5797,7	5315,5	5316,47	5791,8	5797,0	71,4	163	NORMAL TEST
7	2470,5	2452,5	5803,5	5808,5	5320,0	5321,04	5803,5	5808,15	71,8	187	NORMAL TEST
8	2476,0	2458,0	5817,9	5821,7	5326,9	5328,3	5817,8	5820,8	71,9	12,8	NORMAL TEST
9	2484,4	2466,4	5839,5	5842,1	5336,3	5337,05	5840,0	5842,3	72,6	389	NORMAL TEST
10	2487,0	2469,0	5845,9	5848,8	5339,8	5340,84	5845,7	5848,5	72,7	142	NORMAL TEST
11	2501,5	2483,5	5880,2	5882,9	5360,3	5361,24	5879,8	5882,5	72,9	69,9	NORMAL TEST
12	2503,8	2485,8	5885,9	5888,6	5363,7	5364,48	5885,4	5888,5	73,1	840	NORMAL TEST
13	2522,0	2504,0	5929,0	5932,2	5389,6	5390,57	5927,7	5930,6	73,5	1580	NORMAL TEST
14	2542,0	2524,0	5976,8	5979,67	5418,1	5419,30	5474,5	5977,5	74,1	588	NORMAL TEST
15	2570,0	2552,0	6046,3	6048,4	5458,0	5459,11	6040,1	6043,11	75,2	1043	NORMAL TEST
16	2595,0	2577,0	6100,4	6103,48	5493,6	5494,57	6097,3	6100,26	76,7	204	NORMAL TEST
17	2614,0	2596,0	6146,3	6149,4	5520,9	5521,79	6141,5	6144,16	77,6	123	NORMAL TEST
18	2465,0	2447,0	5794,4	5801,26	5314,3	5315,6	5793,8	5800,23	73,9		SEGREGATED SAMPLE

Table 5.3 Formation pressures, well 34/7-19

# Well 34/7-19



FORMATION FLUID SAMPLING			Well:34/7-19	
			Rig:WEST ALPHA	
Pretest No. 17	Sample Depth: 2465.0 (mRKB)		Witnesses:BAa/ToR	
Run No.: 2A	Sample No.: 1	1st Chamber	2nd Chamber	3rd Chamber
Chamber volume (gals/litres)		2 3/4 gals	1 gal	
Chamber No.			RFSAC 1073	
Filling time (mins.)		27	3.5	
Shut in press. (bar)/T°C		366.5/ 73.9	366.5 /73.9	
Chamber press. (surf bar)/T°C		13.8/ 15	20.7/ 15	
Gas volume (SCF)		0.25	0	
Oil volume (litres)		0.20	traces	
Filtrate density (g/cc)				
Water / Filtrate (litres)		10.3	3.2	
Water / Filtrate PPM CL				
Mud filtrate PPM CL				
Oil density (g/cc)				
Gas composition %				
C <sub>1</sub>				
C <sub>2</sub>				
C <sub>3</sub>				
IC <sub>4</sub>				
NC <sub>4</sub>				
H <sub>2</sub> S				
CO <sub>2</sub>				
<p><b>REMARKS:</b>                      Drawdown during sampling : 40 - 50 psia                      Probe used: Long nose probe, 8 x 0.15" choke                      Hydrostatic pressure after sampling: 5800.2 psia (HP)                      RMF = 0.090 Ohmm at 10 DEG C                      1 gallon chamber opened by Geco.</p>				

Table 5.4 Results from RFT-sample chambers, well 34/7-19

5.2.92 ERF/SWR/BAa

## 5.4 Well Test

A summary of the two well tests is given below. The pressure histories are presented in Figure 5.2 and 5.3, and the main results in Table 5.5. The final results, pressure transient and fluid analysis will be presented in the "Well Test Report 34/7-19".

### Test 1

The water bearing Formation was perforated and tested in the interval 2542 - 2557 mRKB. The main objective of the test was to get representative samples of Brent formation water.

Clean formation water with very little gas was produced.

The test consisted of a 26 hours flow period followed by a 12 hours build-up period. A new flow and build-up period, of 6 and 2 hours, respectively, was then performed for taking bottom-hole samples. Maximum stable production rate during main and sampling flow periods, respectively, was 466 and 290 Sm<sup>3</sup>/d. To avoid sand production, a sandscreen was used. The screen probably became partly plugged by fines, interpreted to have caused the observed large, rate dependent skin. Assuming no formation damage ( $s = 0$ ), a productivity index was estimated at approximately 900 Sm<sup>3</sup>/d/Bar. Initial reservoir pressure and temperature, at sensor depth (2487,7 mRKB), was measured to 369,2 Bar and 86 °C.

Four surface samples, 2 bottomhole, and 3 well head samples were taken during the test and sent to Petrotech a.s. for analysis. A summary of the sampling is given in Table 5.6.

### Test 2

The oil bearing Formation was perforated and tested in the interval 2455,3 - 2468,3 mRKB.

Clean oil (without sand) was produced.

The test consisted of a clean up flow and build-up period of 1.7 and 0.9 hours, respectively, followed by a main flow (multirate) and build-up period of 36 and 24 hours, respectively. Simulation of the test indicates that the flowing pressure behaviour was influenced by clean up effects, while the main build-up analysis shows a clean well with no formation damage. Measured productivity index was 22 Sm<sup>3</sup>/d/Bar and initial pressure and temperature, at sensor depth (2414,2 mRKB), was measured to 361,8 Bar and 83 °C, respectively. Maximum stable production rate was 1070 Sm<sup>3</sup>/d and the corresponding GOR 42 Sm<sup>3</sup>/Sm<sup>3</sup> at  $P_{sep} = 39$  Bar and  $T_{sep} = 43$  °C (gas line).

Four monophasic oil samples, 6 separator sets and 3 separator oil samples were taken during the test and sent to Geco-Prakla for analysis. A summary of the sampling is given in Table 5.7.

It is decided to carry out a full PVT analysis program on a monophasic oil.

Fluid	water	oil
Perforation interval (mRKB)	2542,0-2557,0	2455,3-2468,3
Last flowing rate (Sm <sup>3</sup> /d)	290 (samp. flow)	1070
Max. flowing rate (Sm <sup>3</sup> /d)	466 (main flow)	1070
Last flowing well head pressure (Bar)	113,1 (samp. flow)	128,6
Last flowing bottom-hole pressure (Bar)	361,1*	313,2**
Choke size (mm)	6,4 (samp. flow)	14,3
Fluid density (kg/Sm <sup>3</sup> )	1019	835
Gas gravity (air = 1)	0,645	0,700
GOR (Sm <sup>3</sup> /Sm <sup>3</sup> )	-	42
- at separator pressure (Bar)		39
- at separator temperature (°C)		43 (gas line)

\* BHP at 2487,7mRKB (sampling flow) \*\* BHP at 2414,2 mRKB

Table 5.5 Well Test Data Summary

### 5.5 RFT - Sample

One RFT sample was taken at 2465 mRKB. The RFT chambers contained water and mud filtrate with only traces of oil (Table 5.4).

The one gallon RFT chamber (No RFS AC 1073) was sent to Geco-Prakla. No PVT-analyses were performed.

no	date	start time hr:min	fluid	sampling			bottle no.	remarks
				point	p [Bar]	temp [°C]		
1	22.11.91	13:15	water	surf.	atm.	34,6		set 1
2	22.11.91	19:00	water	surf.	atm.	43,8		set 2
3	22.11.91	20:00	water	surf.	atm.	36,5		set 3
4	22.11.91	21:00	water	surf.	atm.	31,9		set 4
1	23.11.91	18:00	water	b. hole	335	85,0	0126 AA	
2	23.11.91	18:00	water	b. hole	335	85,0	TS-44-03	
1	23.11.91	17:00	water	u.ch.man.	113	32,5	0131 AA	
2	23.11.91	17:30	water	u.ch.man.	113	32,5	0164 AA	PVT-set 2
3	23.11.91	18:30	water	u.ch.man.	113	32,5	0123 AA	PVT-set 3

Table 5.6

Sampling Data, Well 34/7-19, Test No. 1.

no	date	start time hr:min	fluid	sampling			bottle no.	remarks
				point	p [Bar]	temp.[ °C]		
1	09.12.91	20:06	oil	well head	157,0	31	TS-34-07	
2	09.12.91	20:56	oil	well head	157,0	29	TS-29-10	
3	09.12.91	21:47	oil	separator	9,4	18	TS-35-09	
4	09.12.91	21:47	gas	separator	9,4	18	A-14743	
5	10.12.91	00:20	oil	well head	146,0	35	TS-29-20	
6	10.12.91	01:05	oil	well head	146,0	36	TS-40-15	
7	10.12.91	01:47	oil	separator	9,0	43	TS-40-01	
8	10.12.91	01:47	gas	separator	9,0	43	A-15776	
9	10.12.91	05:25	oil	separator	33,1	39	TS-26-20	
10	10.12.91	05:25	gas	separator	33,1	39	A-15779	
11	10.12.91	08:50	oil	separator	38,0	40	A-15739	
12	10.12.91	09:20	oil	separator	37,0	40	A-14758	
13	10.12.91	09:40	oil	separator	37,0	40	A-14758	
14	10.12.91	12:30	oil	separator	37,0	40	TS-24-07	
15	10.12.91	12:30	gas	separator	37,0	40	A-15247	
16	10.12.91	13:29	oil	separator	37,0	41	TS-34-10	
17	10.12.91	13:29	gas	separator	37,0	41	A-16696	
18	10.12.91	14:29	oil	separator	37,0	41	TS-26-22	
19	10.12.91	14:29	gas	separator	37,0	41	A-13992	

Table 5.7

Sampling Data, Well 34/7-19, Test No. 2

Well: 34/7-19

SEUWPM168209126012601260

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
910917	PSPUD					/		/					SPUD MUD
910918	PSPUD					/		/					SPUD MUD
910919	PSPUD					/		/					SPUD MUD
910920	PSPUD					/		/					SPUD MUD
910921	PSPUD					/		/					SPUD MUD
910922	PSPUD					/		/					SPUD MUD
910923	PSPUD		1.05			/		/					SPUD MUD
910924	36"	402.0	1.05			/		/					SPUD MUD
910925	36"	402.0	1.05			/		/					SPUD MUD
910926	9 7/8"	420.0	1.05			/		/					SPUD MUD
910927	9 7/8"	686.0	1.05			/		/					SPUD MUD
910928	26"	1166.0	1.05			/		/					SPUD MUD
910929	26"	1166.0	1.05			/		/					SPUD MUD
910930	26"	1166.0	1.20			/		/					SPUD MUD
911001	26"	1166.0	1.20			/		/					SPUD MUD
911002	26"	1166.0	1.25	18.0	16.0	3/7	7.5	.1/.4	200	60000		6.3	KCL MUD
911003	26"	1166.0	1.25	19.0	16.0	3/8	7.5	.1/.4	200	60000		6.3	KCL MUD
911004	26"	1166.0	1.35	20.0	17.0	3/9	7.5	.1/.4	200	60000		9.4	KCL MUD
911005	26"	1166.0	1.35	20.0	17.0	3/9	7.5	.1/.4	200	60000		9.4	KCL MUD
911006	17 1/2"	1402.0	1.40	32.0	23.0	5/7	8.6	.9/.5	630	66000		9.4	KCL MUD
911007	17 1/2"	1554.0	1.40	33.0	24.0	4/8	8.3	.1/.4	560	69000		11.5	KCL MUD
911008	17 1/2"	1767.0	1.45	34.0	22.0	4/5	8.5	.1/.4	480	65000		13.4	KCL MUD
911009	17 1/2"	1960.0	1.50	30.0	15.0	4/4	8.6	.1/.5	600	70000		15.1	KCL MUD
911010	17 1/2"	1960.0	1.52	25.0	15.0	3/4	8.2	.0/.3	1400	68000		15.6	KCL MUD
911011	17 1/2"	1960.0	1.52	23.0	15.0	5/6	8.5	.0/.2	1500	72000		15.4	KCL MUD
911012	17 1/2"	1960.0	1.52	21.0	14.0	3/4	9.0	.0/.3	1360	72000		15.4	KCL MUD
911013	17 1/2"	1960.0	1.52	20.0	13.0	3/4	11.4	.4/1.1	1440	68000		15.5	KCL MUD

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Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
911014	12 1/4"	2160.0	1.60	36.0	24.0	4/8	9.2	.1/.6	480	65000		18.7	KCL MUD
911015	12 1/4"	2303.0	1.62	34.0	25.0	4/10	9.3	.0/.5	600	62000		20.0	KCL MUD
911016	12 1/4"	2439.0	1.64	35.0	24.0	5/10	8.6	.0/.5	680	63000		19.9	KCL MUD
911017	12 1/4"	2439.0	1.64	38.0	25.0	5/12	8.3	.0/.5	640	62000		19.9	KCL MUD
911018	12 1/4"	2439.0	1.64	38.0	25.0	5/12	8.3	.0/.5	640	62000		18.8	KCL MUD
911019	12 1/4"	2439.0	1.64	38.0	25.0	5/12	8.3	.0/.5	640	62000		19.9	KCL MUD
911020	12 1/4"	2439.0	1.64	38.0	25.0	5/12	8.3	.0/.5	640	62000		19.9	KCL MUD
911021	12 1/4"	2439.0	1.64	38.0	25.0	5/12	8.3	.0/.5	640	62000		19.9	KCL MUD
911022	12 1/4"	2439.0	1.64	38.0	25.0	5/12	8.3	.0/.5	640	62000		19.9	KCL MUD
911023	12 1/4"	2439.0	1.64	46.0	24.0	5/16	8.5	.0/.4	640	63000		19.9	KCL MUD
911024	12 1/4"	2439.0	1.64	46.0	25.0	4/17	8.4	.1/.4	640	63000		19.9	KCL MUD
911025	12 1/4"	2449.0	1.64	31.0	14.0	3/6	8.6	.1/.7	700	59000		19.7	KCL MUD
911026	12 1/4"	2451.0	1.64	30.0	15.0	3/6	8.5	.1/.6	800	58000		19.9	KCL MUD
911027	12 1/4"	2485.0	1.64	29.0	15.0	3/7	8.4	.0/.4	720	58000		19.9	KCL MUD
911028	12 1/4"	2508.0	1.64	30.0	16.0	3/10	8.3	.0/.4	720	59000		19.8	KCL MUD
911029	12 1/4"	2508.0	1.64	32.0	20.0	4/11	8.0	.0/.3	680	56000		20.0	KCL MUD
911030	12 1/4"	2558.0	1.64	33.0	20.0	3/11	8.0	.0/.3	720	57000		20.0	KCL MUD
911031	12 1/4"	2558.0	1.64	30.0	16.0	3/10	8.0	.0/.3	720	57000		20.0	KCL MUD
911101	12 1/4"	2558.0	1.64	30.0	15.0	3/10	8.0	.0/.3	720	57000		20.0	KCL MUD
911102	12 1/4"	2558.0	1.64	30.0	15.0	3/10	8.0	.0/.3	720	58000		20.0	KCL MUD
911103	12 1/4"	2558.0	1.64	32.0	18.0	4/14	8.1	.0/.5	800	58000		21.0	KCL MUD
911104	12 1/4"	2577.0	1.64	32.0	19.0	3/10	8.0	.0/.5	800	57000		20.0	KCL MUD
911105	12 1/4"	2605.0	1.64	28.0	16.0	4/9	8.0	.0/.5	800	57000		20.0	KCL MUD
911106	12 1/4"	2633.0	1.64	28.0	14.0	3/9	8.0	.0/.5	720	58000		19.0	KCL MUD
911107	12 1/4"	2661.0	1.64	33.0	15.0	3/7	7.9	.0/.5	840	57000		20.0	KCL MUD
911108	12 1/4"	2724.0	1.64	29.0	15.0	4/9	7.9	.0/.5	760	57000		20.0	KCL MUD
911109	12 1/4"	2794.0	1.64	28.0	15.0	4/13	7.9	.0/.5	720	55000		20.0	KCL MUD

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Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
9111110	12 1/4"	2800.0	1.64	30.0	15.0	5/15	7.9	.0/.5	780	54000		20.1	KCL MUD
9111111	12 1/4"	2800.0	1.64	30.0	15.0	5/15	8.0	.0/.5	780	54000		20.1	KCL MUD
9111112	12 1/4"	2800.0	1.64	30.0	15.0	5/15	8.0	.0/.5	780	54000		20.1	KCL MUD
9111113	12 1/4"	2800.0	1.64	19.0	16.0	4/10	7.4	.2/.4	680	55000		20.0	KCL MUD
9111114	12 1/4"	2800.0	1.64	21.0	22.0	4/16	7.9	.3/.4	720	54000		20.0	KCL MUD
9111115	12 1/4"	2800.0	1.64	21.0	22.0	4/16	7.9	.0/.4	720	54000		20.0	KCL MUD
9111116	12 1/4"	2800.0	1.64	27.0	22.0	7/27	9.9	.1/.5	720	50000		20.5	KCL MUD
9111117	DST#1	2800.0	1.64	33.0	24.0	6/26	8.9	.9/.5	680	48000		21.0	KCL MUD
9111118	DST#1	2800.0	1.64	33.0	24.0	6/26	8.9	.6/.5	680	48000		21.0	KCL MUD
9111119	DST#1	2800.0	1.64	33.0	24.0	6/26	8.9	.6/.5	680	48000		21.0	KCL MUD
9111120	DST#1	2800.0	1.64	33.0	24.0	6/26	8.9	.1/.5	680	48000		21.0	KCL MUD
9111121	DST#1	2800.0	1.64	34.0	24.0	5/26	8.5	.1/.5	680	48000		21.0	KCL MUD
9111122	DST#1	2800.0	1.64	35.0	24.0	6/26	8.5	.1/.4	680	45000		21.0	KCL MUD
9111123	DST#1	2800.0	1.64	34.0	24.0	5/25	8.5	.1/.4	680	46000		21.0	KCL MUD
9111124	DST#1	2800.0	1.64	34.0	20.0	6/29	8.2	.0/.4	680	50000		21.0	KCL MUD
9111125	DST#1	2800.0	1.64	34.0	20.0	6/29	8.2	.0/.4	680	50000		21.0	KCL MUD
9111126	DST#1	2800.0	1.64	34.0	20.0	6/29	8.2	.0/.4	680	50000		21.0	KCL MUD
9111127	DST#1	2800.0	1.64	28.0	22.0	5/20	8.9	.1/.5	720	48000		21.0	KCL MUD
9111128	DST#1	2800.0	1.64	29.0	21.0	5/19	10.0	.1/.5	720	48000		21.0	KCL MUD
9111129	DST#1	2800.0	1.64	31.0	21.0	6/20	10.3	.1/.5	760	48000		21.0	KCL MUD
9111130	DST#1	2800.0	1.64	31.0	21.0	6/20	10.3	.1/.5	760	48000		21.0	KCL MUD
911201	DST#1	2800.0	1.64	29.0	19.0	5/18	11.0	.1/.8	800	45000		21.0	KCL MUD
911202	DST#1	2800.0	1.64	28.0	19.0	5/19	11.5	.1/.7	800	45000		21.0	KCL MUD
911203	DST#1	2800.0	1.64	27.0	20.0	6/27	11.0	.1/.7	720	40000		20.0	KCL MUD
911204	DST#1	2800.0	1.64	27.0	20.0	6/27	11.0	.1/.6	720	40000		20.0	KCL MUD
911205	DST#1	2800.0	1.64	27.0	20.0	6/27	11.2	.2/.7	760	40000		20.0	KCL MUD
911206	DST#1	2800.0	1.64	28.0	30.0	9/28	10.9	.1/.4	960	39000		20.0	KCL MUD



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Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
911207	DST#1	2800.0	1.64	29.0	26.0	9/28	10.5	.1/.4	560	39000		20.0	KCL MUD
911208	DST#2	2800.0	1.64	29.0	26.0	9/28	10.5	.1/.4	560	39000		20.0	KCL MUD
911209	DST#2	2800.0	1.64	29.0	26.0	9/28	10.5	.1/.4	560	39000		20.0	KCL MUD
911210	DST#2	2800.0	1.64	29.0	26.0	9/28	10.5	.1/.4	560	39000		20.0	KCL MUD
911211	DST#2	2800.0	1.64	29.0	26.0	9/28	10.5	.1/.4	560	39000		20.0	KCL MUD
911212	DST#2	2800.0	1.64	24.0	26.0	8/24	9.5	.1/.3	980	39000		20.0	KCL MUD
911213	DST#2	2800.0	1.64	24.0	26.0	8/24	9.5	.1/.3	980	39000		20.0	KCL MUD
911214	DST#2	2800.0	1.64	25.0	25.0	8/24	9.5	.1/.3	940	39000		20.0	KCL MUD
911215	DST#2	2800.0	1.64	25.0	25.0	8/24	9.6	.1/.3	940	39000		20.0	KCL MUD
911217	P&A					/		/					P&A FLUID
911218	P&A					/		/					P&A FLUID
911219	P&A					/		/					P&A FLUID
911220	P&A					/		/					P&A FLUID
911221	P&A					/		/					P&A FLUID
911222	P&A					/		/					P&A FLUID
911223	P&A					/		/					P&A FLUID
911224	P&A					/		/					P&A FLUID
911225	P&A					/		/					P&A FLUID
911226	P&A					/		/					P&A FLUID
911227	P&A					/		/					P&A FLUID

6.2.2 Mud Materials Used

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Material	Unit	36" hole	26" hole	17 1/2" hole	12 1/4" hole	DST	Total
Barite	MT		37	568	526	363	1494
Bentonite	MT	25	15	n	10	4	60
Caustic Soda	25 kg	8	16				24
Citric Acid	25 kg				16	5	21
Lime	25 kg			70			70
Soda Ash	25 kg			5			5
Pot. Bicarb	25 kg			1	90	45	136
Pot. Hydroxide	25 kg				3		3
Desco CF	25 lb				10	4	14
Antisol 30	25 kg			405	258		663
Antisol 30000	25 kg			73	10		83
XC Polymer	25 kg			30	14	42	86
Blacksmith 0-837	200 ltr				2	1	3
Barafilm	55 gal				3	1	4
Pot. Chlorid	25 gal			350			350
Pot. Chlor. Brine	m 3			618	71		689
Barascav-D	25 kg			23	15	5	43
Condet	55 gal				2		2
EZ mud DP	25 kg			78	48		126

Table 6.2.2 Mud Materials Used