DRILLING SERVICES

D I R E C T I O N A L D R I L L I N

FOR WELL 31/2-13.

Kick-off started at 500 m. in 14 3/4" hol
455.5m.
B.H.A. no. 1, 14 3/4" BIT, 9 1/2" Navi Drill, 1 1/2° Bent Sub, Orienting Sub, 2 x 9 1/2" NMDC, X.O., 3 x 8" DC, Down-Jar, Up-Jar, 2 x 8" DC, X.O., 1 HWDP, Dart Sub, 32 HWDP. The bit was run without jets because expected soft formations could cause washing out and result in a lower angle build.

Scientific Drilling Controls' steering tool was utilized through the initial build-up section. A long spare kelly hose on the rig made it possible to use 3 joints of HWDP, a pup joint of DP on top and two valves below as a "kelly".

At 583 m. the drilling operations was halted because of rough weather, which made it difficult to maintain a constant weight on bit. The bit was pulled into the casing shoe.
After the heave subsided the bit was run to bottom w/o problems and operations resumed. The initial kick-off was stopped at 750 m. as Shell wanted no more than 15 deg. angle at 20" casing point projected at 804m.

The BHA worked good and gave ample angle build. Max dogleg was 2.51 °/30m., more than the plan called for (1.5 °/30m.)
Below 640 m., survey depth 624 m., one single was drilled with rotation in an attempt to reduce the dogleg to the planned 1.5 °/30 m., but further rotation was halted by the Shell office in Stavanger with the understanding that the dogleg was allowed to be higher.
The string was worked and circulated more after each "kelly down" in order to get some washing out effect. Average angle build was 1.8 °/30 m.
A 1° Bent Sub could have been used and /or small jets at this stage, but that would have called for one extra round trip.

COMMENTS ON KICK-OFF

The choice of a 1 1/2° Bent Subs and no jets for the bit was made because of fears that the soft formation would wash out. Our experience now tells us that this was not a big problem. It should be considered for the next well to run:-

DRILLING SERVICES

D I R E C T I O N A L D R I L L I N G R E P O R T

FOR WELL 31/2-13.

Kick-off started at 500 m. in 14 3/4" hole below 30" casing set at 455.5m.
B.H.A. no. 1, 14 3/4" BIT, 9 1/2" Navi Drill, 1 1/2° Bent Sub, Orienting Sub, 2 x 9 1/2" NMDC, X.O., 3 x 8" DC, Down-Jar, Up-Jar, 2 x 8" DC, X.O., 1 HWDP, Dart Sub, 32 HWDP. The bit was run without jets because expected soft formations could cause washing out and result in a lower angle build.

Scientific Drilling Controls' steering tool was utilized through the initial build-up section. A long spare kelly hose on the rig made it possible to use 3 joints of HWDP, a pup joint of DP on top and two valves below as a "kelly".

At 583 m. the drilling operations was halted because of rough weather, which made it difficult to maintain a constant weight on bit. The bit was pulled into the casing shoe.
After the heave subsided the bit was run to bottom w/o problems and operations resumed. The initial kick-off was stopped at 750 m. as Shell wanted no more than 15 deg. angle at 20" casing point projected at 804m.

The BHA worked good and gave ample angle build. Max dogleg was 2.51 °/30m., more than the plan called for (1.5 °/30m.)
Below 640 m., survey depth 624 m., one single was drilled with rotation in an attempt to reduce the dogleg to the planned 1.5 °/30 m., but further rotation was halted by the Shell office in Stavanger with the understanding that the dogleg was allowed to be higher.
The string was worked and circulated more after each "kelly down" in order to get some washing out effect. Average angle build was 1.8 °/30 m.
A 1° Bent Sub could have been used and /or small jets at this stage, but that would have called for one extra round trip.

COMMENTS ON KICK-OFF

The choice of a 1 1/2° Bent Subs and no jets for the bit was made because of fears that the soft formation would wash out. Our experience now tells us that this was not a big problem. It should be considered for the next well to run:-

1) Jets in the bit - (once or twice the bit "balled")

2) 1° Bent-Sub .(Although this may give less than 1.5/30m. build.)

3) A shorter tooth bit, as the OSC 3 AJ came out with the inside rows of teeth worn completely, and probably would not have made it to the planned depth of 825 m.

4) A down hole motor with higher max volume requirements, the mach III was quite adequate for the 14 3/4" pilot hole. Hole cleaning may have been a problem if run in 17 1/2" for a correction run etc.

At 750 m. the assembly was pulled and BHA no. 2 consisting of 14 3/4" Bit, 14 3/4" N.B. stabilizer, 1 x 9 1/2" NMDC, 14 3/4" Stabilizer 1 x 9 1/2" NMDC, 14 3/4" stabilizer, X.O., 9 x 8" DC's, Jars, 2 x 8" DC, 1HWDP, Dart Sub, 32 HWDP was RIH.

The BHA no. 2 was worked down to 720 m. with normal resistance. The hole from 720 m. - 750 m. took light reaming. Then drilling with the assembly from 750 m. to 825 m. (csg. point). Opening of the 14 3/4" hole to 26" went without difficulties down to 775 m. where high pump pressure was encountered. The assembly was pulled and another similar assembly with a pup joint instead of a 30' DP was tried without success. Then a 14 3/4" Bit was run below the hole opener and the hole opened to casing point. The 20" casing was run without difficulties.

COMMENTS ON OPENING PILOT -HOLE

The problem arose with the hole opener at 775 m. and the bull nose at around 785m. This section of hole was near full gauge, accordinng to the caliper log, whereas previously it was enlarged from washing out. The flexible stinger allowed the bullnose to droop and catch on the ledge leading into the smaller diameter hole, making it impossible to progress. The only sure way to overcome this problem would be to run a bit below the hole opener from the beginning, but this could cause a sidetrack. Perhaps a shorter stinger between the bullnose and the hole opener would be the answer here.

17 1/2" SECTION

After the 20" casing was drilled out, a build-up assembly, BHA no.3 was RIH. It consisted of 17 1/2" OSC/G 3 x20 Bit, 17 15/32" 2 N.B. Stabilizer. 2 x 9 1/2" NMDC, 1 x 9 1/2"DC, 17 15/32" Stablizer, 1 x 9 1/2" DC, 17 15/32" Stabilizer, X.O., 5 x 8" DC, Down Jar, Up Jar, 2 x 8" DC, X.O., 1 HWDP, Dart Sub, 32 HWDP. The assembly was run from 819 to 943, where it gave too much angle build despite low weight on bit and a lot of reaming.

Then BHA no. 4, 17 1/2" OSC/G 3 x 20 Bit, 17 15/32" N.B., 2 x 9 1/2" NMDC, 17 15/32" Stabilizer, 1 x 9 1/2" DC, 17 15/32" Stabilizer, 1 x 9 1/2"DC, X.O., 5 x 8" DC, Down Jar, Up Jar, 2 x8" DC, X/O, 1 HWDP, Dart Sub, 32 HWDP was RIH. This assembly gave about 2.5°/30 m. angle build from 25.5° to about 40° of hole angle. During this assembly run we started to encounter very high drag during single shot surveys. Drag of 100 000 lbs. was normally the case during the survey and most of the time one single had to be laid out, the kelly picked up so the bit could be washed to bottom, up to 200 000 lbs. had to be used to work and jar up to the next tool joint.

Next BHA no. 5 was 17 1/2" Bit Oscig 3 x 20, 17 15/32" N.B. Stabilizer, 1 x 9 1/2" NMDC, 17 15/32" NM Stabilizer, 1 x 9 1/2" NMDC 1 x 9 1/2" DC, 17 15/32" Stabilizer, 1 x 9 1/2" DC, X.O., 5 x 8" DC, Down Jar, Up Jar, 2 x 8" DC, X.O. 1 HWDP Dart Sub, 32HWDP. THis assembly surprisingly had a strong dropping tendency of 1.2 °/30m. and had to be POOH. The BHA was run between 1152 m. and 1295 m. Then BHA no. 4 was RIH again and used from 1295 to 1391 m.

The wireline broke when pulling the survey tool out, but no attempt was made to fish out the wireline and survey tool as the hole angle was expected to be very near the desired one, going by achieved angle build. Then BHA no. 6, 17 1/2" OSC IG 3 x 20, 17 15/32" N.B. Stabilizer, 1 x 9 1/2" Short NMDC, Bit sub, 1 x 9 1/2"NMDC, 17 15/32" NB Stabilizer, 1 x 9 1/2 NMDC, 1 x 9 1/2" DC, 17 15/32" Stabilizer, 1 x 9 1/2"DC, X.O. 8 x 8" DC, Down Jar, Up Jar 2 x 8" DC, X.O., 1 HWDP, Dart Sub, 32 HWDP was RIH. THe assembly worked as expected with a hold to a slight building tendency and was used to casing point.

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DRILLING SERVICES

DISCUSSION ON BHA SELECTION

Because the hole was lined up on target it was decided to take the risk and R.I.H. with a build up assembly after drilling out 20" shoe instead of rerunning the down hole motor.
With only 14° in the hole the "90 ft."build up assembly was chosen to pick up the angle.
This proved to work too well, and had to be pulled and replaced with a "60 ft." assembly, which built up at the desired rate to around 41°.

In retrospect the "60 ft." assembly should be adequate to attain the 2.5°/30m. rate of build, but it may be slow at the beginning if only 14° of angle in the hole.

The locked in assembly which dropped angle coincided with formation changes and perhaps should not be discarded in future. Perhaps an under gauge stabilizer at "30 ft." would work.

CONCLUSION

This well proved that the objective displacement could be reached without resorting to excessively high max angles. Good rates of build can be achieved high up in the hole. Problems to watch are occasional tight hole, and a possible dropping tendency at around 1200 m. T.V.D.
With the well finishing up very close to the center of the target and taking approx 12 directional drilling days, 31/2-13, the Troll fields first directional well was a success.

DS ds Engineers: I. Nitis
J. Schultzberg
D. Milne

Final report : I. Nitis

DIRECTIONAL DRILLING PLAN 31/2-H

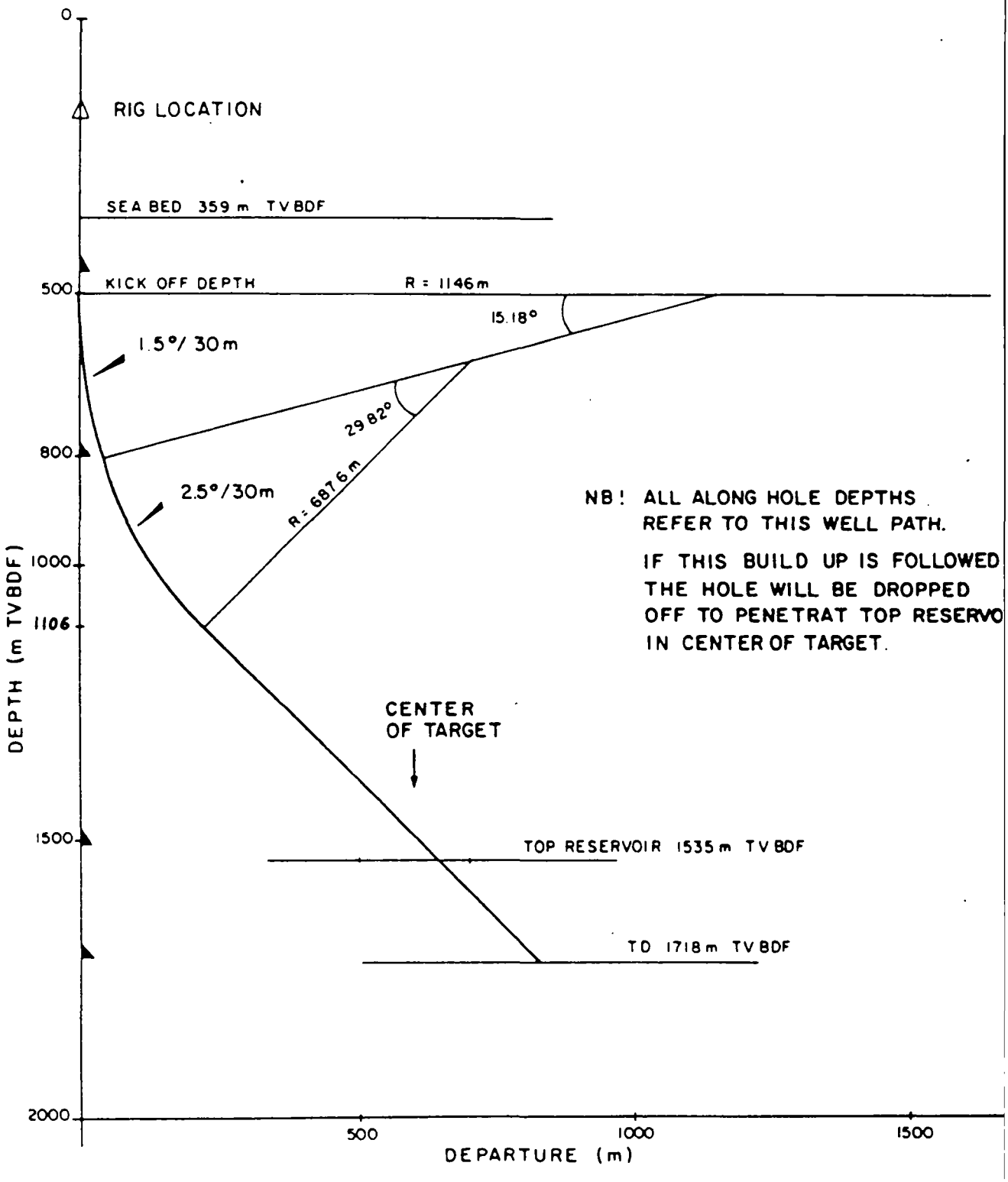

FIG. 2

NSEP 197 G1205/

[redacted]

COMPANY	SHELL
FIELD	TROLL
WELL NO.	31/2-13
MAX. ANGLE	45
DIRECTION	318.86
TYPE OF SURVEY	Magnetic Single Shot
ENGINEER	D.Milne, I. Nitis &I.Schultzberg.

SHEET 1 OF 2

RB	Rock Bit	KS	Kick Sub
DB	Diamond Bit	DC	Drill Collar
BS	Blades Stabilizer	HW	Heavy Weight DP
RR	Roller Reamer	DP	Drill Pipe
SR	String Reamer		
MK	K Monel		
TD	Turbo Drill		
DD	Dyna Drill		

DATE:

Measured Depth	Drift Angle	Geographic Direction	Total Vertical Depth	TOTAL SECTION	RECTANGULAR COORDINATES North	South	East	West	DOG LEG °	BUILD + −	TURN + −	BOTTOM HOLE ASSEMBLE	Drilling Weight 000	RPM	PSI
355	0	123 00	355	-			-		-	-	-				
513	0.75	123 00	513	- 1		0.56	0.87		0.14	0.14	-	BHA no.1 500m. -750m.	5/10		1200/1400
539	1.50	307 00	538	- 0.92		0.30	1.06		2.60	0.87	-		"		"
570	2.75	312 00	569	0.22	0.44		0.17		1.22	1.21	6		"		"
595	4.25	312 00	594	1	1.46			0.96	1.80	1.80	-		"		"
624	6.50	322 00	623	4	3			2	2.51	2.33	10.34		"		"
662	8.00	322 00	661	9	7			5	1.20	1.08	-		"		"
690	10.25	320 00	689	13	10			8	2.44	2.41	-2.14		"		"
719	12.50	320 00	717	19	15			12	2.33	2.33	-		"		"
733	13.25	319 00	731	22	17			14	1.68	1.61	-2.14		"		"
769	14.00	319 00	766	30	23			19	0.62	0.62	-	BHA no.2 750m. -825m.	35	120	2150
818	14.25	319 00	813	42	32			27	0.15	0.15	-		"	"	"
834	14.25	319 00	829	46	35			30	-	-	-	BHA no.3 819m. -943m.	35	90	1850
854	15.25	318 50	848	51	39			33	1.52	1.50	-1.50		50	90	1900
905	22.25	318 00	896	68	51			44	4.12	4.12	-		30	100	1900
929	25.50	317 50	918	78	59			51	4.08	2.81	-0.62		35	100	1900
974	29.00	314 50	958	98	73			65	2.50	2.33	-2.00	BHA no.4 943m. - 1153m.	35	125	3400
1024	31.25	314 50	1002	123	91			83	1.35	1.35	-		45	90	3400
1068	35.00	314 00	1038	147	108			100	2.57	2.56	-0.34		50/55	90	3400
1118	39.50	317 00	1078	177	129			121	2.91	2.40	1.80		35/40	110/120	3400

[redacted]

COMPANY	SHELL
FIELD	TROLL
WELL NO.	31/2-13
MAX. ANGLE	45
DIRECTION	318.86
TYPE OF SURVEY	Magnetic Single Shot
ENGINEER	D.Milne. I.Nitis &J. Schultzberg.

SHEET 2 OF 2

RB	Rock Bit	KS	Kick Sub
DB	Diamond Bit	DC	Drill Collar
BS	Blades Stabilizer	HW	Heavy Weight DP
RR	Roller Reamer	*DP*	*Drill Pipe*
SR	String Reamer		
MK	K Monel		
TD	*Turbo Drill*		
DD	Dyna Drill		

DATE:

Measured Depth	Drift Angle	Geographic Direction	Total Vertical Depth	TOTAL SECTION	RECTANGULAR COORDINATES North	South	East	West	DOG LEG °	BUILD + −	TURN + −	BOTTOM HOLE ASSEMBLE	Drilling Weight	RPM	PSI
1184	41.0	319.50	1129	220	161			150	1	0.68	1.14	BHA no. 5 1153 m - 1295m	40	110	3100
1230	39.0	319.50	1164	250	184			169	1.30	-1.30	-		55	100	3100
1280	37.0	320.50	1203	280	207			189	1.26	-1.20	0.60		60	80	3100
1327	39.0	320.50	1240	309	230			207	1.28	1.05	-	BHA no. 4 1295 m -1391 m	50/55	90	3200
1377	42.75	322.00	1278	342	255			227	2.32	2.25	0.90		30/35	120	3400
1426	44.25	320.50	1314	376	281			249	1.12	0.79	-0.92	BHA no. 6 1391m. - 1710 m(Casing point)	35/40	110	3400
1472	44.50	320.50	1346	408	306			269	0.16	0.16	-		50	120	3450
1517	45.00	322.00	1378	439	331			289	0.78	0.33	1		55	110	3450
1570	45.00	322.00	1416	477	360			312	-	-	-		60	110	3400
1612	45.25	322.50	1445	507	384			330	0.31	0.18	0.36		60	110	3400
1700	45.75	323.00	1507	569	434			368	0.21	0.17	0.17		50	110	3350

[redacted]
DRILLING SERVICES

Summary of progress from Kick-off at 500 m. to 13 3/8 csg. point at 1710 m.

BHA no.	Size	Depth In	Depth Out	Footage	HRS	Rop m/hr	Remarks
1	14 3/4	500	750	250	17*	14.7*	Rop slowed down at 750
2	14 3/4	750	825	75	3	25	
3	17 1/2	819	943	124	6	20.7	
4	17 1/2	943	1153	210	9.5	22.1	Mud wt 1.32-1.40 Increased
5	17 1/2	1153	1295	142	5.5	25.8	
4	17 1/2	1295	1391	96	4	24	
6		1391	1710	319	17	18.8	

* inclusive of circulation time.

BHA COMPONENTS

BHA NO.1

	Length
14 3/4 Bit Osc 3AJ Open	0.40
9 1/2 Navi Drill	7.57
1 1/2° Bent Sub	0.72
Orienting Sub	0.46
2 x 9 1/2 NMDC	17.56
X.O.	0.91
3 x 8" DC	27.25
Down Jar	5.51
Up Jar	6.17
2 x 8" DC	18.28
X.O.	0.76
1 HWDP	9.29
Dart Sub	0.41
32 HWDP	292.85

DRILLING SERVICES

BHA NO.2

	Length
14 3/4 Bit S4J 3 x 18	0.40
14 3/4 N.B. Stab	2.21
9 1/2 NMDC	8.82
14 3/4 Stab	2.08
9 1/2 NMDC	8.83
14 3/4 Stab	2.02
X.O.	0.91
9 x 8" DC	83.31
D.Jar	
etc. same as BHA no.1	

BHA NO.3

	Length
17 1/2 Bit Oscig 3 x20	0.41
17 15/32 N.B. Stab	1.91
2 x 9 1/2 NMDC	17.65
1 x 9 1/2 DC	8.86
17 15/32 Stab	1.98
1 x 9 1/2 DC	8.84
17 15/32 Stab	2.09
X.O.	1.09
5 x 8" DC	46.48
Rest same as BHA no.1	

BHA NO.4

	Length
17 1/2 Bit Oscig 3 x20	0.41
17 15/32 N.B. Stab	1.91
2 x 9 1/2 NMDC	17.65
17 15/32 Stab	2.09
1 x 9 1/2 DC	8.86
17 15/32	1.98
1 x 9 1/2 DC	8.84
X.O.	1.09
5 x 8" DC	46.48
Rest same as BHA no.1	

[redacted]
DRILLING SERVICES

BHA NO.5

	Length
17 1/2 Bit Oscig 3 x20	0.41
17 15/32 N.B. Stab	1.91
1 x 9 1/2 NMDC	8.82
17 15/32 NM Stab	2.11
1 x 9 1/2 NMDC	8.83
1 x 9 1/2 DC	8.86
17 15/32 Stab	1.98
1 x 9 1/2 DC	8.84
X.O.	
5 x 8" DC	
Rest same as BHA no.1	

BHA NO.6

	Length
17 1/2 Bit Oscig 3 x 20	0.41
17 15/32 N.B. Stab	1.91
1 x 9 1/2 Short NMDC	3.38
Bit Sub	1.22
1 x 9 1/2 NMDC	8.82
17 15/32 NM Stab	2.09
1 x 9 1/2 NMDC	8.83
1 x 9 1/2 DC	8.86
17 15/32 Stab	1.98
1 x 9 1/2 DC	8.84
X.O.	1.09
8 x 8" DC	74.04
Rest same as BHA no.1	

D S
DRILLING
SERVICES

WELL : 31/2-13 SRG

D S
DRILLING
SERVICES

SURVEY COMPUTATIONS

Dowell Schlumberger
Drilling Services
P.O. Box 138 , 4001 Stavanger,
Norway.

Region WDS
Division EUR
Location TNO

NORSKE SHELL
Tananger
Norway.

Area	:	NORTH SEA
Country	:	NORWAY
Field	:	31/2-H
Rig/platform	:	BORGNY DOLPHIN
Job number	:	01
Surveyed on	:	31-JAN-84
Engineer	:	IKE NITIS.

General description

Magnetic measurement tool
Measurement tool identification SURFACE READOUT GYRO

Declination 0.00 W degrees

All bearings are TRUE

RKB Coordinates are relative to TROLL FIELD

Other coordinates are relative to RKB

	Units	RKB
Measured Depth	meters	0.00
Inclination	degrees	0.00
TRUE bearing	degrees	0.00
True Vertical Depth	meters	0.00
Latitude	meters	0.00 N
Departure	meters	0.00 E

Target description

Target Coordinates are relative to starting point

	Units	TARGET 31/2-13
Inclination	degrees	44.32
TRUE bearing	degrees	318.86
True Vertical Depth	meters	1535.00
Latitude	meters	444.33 N
Departure	meters	388.16 W
Radius of target	meters	100.00

	TROLL FIELD	RKB
Latitude	60DEGS 47MINS 14.15SECS NORTH	0.0
Departure	03DEGS 26MINS 03.43SECS EAST	0.0
True Vertical Depth	FINAL POSITION BORGNY DOLPHIN	0.0

Target

	TARGET 31/2-13
Latitude	60DEGS 47MINS 28.56SECS NORTH
Departure	03DEGS 25MINS 37.66SECS EAST
True Vertical Depth	CENTER OF GEOLOGICAL TARGET

Template
MSL TO SEABED 333 M
RKB TO MSL 25 M
RKB TO SEABED 358 M

Casing program

Measured Depth	Casing diameter
meters	inches
455.55	30
806.00	20
1700.00	13 3/8
1999.00	9 5/8

Surveyed well computed by: Radius of Curvature Method
Coordinates are relative to RKB
Vertical section computed on a bearing of: 318.86

Measured Depth meters	Inclination degrees	Bearing degrees	True Vertical Depth meters	Latitude meters	Departure meters	Vertical section meters	Dog-leg severity d/30m
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	
360.00	0.00	0.00	360.00	0.00 N	0.00 E	0.00	0.00
390.00	1.08	106.12	390.00	0.08 S	0.27 E	-0.24	1.08
420.00	1.15	109.32	419.99	0.26 S	0.83 E	-0.74	0.09
450.00	1.27	104.38	449.99	0.44 S	1.43 E	-1.27	0.16
480.00	1.06	103.47	479.98	0.60 S	2.02 E	-1.77	0.21
510.00	0.41	6.43	509.98	0.40 S	2.30 E	-1.81	1.18
540.00	1.60	313.42	539.97	0.09 N	2.13 E	-1.34	1.40
570.00	3.26	316.07	569.94	0.98 N	1.23 E	-0.07	1.66
600.00	4.82	319.98	599.87	2.55 N	0.20 W	2.05	1.58
630.00	6.84	325.27	629.71	4.97 N	2.04 W	5.09	2.09
660.00	8.22	323.98	659.45	8.18 N	4.31 W	9.00	1.40
690.00	10.55	320.88	689.05	12.06 N	7.30 W	13.88	2.38
720.00	12.79	317.45	718.43	16.65 N	11.26 W	19.94	2.34
750.00	13.90	316.03	747.62	21.70 N	16.01 W	26.86	1.16
780.00	14.04	316.77	776.73	26.93 N	21.00 W	34.10	0.22
810.00	14.40	316.88	805.81	32.31 N	26.04 W	41.46	0.36
840.00	14.64	315.80	834.85	37.75 N	31.24 W	48.98	0.36
870.00	16.99	315.83	863.71	43.61 N	36.93 W	57.14	2.35
900.00	21.23	316.32	892.06	50.68 N	43.74 W	66.95	4.24

Coordinates are relative to RKB
Vertical section computed on a bearing of: 318.86

Measured Depth meters	Inclination degrees	Bearing degrees	True Vertical Depth meters	Latitude meters	Departure meters	Vertical section meters	Dog-leg severity d/30m
930.00	25.27	315.85	919.61	59.21 N	51.96 W	78.77	4.04
960.00	27.61	315.73	946.47	68.78 N	61.27 W	92.11	2.34
990.00	29.32	315.88	972.85	79.03 N	71.24 W	106.40	1.71
1020.00	31.05	315.97	998.78	89.87 N	81.73 W	121.45	1.73
1050.00	33.18	315.03	1024.20	101.24 N	92.91 W	137.37	2.20
1080.00	35.74	315.85	1048.92	113.34 N	104.82 W	154.31	2.60
1110.00	38.36	316.27	1072.86	126.35 N	117.36 W	172.37	2.63
1140.00	40.87	316.65	1095.97	140.22 N	130.53 W	191.48	2.52
1170.00	41.37	316.88	1118.57	154.60 N	144.05 W	211.20	0.52
1200.00	40.68	317.50	1141.20	169.04 N	157.43 W	230.87	0.80
1230.00	39.47	318.22	1164.16	183.36 N	170.40 W	250.18	1.30
1260.00	38.16	319.07	1187.53	197.47 N	182.81 W	268.99	1.42
1290.00	37.05	319.60	1211.30	211.36 N	194.74 W	287.30	1.16
1320.00	38.60	320.05	1235.00	225.41 N	206.61 W	305.70	1.58
1350.00	41.32	320.30	1257.99	240.21 N	218.95 W	324.95	2.73
1380.00	43.92	320.33	1280.06	255.84 N	231.92 W	345.26	2.60
1410.00	44.82	320.35	1301.51	271.99 N	245.31 W	366.23	0.91
1440.00	45.04	320.22	1322.75	288.30 N	258.84 W	387.41	0.24
1470.00	45.26	321.18	1343.90	304.75 N	272.32 W	408.66	0.71
1500.00	45.55	321.57	1364.97	321.44 N	285.65 W	430.01	0.41
1530.00	45.72	321.80	1385.94	338.27 N	298.95 W	451.43	0.24

Coordinates are relative to RKB
Vertical section computed on a bearing of: 318.86

Measured Depth meters	Inclination degrees	Bearing degrees	True Vertical Depth meters	Latitude meters	Departure meters	Vertical section meters	Dog-leg severity d/30m
1560.00	45.90	321.82	1406.85	355.18 N	312.25 W	472.91	0.18
1590.00	46.02	321.97	1427.71	372.15 N	325.56 W	494.45	0.16
1620.00	45.79	321.82	1448.60	389.10 N	338.85 W	515.96	0.25
1650.00	46.06	321.88	1469.45	406.05 N	352.17 W	537.50	0.27
1680.00	46.18	321.85	1490.25	423.06 N	365.52 W	559.08	0.12
1705.00	45.47	322.18	1507.67	437.20 N	376.55 W	576.98	0.90
1730.00	46.65	321.80	1525.02	451.37 N	387.64 W	594.96	1.45
1755.00	45.99	321.73	1542.28	465.57 N	398.83 W	613.02	0.80
1780.00	45.23	321.47	1559.77	479.57 N	409.93 W	630.86	0.94
1805.00	44.60	321.45	1577.47	493.38 N	420.92 W	648.50	0.76
1830.00	43.99	321.27	1595.37	507.02 N	431.82 W	665.94	0.74
1855.00	43.44	321.03	1613.44	520.48 N	442.66 W	683.20	0.70
1880 00	43.42	320.83	1631.60	533.82 N	453.50 W	700.38	0.17
1905.00	42.91	320.35	1649.83	547.03 N	464.35 W	717.47	0.73
1930.00	42.91	320.00	1668.14	560.11 N	475.25 W	734.50	0.30
1955 00	43.05	319.73	1686.43	573.14 N	486.24 W	751.53	0.28