

**General information**

Wellbore name	2/4-16
Type	EXPLORATION
Purpose	WILDCAT
Status	SUSPENDED
Factmaps in new window	<a href="#">link to map</a>
Main area	NORTH SEA
Well name	2/4-16
Seismic location	BB-87-043A- SP. 10870
Production licence	<a href="#">146</a>
Drilling operator	Saga Petroleum ASA
Drill permit	680-L
Drilling facility	<a href="#">TREASURE SAGA</a>
Drilling days	182
Entered date	07.05.1991
Completed date	04.11.1991
Release date	04.11.1993
Publication date	18.01.2007
Purpose - planned	WILDCAT
Reentry	NO
Content	SHOWS
Discovery wellbore	NO
Kelly bushing elevation [m]	26.0
Water depth [m]	67.5
Total depth (MD) [m RKB]	4996.0
Final vertical depth (TVD) [m RKB]	4995.0
Maximum inclination [°]	3.1
Bottom hole temperature [°C]	172
Oldest penetrated age	MIDDLE JURASSIC
Oldest penetrated formation	BRYNE FM
Geodetic datum	ED50
NS degrees	56° 40' 39.41" N
EW degrees	3° 9' 2.9" E
NS UTM [m]	6281650.56
EW UTM [m]	509240.64
UTM zone	31
NPDID wellbore	1702



## Wellbore history

### General

Well 2/4-16 was drilled on the eastern margin of the Feda Graben North of the Albuskjell and Ekofisk Fields in the North Sea. Geologically the area consists of three sub-platforms. These are separated by large NW-SE striking normal faults down-faulted to the southwest and stepping down to the Feda Graben in the southern part of the block. The 2/4-16 well is located in the centre of the licence area on the same down faulted segment as the blowout wells 2/4-13, -14 and -15. Shallow gas was predicted from seismic anomalies at 10 different levels, and several precautions and actions were carried out to be able to handle potential gas-charged shallow gas.

The main objective for the well was to test the Late Jurassic, expected to contain a thick sand resting unconformable on the Middle Jurassic. This objective was the basis also for the 2/4-14 well. A secondary objective for the well was to penetrate the Middle Jurassic and 150 m into the Triassic sequence to test for possible hydrocarbon bearing sandstones sequences.

### Operations and results

Wildcat well was spudded with the semi-submersible installation Treasure Saga on 7 May 1991 and drilled to TD at 4996 m in the Middle Jurassic Bryne Formation. Shallow gas was detected at 522, 606, 628 and 675 m during drilling of 9 7/8" pilot hole. While drilling through very hard chalk rocks in the 12,6" section severe problems with the drilling equipment was experienced. The hard rocks also caused 8.5 days of delay due to ten washouts and fishing jobs. In addition the vibration together with high temperature caused twelve failures to the MWD tools, and also problems related to equipment deliveries. When drilling down to 4996 m the top drive saver sub had to be changed out due to a washout. During change of saver sub, the well started flowing uncontrolled up through the drill string, and the drill pipe was cut with the shear ram. Fifty-eight days were spent from shearing the pipe until temporary abandoning the well was decided. The well was drilled with spud mud down to 424 m, with gel mud from 424 m to 951 m, with KCl mud from 951 m to 4726 m, with a reduced ph water based mud from 4726 m to 4910 m, and with HI TEMP Polymer mud from 4910 m to TD.

A detailed study of the logs indicated no gas in the sand beds at 497 m and 832 m. Gas peaks were observed only on the MWD in the following thin sand beds from: 520.8 - 521.5 m, 604.5 - 606.2 m, 625 - 626 m and 675.5 - 676.1 m. This was later verified on the wire line logs, with a 3 m depth shift. This was interpreted as "original" gas, as similar observations were experienced at similar depths (520, 605 and 625 m in wells 2/4-13, 14 and 15).

There were no hydrocarbon indications from the logs in the well. The only indications from sidewall cores were some very weak shows in 3140 to 3155 m in the Balder Formation. Post-well organic geochemical analyses also reported migrant hydrocarbons in the interval 4638 to 4737 m in the Cromer Knoll Group.

The 2/4-16 well consisted of a 3341 m thick Cenozoic sequence. The Late Miocene to Pliocene Nordland Group was mainly composed of sand and clay down to 900 m. The rest of the Nordland Group and the Hordaland Group was dominated by claystones with thin beds of sandstone and limestone. The Late Paleocene Rogaland Group at 3140 m consisted of the characteristic tuffaceous claystone in the upper part. The middle part was dominated by claystone with traces of limestone/dolomite becoming claystone interbedded with limestone and marl downwards. The 1321 m thick chalk sequence of the Shetland Group rested unconformable on claystone and marl of the Early Cretaceous Cromer Knoll Group. The 140 m thick Tyne Group was dominated by claystones and siltstones with thin beds of limestone/dolomite. The final section above



TD was 119 m of Vestland Group siltstones and shales with minor sand and coal beds.

No conventional cores were cut and no wire line fluid samples taken. A total of 371 sidewall cores were attempted, of which 147 were recovered.

Due to the gas kick at 4996 m the well was terminated without having reached the Triassic target. The well was suspended on 4 November as a dry well with shows.

**Testing**

No drill stem test was performed

**Cuttings at the Norwegian Offshore Directorate**

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
430.00	4996.00

Cuttings available for sampling?	YES
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**Palynological slides at the Norwegian Offshore Directorate**

Sample depth	Depth unit	Sample type	Laboratory
2110.0	[m]	DC	RRI
2130.0	[m]	DC	RRI
2150.0	[m]	DC	RRI
2170.0	[m]	DC	RRI
2190.0	[m]	DC	RRI
2210.0	[m]	DC	RRI
2230.0	[m]	DC	RRI
2250.0	[m]	DC	RRI
2270.0	[m]	DC	RRI
2290.0	[m]	DC	RRI
2310.0	[m]	DC	RRI
2330.0	[m]	DC	RRI
2350.0	[m]	DC	RRI
2370.0	[m]	DC	RRI
2390.0	[m]	DC	RRI
2410.0	[m]	DC	RRI
2430.0	[m]	DC	RRI
2450.0	[m]	DC	RRI
2470.0	[m]	DC	RRI
2490.0	[m]	DC	RRI
2510.0	[m]	DC	RRI



2530.0	[m]	DC	RRI
2550.0	[m]	DC	RRI
2570.0	[m]	DC	RRI
2590.0	[m]	DC	RRI
2610.0	[m]	DC	RRI
2630.0	[m]	DC	RRI
2650.0	[m]	DC	RRI
2670.0	[m]	DC	RRI
2690.0	[m]	DC	RRI
2710.0	[m]	DC	RRI
2730.0	[m]	DC	RRI
2750.0	[m]	DC	RRI
2770.0	[m]	DC	RRI
2790.0	[m]	DC	RRI
2810.0	[m]	DC	RRI
2830.0	[m]	DC	RRI
2850.0	[m]	DC	RRI
2870.0	[m]	DC	RRI
2890.0	[m]	DC	RRI
2910.0	[m]	DC	RRI
2930.0	[m]	DC	RRI
2950.0	[m]	DC	RRI
2970.0	[m]	DC	RRI
2990.0	[m]	DC	RRI
3010.0	[m]	DC	RRI
3030.0	[m]	DC	RRI
3050.0	[m]	DC	RRI
3070.0	[m]	DC	RRI
3090.0	[m]	DC	RRI
3110.0	[m]	DC	RRI
3130.0	[m]	DC	RRI
3150.0	[m]	DC	RRI
3170.0	[m]	DC	RRI
3190.0	[m]	DC	RRI
3210.0	[m]	DC	RRI
3230.0	[m]	DC	RRI
3240.0	[m]	DC	RRI
3250.0	[m]	DC	RRI
3270.0	[m]	DC	RRI
3290.0	[m]	DC	RRI



3310.0 [m]	DC	RRI
3330.0 [m]	DC	RRI
3350.0 [m]	DC	RRI
3370.0 [m]	DC	RRI
3390.0 [m]	DC	RRI
3410.0 [m]	DC	RRI
3430.0 [m]	DC	RRI
4600.0 [m]	DC	RRI
4610.0 [m]	DC	RRI
4620.0 [m]	DC	RRI
4630.0 [m]	DC	RRI
4640.0 [m]	DC	RRI
4650.0 [m]	DC	RRI
4660.0 [m]	DC	RRI
4670.0 [m]	DC	RRI
4680.0 [m]	DC	RRI
4690.0 [m]	DC	RRI
4700.0 [m]	DC	RRI
4710.0 [m]	DC	RRI
4720.0 [m]	DC	RRI
4737.0 [m]	DC	RRI

**Lithostratigraphy**

Top depth [mMD RKB]	Lithostrat. unit
94	<a href="#">NORDLAND GP</a>
833	<a href="#">NO FORMAL NAME</a>
914	<a href="#">NO FORMAL NAME</a>
1798	<a href="#">HORDALAND GP</a>
3140	<a href="#">ROGALAND GP</a>
3140	<a href="#">BALDER FM</a>
3155	<a href="#">SELE FM</a>
3189	<a href="#">LISTA FM</a>
3238	<a href="#">VIDAR FM</a>
3254	<a href="#">LISTA FM</a>
3292	<a href="#">VÅLE FM</a>
3317	<a href="#">SHETLAND GP</a>
3317	<a href="#">EKOFISK FM</a>
3435	<a href="#">TOR FM</a>



3920	<a href="#">HOD FM</a>
4575	<a href="#">BLODØKS FM</a>
4598	<a href="#">HIDRA FM</a>
4638	<a href="#">CROMER KNOLL GP</a>
4638	<a href="#">RØDBY FM</a>
4678	<a href="#">TUXEN FM</a>
4714	<a href="#">ÅSGARD FM</a>
4737	<a href="#">TYNE GP</a>
4737	<a href="#">MANDAL FM</a>
4770	<a href="#">FARSUND FM</a>
4828	<a href="#">HAUGESUND FM</a>
4877	<a href="#">VESTLAND GP</a>
4877	<a href="#">BRYNE FM</a>

**Composite logs**

Document name	Document format	Document size [MB]
<a href="#">1702</a>	pdf	0.82

**Geochemical information**

Document name	Document format	Document size [MB]
<a href="#">1702_1</a>	pdf	2.89

**Documents - older Norwegian Offshore Directorate WDSS reports and other related documents**

Document name	Document format	Document size [MB]
<a href="#">1702_01 WDSS General Information</a>	pdf	1.02
<a href="#">1702_02 WDSS completion log</a>	pdf	0.27

**Documents - reported by the production licence (period for duty of secrecy expired)**





Document name	Document format	Document size [MB]
<a href="#">1702 2 4 16 COMPLETION REPORT AND LOG</a>	pdf	40.57

## Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL	2890	4650
CBL VDL GR	2890	4650
CST GR	2890	4650
CST GR	4634	4910
DIL LSS MSFL GR SP	409	948
DIS MSDL LSS GR AMS	4634	4910
DLL LSS MSFL GR SP	936	2899
DLL LSS MSFL GR SP	2890	4650
LDL CNL GR	409	948
LDL CNL GR AMS	2890	4650
LDL CNL GR AMS	4634	4910
LDL GR CAL	936	2899
MSCT	4634	4910
MWD - GR RES DIR TEMP	170	4910
RFT	409	948
RFT GR TLC AMS	4634	4910
SHDT GR AMS	2890	4650
SHDT GR AMS	4634	4910
VELOCITY	1000	4630

## Casing and leak-off tests

Casing type	Casing diam. [inch]	Casing depth [m]	Hole diam. [inch]	Hole depth [m]	LOT/FIT mud eqv. [g/cm3]	Formation test type
CONDUCTOR	30	167.0	36	170.0	0.00	LOT
INTERM.	24	410.0	30	424.0	1.44	LOT
INTERM.	18 5/8	937.0	24	951.0	1.85	LOT
INTERM.	14	2897.0	17 1/2	2912.0	1.93	LOT
INTERM.	10 3/4	4632.0	12 1/2	4650.0	2.20	LOT
INTERM.	7 5/8	4892.0	9 1/2	4910.0	2.35	LOT
OPEN HOLE		4963.0	6	4996.0	0.00	LOT





**Drilling mud**

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
424	1.05			WATER BASED	
431	1.27	11.0		WATER BASED	
770	1.27	4.0		WATER BASED	
951	1.25	14.0		WATER BASED	
968	1.39	31.0		WATER BASED	
1330	1.60	33.0		WATER BASED	
1335	1.60	31.0		WATER BASED	
1427	1.70	39.0		WATER BASED	
1703	1.72	63.0		WATER BASED	
1991	1.72	49.0		WATER BASED	
2164	1.72	66.0		WATER BASED	
2212	1.72	47.0		WATER BASED	
2488	1.72	52.0		WATER BASED	
2674	1.72	47.0		WATER BASED	
2897	1.70	37.0		WATER BASED	
2912	1.72	51.0		WATER BASED	
2927	1.72	40.0		WATER BASED	
2933	1.72	44.0		WATER BASED	
4089	1.67	23.0		WATER BASED	
4127	1.67	25.0		WATER BASED	
4155	1.67	25.0		WATER BASED	
4188	1.67	22.0		WATER BASED	
4205	1.67	24.0		WATER BASED	
4288	1.67	22.0		WATER BASED	
4305	1.67	23.0		WATER BASED	
4354	1.67	24.0		WATER BASED	
4427	1.67	25.0		WATER BASED	
4428	1.67	25.0		WATER BASED	
4441	1.67	25.0		WATER BASED	
4473	1.67	25.0		WATER BASED	
4491	1.72	33.0		WATER BASED	
4512	1.75	35.0		WATER BASED	
4547	1.75	28.0		WATER BASED	
4583	1.75	27.0		WATER BASED	



4594	1.80	29.0		WATER BASED	
4632	2.12	19.0		WATER BASED	
4650	1.85	29.0		WATER BASED	
4655	2.00	28.0		WATER BASED	
4697	2.02	31.0		WATER BASED	
4726	2.06	25.0		WATER BASED	
4727	2.06	26.0		WATER BASED	
4742	2.10	25.0		WATER BASED	
4754	2.12	28.0		WATER BASED	
4771	2.12	23.0		WATER BASED	
4803	2.12	24.0		WATER BASED	
4838	2.12	22.0		WATER BASED	
4893	2.12	24.0		WATER BASED	
4910	2.12	21.0		WATER BASED	
4914	2.12	18.0		WATER BASED	
4917	2.12	18.0		WATER BASED	
4924	2.20	48.0		WATER BASED	
4935	2.20	33.0		WATER BASED	
4951	2.12	29.0		WATER BASED	
4996	2.20	33.0		WATER BASED	

## Pressure plots

The pore pressure data is sourced from well logs if no other source is specified. In some wells where pore pressure logs do not exist, information from Drill stem tests and kicks have been used. The data has been reported to the NPD, and further processed and quality controlled by IHS Markit.

Document name	Document format	Document size [MB]
<a href="#">1702 Formation pressure (Formasjonstrykk)</a>	pdf	0.22

