General information

Wellbore name	16/1-15
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Press release	link to press release
Factmaps in new window	link to map
Main area	NORTH SEA
Field	EDVARD GRIEG
Discovery	16/1-8 Edvard Grieg
Well name	16/1-15
Seismic location	LN 0902 R10 inline 1488 & crossline 5496
Production licence	338
Drilling operator	Lundin Norway AS
Drill permit	1334-L
Drilling facility	BREDFORD DOLPHIN
Drilling days	74
Entered date	22.01.2011
Completed date	05.04.2011
Release date	05.04.2013
Publication date	05.04.2013
Purpose - planned	WILDCAT
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	EARLY CRETACEOUS
1st level with HC, formation	INTRA ÅSGARD FM SS
2nd level with HC, age	PRE-DEVONIAN
2nd level with HC, formation	BASEMENT
Kelly bushing elevation [m]	25.0
Water depth [m]	111.0
Total depth (MD) [m RKB]	2150.0
Final vertical depth (TVD) [m RKB]	2150.0
Maximum inclination [°]	2.4
Bottom hole temperature [°C]	94
Oldest penetrated age	PRE-DEVONIAN
Oldest penetrated formation	BASEMENT
Geodetic datum	ED50
NS degrees	58° 52' 23.82'' N

EW degrees	2° 15' 41.3'' E
NS UTM [m]	6526327.33
EW UTM [m]	457412.51
UTM zone	31
NPDID wellbore	6517

Wellbore history

General

Well 16/1-15 was drilled on the western side of the Utsira High in the North Sea. The objective was to test Jurassic/Triassic sandstones prognosed at 1925 in the Tellus prospect north of the Luno Discovery. The Luno Discovery has later been officially named the Edvard Grieg Field. The Tellus prospect was separated from Luno by a fault zone trending NW SE.

Operations and results

Wildcat well 16/1-15 was spudded with the semi-submersible installation Bredford Dolphin on 22 January 2011 and drilled to TD at 2150 m, 230 m into pre-Devonian basement rock. Due to possible shallow gas sands a precautionary 9 7/8" pilot hole was drilled down to 585 m. Only water filled sands were seen. Several incidents interrupted the progress where the most serious was a failed 20" casing cement job. The other incidents were related to the BOP and a stuck wire line string. The well was drilled with seawater and sweeps down to 585 m, and with Performadril mud from 585 m to TD.

The well proved an oil column of 48 metres in a thin, Intra Åsgard Formation Sandstone directly overlying weathered and porous / fractured basement. Top of fractured basement was at 1920 m. No Triassic or Jurassic sediments were identified in the well. The Intra Åsgard Formation Sandstone is a chalk arenite, 2.7m thick, with excellent reservoir properties. An oil/water contact was established at approximately 1965 m (1940 m TVD MSL). The acquired pressure, geochemistry and PVT data supports communication between the Luno and Tellus Discoveries, making the Tellus area a northern extension of the Luno Discovery.

Intermittent oil shows were described on core 1 immediately above the reservoir in a thin Hod Formation limestone. Below OWC shows were described on cores down to 1976 m. Further weak shows were described on cuttings down to 1997 m.

A total of 61 meter core was recovered in four cores from 1915 to 1976 m (all core depths 2.15 m deeper than logger's depth) in the Hod Formation, Intra Åsgard Formation Sandstones and Basement. The overall recovery rate was 85.2%. Fluid sampling, water and oil, was performed using an extra-large diameter MDT-probe and dual packer. Samples were taken in the oil bearing zone at 1918.99 m, 1921.47 m, 1923.81 m, 1932.96 m,1937.23 m, 1952.43 m, 1959.62 m, and 1967.04 m. A water sample was taken at 2030.52 m. The oil samples show an under saturated light oil similar to the oil found in the Luno Field. The typical GOR from the MDT samples was 125 Sm3/Sm3, the oil density was 0.72 g/cm3 and the gas gravity was 0.95 (air=1).

The well was plugged back to the 20" casing shoe on 5 April 2011 and a sidetrack 16/1-15 A was prepared. Well 16/1-15 is classified as an oil appraisal.

Testing

Two drill stem tests were performed.

DST 1 tested the interval 1926 to 1960 m in the basement. After a slow initial production,

the perforations were cleaned up and the well produced with a continuous flow to surface with an oil-rate of 105 sm3/d on a 40/64" choke and a bottom-hole pressure of 56.6 bar. No water was produced. This was the first successful full-scale production test of a reservoir consisting of cracked and porous bedrock on the Norwegian Continental Shelf.

DST 2 tested the interval 1917 to 1920 m in the Intra Åsgard Formation Sandstone. The main flow produced 470 sm3/d on a 36/64" choke with a bottom-hole pressure of 179.7 bar. No water was produced. The average GOR was 90 Sm3/Sm3. The maximum temperature at reference depth 1916.9 m was 84.5 deg C.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
590.00	2150.28

Cuttings available for sampling?	YES

Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	1915.0	1931.2	[m]
2	1931.2	1937.1	[m]
3	1946.0	1960.1	[m]
4	1960.3	1976.2	[m]

Total core sample length [m]	52.1
Cores available for sampling?	YES

Oil samples at the Norwegian Offshore Directorate

Test type	Bottle number	Top depth MD [m]	Bottom depth MD [m]	Fluid type	Test time	Samples available
DST		0.00	0.00			YES
MDT		2067.80	0.00	OIL	07.05.2011 - 00:00	NO

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
136	NORDLAND GP
774	UTSIRA FM
870	NO FORMAL NAME
944	HORDALAND GP
944	SKADE FM
1189	NO FORMAL NAME
1553	GRID FM
1642	NO FORMAL NAME
1766	ROGALAND GP
1766	BALDER FM
1778	SELE FM
1800	LISTA FM
1879	VÅLE FM
1889	SHETLAND GP
1889	EKOFISK FM
1906	TOR FM
1913	HOD FM
1915	CROMER KNOLL GP
1915	ÅSGARD FM
1917	INTRA ÅSGARD FM SS
1920	BASEMENT

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	1926	1960	15.8
2.0	1917	1920	15.8

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				
2.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	105				
2.0	620				

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CMR XPT EDTC	1872	2146
FMI PPC MSIP PPC ECRD LEH QT	1466	1872
FMI PPC MSIP PPC ECRD LEH QT	1872	2149
HRLA PEX ECS HNGS	1872	2144
MDT GR LEH QT	1872	2149
MRX LEH QT	1872	2149
MWD LWD - GR RES DEN NEU AC PWD	557	2147
MWD LWD - GR RES PWD DIR	131	582
VSP GR	136	2085

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	214.0	36	214.0	0.00	LOT
SURF.COND.	20	576.0	26	585.0	1.70	LOT
PILOT HOLE		585.0	9 7/8	585.0	0.00	LOT
INTERM.	9 5/8	1874.0	12 1/4	1880.0	1.91	LOT
LINER	7	2148.0	8 1/2	2150.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
517	1.35	16.0		Polymer Mud	
585	1.29	27.0		PERFORMADRIL	
585	1.30	30.0		PERFORMADRIL	
585	1.30	30.0		Performadril WBM	
619	1.30	27.0		PERFORMADRIL	

635	1.35	16.0		Polymer Mud	
1880	1.35	41.0		PERFORMADRIL	
1914	1.20	29.0		PERFORMADRIL	
1931	1.20	27.0		PERFORMADRIL	
1939	1.20	26.0		PERFORMADRIL	
1960	1.20	26.0		PERFORMADRIL	
1976	1.20	27.0		PERFORMADRIL	
2150	1.20			sodium chloride brine	
2150	1.20	29.0		PERFORMADRIL	

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]
6517_Formation_pressure_(Formasjonstrykk)	pdf	0.22