General information

Wellbore name	16/4-9 S
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	SOLVEIG
Discovery	16/4-6 S Solveig
Well name	16/4-9
Seismic location	LN0902R10 3D :inline 3746 crossline 140
Production licence	359
Drilling operator	Lundin Norway AS
Drill permit	1558-L
Drilling facility	BREDFORD DOLPHIN
Drilling days	64
Entered date	14.06.2015
Completed date	16.08.2015
Release date	16.08.2017
Publication date	16.08.2017
Purpose - planned	WILDCAT
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	TRIASSIC
1st level with HC, formation	SKAGERRAK FM
Kelly bushing elevation [m]	25.0
Water depth [m]	100.0
Total depth (MD) [m RKB]	2358.0
Final vertical depth (TVD) [m RKB]	2330.0
Maximum inclination [°]	13
Bottom hole temperature [°C]	89
Oldest penetrated age	TRIASSIC
Oldest penetrated formation	SKAGERRAK FM
Geodetic datum	ED50
NS degrees	58° 42' 22.76'' N
EW degrees	2° 9' 55.07'' E
NS UTM [m]	6507802.03

EW UTM [m]	451635.06
UTM zone	31
NPDID wellbore	7631

Wellbore history

General

Well 16/4-9 S was drilled to appraise the 16/4-6 S Luno II discovery on the Utsira High southwest of the Johan Sverdrup Field in the North Sea. The well should prove extension of Triassic/Jurassic reservoir sandstone and verify pressure communication towards the Luno II C segment northwest of the 16/4-6 S discovery well.

Operations and results

Appraisal well 16/4-9 S was spudded with the semi-submersible installation Bredford Dolphin on 14 June 2015 and drilled to TD at 2358 m (2330 m TVD) in the Triassic Skagerrak Formation. The well was drilled S-shaped, building angle from 602 m to a sail angle of ca 12.9° in the interval 1000 m to 1750 m and back to vertical again from ca 1970 m. No significant problem was encountered in the operations. The well was drilled with seawater and high viscosity pills down to 6011 m and with Aquadril mud from 6011 m to TD.

Top reservoir Skagerrak Formation sandstones was penetrated at 1983 m. The reservoir consisted of relatively homogenous sandstone overlain by a more conglomeratic sequence. It held an oil column of ca 25 m down to a clean OWC at 2008.8 m (1981 m TVD). The oil is a mix of biodegraded residual oil and a fresh light oil. The reservoir is 4 bar depleted compared to well 16/4-6 S. No shows were observed above the reservoir. Below the reservoir, good oil shows were recorded on cores down to 2042 m, and weaker shows were seen down to 2053 m. No shows were seen below 2053 m.

Three cores were cut from 1985 m to 2066.2 m with close to 100% recovery. The core depth was 0.775 m deeper than log depth for all three cores. MDT fluid samples were taken at 1984.5 m (oil), 2000.1 m (oil), 2006.66 m (oil and water), and 2030.1 m (water).

The well was permanently abandoned on 16 August 2015 as an oil appraisal well.

Testing

One production test (DST) was performed from the interval 1981 to 2001.9 m. The DST produced on average 136 Sm3 oil and 23400 Sm3 gas/day through a 28/64" choke (main flow). The GOR was 172 Sm3/Sm3. The maximum downhole temperature in the DST was 78.5 °C.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
620.00	2358.00

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	1985.0	2011.4	[m]
2	2012.0	2040.2	[m]
3	2040.2	2065.6	[m]

Total core sample length [m]	80.0
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		2002.00	1981.00	OIL	03.08.2015 - 01:25	YES
DST		2002.00	1981.00	OIL	03.08.2015 - 02:45	YES

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
125	NORDLAND GP
735	UTSIRA FM
984	HORDALAND GP
995	SKADE FM
1245	HORDALAND GP
1663	GRID FM
1670	HORDALAND GP
1705	GRID FM
1708	HORDALAND GP
1871	ROGALAND GP
1871	BALDER FM
1882	SELE FM
1911	LISTA FM
1969	VÅLE FM
1975	SHETLAND GP
1975	EKOFISK FM

1977	TOR FM
1982	HOD FM
1984	HEGRE GP
1984	SKAGERRAK FM

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	1981	2002	11.1

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				78

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	136	23400			172

Logs

Log type	Log top depth [m]	Log bottom depth [m]
ADT CMR ON TLC	0	0
FMI HRLA PEX HNGS GR ON TLC	0	0
FMI ON TLC	0	0
GR RES DIR	1941	1984
GR RES DIR CAL DEN NEU SON	1937	2357
MDT ON TLC	0	0
MWD - DIR PWD	192	596
MWD - ECD	1937	2357
MWD - GR DIR PWD	92	129
MWD - GR RES DIR CAL DEN NEU SON	608	1941
MWD - GR RES SIR PWD SON	192	608
XLROCK ON TLC	0	0

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	203.2	36	207.5	0.00	
SURF.COND.	20	602.5	26	609.0	1.55	FIT
PILOT HOLE		611.0	9 7/8	611.0	0.00	
INTERM.	9 5/8	1937.2	12 1/4	1945.0	1.81	LOT
LINER	7	2096.2	8 1/2	2096.2	0.00	
OPEN HOLE		2358.0	8 1/2	2358.0	0.00	

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
208	1.50	1.0		Glydril	
208	1.40	1.0		Glydril	
611	1.25	1.0		Spud Mud	
971	1.35	13.0		Water Based	
1409	1.40	19.0		Water Based	
1945	1.20	14.0		Water Based	
1945	1.40	20.0		Water Based	
2100	1.20	20.0		Water Based	
2358	1.20	20.0		Water Based	
2358	1.20	13.0		Water Based	