



Generell informasjon

Brønnbane navn	16/3-5
Type	EXPLORATION
Formål	APPRAISAL
Status	P&A
Pressemelding	lenke til pressemelding
Faktakart i nytt vindu	lenke til kart
Hovedområde	NORTH SEA
Felt	JOHAN SVERDRUP
Funn	16/2-6 Johan Sverdrup
Brønn navn	16/3-5
Seismisk lokalisering	LN0902 : inline 5019 & crossline 3639
Utvinningstillatelse	501
Boreoperatør	Lundin Norway AS
Boretillatelse	1419-L
Boreinnretning	BREDFORD DOLPHIN
Boredager	63
Borestart	04.01.2013
Boreslutt	07.03.2013
Plugget og forlatt dato	07.03.2013
Frigitt dato	07.03.2015
Publiseringsdato	20.05.2015
Opprinnelig formål	APPRAISAL
Gjenåpnet	NO
Innhold	OIL
Funnbrønnbane	NO
1. nivå med hydrokarboner, alder	LATE JURASSIC
1. nivå med hydrokarboner, formasjon.	INTRA DRAUPNE FM SS
2. nivå med hydrokarboner, alder	PERMIAN
2. nivå med hydrokarboner, formasjon	ZECHSTEIN GP
Avstand, boredekk - midlere havflate [m]	25.0
Vanndybde ved midlere havflate [m]	115.0
Totalt målt dybde (MD) [m RKB]	2050.0
Totalt vertikalt dybde (TVD) [m RKB]	2050.0
Maks inklinasjon [°]	0.7



Temperatur ved bunn av brønnbanen [°C]	86
Eldste penetrerte alder	PERMIAN
Eldste penetrerte formasjon	ROTLIEGEND GP
Geodetisk datum	ED50
NS grader	58° 46' 31.59" N
ØV grader	2° 42' 18.59" E
NS UTM [m]	6515235.00
ØV UTM [m]	482950.01
UTM sone	31
NPDID for brønnbanen	7046

Brønnhistorie

**General**

Well 16/3-5 is an appraisal well on the southeaster part of the Sverdrup Field on the Utsira High in the North Sea. The objectives were to determine presence and thickness of the Late Jurassic Intra-Draupne Formation sandstone in a representative part of the Avaldsnes High (informal basement structure), and to investigate the reservoir properties of the Permian Rotliegend Group and Zechstein Group.

Operations and results

Appraisal well 16/3-5 was spudded with the semi-submersible installation Bredford Dolphin on 4 January 2013 and drilled to TD at 2050 m in the Permian Rotliegend Group. No significant problem was encountered in the operations. The well was drilled with seawater down to 700 m and with Performadril water based mud from 700 m to TD.

The well encountered top Draupne Formation shales at 1909 m and the Intra-Draupne Formation sandstone at 1918 m. The Draupne shales are immature but has very good source rock potential with TOC around 7-8 % and Hydrogen Index around 540 mg HC/g TOC. The Intra-Draupne sandstone is 14 m thick and rested on Permian Zechstein Group carbonates. An oil column of approximately 30 meters was found in the Intra Draupne Sandstone and Permian carbonate. The well proves an excellent development of the Late Jurassic sandstone in the southern part of the Avaldsnes High and the reservoir level was encountered a bit shallower than predicted. The Permian carbonates, mainly limestone, had varying reservoir quality with the best quality principally located in open and partially cemented vugs, plus in the fractures. The well results show an oil down-to situation and consequently no oil/water contact was encountered. The oil bearing Zechstein limestones are in pressure communication with the overlying Draupne sandstone.

Two cores were cut from 1912 to 1950.5 m with ca 97% recovery in both. The cored interval includes the lower part of the Draupne Formation shales, the whole Intra-Draupne sandstone unit, one m of Triassic sediments, and 18.5 m of Permian limestones. MDT oil samples were taken at 1920.1 m, 1929.5 m, and 1943.6 m. MDT water samples were taken at 1959.4 m.

The well was permanently abandoned on 7 March 2013 as an oil appraisal well.

Testing

One commingled production test from both Draupne sandstones and Zechstein carbonates was performed in the well. DST 1A tested only the lower zone in the Zechstein Group carbonates from 1937 to 1945 m. This zone did not produce oil to surface, but a rate of 2-3 Sm³/day was estimated based on volumes of base oil to tank.

DST1 B tested both zones: 1937 to 1945 m in Zechstein plus 1918 to 1931.3 m in the Intra-Draupne Formation Sandstone. The Intra-Draupne sandstone showed extremely good reservoir properties as well as no indications of pressure barriers. This zone produced 740 Sm³ oil and 17000 Sm³ gas /day through a 40/64" choke. The GOR was 17.5 Sm³/Sm³, the oil density was 0.89 g/cm³ and the gas gravity was 0.79 (air = 1). The H₂S and CO₂ contents in the gas were ca 0.5 ppm and ca 0.4%, respectively. The maximum DST temperature at the end of the Main flow was 79.9 °C.

Borekaks i Sokkeldirektoratet

Borekaksprøve, topp dybde [m]	Borekaksprøve, bunn dybde [m]
710.00	2049.00



Borekaks tilgjengelig for prøvetaking?	YES
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Borekjerne i Sokkeldirektoratet

Kjerneprøve nummer	Kjerneprøve - topp dybde	Kjerneprøve - bunn dybde	Kjerneprøve dybde - enhet
1	1912.0	1933.3	[m]
2	1934.0	1950.1	[m]

Total kjerneprøve lengde [m]	37.4
Kjerner tilgjengelig for prøvetaking?	YES

Oljeprøver i Sokkeldirektoratet

Test type	Flaske nummer	Topp dyp MD [m]	Bunn dyp MD [m]	Væske type	Test tidspunkt	Prøver tilgjengelig
MDT		1943.60	0.00	OIL	03.02.2013 - 00:00	NO
MDT		0.00	1920.10	OIL	03.02.2013 - 00:00	NO

Litostratigrafi

Topp Dyb [mMD RKB]	Litostrat. enhet
140	NORDLAND GP
788	UTSIRA FM
864	UNDIFFERENTIATED
899	HORDALAND GP
899	SKADE FM
957	NO FORMAL NAME
1326	NO FORMAL NAME
1358	ROGALAND GP
1358	BALDER FM
1385	SELE FM
1393	LISTA FM
1465	VÅLE FM
1493	SHETLAND GP
1493	EKOFISK FM



1499	TOR FM
1572	HOD FM
1691	TRYGGVASON FM
1699	BLODØKS FM
1729	SVARTE FM
1769	CROMER KNOLL GP
1769	RØDBY FM
1855	SOLA FM
1875	ÅSGARD FM
1910	VIKING GP
1910	DRAUPNE FM
1918	INTRA DRAUPNE FM SS
1931	HEGRE GP
1932	ZECHSTEIN GP
1966	KUPFERSCHIEFER FM
1967	ROTLIEGEND GP

Borestrengtester (DST)

Test nummer	Fra dybde MD [m]	Til dybde MD [m]	Reduksjonsven til størrelse [mm]
1.0	1918	1945	16.0

Test nummer	Endelig avstengningstrykk [MPa]	Endelig strømningstrykk [MPa]	Bunnhullstrykk [MPa]	Borehullstemperatur [°C]
1.0				

Test nummer	Olje produksjon [Sm3/dag]	Gass produksjon [Sm3/dag]	Oljetetthet [g/cm3]	Gasstygde rel. luft	GOR [m3/m3]
1.0	740	16000			17

Logger

Type logg	Topp dyp for logg [m]	Bunn dyp for logg [m]
FMI PPC MSIP PPC EDTC	1425	1955
GR CCL	1794	1833
MDT	1958	2024



MSCT GR	1059	2044
MSCT GR	1961	1965
MWD - DIR PWD GR RES	140	706
MWD - DIR PWD GR RES	1950	2049
MWD - DIR PWD GR RES DEN NEU SON	695	1957
PEX HRLA ECS HNGS	1926	2045
USIT CBL	1357	1950
VSP	532	2030

Foringsrør og formasjonsstyrketester

Type utforing	Utforing diam. [tommer]	Utforing dybde [m]	Brønnbane diam. [tommer]	Brønnbane dyp [m]	LOT/FIT slam eqv. [g/cm3]	Type formasjonstest
CONDUCTOR	30	218.0	36	220.0	0.00	
SURF.COND.	20	692.0	26	698.0	1.68	LOT
PILOT HOLE		706.0	9 7/8	706.0	0.00	
INTERM.	9 5/8	1873.0	12 1/4	1882.0	1.67	LOT
LINER	7	1957.0	8 1/2	1958.0	0.00	
OPEN HOLE		2050.0	6	2050.0	0.00	