

**General information**

Wellbore name	31/2-16 S
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Field	TROLL
Discovery	31/2-1 (Troll Vest)
Well name	31/2-16
Seismic location	NH 8901 - 1145 SP. 336
Production licence	054
Drilling operator	Norsk Hydro Produksjon AS
Drill permit	622-L
Drilling facility	DEEPSEA BERGEN
Drilling days	92
Entered date	27.09.1989
Completed date	27.12.1989
Release date	27.12.1991
Publication date	18.12.2008
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL/GAS
Discovery wellbore	NO
1st level with HC, age	LATE JURASSIC
1st level with HC, formation	SOGNEFJORD FM
Kelly bushing elevation [m]	23.0
Water depth [m]	331.0
Total depth (MD) [m RKB]	2390.0
Final vertical depth (TVD) [m RKB]	1587.0
Maximum inclination [°]	92.8
Bottom hole temperature [°C]	40
Oldest penetrated age	LATE JURASSIC
Oldest penetrated formation	SOGNEFJORD FM
Geodetic datum	ED50
NS degrees	60° 46' 0.2" N
EW degrees	3° 25' 26.9" E
NS UTM [m]	6737038.10
EW UTM [m]	523108.99



UTM zone	31
NPDID wellbore	1453

Wellbore history

General

Well 31/2-16 S was drilled as an appraisal in the Troll-West Oil province in the Northern North Sea. It was located on the crestal part of the Oil Province close to well 31/2-5. The primary objective was to drill hole and prepare for a long term production from a horizontal well drilled 5 m above the oil/water contact in the 23.5 m thick oil column. The length of the horizontal section should preferably be 500 m.

Operations and results

Appraisal well 31/2-16 S was spudded with the semi-submersible installation Deepsea Bergen on 27 September 1989 and drilled to TD at 2390 m (1587 m TVD RKB) in the Late Jurassic Sognefjord Formation. The well was drilled vertical down to 1118 m in the 17 1/2" section and kicked off from there, building angle up to a horizontal well path from ca 1950 m. Problems with tight hole, lost circulation and hard formation (stringers) were encountered repeatedly in the 17 1/2 and 12 1/4" sections from 1015 to 1891 m. The well was drilled with sea water and hi-vis pills down to 1015 m and with Versaport oil based mud from 1015 m to 1891 m, and with a super-saturated NaCl / polymer mud from 1891 m to TD. During well completion and preparation for production testing the screen-packer stuck at 570 m. Close to eight days were lost in milling and retrieving the fish before normal operations could be resumed.

The Sognefjord Formation was encountered at 1659 m (1533 m TVD RKB). The established gas/oil contact in the Troll Field is at 1547 m MSL TVD, which is 1.5 m deeper than observed in this well. This 1.5 m is within the uncertainty of the TVD calculations, and a common gas/oil contact is assumed.

No conventional or side wall cores were cut. No wire line pressure tests or fluid samples were taken. Apart from runs 1A, wire line logging was performed by the use of pipe conveyed Logging Systems. MWD was the only deep resistivity measuring device through the whole well.

After drilling to TD the well was completed with 502 m 6 5/8" prepacked screens in the Sognefjord Formation reservoir, from 2390 to 1888 m (1587 - 1586 m RKB TVD). The well was completed on 27 December 1989 as an oil and gas appraisal. It was subsequently reclassified to test production well 31/2-T-16 S. After the test production it was again re-classified to development well 31/2-F-5 H.

Testing

A clean-up flow was conducted as part of the 31/2-16 S well completion. During this flow one bottom hole fluid sample and three separator PVT-sets (1 x oil/2 x gas) samples were taken.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
1030.00	1890.00



Cuttings available for sampling?	YES
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Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
377	NORDLAND GP
782	HORDALAND GP
1358	ROGALAND GP
1358	BALDER FM
1413	SELE FM
1453	LISTA FM
1645	VÅLE FM
1650	SHETLAND GP
1659	VIKING GP
1659	SOGNEFJORD FM

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

Document name	Document format	Document size [MB]
1453_01_WDSS_General_Information	pdf	0.28
1453_02_WDSS_completion_log	pdf	0.13

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

Document name	Document format	Document size [MB]
1453_31_2_16_S_COMPLETION_REPORT_AND_LOG	pdf	17.08

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	1888	2384	50.8





Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0	4.000		14.700	67

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	1990	89444	0.882	0.638	

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL CDL GR CCL	354	1604
CBL VDL GR CCL - MISRUN	1404	1885
CDL CN GR	1599	1795
CDL CN GR - MISRUN	1566	1900
GYRO	1465	1880
GYRO	1470	1880
GYRO CCL	354	1590
MLL CDL CN GR	1885	2390
MWD - GR CDR CDN DIR	1888	1969
MWD - GR CDR DIR	1020	1905
MWD - GR CDR DIR	1888	2390
MWD - GR RES SN DIR	354	1020
PLS	1850	2345

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	439.0	36	439.0	0.00	LOT
INTERM.	20	1003.0	26	1020.0	1.79	LOT
INTERM.	13 3/8	1601.0	17 1/2	1607.0	1.45	LOT
INTERM.	9 5/8	1888.0	12 1/4	1891.0	0.00	LOT
LINER	7	2390.0	8 1/2	2390.0	0.00	LOT

Drilling mud



Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
439	1.05			WATER BASED	29.09.1989
623	1.25	11.0	6.0	WATER BASED	08.07.1991
1020	1.34	54.0	15.0	OIL BASED	09.10.1989
1020	0.00			WATER BASED	03.10.1989
1020	0.00			WATER BASED	05.10.1989
1020	1.34	52.0	15.0	OIL BASED	06.10.1989
1020	1.34	51.0	15.0	OIL BASED	09.10.1989
1023	1.36	53.0	14.0	OIL BASED	09.10.1989
1315	1.41	47.0	11.0	OIL BASED	10.10.1989
1315	1.41	44.0	11.0	OIL BASED	12.10.1989
1315	1.41	46.0	11.0	OIL BASED	11.10.1989
1321	1.40	42.0	10.0	OIL BASED	13.10.1989
1370	1.41	46.0	11.0	OIL BASED	16.10.1989
1370	1.41	50.0	11.0	OIL BASED	16.10.1989
1375	1.39	36.0	9.0	OIL BASED	16.10.1989
1398	1.39	35.0	8.0	OIL BASED	18.10.1989
1403	1.35	31.0	8.0	OIL BASED	18.10.1989
1513	1.35	44.0	13.0	OIL BASED	19.10.1989
1607	1.35	48.0	14.0	OIL BASED	23.10.1989
1607	1.35	37.0	9.0	OIL BASED	23.10.1989
1607	1.35	48.0	14.0	OIL BASED	23.10.1989
1607	1.35	37.0	9.0	OIL BASED	23.10.1989
1607	1.25	26.0	4.0	OIL BASED	24.10.1989
1607	1.35	38.0	9.0	OIL BASED	23.10.1989
1607	1.35	38.0	9.0	OIL BASED	23.10.1989
1610	1.26	31.0	7.0	OIL BASED	25.10.1989
1679	1.25	33.0	6.0	OIL BASED	27.10.1989
1743	1.26	39.0	8.0	OIL BASED	27.10.1989
1774	1.27	36.0	9.0	OIL BASED	30.10.1989
1802	1.26	33.0	8.0	OIL BASED	30.10.1989
1804	1.26	31.0	7.0	OIL BASED	30.10.1989
1861	1.25	12.0	9.0	WATER BASED	09.11.1989
1873	1.26	33.0	7.0	OIL BASED	31.10.1989
1890	1.23	14.0	11.0	WATER BASED	06.11.1989
1890	1.24	13.0	11.0	WATER BASED	07.11.1989
1891	1.27	31.0	7.0	OIL BASED	01.11.1989
1891	1.27	34.0	7.0	OIL BASED	02.11.1989



1891	1.27	34.0	7.0	OIL BASED	03.11.1989
1891	1.27	34.0	7.0	OIL BASED	06.11.1989
1891	1.23	14.0	11.0	WATER BASED	06.11.1989
1905	1.24	13.0	13.0	WATER BASED	09.11.1989
1905	1.25	13.0	12.0	WATER BASED	13.11.1989
1905	1.25	13.0	12.0	WATER BASED	13.11.1989
1905	1.25	13.0	11.0	WATER BASED	10.11.1989
1905	1.25	13.0	13.0	WATER BASED	13.11.1989
2000	1.25	13.0	13.0	WATER BASED	14.11.1989
2033	1.26	14.0	12.0	WATER BASED	15.11.1989
2056	1.25	14.0	12.0	WATER BASED	16.11.1989
2183	1.25	13.0	12.0	WATER BASED	17.11.1989
2317	1.26	15.0	13.0	WATER BASED	20.11.1989
2390	1.25	14.0	16.0	WATER BASED	27.11.1989
2390	1.15	11.0	6.0	WATER BASED	04.12.1989
2390	1.15	11.0	6.0	WATER BASED	11.12.1989
2390	1.05	11.0	6.0	WATER BASED	20.12.1989
2390	1.05	11.0	6.0	WATER BASED	21.12.1989
2390	1.05	11.0	6.0	WATER BASED	22.12.1989
2390	1.25	12.0	8.0	WATER BASED	01.07.1991
2390	1.25	12.0	8.0	WATER BASED	01.07.1991
2390	1.25	9.0	6.0	WATER BASED	01.07.1991
2390	1.25	11.0	7.0	WATER BASED	05.07.1991
2390	1.26	9.0	5.0	WATER BASED	08.07.1991
2390	1.26	15.0	14.0	WATER BASED	20.11.1989
2390	1.25	10.0	6.0	WATER BASED	20.11.1989
2390	1.25	12.0	7.0	WATER BASED	21.11.1989
2390	1.25	12.0	7.0	WATER BASED	22.11.1989
2390	1.25	16.0	18.0	WATER BASED	23.11.1989
2390	1.25	16.0	18.0	WATER BASED	24.11.1989
2390	1.25	15.0	16.0	WATER BASED	27.11.1989
2390	1.25	14.0	16.0	WATER BASED	27.11.1989
2390	1.25	10.0	8.0	WATER BASED	28.11.1989
2390	1.25	13.0	12.0	WATER BASED	29.11.1989
2390	1.25	11.0	7.0	WATER BASED	30.11.1989
2390	1.25	11.0	6.0	WATER BASED	01.12.1989
2390	1.25	11.0	6.0	WATER BASED	04.12.1989
2390	1.15	11.0	6.0	WATER BASED	04.12.1989
2390	1.05	11.0	6.0	WATER BASED	11.12.1989
2390	1.05	11.0	6.0	WATER BASED	11.12.1989



2390	1.15	11.0	6.0	WATER BASED	13.12.1989
2390	1.05	11.0	6.0	WATER BASED	13.12.1989
2390	1.05	11.0	6.0	WATER BASED	14.12.1989
2930	1.05	11.0	6.0	WATER BASED	15.12.1989
2930	1.05	11.0	6.0	WATER BASED	18.12.1989
2930	1.05	11.0	6.0	WATER BASED	18.12.1989
2930	1.05	11.0	6.0	WATER BASED	18.12.1989
2930	1.05	11.0	6.0	WATER BASED	19.12.1989